Version 0.9 What follows are the beginnings of my critique and study of all the works I was able to gather generated by Carey Reams when explaining his pioneering agricultural concepts and by his students when they attempted the same. My thought as I go into this project is that if I can critique, compare, and explore 200-300 of the most common terms used by Reams we should have a fair idea of what he wanted us to understand. If you are seeing these words and feel you have something positive to contribute, please know that it will be welcomed.

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PREFACE TO THE REAMS-AG CRITIQUE

A great deal has been written about Carey Reams agriculture, i.e., Reams-Ag, both before and after he left this earth in 1985. The goal of this continuing critique is to track down as much direct Reams-related agricultural material as possible, including books, audio files, class handouts, and transcripts. The information can then be arranged or rearranged in a meaningful array and in such a manner that his basic concepts and tenets show through clearly.

While it is possible, even ordinary, to teach or explain Reams' original agronomic thoughts by studying those materials or books and then writing a new book, that is not the intent here. Instead, this manual is designed from the start to simply extract short excerpts about hundreds of terms from almost two dozen RBTI-slanted source documents and hold them up to historical and modern light for comparison. Perhaps then we can determine which author, lecturer, or student "got it," which almost "got it," and which might not have understood at all.

"RBTI?" Anyone reviewing this manual should not go much further until they understand at least something about the Reams Biological Theory of Ionization. While the purpose here is not to boldly teach the theory, there is no harm in saying that at its core, Reams taught that in higher organisms cells are constructed, or ionized---ion by ion---into place with no acceptance of mainstream chatter that cells divide. As far as RBTI is concerned, the much-promulgated division process is left to single-celled organisms, if they are freely living and not connected to the nervous system or, described another way they are corpuscles of a higher organism. Ionization proceeds at a speed set by energy supply and also availability of building materials, i.e., minerals.

Reams often opened his lectures by making a strong point that it all starts with energy, energy itself. He then explained that at an atomic level particles interact in such a way that inherent energy is "lost" as those particles tend to reach a synchronization, or resting point. "Lost" is italicized here because there is no loss at all. Living organisms, plant or animal, stand at the ready to harvest that freed energy for their own purposes---to carry forth their life and anatomy to its full genetic potential. Many students still find the original Reams class handout that shows rotating and counter-rotating ions quite illuminating when exploring the idea of harvesting energy. For that reason the diagrams are reproduced on the back of this manual.

Reams' agricultural genius started showing when he perfected a way to assign energy availability to fertilizers and other elements at an ionic level. The computational tool he used was the Milhaus unit of energy, which gave respective value to the potential power of the parts of atoms, as determined by their atomic weights. This assignation of the energy values of the various elements allowed easy calculation of fertilizer values and, therefore, the probable quantity plus quality of a crop long before harvest. While there are those who scoff at the Milhaus theory, the fact remains that it offers a way to compute available energies in the soil and actual yield at the end of the growing season. This is something that all the Kings of

Agriculture in all their ivy-covered towers have yet to do.

However, fully explaining the RBTI is far beyond the scope of this document, which ultimately is a simple critique and comparison of who said what, where they said it, when they said it, and perhaps why they said it, all when discussing the agricultural side of the RBTI. As stated above, the only purpose here is to excerpt what authors, including Reams, had to say about a limited number of terms or concepts. The hope is that when those excerpts are held up for review one-by-one, a certain amount of fundamental truth may shine through.

Be warned that there are detractors from the RBTI. Some will tell you that the Brix concept is of no use. Some will tell you that it is impossible to grow crops that cannot rot. Others will deny that there is any difference in crop quality---that any fruit, vegetable, or grain can sustain life equally. The list does go on and this document is not meant for them. Let them go their way. Let them keep seeking the not-yet-developed poison to be sprayed for the pest or disease that they are sure will one day come over the horizon. I fully expect people who think that simplistic way to use the material you hold in your hands to discredit the RBTI and its promise of high yields of disease-free, health enhancing crops. Please feel free to ignore them and proceed.

Be also warned that there are supporters of Reams-Ag who don't go "all the way." A simple case might be where a Reams-Ag disciple is mentally ingrained with crop rotation teaching, but who otherwise follows Reams. Their extension training sometimes slips through and a "**NOTE**" is used to highlight the slip. Although no immediate harm to Reams-Ag is done, it would be wrong to leave beginners confused. They have to put their money in the ground and can ill-afford poor crops.

Likewise, the Reams-Ag student should thoroughly understand that Reams chemistry/physics are not identical to the hoary chemistry/physics taught in countless high schools. For instance, Reams' system of assigning energy gives us a workable plan to address farming problems of all sorts. "Standard" chemistry and physics give us nothing. Actually, the most educated chemists/physicists in the entire world---people who will only speak to another Ph.D.---have little idea of what goes on. Their solution to endless paradoxes is always to assume yet another tiny particle of odd name will come on scene via a trillion dollar device to save the day. Reams-Ag definitions and methods may yet emerge the clear winner.

Is this work all inclusive? No---Reams spent decades teaching agriculture in many forums. For instance, he leads off the 1978 Foliar Seminar by saying that it is third in a series and he wishes to first review what was taught in the earlier two classes---material that is not yet available for this edition. There are other cases where one becomes suspicious that an earlier explanation is not yet on hand. So we must work with what is available with the thought that much wisdom that seems "unavailable" will surface one day via review of associated documents. The beauty of a database approach is that supporting thoughts from other material can be inserted easily as the book matures. And as much as you or I might wish, there is no way to include all the sometimes thousands of mentions of certain key terms. Picking and choosing the few with the most illuminating context is daunting, but necessary.

Actually, it would be the height of arrogance to faintly hint this book is all inclusive, for it surely is not. A dream of mine is that some future writer with seven decades of personal farming combined with extensive farm consulting will pick this document up and use it as an outline to create a truly comprehensive Reams-Ag textbook. Such a book can guide new and old farmers alike to the successful farming that Reams tried to share.

Does anyone share my thought that the possibility exists that such a Reams wonder-book could be written by a woman? Farming has been such a man-dominated profession that one must look long and hard to find

a "lady farmer." The few I have located and interviewed over the years let slip much more of their nurturing attitude toward the soil than the average "man farmer." They appeared to be inclined more to work with nature than to wrestle nature into submission. At its heart, the Reams system is absolutely oriented toward working with nature. Might any imagined future "wonder book" capture far more attention from grizzled farmers by coming from an opposite sex viewpoint?

This is not a new idea. While there might be better examples, the aviation industry found that female-spoken audio warnings in cockpits broke through the all-male chatter and created far safer flying. Could a Reams-At textbook authored from the female side cause a similar hush in the farming community coffee shop? Could an "unlearning" from the relentless sell-more-product advertisements of the chemical industry actually happen? Could those lords of death be shamed into converting their factories to make products for a healthier earth?

And finally---the "T" words: transcription, translation, transliteration, and transposing. Reams liked to lecture in a folksy way. He should have written a book---or many books. However, he did not and transcriptionists both today and long ago are forced to struggle with crumbling audiotapes famous for poor quality. That effort is further hampered when the person transcribing has no farming background and heard words are innocently given a wrong context. Another problem arises when Reams famous classroom humor falls flat on the ear of our hapless transcriber. Last, but not least, words strung together by a lecturer often need transposition when written out. It is a tough battle and this author makes no excuses about boldly rewriting almost forty year removed sounds as long as intent and context are maintained. That effort even extends to spelling, grammatical, and readability corrections in the current era published works of the other authors critiqued.

DISCLAIMER FOR THE REAMS-AG CRITIQUE

This book is not for the average farmer. If you are satisfied that today's extension service and its blind partnereship with agri-chem farming is right for you, this book may cause you great distress. I speak of the people who forbid even their lowliest by rules, regulations, and laws to advise you that a drop or two of dishwashing soap in water can cause aphids to fly away. There is no place within this document for the simplistic concept of planting on worn-out soil and then attacking pests of every description in unimagainable numbers that are sure to be drawn straight to your field. The tool of choice for such people is always more and more increasingly powerful industrial poisons, with the modern twist of genetically engineering the plants to create their own internal versions of "death at first bite." Reams-Ag is different.

You may be bitterly disappointed with Carey Reams' bold proclamation---and proof---that "all disease is a mineral deficiency." And you would not be the first to balk. Reams discovered that pests have a singular duty: to clean up improper biology. Here we offer a solitary thought has has helped many escape the chemical industry with their teaching that all crops are fair food for pests and that only their ever more powerful poisons can save the day. The thought? Just this: if pests attacked all green matter equally, an earth without the "blessings" of such as Monsanto or DuPont would have become a bare rock eons ago, deep in dead insects, molds, and germs. Yes, pests focus on the bad. Why not deal in the good and forget the pests who will find it more protitable to visit your unwise neighbor.

If you have read the above and are still desirous of knowing about a better agriculture, you must first connect to a few fundamentals about the Reams Biological Theory of Ionization as applied to farming.

■ First, cells are created or grown via an ionization process similar to electroplating silver, gold, or chromium. So cell "division," (termed mitosis) is out.
■ Second, the energy in every speck of matter can be calculated. This is very true of fertilizers and you will learn that plants harvest growing energy when dissimilar fertilizers clash in the soil as they reach equilibrium.
■ Third, the energy of nitrate nitrogen creates growth in plants and the energy of ammoniacal nitrogen creates fruiting.
■ Fourth that only water-soluble calcium can be utilized by the plant. That means that flame photometer calcium readings are useless to the roots and therefore don't count.
■ Fifth, that calcium, potassium, and chlorine are the only true anions. This obviously turns the Albrecht cation balancing taught in a thousand ag schools on its head.
■ Sixth, that manganese is the element of life and that every seed created needs its share if life is to be passed on.
■ Seventh, that phosphate (not phosphorous) is the element that paves the way for every other element (save nitrogen) to enter a plant. Call it a catalyst, facilitator, helper, grease, whatever---abundant on-hand elements are denied entry into the plant unless enough phosphate is present.
■ Eighth, that the Brix, or carbohydrate content, of plant sap is a direct indicator of mineral content.
■ Ninth, that if the Brix of your weeds exceeds the Brix of your crop, you will be fighting a losing battle. While you may be able with enough expense to fight back the weeds via cultivation or chemicals, your crop will hardly be worth harvesting.
■ Tenth, weed Brix higher than the crop Brix is obvious proof that your fertility program ended up encouraging weed vitality.
■ Eleventh, maintaining a soil ratio of 4 parts phosphate to 2 parts potash (4:1 for grasses) will reverse that weed pressure and, with adequate calcium, deliver 12 or more Brix in the leaf of your crop.
■ Twelfth, that soil pH is nothing more than an indicator of resistance. Soil pH tells us precious little about calcium sufficiency.

So you have reviewed the disclaimer and a dozen impossible sounding claims. If you read past this point, it indicates your curiosity has you questioning whether it might be worthwhile to explore Reams-Ag and its teaching of how to gain large scale farm production, of superior quality, while working with nature instead of against. By the way, your chemical salesman might never understand your desire to find something better.

Regretfully, this book is not intended to actually teach you Reams-Ag. There are already many materials designed to do that and I suspect more is coming. This book is instead a critique or comparison of various terms as used by Reams and his disciples in the 1970s, 1980s, and 1990s. Those terms were collected by breaking apart the transcripts of Reams seminars. Each key word was then used as a search term to deeply scan thousands of pages of literature compiled from

lectures, seminars, and books. As each located term was put into context, it was entered into the critique you hold.

Many have seen a beauty in this approach. The main benefit is that rocket science is no longer needed to quickly see where Reams' students may have stayed true, or instead veered a little---or a lot---from the path he pioneered. Human nature being what it is, some of his students may feel a flash of annoyance when they see their words contrasted such that they feel diminshed in the eyes of others. I see absolutely no need for such a reaction. If an author thinks their words are being used unfairly, they are always free to issue an errata sheet that clearly shows what they truly meant to say.

Let us think about an errata sheet for a moment. Such sheets were quite common in years past. They provided an easy way for an author to clarify points and often simply rewrite phrases that someone claimed were murky or misleading. However, they were slow to reach bookowners and sometimes never arrived. My promise is that I will take any errata sheets coming to my attention very seriously, indeed. Obviously, I will make corrections in this document and get those to the printer on a regular schedule. However, I intend to also provide web presence so that those who own copies of this critique can quickly check for corrections.

A side benefit for many readers is that they may learn enough Reams-Ag by simple mental osmosis to create in them an almost overpowering desire to engage in deeper study. Or, and this is something to think about, readers may come across---even in the first few pages---hints, ideas, or thoughts that save them the cost of the book.

GO TO TABLE OF CONTENTS

SOURCES

ADVANCED AG: *Although obtaining a full transcript of Carey Reams' March 1981 ADVANCED AG seminar was not possible, pulling out excerpts from the audio disks so as to critique and compare has not posed a problem.*
http://www.pikeagri.com/component/virtuemart/audio-seminars/new-dr-carey-reams-1981-march-advanced-ag-seminar-detail?Itemid=0

AG LECTURES: *One of Thomas Giannou's clients handed this 255 page transcript of a Reams seminar to him one day and requested it be shared with the world. The donor requested anonymity and Giannou has respected both requests. The full transcript can be downloaded for free from his website.*
http://www.tandjenterprises.com/reams-black-session1/Agriculture-Reams-year-unk.pdf

ANDERSEN: *Dr. Arden Andersen's "Science In Agriculture," covers much more than his take on Carey Reams' Biological Theory. Published in 1992, new copies are still sold in the ACRES USA bookstore.*

BEDDOE: *Dr. Alexander Beddoe first published his "Biologic Ionization In Farming & Soil Management" in 1985. Apparently, his intention from the beginning was that the farm book would serve as a companion to his highly-regarded "Biologic Ionization as Applied to Human Nutrition." Included in my collection are two short booklets that Beddoe published with one being a means to help clients understand Reams-Ag soil testing and another as an introduction to his big agriculture book.*
http://www.advancedideals.org/

ENERGY RESEARCH: *In the late 1980s or early 1990s, Dwight Johnson edited and published a 186 page transcript of a Dan Skow seminar on foliar feeding deeply rooted in what Reams had laboriously taught Skow over the years.*

http://www.amazon.com/FEEDING-Printed-Transcript-Research-Development/dp/B003M6RWXM/ref=pd_rhf_se_p_dnr_6 ***FOLIAR FEED 1981:*** *While a transcript is unavailable, the index combined with transcribing short excerpts from the audio disks allows for an easy critique and comparison of the rules in this work to be contrasted with other documents. The audio disks are available from Pike Agrilab.*

FOLIAR SEMINAR 1983: *This critique edition was prepared with the aid of the track listing of the audio disks available from Pike Agrilab. It should be pointed out that almost 30% of this recorded seminar was presented by Bill Johnson, who is far more an Albrecht disciple than one who understands Reams agronomy and we can only imagine Reams rolling his eyes. At this writing, I have been unable to ascertain why Dr. Skow was willing to turn the podium over to Bill Johnson (do not confuse with Dwight Johnson). A serious study has not yet been undertaken that can point out how much of Johnson's address undermined Reams' teaching, but Johnson's comments will be ignored everywhere possible in this critique.*

FWTK: *Dr.Skow republished Reams' 23 page "The Farmer Wants To Know" booklet in the 1970s as an introduction to Reams-style agriculture. In one track of the PLANT FEED 1978 Reams can be heard saying that he wrote FWTK "30 years ago." The lessons are timeless and copies of the modified booklet, not the original, are available for a small fee from IAL.*

FWTK-pH: *"The Farmer Wants to Know About pH & Energy" has an interesting history. Supposedly, Reams wrote it in the 1950s, possibly as a seminar handout. Sometime after Dan Skow became his top agricultural student in the 1970s, he turned it over to Skow and suggested it be republished under Skow's name. Skow did so and IAL still keeps the booklet in print. A side note about both booklets is that a rumor persists that Skow's admitted "revision" mentioned in the opening page consisted of several changes in the manuscript to make the work more acceptable to mainline soil scientists. As both Reams and Skow are deceased, there is no way to either prove or disprove the story. An effort was made during preparation of this book to not include or at least note any section for critique that is not fully supportive of Reams' views in other documents. Obtain from IAL* http://www.aglabs.com/carey-reams.html .

FRANK: *Jon Frank of International Ag Lab is a confirmed senior Reams student. From time to time he releases transcripts of field interviews that are developed with his better fellow Reams students. The Frank references here include his "30 Emails in 30 Days," which he is planning to use as the core of a Reams-Ag book.*

http://www.aglabs.com/carey-reams.html

GARDENING: *Is a 28 page transcript of a Reams audio lecture that was discovered in the Bob Kilian archives. The actual work was performed by Debbie Rich, a dedicated member of the BrixTalk newsgroup.*

PLANT FEEDING 1976: *Carey Reams conducted a 5 day plant feeding seminar in 1976. This 257 page transcript of the audio record appears to "cover it all" as far as Reams Biological Theory of Ionization applies to farming.*

PLANT FEEDING AUDIOS: *Pike Agri-Lab worked with the old audiotapes of the same 1976 "Plant Feeding" and produced a 185 item series of audio clips covering the more important points. A few mis-translations occured during this process and are clearly "* **NOTED".**

PLANT FEED 1978: *While a transcript is unavailable, the index combined with transcribing short excerpts from the audio disks allows for an easy critique and comparison of the rules in this work to be contrasted with other documents. The audio disks are available from Pike Agrilab.*

REAMS/SKOW COOKING: *Is a 104 page transcript of a cooking class rich in RBTI theory that was conducted by Reams in 1982 at Dan Skow's offices..*

SAIT: *In 1998, Nutri-Tect's Graeme Sait recorded and published an 8 page interview with Dr. Arden Andersen, who is both a Reams-oriented agronomist and an osteopathic doctor.*

SKOW: *Although Charles Walters, Jr., editor of ACRES USA actually wrote the book, Dr. Skow's "Mainline Farming For Century 21" is considered to be Skow's faithful testament to the biological theories*

he was taught by Carey Reams.
http://www.amazon.com/Mainline-Farming-Century-Dan-Skow/dp/0911311270

SUCROSE: *Reams' "Sucrose Yield" technical paper has been difficult to date. The phone number and address on the front of this 10 page report easily lead one to suspect 1950s or even before. You can downlaod a free copy from this link.*
http://www.wideturn.com/

WHEELER: *Dr. Phil Wheeler is a partner in Crop Services International, of Grand Rapids, Michigan. He and Ronald Ward published the 236 page "Non-Toxic Farming Handbook" in 1998, which leans heavily on Carey Reams science.*
http://www.amazon.com/Non-Toxic-Farming-Handbook-Philip-Wheeler/dp/0911311564

TABLE OF CONTENTS

ACID, AMINO

ADVANCED AG: Skow agrees with student that many feeds are protein-deficient and that added sulfur can **increase amino acids** leading to improved protein.

ADVANCED AG: Sulfur increases protein by increasing **amino acids**.

ANDERSEN: ...microbes also increase the metabolism of **amino acids** in the roots by converting inorganic nitrogen to organic nitrogen compounds.

ANDERSEN: By definition, nutrition must include vitamins, enzymes, **amino acids**, proteins, carbohydrates, and minerals. Academicians insist that plants do not need to be fertilized with such sophisticated materials because they are able to synthesize these substances for themselves.

BEDDOE: The aerobes *[aerobic bacteria]* in the soil convert everything possible into protein molecules. This is because they absorb mineral energy and chelate (link) it into their bodies **amino acid structure** just like your body links mineral energy from your food into usable amino acid chelates.

BEDDOE: Amino Acid Core (AAC)—The center structure of an **amino acid** which contains the nitrogen.

ENERGY RESEARCH: Liquid fish is a real nice thing to use from the stand point that it furnishes oil, **amino acids**, some nitrogen, phosphorus, potassium, a full array of trace minerals and calciums.

ENERGY RESEARCH: To get enough sugars, they go down into the rootlets and combine with nitrogen and you get what we call **amino acids** or organic acids produced.

ENERGY RESEARCH: In other words, you have organic acids, vitamins, and in particular, **amino acids**, fatty acids and the base of all these is carbon, hydrogen and oxygen.

FRANK: Add hydrogen and oxygen (as water) to carbon, and you have the elements of sugars. Add nitrogen, and you have the makings of a **rudimentary amino acid**.

FRANK: Dry or liquid seaweed is great for trace minerals, **amino acids**, and naturally occurring plant growth regulators.

SKOW: In order to **make an amino acid**, carbon, nitrogen, and oxygen hydrogen are required. These amino acid are the workhorse labor force in any soil system.

SKOW: That soil carbon has to be constructed by bacteria as **amino acids**. The sequence for action is at once simple and complicated in the extreme. Bacteria have a stronger magnetic force than the corn stover. As they break down the corn residue, they lose their electrical charge. In a weaker form the breakdown product becomes an amino acid first, finally carbon.

WHEELER: These *[chemical trace nutrient]* forms, however, aren't of the highest energy nor are these the most biologically available forms. Other forms such as **amino**, citrate or humic acid types are more easily assimilated by the plant.

WHEELER: Sulfur is needed in protein and **amino acid formation**, in the formation of nodules on legumes, and in many other plant processes.

COMMENTARY: *Remarkably, a diligent search of all the Reams-Ag literature failed to turn up a single instance of Reams using "amino." Any reader who can solve this conundrum is invited to contact the author.*

RETURN TO TOC

ACID, GIBBERELLIC

ADVANCED AG: gibberellic acid can be used to speed up osmosis.

BEDDOE: One substance that can be used to increase the osmotic reaction is **gibberellic acid**. It is best used in foliar sprays at very early stages of growth to stimulate anionic growth.

BEDDOE: The use of the growth hormone **gibberellic acid**, if timed properly, in some plants can highly enhance the early anionic growth to a real advantage. Gibberellins cause an increase in the movement of energy into a plant, so the cells increase in length and rate of growth.

BEDDOE: From the time the seed sprouts until the 40-50 day period has passed, keep plants anionic. Also, Gibberellic acid can be used to increase osmosis and top growth rate. Use no more than 50 ppm.

FOLIAR SEMINAR 1983: gibberellic acid can create problems if the crops outgrow capacity of soil to give up elements to meet demand.

FOLIAR FEED 1981: You can use g**ibberellic acid** to hasten process of osmosis, but you should never use more than 30PPM.

FWTK: Along with the N-P-K and trace elements, other products such as sea kelp [seaweed], fish fertilizer, vinegar, and sometimes some g**ibberellic acid** can be added to foliar sprays.

SAIT: What is your opinion of the use of natural hormones to manipulate plant growth? Andersen: Yes. I did a research project on **gibberellic acid** and growth hormones in general at the University of Arizona. I find that, if I understand the energetics of nutrition, I can get the same out of nutrition as I can from hormones.

RETURN TO TOC

ACID, HUMIC/HUMATE

ANDERSEN: As with the application of sulfuric acid and gypsum, some people [*foolishly*] reason that if a little [*humic acid*] is good, more must be better...

ANDERSEN: In negligibly small concentrations (0.001% and 0.0001%) they **[humic acids]** enhanced growth and increased the yield of wheat, oats, barley, sugar beet, tomatoes and other plants. The action of humic fertilizers was tested by the author in different soils. In all cases the effect was positive.

ANDERSEN: This [burning out the soil] is why anhydrous ammonia should not be used directly on the soil. Instead, it should be mixed with water to form aqua ammonia and a carbohydrate like sugar or molasses to help retain it in the soil, and some humic acid to help chelate it for better use rather than reducing further the soil's already **depleted humic acids**.

ANDERSEN: An interesting additional note about **alkaline extracted humic acid** products is that once they are applied to the soil and they are exposed to a pH less than 7, the humic acid precipitates and has little or no activity or benefit. The acid soluble fulvic acid component of the humate is the only component that remains active to give soil/crop benefit.

SAIT: Graeme: We have had tremendous results with **humates and humic acid**, and I'm aware that it is possible to use too much of a good thing with these materials. What are the negatives associated with overuse? Andersen: There are two problems here. I agree that humates can provide an invaluable boost to fertility, but, if overused, they are capable of tying up valuable nutrients. Humates have the capacity of binding pesticides and toxic chemicals in the soil.

SAIT: Graeme: Yes, it's much the same with compost production. Your compost will only be as good as the

ingredients it contains. The home gardener's lawn clipping compost is a prime example. If they were to add rock phosphate, **humic acid**, animal manure and molasses to the clippings, their end compost would be far more productive. **NOTE:** *Sait is in Australia, so we do not know if he means soft or instead hard rock phoshphate.*

SKOW: The **need for humic acids** in a soil is very small. Too much is worse than no application at all. When humic acids are applied in liquid form on, say, the worst sands in Arizona or New Mexico, a gallon would be too much. Most of the time a pint to a quart per acre would be indicated.

SKOW: All plant root systems have a base exchange, and as the old rootlets drop off and new ones establish they supply nutrient for the bacteria introduced at planting time. This rootlet residue is rapidly **converted to humus and humic acids** which are powerful chelating agents and help the plant acquire plant foods more readily.

SKOW: **Humates** are known to stimulate plant enzymes which further aid the production of simple sugars in the plant leaf.

WHEELER: When nutrients are low on a CEC test they usually need to be added. When the calcium percentage shows less than 60 percent, many (most?) microbial products, including **humic acid**, don't work that well. Microbes need calcium to live. **NOTE:** *Reams-Ag does not speak to CEC nor measure calcium as a "percent."*

RETURN TO TOC

ACID, ORGANIC

ADVANCED AG: Only that plant food **soluble in water** or dilute organic acids and will stand in suspension is available to the plant.

ANDERSEN: To regenerate the microorganism populations rapidly, they must be fed. Then and only then can they digest crop residues and produce **organic acids**, humus, and nutrients.

ANDERSEN: **Organic acids are important in dissolving and holding soil nutrients for subsequent use by microorganisms and plants. Some organic acids, like ascorbic acid, are used directly. Organic acids are obtained directly from microorganism metabolism of sugars or from humus as humic acid. The latter, however, also depends on microorganisms for its manufacture.**

ANDERSEN: The Morgan extract (UES) is a weak **organic acid** solution that acts on soil particles to dissolve nutrients that are likely to be made available by the exudate from plant rootlets. This test is often referred to as testing for water soluble nutrients.

BEDDOE: Calcium is the main element to provide resistance against the **organic acids** in the soil, thereby creating the energy to grow a crop.

BEDDOE: The phrase "water soluble" in reality means that the test is done with the weakest type of **organic acid**. This is a weak plant acid similar to what the plant roots produce to mobilize soluble mineral energy in the soil.

ENERGY RESEARCH: To get enough sugars, they go down into the rootlets and combine with nitrogen and you get what we call amino acids or **organic acids produced**. Those organic acids will cause things like phosphate, calcium to dissolve into solution around the rootlet and as they dissolve, they draw to the plant and you can get a dramatic change in a crop particularly a small grain crop because you get all that acid released into the root zone.

ENERGY RESEARCH: The raw structure of **organic acids** is still carbon, hydrogen, and oxygen. Then different molecules add on to make different kinds of acids. For instance there is acetic acid which some of you are familiar with. There is vinegar, propionic acid, and deuteric acid. Deuteric acid usually has a bad smell (which is produced by anaerobic bacteria which you really don't want). You can get a tremendous release of an element in the soil if it is locked up by getting those organic acids produced which are secreted by the rootlets of the plant.

ENERGY RESEARCH: One of the primary functions of the root is to absorb calcium but the **root must secrete organic acids**. The more sugar that is produced in the leaf, the stronger the organic: acids get at the rootlet level. The stronger they get, the more nutrient they can dissolve so the plant can take them up.

FRANK: Roots also absorb CO2, and root uptake is just as important to yields as leaf absorption of CO2. When you apply calcium carbonate to the soil, **organic acids** excreted by microbes in the root zone react with it to release more CO2 for root uptake.

SKOW: Calcium in the soil is very insoluble. It has to be acted upon by **organic acids** which are produced by plant roots, bacteria, yeasts and fungi in the soil.

SKOW: When it *[foliar applied phosphate]* reaches the rootlet it forms an **organic acid** and solubilizes fertility elements for plant uptake. But once phosphate reaches a basic level in the soil, its need is greatly reduced.

COMMENTARY: *There may be a huge disparity in this subject between Reams' basic teachings and those of his students. Although I searched diligently through the literature, I could not find where Reams thought in terms of "organic acids" dissolving plant food minerals as his students claim. Quite the contrary, Reams apparently*

stayed very close to his "water soluble." Perhaps phosphoric acid plays a part.

RETURN TO TOC

ACID, PHOSPHORIC

COMMENTARY: ***P2O5 is*** *diphosphorus pentoxide, even though it is called "phosphoric acid" countless times by Reams-Ag people. True phosphoric acid is* ***H3PO4****.. Perhaps every Reams-Ag person would benefit from increased clarity if everyone automatically changed all instances of "phosphoric acid" to "phosphate" unless the writer added "H3PO4" to his description. Sometimes "white" is a tipoff that the person truly means H3PO4.*

AG LECTURES: Student: Too much is what caused the root to split? Reams: That's right, too much nitrogen salt, yes. Student: What do you do to prevent this? Reams: Raise your **phosphoric acid content**. Your copper, you make the roots stretch. Raise your calcium content and copper ratio. In other words, your nitrogen is too great for the other elements

ANDERSEN: Programs are only as good as the quality of their individual components. A component may perform well in one part of the country but poorly in another. As a rule of thumb, avoid industrial-waste acids like 10-34-0 made with **waste phosphoric acid**, which was used to clean metal.

ANDERSEN: You can get somewhat more sophisticated *[beyond "organic"]* and add to the vinegar and ammonia 1 to 4 pints of **phosphoric acid**, 1 pound of powdered fish, 2 to 6 ounces of seaweed, and 1 to 2 pounds of sugar and/or molasses mix.

ANDERSEN: If you used **phosphoric acid**, which is commonly used in liquid fertilizers and soft drinks, you would need 9.8 grams in 990.2 grams of distilled water to reach a pH of 1.

BEDDOE: One other somewhat complicating factor that can create some misunderstanding has to do with how the P and K are expressed. That is, they can be expressed as the pure element of phosphorus and potassium, or as the oxide form called **phosphoric acid (P2O5)** and potassium oxide (K2O). Most labels will have both, but a demonstrated tendency is to label on the elemental basis.

BEDDOE: Phosphoric acid: H3PO4 liquid. 50-80% phosphate depending on the strength and grade. Cationic. Used in soil sprays and foliar sprays.

BEDDOE: When mixing the spray, and too much foam develops after the first few ingredients are put in, then this is a sign that the ratio between nitrogen and **phosphoric acid** is not correct. Therefore, you should add more phosphoric acid until the excess foam is cut to the point of not being noticed. Be careful to add only small amounts, about half a cup at a time.

ENERGY RESEARCH: The next thing we are going to put in in just about every instance when you are building a spray is the phosphate source. There may be exceptions but for this course our primary source of phosphate is **liquid phosphoric acid**, 75% or better, white acid, food grade. I don't mean black or cut or brand X or cheap ones.

ENERGY RESEARCH: For all practical purposes now we have covered our nitrogens and potassiums. Our phosphate we are, basically, for this course, going to use the plain **white phosphoric acid** 85%.

FOLIAR FEED 1981: If the water in the tank is excessively hard, you should increase the phosphoric **acid** (P2O5) to offset it.

FOLIAR SEMINAR 1983: You should start out with **food grade phosphoric acid**, but you can experiment with cheaper ones.

F**RANK:** We use a 2-5-0.2 fish from Dramm that is acidified with **phosphoric acid**.

PLANT FEED 1976: The ratio between **phosphoric acid** and potassium is 2:1, two phosphate and one potash except alfalfa and grass with the ratio of 2.5 to .5 *[while this indicates 5:1, every other mention is 4:1]*.

PLANT FEED 1976: The first number on the fertilizer tag is nitrogen. The second is the **phosphoric acid** and the third is the potash, while four is the calcium.

PLANT FEED 1976: The next step to a Reams-Ag soil after calcium is **phosphoric acid**, P2O5. We should have 400 pounds water soluble.

PLANT FEED 1978: Reams: The first tomatoes are big and then get smaller and smaller. What can offset that until the end of season? Student: Manganese? Yes, a little, but Alaska fish and **phosphoric acid** will do better.

SKOW: Humid territory suggests a higher level of nutrients in solution. This translates to using half a pint to a pint of **phosphoric acid** per acre when humidity is high, and less than half a pint under dry conditions.

SKOW: Using a conventional sprayer, usually 20 gallons of water to the acre is correct. A mist blower---such as a Chiron sprayer---would work best with a pint of **phosphoric acid** in 100 gallons of water.

SKOW: Manganese is a prime requirement for getting a good seed fill. This is especially true for stone fruit, peaches and apricots, for instance. Housewives who purchase grocery store fruit often encounter rotted centers, always a sign of manganese deficiency. Foliar application can prevent the problem. Manganese sulfate will do, but the key is its mix with **phosphoric acid**. Application must be started a year ahead of time.

SKOW: The idea of a good strawberry is to have less seed on it. There is a case where you don't want to use very much fish on strawberries. You want to use mainly your **phosphoric acid**, ammonia, and calcium nitrate.
RETURN TO TOC

ACID, SULFURIC

ADVANCED AG: Spray **sulfuric acid** to fix magnesium problems.
ADVANCED AG: Use commercial grade [battery] **sulfuric acid**.
ADVANCED AG: Reams: You need 2 gallons sulfuric acid per 100 gallons of spray. Skow: The other way to do it is hydrogen peroxide. Student: There is no sulfur in hydrogen peroxide. Reams: Anyway, **sulfuric acid is cheaper** than hydrogen peroxide.
ADVANCED AG: Make sure 0-20-0 is made with **sulfuric acid**.
AG LECTURES: Reams: Sulfuric acid is an electrolyte. In certain alkaline soils, we **use some sulfuric acid,** but suppose we didn't have an alkaline soil. What would we use? Student: Aluminum? Reams: No, use super phosphate about 100 lbs. to the acre and that releases a lot more energy.
ANDERSEN: This sheds some light on why there appears to be an opening of the soil after gypsum or **sulfuric acid** is applied. The SO4-- anions cause dispersion of the clay colloids [see note below] in a thinning action.
ANDERSEN: As with the application of **sulfuric acid** and gypsum, some people reason that if a little [humic acid] is good, more must be better...
BEDDOE: Acids (cations) coming into contact with bases (anions) are heat and energy producing because of the resistance between the anions and cations. Whatever organic or inorganic substance there happens to be in the soil also takes part in this chemical action and can be affected by it. These types of reactions, if too strong, can cause calcium and phosphate as well as carbon to be oxidized to the point of leaving a very low plant food bank account of soluble nutrient. *[See Entry **UNAVAILABLE**]*
BEDDOE: You can experience this heat loss by placing a small amount of **strong acid like sulfuric** in water. The water will immediately get warm. It is this type of reaction heat from anion-cation encounters that causes burning and dehydration of the roots. The result can be seen as a sudden die back in the leaves because of reversing the normal osmotic flow. So the water in the plant is drawn right out through the roots. Only abundant water will compensate for this problem until the reaction weakens.
BEDDOE: Ammonium sulfate is made by reacting anhydrous ammonia with **sulfuric acid**.
BEDDOE: Sulfur is a very active material, because when it contacts the soil moisture and bacteria it has the **effect of sulfuric acid**. This means it creates a lot of resistance as well as heat. The ideal time to use flowers of sulfur is when the soil is in a very wet condition and the weather has been cool.
ENERGY RESEARCH: Student: How come most of the [trace element] minerals have sulfate added to them? Skow: The sulfate is mainly a mineral salt, and that is the only way they are water soluble. In other words, they have been treated with sulfuric acid. See, if it was in oxide form, it wouldn't go into solution so what they do is they take it with **sulfuric acid** and then they dry it to make it soluble in water.
FRANK: I'm going to clarify what Inferno [the product] is--it's a **sulfuric acid based fish** with extra acidity, extra sulfuric acid, just a little bit to drop the pH a little lower.
PLANT FEED 1976: For instance, if you added 1 ton of superphosphate per year you would have 1,000 lbs. of **sulfuric acid added to that acre**. Do you realize that? You take hard rock phosphate, 1,000 lbs. of it and 1,000 lbs. of the top quality highest hard rock phosphate and you will come up with the 20% phosphate- water soluble, and the rest will be sulfuric acid and sodium filler. Then you will have approximately a thousand pounds of sulfuric acid absorbed and soaked into that material. It is highly acid forming and you won't grow anything on that acre from 3-5 years. **NOTE:** *The transcript appears garbled, but it is clear that Reams felt superphosphate was full of sulfuric acid via its creation process and should only be used to create energy, not add phosphate.*
WHEELER: Sulfur could be applied as **dilute sulfuric acid**, thiosul or ammonium sulfate.
NOTE: *"Clay colloids" are not the "chemical compound colloids" of Reams-Ag.*
RETURN TO TOC

ACIDS, MINOR

ADVANCED AG: Reams used to buy unsalable oranges and use them in lieu of fertilizer because it was cheaper than fertilizer and because the **citric acid** would remove chloride from groves.
AG LECTURES: ...when the blossoms starts to shed off, what are you going to do to stop it? Student: Add acid. Reams: Well, **what is the name of that acid you're going to add? Student: Superphosphate. Reams:**

Superphosphate, yes, or you can use just plain vinegar, if you've got a backyard garden.

AG LECTURES: The citrus leaf has **citric acid** in it and it's hot stuff. If a bug bites a citrus leaf with citric acid in it he gets a hot foot and he doesn't like that at all. He's not even going to start there because it will burn him up.

AG LECTURES: Another thing that doesn't work very well is earthworms, which are nematodes, in orange groves, because the **citric acid** in the roots is very difficult for the nematodes who can't live in citrus soils or any other soil that's too dry.

ANDERSEN: Lactobacillus microorganisms produce hydrogen peroxide, as well as **lactic acid**,

ANDERSEN: Copper is the key to elasticity in the plant. It is an important constituent of many proteins like **ascorbic acid** oxidase, cytochrome oxidase, diamine oxidase, and polyphenol oxidase

ANDERSEN: An interesting additional note about alkaline extracted humic acid products is that once they are applied to the soil and they are exposed to a pH less than 7, the humic acid precipitates and has little or no activity or benefit. The acid soluble **fulvic acid component** of the humate is the only component that remains active to give soil/crop benefit.

ANDERSEN: As a rule of thumb, **avoid industrial-waste acids** like 10-34-0 made with waste phosphoric acid, which was used to clean metal.

BEDDOE: It *[molybdenum]* has one primary benefit. It makes the grain kernel harder by making calcium more available. In animals it appears to make the bones denser. It is best used in the foliar sprays. **Molybdic acid** is used in the foliar formula in very, very small (milligram) amounts.

BEDDOE: Calcium nitrate helps other calciums become available because of its **nitric acid**.

BEDDOE: This type of calcium is also good to counteract other problems that are becoming more prevalent today, such as **excess acids from fertilizers**, rain, and sulfur-containing irrigation water.

ENERGY RESEARCH: Zinc is used to control many types of blight. It is also a minor catalyst for Sul-Po-Mag and copper. It helps to make the **acedic acid** in the root to keep it from rotting.

ENERGY RESEARCH: In other words, you have organic acids, vitamins, and in particular, amino acids, **fatty acids** and the base of all these is carbon, hydrogen and oxygen.

ENERGY RESEARCH: The raw structure of organic acids is still carbon, hydrogen, and oxygen. Then different molecules add on to make different kinds of acids. For instance there is acetic acid which some of you are familiar with. There is vinegar, **propionic acid**, and **deuteric acid**. Deuteric acid usually has a bad smell (which is produced by anaerobic bacteria which you really don't want).

FRANK: There may also be some benefit from the slight pH reduction in a spray solution containing CO2: Carbon dioxide reacts with water to form mild **carbonic acid**, reducing the pH slightly.

FOLIAR FEED 1981: Aphids don't like high carbohydrate in leaves. They do not like the **citric acid** in citrus leaves.

GARDENING: If the **citric acid** is too low, you have a number of different kinds of scale *[disease]*, but if the citric acid is high, you won't have any scale. There are citrus groves in Florida that are 60-70 years old now that have never had a spraying machine in the grove.

SKOW: In order to lower pH *[in foliar feeds]*, use acidifying substances diluted in water — vinegar (**acetic acid**), **citric acid**, **ascorbic acid**, phosphoric acid, sulfuric acid.

WHEELER: It *[humus]* contains several factions of acids, such as humic, fulvic, and **ulmic**, as well as active carbon sources such as polysaccharides (soil sugar/glue). **NOTE:** *Wheeler's phrase "glue" may have connection to Reams' **PROTOPLASM** (see).*

RETURN TO TOC

AIR

ADVANCED AG: Skow: Close mowing peas (legumes) in an orchard with dolomitic soil will put a glossy sheen on the leaves by **releasing magnesium to the air**.

ADVANCED AG: Alfalfa takes more **mineral from the air** and requires less potassium from the soil.

AG LECTURES: The raw manure creates a heat in the soil. If you have a dry year what happens? It releases too much moisture and you're really suffering from a drought. But compost does just the opposite, it **draws moisture from the air** and holds it in the ground.

AG LECTURES: Remember, alfalfa has the ability to take practically all its potash **from the air.**

AG LECTURES: Student: How can you measure how much nutrient it's going to take out of the soil when it gets some of the nutrients out of the air? Reams: You're not interested in **how much it takes out of the air**, care less about that. All you want to know about is how much you have to put back in the soil.

AG LECTURES: Reams: Suppose you have soil that had 600 ERGS, what would that mean? Student: It means it's jumping? Reams: It means you'd have an extremely great loss of energy. Plants can't take it in that fast. Where

would this energy be going? Student: Into the air? Reams: **Into the air**, that's right, but some of this energy could be being picked up by the bottom of the leaf.

AG LECTURES: Reams: The **carbons hold the moisture and take it out of the air**.

ANDERSEN: When someone tells you that the chlorine from muriate of potash just **evaporates into the air**, you will know better because the molecular weight of chlorine gas (Cl2) is 70, compared to the lighter weights of H20 (18), C02 (44), N2 (28), and 02 (32), which are the **major components of air**. Thus, because chlorine gas is heavier than air, it will remain close to the ground.

ANDERSEN: Carey Reams repeatedly asserted that **plants absorb much nutrition from the air**. But they can do this only if the plant is a good conductor and if the soil acts as a good electrical ground.

BEDDOE: The carbonate form of calcium has an advantage in that it contains the carbon complexes. These can help the plant get **more water out of the air**.

BEDDOE: **Air is probably the most important source** of the colloids. These air-borne colloids come from the oceans of the world.

BEDDOE: On grasses you want a ratio of 4 parts phosphate and 1 part potassium. These grass crops have the ability to get practically all their **potassium from the air**.

ENERGY RESEARCH: One thing that can make the soil pH go up is just the **lack of air**. As that pH goes up nutrients become unavailable and the quickest way to solve that problem is to go out and cultivate.

ENERGY RESEARCH: Everybody has the opinion that you have to put on herbicides and insecticides to get a toxic buildup in the soil. I am here to tell you that that is not true. You can get that by the ground crusting over and **not getting air into it**.

FOLIAR SEMINAR 1983: Magnesium is a no-no because **plants get all they need from the air** and it is such an enemy of nitrogen.

FRANK: Plants have a special ability to combine heat energy, light/electrical energy, mineral energy from soils and foliar sprays, **mineral particles from the air**, and atmospheric sourced CO2 into plant tissue and produce.

FWTK: Aerobic bacteria **take nitrogen out of the air**; they also yield some from the rain and snow.

FWTK: Furthermore, healthy plants take a large part of the **trace elements they need from the air**. They supply magnesium, manganese, zinc. cobalt, copper, sulfur **and boron** in this way. Soil must contain proper mineral levels for this process to take place.

FWTK: All grasses, such as the Bermudas and fescues, and even sugar cane, can take most of their **potassium from the air**.

GARDENING: The moth knows by instinct that where she stings the plant leaf and lays her eggs a small drop of sap will come out of the plant. And these little worms will eat on that sap until they get big enough to eat the leaf. But suppose that little drop of sap that comes out is very high in sugar content. When that sugar content then strikes the **oxygen content of the air**, it's going to ferment and turn to alcohol. And those little worms are going to get drunk and roll off of that leaf into the ground and the bacteria are going to eat them and you'll have a garden without any worms in it. **NOTE:** *An implication is made here that if plant sap is kept away from air, it will not ferment. The claim deserves investigaiton.*

PLANT FEED 1976: The weaker the sap in the plant - the less minerals it can **take in from the air.**

PLANT FEED 1976: Density definition: how far apart the particles are which make the energy in the soil for plant growth It is the distance apart that matters. Suppose you have a strip of fog one mile wide, 10 feet deep and 30 miles long. I am talking about fog that is dense---100% vapor. How much water is in the fog visable to the eye would there be in gallons? I am using fog as a metaphor for density of plant food. If the fog was at saturation, there would be less than a bathtub full. There is **more water in the air that you don't see than you do see**. That little bit you do see is just a little steam blown up hundreds of times. This is density. The less the density of your soil nutrients, the less the yield. The greater the density, the greater the yield. Isn't that easy?

PLANT FEED 1976: Our foods have never been so safe from poison sprays as they are today. The sprays we use today are all gases that kill the pests. They evaporate off the vegetables and plants and don't remain on there like you read in the health books. It **gets more into the air** and **messes up the air**, doing **more harm to the air** you breathe, than it does to the food you eat.

PLANT FEED 1976: All plants can take all the **magnesium they need out of the air**. You do not have to add magnesium to any crop that I have seen, anywhere in the world. Unless the farmer had added so much nitrogen he had to add Epsom Salts in order to release the nitrogen to keep it from burning the roots.

PLANT FEED 1976: Student: Yesterday you said that the plants breathed their magnesium from the air---which carries the most magnesium, **hot air or cold air**? Reams: It doesn't make a lot of difference. Maybe I can aneuer your question by asking one. Which air carries the greater electrical charge, hot or cold? The cold air does. Does that answr your question?

PLANT FEED 1976: Student: Is there any mineral the plants **cannot get from the air**? Reams: Yes, calcium, potassium [?], phosphate, potash [?] - those are the main ones they can't get from the air. **NOTE:** *This is a puzzling claim as Reams also says ALFALFA [see] can get all its potassium from the air.*

SKOW: Alfalfa has the ability to **take practically all its potash from the air**. Therefore, it needs very little from the soil.

SKOW: The age old problem of acid and alkaline requires steady scrutiny, with full appreciation of what pH means and what it does not mean. If a soil is tight and permits no **circulation of air**, it will probably be both acid and alkaline. If you were to run a water soluble test on this, more than likely you would find no calcium, but this would suggest a fair amount of calcium but no energy. There is a requirement for carbon and **air circulation**.

SKOW: Carbon attracts moisture from the air, especially at night. If there is **high humidity in the air** and enough carbon in the soil, plants can get enough moisture from the air to fix a crop if there is at least 20 to 25% humidity.

SKOW: Plants, generally, become susceptible to molds because of stress. This stress might be nothing more than high humidity and a **lack of air flow**.

SUCROSE: Soils that are depleted of carbon will result in air that contains less carbon; however, it is **not necessary for all the carbon to come from the air**. Much of the carbon can be taken in through the roots, as this supply is mined out of the soil by the sugarcane; and its yield will decrease in direct ratio to the supply of the available carbon in the air and the soil.

RETURN TO TOC

ALCOHOL

AG LECTURES: Reams: The higher the sugar content, the higher the mineral content and the higher the sugar and mineral content, the less bugs you have. Why? Student: The **alcohol kills them**? Reams: Yes, the alcohol kills them, but there's another reason too. There's one more reason I haven't told you about. It increases the oil content and it gives him a physic. That's right, that is exactly what happens. In other words he gets diarrhea.

ANDERSEN: Some nutritionists advocate feeding cattle alcohol as a quick energy source. That it is, but it has very detrimental effects. **Alcohol suppresses rumen bacteria**. It also causes calcium to precipitate and thus become unavailable. When the alcohol enters the blood, it also precipitates blood calcium (resulting in plaque build-up or hardening of the arteries); alcohol further stresses the liver, precipitating calcium and causing cirrhosis of the liver. Animals that **are fed alcohol** are certain to need more mineral supplementation which is convenient if you are selling both.

FWTK: Most laboratories use carbon disulfide, **alcohol** and strong acids to dissolve the elements in the soil. This type of test may show a forty-year supply of calcium, phosphate or potash, and yet these may not be available to the plant at all.

FWTK: Damage-produced from chewing insects [in high Brix plants] is also reduced because of the oxidation *[fermentation?]* of the sugar in the sap of the plant into alcohol. The **alcohol intoxicates the insects**, killing them or making them sick in the process. This can only happen if the plant contains a high sugar content.

FWTK pH: All soil solvent testing reagents that are foreign to what is available in the soil should not be used. They are unreliable for the same reason that the flame photometer is unreliable. **Where could plants go to get alcohol** or carbon disulfide to dissolve the oxidized plant food?

FWTK pH: The higher the sucrose content of the fruit or vegetable crop, the lower the freezing point. When fruit freezes and the **sucrose turns to alcohol**, the fruit is headed for skid row rather than th farmers market.

GARDENING: The moth knows by instinct that where she stings the plant leaf and lays her eggs a small drop of sap will come out of the plant. And these little worms will eat on that sap until they get big enough to eat the leaf. But suppose that little drop of sap that comes out is very high in sugar content. When that sugar content then strikes the oxygen content of the air, **it's going to ferment and turn to alcohol**. And those little worms are going to get drunk and roll off of that leaf into the ground and the bacteria are going to eat them and you'll have a garden without any worms in it.

PLANT FEED 1976: If you have a lot of sugar in the plant and the bug bites it or the moth lays its eggs there or punctures it in the least, this sugary sap will leak out in a day or so when the worms hatch. By that time the sugar has turned to alcohol and that bug gets drunk and falls off on the ground when tne sun hits him. Just rolls up and rolls off. Do you know what happens to him? The bacteria In good soil eats him up before the day is ovar and that is the end of him.

SAIT: We [Andersen speaking of overusing molasses] start getting decreased biology and even fermentation, and the **associated production of alcohols**, which are not good. We start precipitating calcium when we get alcohol and we can start the process of sterilization.

SKOW: An unbalanced equilibrium of calcium and magnesium **permits organic residues to decay into alcohol**, a sterilant to bacteria; and into formaldehyde, a preservative of cell tissue.

SKOW: In a field that has high energy and a high sugar content in the crop, **alcohol is produced**. A human being can consume alcohol with moderation. An excess can cause diarrhea, but diarrhea in a human being is nothing compared to the same malaise in an insect.

WHEELER: To moldboard plow residue 8 to 10 inches deep in this soil condition is to almost guarantee that there will be little decay system and no new humus formed. The aerobic bacteria will be buried below the oxygen level while the anaerobic bacteria will be left on top exposed to the air. The residue will ferment**, producing an alcohol** or aldehyde.

WHEELER: [Higher Brix plants] will **produce more alcohol** from fermented sugars and be more resistant to insects, resulting in a decreased insecticide usage.

RETURN TO TOC

ALFALFA

ADVANCED AG: **Alfalfa** takes more mineral from the air and requires less potassium from the soil.

ADVANCED AG: Some types of **alfalfa**, corn, or soybeans require less water than others. Experiment and discover them.

ADVANCED AG: If you have no pith at all in pasture grasses **or alfalfa**, you have boron deficiency.

ADVANCED AG: Calcium nitrate can greatly increase Brix and yield of **alfalfa**.

AG LECTURES: Remember, **alfalfa has the ability** to take practically all its potash from the air.

AG LECTURES: Did you ever take a leaf of alfalfa, sugar cane or corn and examine it closely and see little black dots in it? Have you noticed that or on the stem? **Have you seen little black dots appear on the stem of alfalfa?** Did you really look that close? That's too much potassium in the soil. How many have seen those little black dots? Have you noticed it on peach leaves, orange leaves, any crop?

AG LECTURES: Student: You said a 4 to 1 P and K for grasses, **do you consider alfalfa a grass**? Reams: Yes, sugar cane too is a grass. Corn is not a grass.

AG LECTURES: You would not **ever want to use a chelate on alfalfa**. Why? Student: Anionic instead of cationic? Reams: That's not the reason, but it's a true statement. Why? If, say you were growing out in Colorado, California, Arizona, Idaho, Nevada, you would not use chelates there. Why? Student: Well, the calcium is high out there. Reams: The calcium is high. That's exactly the right answer. Calcium is high. So what happens when you use a chelate in a high calcium soil? It loses its leaves, all the leaves fall off. Why? Because it thins the protoplasm that holds the leaf onto the stalk. Nothing to hold it on. The leaf is held onto the stalk by protoplasm. Did you ever break a leaf off and look at it about 3 minutes later under a glass and you saw a little jelly-like substance form in there? It's that little jelly-like substance that holds that leaf on the plant. And what happens when you use a chelate on a carbonate soil, high calcium soil? It sheds the leaf off. Many times this happens naturally in your soil and you don't want it to. Therefore the **alfalfa leaf sheds off**, you start to mow and the leaves all fall off. This material has been chelated and you don't want this to happen in a high carbonate soil. We are going to learn more about that later when we study soils and how to prevent it. But do not use a chelate in a high carbonate soil.

ANDERSEN: If cellulose is nitrated it forms nitrocellulose, which is used in the manufacture of explosives, collodion, and lacquers. Add **excess potash to alfalfa, displacing calcium, and you will have "gunpowder hay**" by the formation of potassium nitrate and nitrocellulose, which form when phosphate is insufficient to catalyze the proper formation of protein and other metabolites.

ANDERSEN: **Alfalfa and small grains commonly have hollow stems**. Farmers are told that this is a genetic trait. However, a few years of proper nutrition can fill in those stems, raising both the yield and nutrient content of the crop.

ANDERSEN: The nutrient ration that is suitable for ocean plants would be **deadly for freshwater plants or alfalfa**.

ANDERSEN: Using the Reams soil-testing method, this ratio should be 2 pounds of phosphate to 1 pound of potash for row crops and **4 pounds of phosphate to 1 pound of potash for alfalfa** and grass crops.

BEDDOE: Potassium is what determines the caliber of a corn stalk or the caliber of an **alfalfa stem**.

BEDDOE: **Alfalfa** can have this [black spots on leaves] happen and the condition is said to be a virus. The problem is actually a potassium excess which opens the way for the virus to set up housekeeping.

BEDDOE: A dairy cow which is **eating alfalfa** that has a 16 Brix sugar level will need only 10-l2 pounds of l2 Brix grain mix to produce 100 pounds of milk. But the same cow eating 7 Brix alfalfa will require 30 pounds of the same gain to produce 100 pounds of milk; besides that, the cow is very vulnerable to disease.

BEDDOE: Hollow stems on grasses and forage crops, such as alfalfa, are not normal. It is an expression of phosphate of boron deficiency.

BEDDOE: Remember, that "normal" in agriculture, as in medicine, basically means an average of a bunch of sick things. In other words, if production levels of a certain farm crop such as alfalfa is randomly sampled and averaged it would show that high "normal" alfalfa production is around 6-7 tons per acre. However, what this statistic does not tell us is what was the soil condition of the fields that the production information was sampled from. If the farmer does not scrutinize this kind of "normal" information he will never realize what the real production potential could be for his particular crops. And **in alfalfa that should be at least 20 tons per acre** with a six month growing season.

ENERGY RESEARCH: Student: You said you were going to say something about Vitamin C yesterday. Skow: OK, vitamin C. This is one we have come up with and have found to be very successful in legume crops. That means peas, string beans, **alfalfa** and bell peppers.

ENERGY RESEARCH: The interesting thing about that aspect [dying cows] was when we examined the **alfalfa crop** the leaves on the alfalfa and the stems were covered solid almost with little black dots. This is an indication of an excess of potassium nitrate...

FOLIAR FEED 1981: Be cautious of nitrogen toxicity in fresh cut **alfalfa**. It is best fed as hay.

FOLIAR FEED 1981: Student: When should we last foliar feed soybeans? Reams: About 5 weeks after blossoms are done. Student: How about corn? Reams: Until it is well past the milk stage. You **can cut alfalfa** when 50% of the blossoms are open. You can spray the day before cutting.

FWTK: Part of the commercial yields achieved with the Reams program are: **20 tons per acre of alfalfa** at 28% moisture; 200 bushels of corn per acre as a starting point; 100 bushels per acre of soybeans; two bales of cotton per acre; 90 bushels per acre of wheat; 4,500 lbs., per acre of peanuts; 40,000 lbs. per acre of watermelons at l2% sugar; 1.000 boxes of oranges per acre; 20.000 quarts of strawberries per acre at 10-12% sugar; 20 tons per acre of cabbages - the list goes on and on.

GARDENING: There are people growing alfalfa today, 4 or 5 tons per acre, who think they are pretty good because that's what the neighbors do. They ought to be ashamed if they cannot produce **20 tons of alfalfa** per acre in a six month growing season.

FRANK: In **alfalfa, we have seen yields triple** when K-Mag *[proprietary?]* was applied to relieve poor xylem circulation. Another circulation problem impairing successful foliar feeding: The stems of alfalfa and small grains such as wheat or oats are often hollow, lacking adequate phloem tubes which carry nutrients from leaves to roots and other parts of the crop. With proper basic nutrition, you can create much larger phloem tube pathways, visible as pith in stalk cores. Look for solid stem alfalfa.

FRANK: Crops with an outside bark over xylem tubes such as trees, **alfalfa**, or sunflowers may have a copper deficiency which doesn't allow the bark to stretch, making foliar nutrition futile.

PLANT FEED 1976: **Alfalfa is a grass** and if the 1-5-.5 ratio between your P205 and your potash gets higher than that on alfalfa, you know what's going to happen? It will go to blossom when it is waist high. **NOTE:** *In other places it is clear that Reams meant that the phosphate:potash ratio should not narrow to less than 4:1. In this document Reams then held out the possibility that alfalfa should grow 12 feet high.*

PLANT FEED 1976: The ratio between phosphoric acid and potassium is 2:1, two phosphate and one potash **except alfalfa** and grass with the ratio of 2.5 to .5 [while this indicates 5:1, every other mention is 4:1].

PLANT FEED 1976: You should also **carry alfalfa over from year to year**. Don't dig it up and replant each time. Let it come up from its roots each time. It's lifetime this way is at least 100 years.

SKOW: I have seen **farmers grow alfalfa, then cut it and watch dehydration virtually make it evaporate**. I mention this to stress again why a farmer needs to understand how a cell is made. When you have a problem with watery crops, calcium is missing in that cell.

SKOW: A soil high in magnesium and low in calcium can test above 6.5, but will be entirely **inadequate for the growth of alfalfa...**

SKOW: The **alfalfa crop is literally annihilated when there is a phosphate shortfall**. Stems will be hollow, and the difference between a hollow stem and a solid stem is the difference between half a yield and a full yield.

WHEELER: When farmers remove every cutting of alfalfa or chop corn for the silo, they are returning little organic matter to the soil. The alfalfa farmer is returning nothing while the corn farmer is returning only the root mass developed during the year. This is poor organic matter practice, and it is why recent emphasis has been given to growing cover crops which will at least provide a green manure to return to the soil. A good suggestion would be to cut and **leave the last crop of an alfalfa field each fall** as an additional humus builder or apply manures.

WHEELER: Farmers have another option when potassium levels are high. Cropping of potassium-loving plants, such as **alfalfa, removes the K** in the harvested crop and it can be sold off the farm. **NOTE:** *This claim must be considered along with Reams' claim that alfalfa can get all its potassium needs from the air.*

WHEELER: When farmers inquire [at the extension office] about methods of **raising better (more nutritious) alfalfa**, the conventional answer comes back with recommending 0-0-60, keep the pH up, cut by the blossom, herbicide the weeds, use 18 pounds of seed per acre, and all the other wrong or wrongly reasoned advice. The failure of standard forage fertility programs is appalling.

RETURN TO TOC

ALKALINE

ADVANCED AG: Measure the calcium in the area of the baseline ERGS. If acidic, you add the baseline to the test value. **If alkaline**, you subtract the baseline.

AG LECTURES: Reams: Sulfuric acid is an electrolyte. In **certain alkaline soils**, we use some sulfuric acid**,** but suppose we didn't have an alkaline soil. What would we use? Student: Aluminum? Reams: No, use super phosphate about 100 lbs. to the acre and that releases a lot more energy.

ANDERSEN: An interesting additional note about **alkaline extracted humic acid** products is that once they are applied to the soil and they are exposed to a pH less than 7, the humic acid precipitates and has little or no activity or benefit. The acid soluble fulvic acid component of the humate is the only component that remains active to give soil/crop benefit.

ANDERSEN: Carey Reams, as an ag consultant, used pH in a different way. He looked at pH as a measurement of the resistance in the soil. He observed that the higher the pH, the greater the resistance there was and the more difficult it was to get energy to flow, **particularly if the pH was somewhat alkaline**, in the 8 or 9 range, resulting in nutrient imbalances. On the other hand, he observed that if the pH was moderately low, below 6, there was not enough resistance. This exchange allowed the energy to flow too readily, making it difficult to contain it *[and for the plant roots to grab it]*, again resulting in apparent nutrient imbalances. This seems to be a practical and workable use of pH, for it addresses the reality of how plants grow through energy exchange. In essence, pH is the result of the nutrient interaction, not the cause. When the nutrient ratios are balanced, the pH will stabilize automatically in the correct range.

ANDERSEN: Nutrients and compounds in the soil **that are considered alkaline** include calcium, magnesium, chlorine, sodium, potassium, salts, ashes, and aldehydes. Their alkalinity is "relative," however, meaning that if you add an item that is less alkaline than whatever else is present, the pH may be lowered even though you added an alkaline material. For example, adding calcium to a high-magnesium soil may actually lower the soil pH. ☑ ***NOTE:*** *Please notice that Dr. Andersen dances lightly on this subject with his use of "considered". He is well aware that the RBTI considers calcium, potassium, and chlorine as the only anions or "alkaline" substances. In Reams physics, pH is a measure of resistance and what may register as "alkaline" is only an indication of slow electron movement and not merely an overabundance of hydroxyl ions..*

BEDDOE: Many soil chemists say that when the pH of the soil is wrong that the iron is less available. In other words, when the pH is on the acid side of the pH scale, the iron is much more available than when it is on the **alkaline side of the scale.** This statement is actually only true if there is not enough available phosphate in ratio to the potassium in the soil chemistry. When there is adequate available phosphate, the pH of the soil makes little difference.

ENERGY RESEARCH: Some other things to watch out for when foliar feeding; If the pH of the water is extremely high **or extremely alkaline**, it probably is not going to be nearly as effective as far as being taken in by the leaf. Basically what you are looking for is something that is equivalent to fog that you can condense into water. That would be your ideal. The temperature of the water should be very close to the air temperature.

FRANK: Avoid ashes on **high calcium alkaline soils**. Ashes are wonderful fertilizers but you must use them judiciously and at the right time. I like both hardwood and softwood ashes.

FRANK: There may also be some benefit from the slight pH reduction in a spray solution containing CO2: Carbon dioxide reacts with water to form mild carbonic acid, reducing the pH slightly. Generally, an acidic spray solution is absorbed more effectively **than a neutral or alkaline solution**.

FWTK: Soil elements or compounds whose electrons rotate faster than those in water are now classified as an acid in soil nutrients. Those elements or compounds whose electrons rotate slower than those in pure water are said to be alkali. This is a contradiction in the purest scientific sense, but this definition relates to what is considered to be acid or alkali regardless of intricate scientific implications. Consequently, a false impression results in relation to what constitutes sweet and sour, or acid **and alkaline**, soils.

PLANT FEED 1976: The liver manufactures the substance called bile **which is alkaline**, which is anionic. When cationic foods touch the anionic bile from the liver, energy is given off because of resistance. That's what we live on. That's what we're studying today. How to produce the most food with the highest nutrient value (TDN - total daily nutrient) required to maintain a plant or animal.

SAIT: Andersen: In plant growth there is the Yin (female) or acid energy, and there is also the **Yang (male) or alkaline energy.** Do you want to set fruit or do you want to get growth? If we want fruit and we have established a good calcium base, either locally or regionally, then I can apply an acid-based foliar and I can set fruit with that. There is a common problem with orchards and grapes, where we have one good year followed by a poor year. This is a nutritional problem.

SKOW: Phosphorus compounds in soils are slowly released to plants during the growing season and their availability is difficult to determine by chemical tests. Both acid and **alkaline soils** fix phosphorus in unavailable forms and annual fertilization may often be required.

SKOW: Let's consider a soil with anaerobic bacteria quite high. Aluminum could flip- flop in such a situation, but probably remain low. The soil would be sour and **highly alkaline** — with lots of calcium unable to release its energy due to a lack of air flow, carbon and water circulation.

SKOW: The age old problem of acid and alkaline requires steady scrutiny, with full appreciation of what pH means and what it does not mean. If a soil is tight and permits no circulation of air, it will probably be **both acid and alkaline**. If you were to run a water soluble test on this, more than likely you would find no calcium, but this would suggest a fair amount of calcium but no energy. There is a requirement for carbon and air circulation.

WHEELER: Although pH is usually thought of as a measurement of acid **or alkaline properties**, it can also be thought of as a measurement of energy flow. This "energy" flow definition is helpful in understanding pH for farming applications.

WHEELER: It is generally held that a clear, distinct line separating the blue and white fields [in the refractometer viewscreen] indicates a more acid condition while a fuzzy line indicates better calcium levels and a **more alkaline condition**.

RETURN TO TOC

ALUMINUM

AG LECTURES: Reams: Sulfuric acid is an electrolyte. In certain alkaline soils, we use some sulfuric acid**,** but suppose we didn't have an alkaline soil. What would we use? Student: **Aluminum?** Reams: No, use super phosphate about 100 lbs. to the acre and that releases a lot more energy.

AG LECTURES: Student: What does **aluminum do for soil**? It's not a soil nutrient or plant food nutrient. What does it do for soil? Why is it important? Is it important? Is it a catalyst? Reams: No sir, but you're getting mighty warm. Student: Is it a conductor? Reams: Right---it is an electrolyte. It's like little transformers in there. Picks up the electrical charge and makes the soil carry an extra bit of current through the soil.

AG LECTURES: Reams: How could **aluminum lead you astray in the soil**? How could it fool you? Student: Make you think you have a nutrient when you really don't. Reams: How would that show on a soil analysis report? Student: Say there's more energy than there really is? Reams: That's right, you'd say there's more energy there. Now what makes energy? Student: Anions and cations. Reams: And how does that show on your chart? Student: As ERGS? Reams: No, not as ERGS. Student: pH? Reams: pH, that's right. It's a measure of the resistance. It can make you think you've got more resistance than you have got there. It can lead you astray. pH is always a measure of resistance. It can fool you, it can lead you astray.

BEDDOE: Therefore, iron is **heavier than aluminum** and iron will also float on boiling lead. For this reason, heavier elements in the soil naturally go down and very often too far down out of the range of the plant roots.

BEDDOE: Metallic substances, such as iron, sulfur, and **aluminum are often the culprits** that give low pH readings in soil where there is already an over-supply of water soluble calcium.

ENERGY RESEARCH: Common electrolytes are iron, **aluminum**, copper, and one of the other ones that you will see a lot written about is magnesium and they get a wonderful response. Now the only reason they get a response is that the plant is constipated. And if any of you have had that problem you know that if you can get it moving again, that you feel better. So there is a time and a place once in awhile, where it is beneficial, where a crop stunned or not doing well and looks like it isn't growing satisfactory, and this is particularly important if you have some herbicide damage and you want to flush it out.**FWTK pH:** Metallic substances, such as iron, sulfur and **aluminum**, are often the culprits that give low pH readings in soil where there is already an over-supply of water-soluble calcium.

FWTK pH: Therefore, iron IS heavier than **aluminum**, manganese is heavier than magnesium, and iron will float on boiling lead.

SKOW: Let's consider a soil with anaerobic bacteria quite high. **Aluminum could flip- flop** in such a situation, but probably remain low.

SKOW: If you record an ERGS reading of 1,000 and a pH of 2, this situation could be caused by the sulfur **or aluminum in the soil**. The aluminum in bauxite is what affects the ERGS in this way. It is a very common

condition in the state of Georgia. If sulfur is the problem, the soil will dry out. Aluminum will not do this. If you have this situation, we would suspect one of these two imbalances, because the pH is down. This is one time when it is important to know the pH. In this case, the way to drop the ERGS is to add lime.

SKOW: **Aluminum is not required for plant growth** but is associated with soil acidity and is harmful to acid-sensitive crops. Liming acid soils reduces aluminum toxicity.

SKOW: A **high aluminum uptake sets up all types of strange things.** It stunts plants, then shrivels them. Under aluminum assault, seeds may not even sprout. These anomalies may not be at once apparent, for which reason the mischief is deferred until animals are fed. A **high aluminum concentration will affect the central nervous system.** If recognized in time, calcium can be used to counteract the effect. There is a product put out by Eli Lilly of calcium gluconate with vitamin D that is excellent.

WHEELER: In the soil, some nutrients tend to rise while calcium and others tend to move downward. A soil left undisturbed will stabilize from the top down in the following layers: carbon, magnesium, phosphate, potash, sulfur, **aluminum**, manganese and calcium.

RETURN TO TOC

AMMONIA

ADVANCED AG: If you have a high calcium and your corn is knee high you would not use ammonium sulfate if the **ammoniacal nitrogen** was up near 150-200 as you could form nitrate. You would use 0-20-0 superphosphate instead.

AG LECTURES: Student: You said the reason for [nematodes] is too much salt in the soil? Reams: Yes. Student: Which particular kind is it, the chlorides? Reams: It can be a chloride, it can be **ammonia salts**, nitrogenous salts, calcium salts, iron chloride salts, yes, it can be many different kinds of salts.

AG LECTURES: Reams: What is the primary benefit of adding compost over manures whenever you disc them in or plow them under. Student: It is immediately available. Reams: That's one thing, but what is the something else I am trying to get across to you? It doesn't burn the plants. The raw manure creates a heat in the soil. If you have a dry year what happens? It releases too much moisture and you're really suffering from a drought. But compost does just the opposite, it draws moisture from the air and holds it in the ground. How does it do that? The carbon content, it's not going through a heat, actually it cools the soil. What form is the nitrogen in the compost? **Ammoniacal nitrogen** and what does it do to the soil? Not only warms, but cools. It controls the temperature. Student: How does it do that? Reams: By refrigeration. Yes, in other words when you heat ammonia it freezes, when you freeze it, it boils, it's a contrary substance. If it wasn't true you couldn't use it for a refrigerant, do you realize that? That alone is worth everything you are paying for all the courses, just to know that one factor, if you use it.

AG LECTURES: Did you ever stick your hand into a bale of hay and it felt hot, warm? Did you ever stick your hand in another bale of hay and it felt cold? Even at the same [*ambient*] temperature? I have and the one that was hot inside was rotting, decaying because it had a low sugar content. And one more thing too, it had a low protein content. The one that you put your hand in that felt cool to you, it had a high sugar content and a high **ammoniacal nitrogen** content and the heat cooled it. See what I mean? This is very important to know.

ANDERSEN: This *[burning out the soil]* is why **anhydrous ammonia** should not be used directly on the soil. Instead, it should be mixed with water to form aqua ammonia and a carbohydrate like sugar or molasses to help retain it in the soil, and some humic acid to help chelate it for better use rather than reducing further the soil's already depleted humic acids.

ANDERSEN: In many cases, the soil in which these plants are growing is **spewing free ammonia** into the atmosphere, either from ammonia fertilization or anaerobic soil digestion. This further pumps up the plant signal---turns the volume up, as one can do with modern hearing aids---notifying the quality-control inspectors *{insects & pests}* to reject this production run due to inferior construction.

ANDERSEN: Nitrogen acts as an "isotope," alternating between the nitrate form and the **ammonium form**.

BEDDOE: Ammonium sulfate is made by reacting **anhydrous ammonia** with sulfuric acid.

BEDDOE: A soil with excellent amounts of aerobic bacteria will have plenty of **available ammonia** nitrogen being produced by the bacteria.

BEDDOE: In a soil with 500 pounds per acre of chloride, chicken manure should not be used on the ground. The chicken manure is high in boron and with lack of plenty of water the stage would be set to convert **ammonia nitrogen** to nitrite nitrogen. If this were to happen it would severely burn the roots of any plants in the soil.

BEDDOE: The parts of the reserve soil TDN are calcium, phosphate, potassium (potash), nitrate nitrogen, **ammonia nitrogen**, iron, and copper.

BEDDOE: Probably corn has one of the **highest demands for ammonia nitrogen**, so it is a good idea to work up to 200 lbs. per acre for its needs at 40-50 days from sprouting.

ENERGY RESEARCH: Student: Is calcium carbonate biologically active carbon? Skow: Not by itself. It has to be worked on by bacteria. Very little of that will stand in suspension in water. Practically none unless you have a good **ammonia level in the soil**. It will become soluble because that is how they make calcium nitrate.

ENERGY RESEARCH: About grasses. Basically Reams' opinion is, no potash in the spray, no manganese in the spray, no cationic nitrogen **or ammonia**. Now he does use Bo-peep *[ammonia]* despite what he says there.

ENERGY RESEARCH: When do you start to **bring ammonia levels up**? Skow: The 45th day from emergence on seed crops primarily. That is why I am suggesting to go out and do a little side-dressing to give that system a little kicker.

ENERGY RESEARCH: We have put the phosphate (P2O5) in the 100 gallons. You added **two quarts of ammonia** and something happened that upset the whole apple cart. It will start, to foam. What do you do? One student says that the foam is escaping nitrogen. That's correct. So you are going to have to add a little more phosphate.

FOLIAR FEED 1981: There is a fill order to a tank. **Ammonia first** and if it foams too much (which is nitrogen loss), add phosphate.

FOLIAR FEED 1981: Student: If I use **household ammonia,** is the detergent harmful.Reams: No, not at all.

FOLIAR FEED 1983: An ordinary nitrogen need is 80 lbs of nitrate on leaf crops, but seed crops should switch to **ammonia** mid-season.

FRANK: Coops typically use the very worst fertilizers that compromise soil health; potassium chloride, DAP, and **anhydrous ammonia** are the worst offenders.

FRANK: How does ammonium sulfate do this? **Ammonia** is a longtime commercial refrigerant. If you heat ammonia it cools and if you cool ammonia it heats. When ammonia is put into the soil in the form of ammonium sulfate it does the same thing. Truly amazing.

FRANK: Nitrate nitrogen pushes growth. **Ammonia nitrogen produces seeds**. We did not need more growth. We needed more seed. We needed more fruit. And so, we started putting ammonium sulfate in there.

FWTK: On those [crops] grown for fruit, seed, root or blossoms (com, wheat, tomatoes, apples, etc.), both nitrate **and ammonia** is used.

FWTK: Testing soil without using a test for water soluble plant foods will lead a farmer to believe his soil has plenty of the elements in which it may be most deficient. The basic tests included are for nitrate nitrogen, **ammoniacal nitrogen**, phosphate, potash, calcium, pH and ERGS.

FWTK: Ammonium sulfate both warms and cools the soil and controls the temperature. Ammonium nitrate has both nitrate and **ammonia nitrogen in it**. It can be used in the spring to supply the nitrate for the growth of the plant. When the nitrate runs out (after about forty days), the ammonia becomes available, and makes flowers, blossoms and fruit.

PLANT FEED 1976: I've seen two soils with the same amount of carbon and one was very low in **ammonia**. Three days after a 6 inch rain, the one soil was like an ash bed, but where the ammonia was the soil was moist. You need something in there to control soil temperature.

PLANT FEED 1976: Student: How long will it be before the cows will start eating the grass **because of the ammonia** where the chicken manure was spread? Reams: They don't mind. Spread the cage manure at 1 to 2 tons per acre. Most of the ammonia will go directly into the soil [air?] in 2-3 days. You don't use chicken litter because you don't want too much potash on your grasses.

PLANT FEED 1978: If you have enough boron in your soil it will prevent the nitrate from **turning to ammonia**.

PLANT FEED 1978: If you realize your trees have been ammoniated, you would use a nutritional spray with Epsom salts, which would release **ammonia nitrogen**.

SAIT: What is the reason for your use of **household ammonia** in your foliar recipes? Why not use ammonium sulfate or any other ammonia source? Andersen: You have to be very careful with ammonia when you are putting it out on the crop. [.] We always prefer to use ammonium sulfate in the soil to encourage microbes and to get the calcium working, and we use a very diluted ammonia in the foliar recipes.

SKOW: Plant foods that cause seed production are **ammoniacal nitrogen**, phosphorus, metal trace nutrients, manures and composts.

SKOW: My best recommendations on the use of **anhydrous ammonia** is: don't! If it is used, never apply more than 40 to 50 pounds per acre at one time. Some growers are using aqua ammonia and adding molasses. This works quite well, and much less is needed.

RETURN TO TOC

AMMONIATION

ADVANCED AG: It is possible to **ammoniate a grove** by creating nitrification via adding chicken manure if the chlorides are too high. This is dependent on the moisture status.

ENERGY RESEARCH: : When you build a spray, you should always add calcium to it in some form if you are going to put boron in. That is to protect against **ammoniation**. Now, if you have plenty of calcium in the soil, you will be alright.

ENERGY RESEARCH: But if the carbons are low and you have an excess of boron in relation to calcium or a high salt or sulfur content, you can get **ammoniation of the plant**. What it does is simply kill them.

ENERGY RESEARCH: When the calciums are too low and the nitrogens are too high, you can get an **ammoniation of the plant** and wipe them out.

ENERGY RESEARCH: Without carbon, **ammoniation can occur** which is fatal to aerobic life. Conditions under which ammoniation can occur when carbon is deficient are; excess boron in relationship to calcium and or high salt or sulfur content.

ENERGY RESEARCH: When spraying boron always add calcium or it **may cause ammoniation**.

FOLIAR FEED 1981: If the bark on the tree plant roots is **loose from ammoniation**, you must completely foliar feed the entire TDN.

PLANT FEED 1976: Student: Would you use chicken manure on citrus? Reams: Yes, but never dig it in. Leave it on top of the ground. Why? Because the boron will **ammoniate** your trees. It will never hurt citrus if you leave it on top of the ground. Not only that, if you've got your calcium and phosphate, you'll never need to spray your grove. No bugs or insects in it . Spread it from tree trunk to tree trunk evenly.

NOTE: *Reams' use of AMMONIATION hardly fits with the common definition of a process whereby ammonia is added to straw or other non-digestible fiber so as to cause a breakdown into at least some digestibility. Perhaps Reams wanted us to share a thought that too much freed ammonia in the soil could harm or "digest" the outer layer of plant roots.*

RETURN TO TOC

ANION-CATION RELATIONS

ADVANCED AG: When adding materials, always consider the **anion-cation amounts and relations**. Lime is usually the biggest factor by volume.

ADVANCED AG: **Cationic** materials are pulled downward by the earth's magnetic field and **anionic** materials are pulled upward by the Van Allen Belts.

AG LECTURES: Reams: How could an **anion tie up a cation**? Because your anionic energy is greater than your cationic energy and it surrounds it. The cations are trying to get back to the cations and the anions are trying to keep it from it, gets in its way.

AG LECTURES: Reams: The only difference between **anionic air and cationic air** is the temperature. Did you know that? Student: No, cold air is cationic? Reams: Yes. Student: And hot air is anionic? Reams: Right. Student: Because of the anions coming from the sun? Reams: They're bouncing. The friction within the molecule makes the difference in temperature, cations will move very slow but anions will move very rapidly.

ANDERSEN: **Anions** appear to be reversed from **cations** because compression and rarefaction appear to be opposites if either is taken out of context, but each is actually the other half of the same cycle. In reality, spin is occurring in both directions simultaneously, as Reams said, but most people missed hearing this.

BEDDOE: Nature senses **anion-cation ratio reactions**, not the pH. For an explanation of this rule refer to the chapter dealing with pH.

BEDDOE: Acids (cations) coming into contact with bases (anions) are heat and energy producing because of the resistance between the **anions and cations**. Whatever organic or inorganic substance there happens to be in the soil also takes part in this chemical action and can be affected by it.

ENERGY RESEARCH: **Anionic** substances go up seeking the Van Allen belt and **cationic** substances go down. Basically why a plant stands and stands up is because there are more anionic substances in the top and less in the bottom.

ENERGY RESEARCH: Once in the root, elements start synchronizing which gives off anions. This causes the **anionic specific gravity ratio to cations** to be greater at a given instant which causes them to rise similar to gas making a balloon rise.

SKOW: Materials useful to making the proper **anion-cation connection** turn up in some unlikely places.

RETURN TO TOC

ANIONIC

ADVANCED AG: Interestingly, water (hydrogen + oxygen) can be "pulled" in **anionic**-cationic **directions**.

AG LECTURES: You would not ever want to use a chelate on alfalfa. Why? Student: **Anionic instead of cationic**? Reams: That's not the reason, but it's a true statement. Why? If, say you were growing out in Colorado, California, Arizona, Idaho, Nevada, you would not use chelates there. Why? Student: The calcium is high out there? Reams: The calcium is high. That's exactly the right answer. Calcium is high.

AG LECTURES: **Anionic plant food makes growth**, cationic plant food makes fruit. So now you're going to change it from anionic to cationic.

AG LECTURES: Reams: I've talked to you now about side-dressing and replacement of side-dressing. Is there anything else you want to know about side dressings? Student: Which should we use? Reams: Depends on what you are growing. **Anionic plant food produces stalk** and cationic produces seed.

AG LECTURES: You certainly want to use **anionic plant food** on lettuce, cabbage, cauliflower, broccoli.

ANDERSEN: According to Reams' concept of energy, **calcium is classified as the kingpin of growth (anionic) energy** and manganese is classified as the kingpin of fruit (cationic) energy.

ANDERSEN: If he [*Reams*] discussed applying a fertilizer or material such as calcium or nitrate nitrogen (like in forage or leaf crops) to get mostly growth without fruit, he stated that an **anionic material should be added.**

BEDDOE: **Making Sprays Anionic**: 1. Use Calcium hydroxide (hydrated lime) or carbonate forms of calcium. The carbonate form of calcium has an advantage in that it contains the carbon complexes. These can help the plant get more water out of the air.

BEDDOE: Hydrated lime (also called slaked lime and calcium hydroxide): dry powder, 54% pure calcium, **anionic**. This is a "hotter" calcium source. It can make more soil heat because of the resistance it makes and it will then cause the soil to dry out. It is best used in the fall so that it can sit all winter long.

BEDDOE: Calcium oxide: (also called unslaked lime or quick lime) CaO, dry powder, 71% pure calcium, **anionic**. This is really hot lime. It can burn plants.

BEDDOE: One substance that can be used to increase the osmotic reaction is gibberellic acid. It is best used in foliar sprays at very early stages of growth to **stimulate anionic growth**.

BEDDOE: There are three main sources for base (**anionic**), or sweet plant food elements in soil chemistry. They are potassium (potash), calcium, and chlorine.

BEDDOE: Tomatoes do best when there is a minimum of available nitrogen. When nitrogen gets too high, **excessive anionic growth** (vegetative growth) will develop.

FOLIAR FEED 1981: When building a spray for grasses (not grain crops) you should not add manganese, potash, vinegar, or cationic nitrogen. You should **add anionic nitrogen**, phosphate, calcium.

FWTK: It is this charge that moves the needle of a compass, and it is the same force passing through the earth that attracts ionized plant food inside the seed. This plant food enters the seed and roots in two forms, **anionic** and cationic.

FWTK: The **anionic form** is found in nitrate nitrogen, and the cationic form is found in ammonia. Isotopes in the soil will follow the path of least resistance, i.e., yield to the greatest magnetic attraction.

PLANT FEED 1976: The liver manufactures the substance called bile which is alkaline, **which is anionic**. When cationic foods touch the anionic bile from the liver, energy is given off because of resistance. That's what we live on. That's what we're studying today. How to produce the most food with the highest nutrient value (TDN - total daily nutrient) required to maintain a plant or animal.

PLANT FEED 1976: The goal to work toward in annual crops is 400-500 pounds of water soluble phosphate per acre and only use superphosphate as a cata1yst in order to change your soil from an **anionic condition of growth** to a cationic condition of production.

PLANT FEED 1978: **Anions** are negative.

RETURN TO TOC

ANTHRACNOSE

AG LECTURES: Student: Going back to the tomatoes, you get these brown spots on the tomato with the black spot in the middle. They call it **anthracnose**. Reams: Yes, it is a copper deficiency.

AG LECTURES: Reams: No, I've never seen **anthracnose as such on grass**. It may be mislabeled, but it's generally a mold. It can be too much potassium, it can be a lack of iron. You have to examine some of these things under glass to really evaluate them.

FOLIAR SEMINAR 1983: There are two tracks in which anthracnose is mentioned as hard on honeydew and also

that **anthracnose** is fireblight caused by manganese and iron deficiency.

WHEELER: Phil Wheeler reproduces part of Arden Andersen's short book, *The Anatomy of Life and Energy in Agriculture* that identifies **anthracnose** as a fungus.

RETURN TO TOC

ANTS

AG LECTURES: Student: Aerobic bacteria also eat live nematodes, right? Reams: Yes, grasshoppers, **ants**, cockroaches, anything else they come across, worms.

AG LECTURES: **Ants** really love cottonseed meal. So if you must add cottonseed meal, you better add a little [harmless] fumigant with it. I would suggest snuff.

PLANT FEED 1976: Everytime I've ever used cottonseed meal, I've used about 100 lbs. of tobacco dust per thousand pounds to keep the **ants** and parasites out or it.

RETURN TO TOC

ANY CROP

AG LECTURES: Have you noticed it [little black dots] on peach leaves, orange leaves, **any crop**? That's too much potassium in the soil.

AG LECTURES: But also remember this, you can produce many times more on 5 or 10 acres of certain crops, well taken care of, than you can on 40-50 acres, half done or trying to do it all yourself.

AG LECTURES: If you will evaluate your soil by what you've got left over after the crop, it will mean a lot more to you than trying to figure out what you've got before you plant your crop.

AG LECTURES: Student: This crop's taking so much material out of the soil. Suppose the crop takes out, say 50 lbs. of phosphorus out and your test showed 100 lbs. of phosphorus when you started. Does that automatically mean your next test would show you needed 50 lbs. of phosphorus? Reams: Generally speaking when testing soil, at your very best you'll only pick up 70-72%. That's all you'll be able to pick up.

AG LECTURES: Student: How can you measure how much nutrient it's going to take out of the soil when it gets some of the nutrients out of the air? Reams: You're not interested in how much it takes out of the air, care less about that. All you want to know about is how much you have to put back in the soil.

AG LECTURES: Citrus requires the least sprays of **any crop** providing you keep the carbon contents of your soil, your phosphates and calciums high enough in your soil. You'll never have to spray.

AG LECTURES: On corn, wheat and soybeans, there's one other ingredient you should use on **any crop that you're growing for the grain**. It's manganese. Manganese is the element of life and without manganese there's not any life.

AG LECTURES: The opportunity is **very, very great on what you can do with most any crop**. One thing I would advise you to do if you're going to do it commercially, is, do not diversify too widely.

ANDERSEN: I dare say that there is not one university agricultural department in this country **that can raise any crop consistently over 12 Brix** at its weakest point or that has any clue as to the nutritional management necessary to do so. Yet there are farmers all across this country with little or no college education who routinely achieve such results.

BEDDOE: Since calcium is the foundation of bulk substance for every cell in all biologic systems, it determines the volume as well as test weight **for any crop with very few exceptions**. The plant uses more calcium by weight and volume than any other element.

ENERGY RESEARCH: Is there any question on the amounts of the use of manganese? Student: How long or how many times can you use it? Skow: This product you can use practically every time you spray. This is for seed crops only, Any crop that you want to harvest the seed. One crop that it is very important to maintain the manganese level is pecans, walnuts, and almonds. Spray, spray, spray, and spray some more with manganese.

FOLIAR SEMINAR 1983: Alfalfa needs more water soluble calcium than **any [other] crop**.

PLANT FEED 1976: All plants can take all the magnesium they need out of the air. You **do not have to add magnesium to any crop that I have seen**, anywhere in the world. Unless the farmer had added so much nitrogen he had to add Epsom Salts in order to release the nitrogen to keep it from burning the roots.

SKOW: Without an active organic matter system in the soil you **cannot grow any crop at all**, no matter how much N, P and K you add.

RETURN TO TOC

APPLE

ADVANCED AG: **Apple trees** with high phosphate will stand cold better.
ADVANCED AG: Nitrate causes **apple to shed**, don't add nitrate to deciduous trees before fruit is off.
ADVANCED AG: **Apple** or citrus trees always bear because they have both male and female blossoms.
ANDERSEN: The branches of **apple trees will grow straight up**, with no fruit production, if there is too much vegetative growth energy. On the other hand, if there is too much fruiting energy the branches will grow straight out from the trunk, thus setting more fruit than the vegetative growth can support. Apple growers will tie or brace branches at a 45 degree angle to the main trunk in an attempt to achieve a balance between fruiting and growth. In doing so, however, they are handling only the symptoms, not the cause of the problem.
ANDERSEN: With apples, the opposite seems to occur. An **apple with apple scab fungus** will itself have a low refractometer reading (below 12); however, the leaves on the branch supporting the sick apple will have very high refractometer values (above 12 or even in the upper 20s). In any event, there is a mineral imbalance/deficiency in the crop.
ANDERSEN: Regardless of whether you follow an organic or a biological procedure, your success will be reflected in the refractometer reading of the commodity and its freedom from insects, diseases, and weeds. A **wormy organic apple is substandard**, pesticides or no pesticides.
BEDDOE: On those [crops] grown for fruit, seed, root, or blossom, such as com, wheat, tomatoes, **apples**, etc., you use both nitrate and ammonia nitrogen at the proper times.
FWTK: On those [crops] grown for fruit, seed, root or blossoms (com, wheat, tomatoes, **apples**, etc.), both nitrate and ammonia is used.
GARDENING: Many times all the blossoms come on at the same time [peaches, pears or **apples**] and they get frozen off because the soil chemistry's out. Those blossoms should come on over a 6 week period. And the first ones that come on are way down the stem so if they get frozen off, then a few more will come out, if they get frozen off a few more will come out, and then a few more will come out, and you can still have a bountiful crop of fruit providing you keep your soil chemistry correct.
PLANT FEED 1976: Tell me, how do you rotate a peach orchard? An orange grove? **Apple orchard**? A grape vineyard? Well, if you don't rotate those, why rotate anything else? You do not rotate crops---but *[you must]* put the nutrient back in the soil.
SKOW: Repeated sprays with fish and seaweed combinations in low amounts as a ten day program — especially in orchards — will gradually build up fruit-wood and root production for the following year. The consequences will be high quality produce. **Apples will be firm and without blemishes.** Moreover, they will exhibit good taste and flavor. Vitamin B-12 added to sprays on a regular basis not only improves flavor, it also presides over improved Brix readings. In working with fruit groves, it is mandatory to start a year ahead of time.
WHEELER: Reams suggested you avoid dolomite for three reasons. The most impressive one has to do with nitrogen release. Magnesium is antagonistic to nitrogen as seen in the use of Epsom salts as a treatment for nitrate poisoning in cattle or an Epsom **salt spray on fruit trees to stop apple drop due to nitrate-weakened stems**. When the magnesium releases from dolomite, it can cause nitrogen to release as a gas.

RETURN TO TOC

ASPARAGUS

ADVANCED AG: Skow: **Asparagus** likes table salt [but not too much].
ADVANCED AG: Reams: I use 10% seawater for **salt on asparagus**.
ADVANCED AG: Reams: When **growing asparagus**, increase count [*planting density*], use commercial calcium nitrate and harvest in morning.
AG LECTURES: Student: You said the reason for [nematodes] is too much salt in the soil? Reams: Yes. Student: Which particular kind is it, the chlorides? Reams: It can be a chloride, it can be ammonia salts, nitrogenous salts, calcium salts, iron chloride salts, yes, it can be many different kinds of salts. Student: **Will [nematodes] attack asparagus** after you put salt on it? Reams: You don't put salt on asparagus for nematode purposes. You do it for ionization and it increases the ionization enough and the nematode can't start. In other words, it tingles him and he doesn't like it.
PLANT FEED 1976: In one day, **asparagus** comes up to the height you should cut it . You have to cut it before the sun shines because if it gets 2 hours of sunshine, it is woody and bitter.

RETURN TO TOC

ATOMIZE/HOMOGENIZE

AG LECTURES: Lets take an orange grove. The trees are 15-20 feet high, producing 1,000 boxes to the acre. You would need 30 gallons of spray to cover an acre, **homogenized**. That's a lot of space, that's a lot of leaves and that's a lot of trunk.

AG LECTURES: Student: What's the difference in a homogenized spray or homogenized substance and one that is not homogenized? Reams: It's broken down. **Homogenized material won't separate**. In other words, each molecule is somewhat equal. The substances are not separate. They are together. In other words, each little molecule becomes a little solar system within itself. Do you know, can anyone tell me how homogenization is done? How do you homogenize anything? Student: Pass it through a very fine orifice? Reams: Yes, then what? It isn't the passing through the orifice that makes it to be homogenized. What actually causes it to homogenize? Do you have any idea how homogenization is done? You pass a very, very fine stream through a nozzle or nozzles. It can be hundreds of them. But then it strikes this cold plate. I don't mean a hot plate, but one you've got to keep at about the temperature of the atmosphere around you, temporarily. What happens when this force strikes this plate then it mixes all the substances in that solution into one molecule and that's homogenized substances. Now, this is what should be done when you spray onto the leaf---homogenize this spray.

AG LECTURES: Whatever you do, try to get a homogenizer spraying machine that will **homogenize the spray** and don't use the big droplets, they're too expensive, too hard to get on. The finer the mist the better.

AG LECTURES: Do not spray too close to you. Spray at a distance, 20-30 feet. It forms a smoke, it rolls when it gets out that far. When it hits the ground it rolls in a fine form. The density of the particles keeps it all from going to the ground. Anytime the force is hitting, with very much force, over 2 lbs. of pressure, the same force that put it there is also taking it away. There **are machines that do homogenize the spray**, in fact the spraying that is done by airplanes homogenizes the spray.

BEDDOE: Homogenized foliar spray solutions have 10 times the effect of non-homogenized. Homogenization is when each molecule within the spray contains all the elements in exactly the same solar system relationship. The process of homogenization is one of adding a high degree of energy to the molecule of plant food spray. What actually happens involves the outer electrons in the molecule. They are forced into a higher speed without changing their positions. When homogenization is accomplished, the end result will give a solution that has a greater density, while the molecule enlarges and increases in porosity. It is this porosity that sets the stage for a shrinkage that locks the molecule on the antennae of the leaves at the time it contacts them.

BEDDOE: The smaller the spray particles, the more complete the molecule. This is **another way to express the affect of homogenization**. Various sprayers are able to accomplish variable degrees of homogenization by the use of micronizing spray heads which reduce the nutrient solution to very fine micron size particles.

BEDDOE: Sprays must be homogenized or micronized for the maximum benefit. The smaller the droplet, usually the more complete the homogenization.

ENERGY RESEARCH: Reams talks about a **homogenizing sprayer** and I am at a loss to know about that completely. He says that is the principle that the Chiron sprayer works on. Theoretically, if something is truly homogenized, it shouldn't separate when put into a container. It should stay uniform throughout the solution. If we run it through a Chiron sprayer, it does separate back out again so I don't know for sure, his concept of that. All I do know, and I think he is trying to explain it in the best terms he knows how, is there is still something different in the way the Chiron affects the spray than any other current machine on the market.

ENERGY RESEARCH: The use of a **homogenizing sprayer** is preferred for the elements will stay intact in each droplet. Also the heavier specific gravity elements will move to the outer most orbit of each molecule, therefore they will show up first in the plant by visual signs like darker color.

FOLIAR SEMINAR 1983: There are two Reams ways to foliar feed, **homogenize** & **atomize**. Homogenize is better but both are beneficial. Economy comes from learning that less spray goes further.

FOLIAR FEED 1981: Add soft rock phosphate to **homogenized spray** to achieve sticker effect on waxy leaves like cabbage.

*****FOLIAR FEED 1981:** Gap Every 80 Feet Spraying Oat And Wheat, Airplanes Don't Homogenize

FRANK: An ordinary submerged sump pump in the tank, lying on its side, is an easy way to spin the solution. You're moving a liquid armature through the earth's magnetic field. The rotating mix accumulates electrons, building the magnetic charge in your spray solution. Recirculating the solution through the pump **also homogenizes nutrients** for a uniform blend.

FRANK: Most foliar sprays mixed with water will form droplets on leaves, even if the mist is **almost atomized**, because water retains its surface tension without a surfactant.

FWTK: One pound of an element sprayed on with a **homogenizing sprayer** is as effective as 20 lbs. applied to the

soil.

FWTK: Reams recommends using a sprayer that **homogenizes the spray** and sprays a mist, which is then spread out with the air current. The purpose of misting is to get the particles to the size a plant can absorb, and to help it reach the bottom of the leaf. The sprayer he recommends using is called a Chiron Sprayer, which they make in West Germany. This type of sprayer is much more effective for foliar feeding than a boom sprayer. Reams did teach a course on foliar feeding in which he explains how to formulate and spray many different crops, from green houses to orchards.

PLANT FEED 1976: I not to show you something about your row crop farming. It's a spray machine called a Chiron Sprayer. It's manufactured in Germany for about $5,000. It's the **only spray machine in the world. that homogenizes the spray** in big amounts, - really homogenizes it. If you should see that spray machine a half mile away on a farm, at work, you'd Just know it use on fire. It looks like smoke and it rolls along the ground on the side of the sprayer

and covers everything like a fog.

PLANT FEED 1976: Student: Is there a **homogenizing sprayer they make in a smaller size**? Reams: No, there is not, except that little paint sprayer — homogenizer that works by electricity for a backyard garden. But it's too small to get into farms and things of that nature. Student: What are these backyard sprayers? Reams: It is a paint sprayer that homogenizes paint — in Sears and Roebuck catalogs all over. It's for paint and it'll homogenize, but it only holds about a pint and it works by electricity and it's only good for a backyard garden.

WHEELER: When temperatures soar, the effectiveness of the spray drops considerably. When using a boom sprayer, use high pressure and purchase **atomizer nozzles** if possible. Tip standard nozzles back about 90 degrees so the spray will roll up under the leaves. Keep active ingredients on the dilute side, e.g., 1 to 2 quarts per acre for majors and a few ounces for traces. It may be possible to use as little as 2 cups of active ingredient per acre and still be effective, especially when using a mist blower. The use of a wetting agent will often assist the solution to **break down and homogenize**.

RETURN TO TOC

ATRIZINE/ATRAZINE

AG LECTURES: Student: I had farmer tell me one day he took and sprayed his corn when it was just coming up with Atrizine, at the rate of 1/3 pound per acre. And he said it didn't kill the weeds, but it just stunted them enough that the corn grew up away from the weeds. Then he would go cultivate and cover everything up. Reams: Yes, I wouldn't have used **Atrizine,** I would just cover them up to start with. Student: Yes, I don't advocate Atrizine either, but that's what he did. Reams: I don't advocate it at all, period. I have never seen a weed killer that didn't do harm in the long run. One of the greatest things it ties up is phosphates, terrifically. Every one of them does.

ANDERSEN: No Atrazine had been applied to the field since 1984 or thereabouts. As a result, it was assumed, backed by industry insistence, that there should be **no danger of Atrazine release stunting the oats**. Consequently, last year no compensation was made in this field's oat-fertility program for Atrazine. The result was a 37 bushel per acre yield [whereas 130-150 was normal]. A sample of these oats was sent to A & L Laboratories for evaluation. Atrazine was isolated and determined to be the cause of the stunting. So much for the propaganda that pesticides readily dissipate.

WHEELER: Overlooked, however, is the effect on countless livestock who also drink the [contaminated] water. Livestock suffer the same decreased performance syndrome as do people, except they can't complain. Their performance goes down with no identifiable cause. Conventional analysis measures the water for nitrates or coliform bacteria but not for Atrazine or other poisoning. Much production is lost with nothing to account for it.

RETURN TO TOC

BACTERIA, AEROBIC

ADVANCED AG: To prevent nematodes, create a soil environment promoting **aerobic bacteria**.

AG LECTURES: Organic fertilizer is rich in bacteria, **aerobic bacteria**.

AG LECTURES: Student: **Aerobic bacteria also eat live nematodes**, right? Reams: Yes, grasshoppers, ants, cockroaches, anything else they come across, worms.

AG LECTURES: **Aerobic bacteria** have something about them similar to what a fish does, they can take oxygen out of the water, out of the soil moisture.

ANDERSEN: The **aerobic zone** of the soil ranges from nothing to only a couple of inches.

ANDERSEN: Ideally, there should be a **majority of aerobic microbes** in relation to anaerobic microbes. The desirable microbes are ultimately responsible for the availability of all nutrients in the soil. As a result, every

fertilizer material that is used must be compatible with these microbes if the desired result is to be realized. Also, because the microbes are ultimately responsible for nutrient availability, the real crop is the microbe; it is what really needs feeding.

ANDERSEN: Also, because the **microbes [aerobic bacteria]** are ultimately responsible for nutrient availability, the real crop is the microbe; it is what really needs feeding. If the microbe is satisfied, it will take care of nutrient availability to the plant.

BEDDOE: Fungi and bacteria have their part in bringing opposite forces into contact with each other to form plant food energy. The aerobes are small one-celled animals that take in plant food by adsorption and procreate themselves by division. They do not ordinarily die, but go into a dormant stage when soil conditions become unfavorable. Soil bacteria are also put together by the process of ionization; the same method that causes plants to grow. The process is similar to a metal electroplating. Conversely, the **aerobic bacteria is taken apart by the same method that is is formed**, except the method is in reverse.

BEDDOE: A soil with **excellent amounts of aerobic bacteria** will have plenty of available ammonia nitrogen being produced by the bacteria.

BEDDOE: The aerobes ***[aerobic bacteria]*** in the soil convert everything possible into protein molecules. This is because they absorb mineral energy and chelate (link) it into their bodies amino acid structure just like your body links mineral energy from your food into usable amino acid chelates.

BEDDOE: As the bacteria feed and function they leave both their excrement as well as their body remains when their life cycle is complete. These remains are referred to as spore protoplasm. This **aerobic bacterial spore protoplasm** is natures way of preventing plant food from leaching as well as holding it in a very easily usable form.

ENERGY RESEARCH: AEROBIC Any organism that breaths oxygen. **These bacteria** convert unavailable nutrients to usable form. They include sulfa ammonis, nitrous ammonis, lactobacillus, and europa.

FWTK: **Aerobic bacteria** take nitrogen out of the air; they also yield some from the rain and snow.

FWTK: **Aerobic bacteria need four basic things**: water, air, food and heat. Sandy soils will respond faster to this program because the chlorine in the soil will leach out more quickly, and because of improved aeration. Thus, the bacteria will be working. The warmer areas of the country will get results sooner, because, as mentioned, bacteria cannot thrive in cold or frozen soils.

FWTK pH: This **aerobic bacterial spore** is nature's way of preventing plant food from leaching. This makes the soil quite gummy and also helps prevent erosion.

PLANT FEED 1976: Student: Your aerobic bacteria in the soil makes nitrogen like a cow makes milk, right? Reams: That's true. Your aerobic bacteria converts nitrogen. And remember there is as much of a plant under the ground as there is above the ground. After you harvest the top, if your soil is not sterile, **your aerobic bacteria will convert** those roots into heavy, heavy amounts of organic nutrients. Nature is trying to help you if you will let it.

SUCROSE: Lack of enough kinds and amounts of **aerobic bacteria** present in the soil will cause a lesser yield. Bacteria does many things to increase yield, such as converting the soil elements into protein which preserves the elements in soil for later use and also serves as a natural means of biological control.

WHEELER: Through continued use of this soil "killer," [chlorine] the **desired aerobic microbial life** has been seriously depleted and/or changed in character.

WHEELER: To moldboard plow residue 8 to 10 inches deep in this soil condition is to almost guarantee that there will be little decay system and no new humus formed. The **aerobic bacteria will be buried below the oxygen level** while the anaerobic bacteria will be left on top exposed to the #. The residue will ferment, producing an alcohol or aldehyde. These substances kill off the aerobic bacteria and preserve the trash.

WHEELER: Through continued use of this soil "killer," [*chlorine*] the desired **aerobic microbial life** has been seriously depleted and/or changed in character.

RETURN TO TOC

BACTERIA, ANAEROBIC

ADVANCED AG: Add lime if your manure slurry pit is **anaerobic**.

ANDERSEN: Many sporiferous **bacteria (anaerobic)** have toxic or herbicidal properties on many plants, suppressing growth and lowering the percentage of germinating seeds.

ANDERSEN: The plugging [in a corn stalk] is caused by many things---chemical toxicity such as herbicides, putrefaction products of an **anaerobic soil**,

ANDERSEN: In many cases, the soil in which these plants are growing is spewing free ammonia into the atmosphere, either from ammonia fertilization or **anaerobic soil digestion**. This further pumps up the plant signal---turns the volume up, as one can do with modern hearing aids---notifying the quality-control inspectors to reject this

production run due to inferior construction.

ENERGY RESEARCH: You must avoid anaerobic conditions. Essentially, this is where the ground crusts over and then your aeration and normal biological system cannot work. When you get into that crusted situation, you will have a salt build up and **anaerobic bacteria produce toxic substances**.

SKOW: Let's consider a soil with **anaerobic bacteria** quite high. Aluminum could flip- flop in such a situation, but probably remain low. The soil would be sour and highly alkaline — with lots of calcium unable to release its energy due to a lack of air flow, carbon and water circulation.

SKOW: Formaldehydes are an **anaerobic breakdown product**. In some cases aerobes work from the top down and dilute and break out the preserved biomass. But aerobes cannot survive in formaldehyde. The remedy, again, is carbon.

WHEELER: Through continued use of this soil "killer," [chlorine] the desired aerobic microbial life has been seriously depleted and/or changed in character. **Compaction has induced the anaerobic bacteria** supposedly found only in the lower levels of the soil to populate the majority of the soil bed.

WHEELER: To moldboard plow residue 8 to 10 inches deep in this soil condition is to almost guarantee that there will be little decay system and no new humus formed. The aerobic bacteria will be buried below the oxygen level while the **anaerobic bacteria will be left on top exposed to the air.** The residue will ferment, producing an alcohol or aldehyde. These substances kill off the aerobic bacteria and preserve the trash.

WHEELER: Compaction has induced the **anaerobic bacteri**a supposedly found only in the lower levels of the soil to populate the majority of the soil bed. Potassium chloride isn't the only culprit. Herbicides, pesticides, and other farm chemicals also contribute to the decrease of proper soil life.

RETURN TO TOC

BANANA

AG LECTURES: Reams: **Which is sweeter, a big banana or a little banana off the same stalk**? Student: Little one. Reams: Right, the smallest one is sweeter. The banana puts the same amount of everything in every banana, mineral wise. So does an orange tree.

GARDENING: The banana, when it grows those bananas, it puts the **same amount of nutrient in every banana** whether it's a big one or little one.

PLANT FEED 1976: When that banana puts food in each of those fingers, it will put the same amount in every one - mineral content. So if you **buy small bananas you will get more mineral** than you will buying big bananas.

RETURN TO TOC

BARK

AG LECTURES: But the copper **makes the bark elastic**. Just like a little boy that out grows his britches, they're too tight. It makes the bark elastic and lets the sap flow.

AG LECTURES: Then it *[copper]* also makes the **bark stretch** in the plant and give you greater yields.

AG LECTURES: The nematode cannot attack the root until the salt weakens the root, **until the bark will slide off** and then he gets in.

ANDERSEN: Molybdenum is a catalyst for **iron in the bark or epidermis**, is important in the integrity of bark or plant skin, and gives a transparent look to the **sheen on the bark**.

ANDERSEN: Pinch the roots slightly and pull to check whether the root **bark sloughs off easily**. If it does, there is a salt problem.

BEDDOE: It is usually the sulfate form of copper that is in common use. However, **copper in the phosphate form is needed in order for the bark of trees to have good elasticity** so that they can stretch properly during the growing process. Without phosphate of copper, the bark of some trees, such as peaches, plums, cherries, apples and pears, will show splitting. This problem is especially detrimental to cherries and peaches, as it allows bacterial infections (called gumosis) to enter the tree and can be fatal to entire orchards.

BEDDOE: Phosphate of copper is **vital to the bark on the trees** stretching properly. If there is not enough then trees either will have symptoms associated with their barks splitting and oozing sap or being too tight so that the tree does not have proper sap flow.

ENERGY RESEARCH: Cobalt it is very important for the **formation of bark** and cellulose.

FOLIAR FEED 1981: Add copper for **tight bark**.

FOLIAR FEED 1981: If the **bark on the tree plant roots** is loose from ammoniation, you must completely foliar feed the entire TDN.

FRANK: Crops with an outside bark over xylem tubes such as trees, alfalfa, or sunflowers may have a copper deficiency which doesn't **allow the bark to stretch**, making foliar nutrition futile.

FWTK: Once the [salty] soil dehydrates the root, the **bark will slide off** it, allowing the nematode to enter the plant.

PLANT FEED 1976: Copper gives the **bark an ability to stretch** without splitting wide enough for the up to leak out.

PLANT FEED 1976: When you see peach, orange, apple or other trees with the **bark leaking out sap** and crystallizing, that means there is a phosphate deficiency first. Second, a copper deficiency. Or phosphate of copper.

SKOW: When too much salt ends up in the root zone, it is often possible to pull a plant out of the soil and slide off the **rootbark**.

SKOW: Copper---or the lack thereof---is most frequently noted when fruit trees do not produce. They do not produce because the **bark cannot stretch**. When the bark cannot stretch, sap can't flow.

SUCROSE: During the summer months, see to it that the phosphate, copper, and magnesium join. This union keeps the outer skin of the sugarcane growing and prevents it from becoming hard and woody and retarding growth. This **tough, woody bark will make the sugarcane slow in coming up** when planted because water cannot get in to start growth. When the sugarcane has a dry, woody bark, it will come up quicker when the joints are cracked or mashed to permit water to get in, and then growth begins. Unless the bark is pliable and elastic, the sugarcane cannot grow as it is hide bound and will sometimes split because it cannot stretch.

WHEELER: Try gently pulling on a medium-size corn root to **see if the root bark will separate and slip off** easily like a stocking. This would indicate weakness caused by excessive salts in relation to carbohydrates and humus and could provide a situation where nematodes could easily penetrate.

WHEELER: Reams claimed Sul-Po-Mag works best in the northern hemisphere when applied between July 15 and September 15. During this time, it supposedly works to release copper which **allows plant bark to expand** and stretch.

RETURN TO TOC

BASIC SLAG

ADVANCED AG: Use of **basic slag** for calcium.

ADVANCED AG: Basic slag contains 20% iron oxide, however is slow release.

ADVANCED AG: Basic slag is economical in some areas (freight is a cost).

AG LECTURES: Just ask the person who is selling lime, he has an analysis on it. Tell him you want Agricultural lime---calcium carbonate, calcium oxide, or **basic slag**.

BEDDOE: Basic slag is a good liming material, unfortunately it is not as readily available as it used to be. It is a by-product of the steel making industry. If available it takes only 500 lbs. to equal the effects of 1 ton of high calcium lime.

BEDDOE: Iron sources include soft rock phosphate, **basic slag**, iron sulfate, molasses, and various chelated irons as can be used in foliar applications.

ENERGY RESEARCH: Manganese Sulfate and **basic slag** are excellent materials for getting manganese into the soil on a long term basis.

FWTK: There are five basic sources of calcium for agricultural purposes. The most common source is ground limestone. Then there is dolomite - which we do not use, gypsum (calcium sulfate), calcium oxide, aragonite and **basic slag**.

PLANT FEED 1976: Anytime you use **basic slag** 500 lbs. will go as far as a ton of agricultural lime per acre.

SKOW: Materials useful to making the proper anion-cation connection turn up in some unlikely places. **Basic slag** is a byproduct of the iron ore smelting industry. They use calcium in the smelting kettles to keep the molten metal from spitting out the top. In the process the lime picks up iron and trace metals. The recommended application rate is 500 pounds per year, which will put about 25 to 40 pounds of actual iron into the soil if that is needed.

WHEELER: This is why we suggest locating and using free or inexpensive, nearby natural minerals where possible. Lime or marl are part of the mineralization process and usually have to be purchased, but gravel or kiln dust may be available for the hauling. **Basic slag from industry is an underused possibility**.

RETURN TO TOC

BEANS

AG LECTURES: Reams: What is the primary benefit of adding compost over manures whenever you disc them in or plow them under. Student: It is immediately available. Reams: That's one thing, but what is the something else I am trying to get across to you? It doesn't burn the plants. The raw manure creates a heat in the soil. If you have a dry year what happens? It releases too much moisture and you're really suffering from a drought. But compost does just the opposite, it draws the moisture from the air and holds it in the ground. How does it do that? The carbon content, it's not going through a heat, actually it cools the soil. What form is the nitrogen in the compost?

Ammoniacal nitrogen and what does it do to the soil? Not only warms, but cools. It controls the temperature. Student: How does it do that? Reams: By refrigeration. Yes, in other words when you heat ammonia it freezes, when you freeze it, it boils, it's a contrary substance. If it wasn't true you couldn't use it for a refrigerant, do you realize that? That alone is worth everything you are paying for all the courses, just to know that one factor if you use it. **We picked beans up to 2 weeks before Thanksgiving right here in the mountains** last year because we used that factor. And do you know where I had to go to get ammonium sulfate? Orlando, Florida.

AG LECTURES: What happens to young plants or onions or peppers, **beans**, tomatoes – row corps; whenever there's a copper deficiency? What happens to your young plants? They rot off at the ground.

AG LECTURES: You only use it [manganese] where you're growing a mature seed. **Would you use it on green beans**? You would, yes, if you don't you'll have skinny looking beans. Yes, you need it in the beans, because nature is trying to leave offspring there.

ANDERSEN: To notice that **one field of beans has a sheen** and the adjacent field does not indicates a difference in nutritional balance.

BEDDOE: In newly **germinating beans** a lack of phosphate of copper means that the cuticle of the plant will not stretch fast enough to keep up with the growth of the plant so the blue mold that causes the damping off disease will be allowed to exercise some destruction.

FRANK: Why not raise our own super foods like **super food green beans** or super food beets and so on. If we pursue highest quality, the foods we raise in our garden will be super foods.

FRANK: This **variation of nutrient density in green beans** applies to all produce. To get true nutrient dense foods you must first fix your soil.

FWTK: According to government standards, it takes 32 lbs. of green beans to make a bushel. A bushel of high quality beans will only till the bushel basket 3/4 full and still weigh 32 lbs. Poor quality beans with a low sugar content will require an extra six inches of beans on top to weigh 32 lbs. The **heavier beans are the most nutritious** since they contain the most minerals.

RETURN TO TOC

BEANS, SOY

ADVANCED AG: There are some crops that ordinarily are a no-no. Only grow tomatoes under contract to a canning company. **Soybeans** are no-no because someone else determines the price.

ADVANCED AG: Some types of alfalfa, corn, or **soybeans** require less water than others. Experiment and discover them.

AG LECTURES: On corn, wheat and **soybeans**, there's one other ingredient you should use on any crop that you're growing for the grain. It's manganese. Manganese is the element of life and without manganese there's not any life. Therefore the lack of manganese can cause a great loss of yield in the long run. So it's a good idea to add manganese to your nutritional spray.

AG LECTURES: Student: Are there other crops you suggest not growing? Reams: **Soybeans is one**. Student: Is that because the farmer has no control over the price? Reams: Yes.

AG LECTURES: Student: If you're applying your chicken manure to your soil, would it make any difference in the amounts you put on for corn, peanuts or **soybeans**? Reams: No it doesn't. Just put down what you can afford. If you're using the litter, use about 4 tons to the acre, but if it's cage manure, one ton to the acre or ton and a half to the acre. I'm talking about the dry or comparatively dry that stacks up under the cages.

ENERGY RESEARCH: You want leaves early in the spring for your corn, **soybeans**, lettuce, romaine lettuce, cabbage or anything where you want growth. Even on your small grain, you want growth and that is when you use your nitrate nitrogen. That is why it is important in your spray formulas to have some form of nitrate nitrogen.

FOLIAR FEED 1981: Student: When should we last foliar feed **soybeans**? Reams: About 5 weeks after blossoms are done.

FOLIAR FEED 1981: Also add iron chelate or iron sulphate [to **soybean** foliar formulas].

FWTK: Part of the commercial yields achieved with the Reams program are: 20 tons per acre of alfalfa at 28% moisture; 200 bushels of corn per acre as a starting point; 100 bushels per acre of **soybeans**...

PLANT FEED 1976: On the other hand, you want to keep a high manganese if you grow such as wheat, corn, peanuts, or **soybeans**. It is important to zero in on this for economics. However, you really pay little attention to this as a backyard grower because soil analysis expenses can run away on you.

SKOW: Farmers have often noticed that corn or **soybeans** planted in east-west rows outperform the same crops planted in north-south rows. This has to do with the magnetic field.

WHEELER: If the plant is a legume, such as alfalfa, clover, **soybeans**, peas, or dry beans, root examination should include nodule observation.

RETURN TO TOC

BEETLE

ADVANCED AG: Reams: **Potato beetle** can eat half plant and not affect potato.

AG LECTURES: All [pest] worms are laid by some kind of a moth **or a beetle**.

AG LECTURES: Nematodes bear their own young and lay eggs. **Worms have to have a moth or beetle** or something on that order to propagate them. Like a butterfly in a cocoon.

ANDERSEN: Squeeze the juice from the stalk next to an ear and take a refractometer reading. If the Brix level is 8 or above and maintains this reading for 24 hours a day, there will seldom be any noticeable damage to the ear silks by adult **rootworm beetles**. However, if this reading drops below 8, there will be progressively greater silk damage as the reading gets lower and lower. It is important to make sure that the reading is a ”true” reading and not one in a dehydrated condition, which would give a false impression. This reading can be a valuable tool in management because, **regardless of the beetle population**, if the reading in the stalk next to the ear is 8 Brix or above throughout the day and night, spraying an insecticide would be unnecessary and a waste of money.

FRANK: Headings:I said [to Skow], I've got **potato beetles** on my potatoes.” He said, “Oh? Well, you don't have high Brix potatoes.” I said, “High Brix, what do you mean?” He said, “Well, the sugars aren't high enough.” And so, it kind of went from there and we started soil testing, and we started seeing phenomenal results right away.

FRANK: Headings: That fall, I can't say we didn't have any **potato beetles** that year because we had just a couple here and there. I saw them. But, it didn't do any damage. Anyway, we harvested an average of 16 potatoes per hill.

FRANK: And so, we mixed up some soluble nutrients and we also used a foliar spray from International Ag Labs. And he called me 24 hours later, and he said, “Duane, you have to come see this. All those **potato beetles moved out into the weeds**.” And I said, “I DO have to see this.” I drove up there and his potato patch was clean. I could not find one beetle in that potato patch, and that IS unusual. I mean, usually, you'll find one or two, but I couldn't find ONE.

PLANT FEED 1976: You put cottonseed meal out there and a ground mole will go from one and of the row to the other and plow up everything. But you put your tobacco dust in it and they won't. That's a secret. Put about 100 lbs. of tobacco dust to every 1,000 lbs. of cottonseed meal, mix it thoroughly and **the beetles** and bugs [or ants] won't get in it.

RETURN TO TOC

BEETS

AG LECTURES: There are certain crops that need a lower temperature than others, i.e. cabbage, lettuce, escarole, romaine, onions, English peas, garden peas, radishes, **beets**.

AG LECTURES: I'll tell you what you can **do with beets**. Take your beet and wash it really good, leave your top on it. Clean out that bud really good because there’s more trash that can get in that bud than you ever thought of. Then freeze the whole thing, top and all. Then take it out, put it in the blender and into the juicer and you've got some of the finest beet juice you ever had in your life. You've got beet juice right out of this world. Beet juice is a wonderful physic. it’s a laxative. It also builds red blood cells, vim, vigor, vitality. It gets you ready to go in the morning. That’s the way you do beets, top quality. The health food stores, once they're shown how to do this, they can’t supply enough beets, beet juice, fresh beet juice, frozen beet juice and it’s really, really good providing the beets are top quality beets when you start. If they're low quality beets, etc., then the juice is low quality.

AG LECTURES: You've got 2-3 weeks to get your [matured] **beets** out of the ground.

ANDERSEN: In negligibly small concentrations (0.001% and 0.0001%) they [humic acids] enhanced growth and increased the yield of wheat, oats, barley, **sugar beet**, tomatoes and other plants. The action of humic fertilizers was tested by the author in different soils. In all cases the effect was positive.

ANDERSEN: Sugar-**beet lime**—fair [calcium source], depending on area of the county and the soil it is going on; inferior to CaCO3.

BEDDOE: Remember [when blending fertilizers to] use the best filler available and that may be just plain white sand. **Beet lime** or high calcium lime could be used also for the added benefit of the calcium.

BEDDOE: Beet lime is a high grade calcium carbonate limestone flour that has been used in the sugar beet processing during sugar making. After it has been used it is accumulated as a by product. It is available for agriculture and is usually very, very cheap. It has one other advantage; it has a higher level of phosphate than ordinary lime due to the process it went through.

GARDENING: Phosphate is what determines the amount of sugar that’s in the leaf and in the carrot, in the potato, in the **beet** and everything else.

PLANT FEED 1976: Sugar beets will vary in content according to the phosphate in the s o i l . They should run

12-15% in the juice as it comes out of the sugar beet.

REAMS/SKOW COOK: **Red beets** have something besides calciums, they are quite high in magnesium. So is watercress. Watercress has high magnesium in it, and so do some mangoes.

RETURN TO TOC

BIOLOGICAL

ANDERSEN: Regardless of whether you follow an organic or a **biological procedure**, your success will be reflected in the refractometer reading of the commodity and its freedom from insects, diseases, and weeds. A wormy organic apple is substandard, pesticides or no pesticides.

ANDERSEN: Calcium is the foundation of all **biological systems** and is the component that gives the living cell its capacitor characteristic via its place in the cell membrane.

ANDERSEN: Common carbohydrates are sugar, molasses, humic acid, humates, fish meal, seaweeds, algae, yeasts, enzymes, **biological brews**, whey, and so on.

ANDERSEN: Sources of phosphate are.: Mycorrhizae fungi—varies with **bioactivity**, good.

ENERGY RESEARCH: Student: Is calcium carbonate **biologically active carbon**? Skow: Not by itself. It has to be worked on by bacteria. Very little of that will stand in suspension in water. Practically none unless you have a good ammonia level in the soil. It will become soluble because that is how they make calcium nitrate.

ENERGY RESEARCH: You must avoid anaerobic conditions. Essentially, this is where the ground crusts over and then your aeration and normal **biological system cannot work**.

ENERGY RESEARCH: Skow quoting "**Rules of Biological Life**": Plants live off of the loss of energy from the elements during the synchronization of these elements.

FRANK: Soft rock phosphate is this colloidal clay impurity. What were the impurities? Clay and trace minerals. It has proven to be one of the best phosphate fertilizers for organic and **biological growers**.

SAIT: Andersen: For example, using liquid calcium with Vitamin B12 and sugar is primarily a chemical catalyst to make calcium available, but introducing a microbial or enzyme-based material as a **biological catalyst**.

SAIT: Andersen: It is possible to build a good **biological system** without a microbial inoculation, simply by the use of fish, seaweed, humic acid, composts and sugar.

SUCROSE: Lack of enough kinds and amounts of aerobic bacteria present in the soil will cause a lesser yield. Bacteria does many things to increase yield, such as converting the soil elements into protein which preserves the elements in soil for later use and also serves as a natural means of **biological control**.

WHEELER: In the authors' experiences, application of high-calcium lime to a soil above 7.0 pH has sometimes actually lowered the pH due to the **complex biological** and chemical processes found in living soil.

WHEELER: These *[chemical trace nutrient]* forms, however, aren't of the highest energy nor are these the most **biologically available forms**. Other forms such as amino, citrate or humic acid types are more easily assimilated by the plant.

WHEELER: Grasses can be brought under control by raising **biologically-active calcium levels**. High-calcium lime and liquid calcium are excellent ways of raising calcium levels.

RETURN TO TOC

BLOSSOM

ADVANCED AG: Tomatoes that appear all vine can be **induced to blossom** with cationic substances such as vinegar.

ADVANCED AG: Apple or citrus trees always bear because they have both **male and female blossoms**.

AG LECTURES: Do you know there won't be a week's difference in the corn that you planted 3 weeks ago and the one you planted 3 weeks from now? Actually there won't be over 10 days difference in it if that much. And the yield will be that much greater. Do you know that oranges that come on the blossom over a 6-7 week period will mature at the same time? Do you know that **peaches that blossom anywhere, we'll say over a 40 day period, will mature at the same time**?

AG LECTURES: Anionic plant food makes growth, cationic plant food makes fruit. So now you're going to change it from anionic to cationic. You know when the **blossoms start to shed off**, regardless, there's a fine delicate point there in your soil chemistry that you're not going to be able to measure. It's too delicate, but when the blossoms starts to shed off, what are you going to do to stop it? Student: Add acid. Reams: What is the name of that acid you're going to add? Student: Superphosphate? Reams: Superphosphate, yes, or you can use just plain vinegar, if you've got a backyard garden. It's a lot quicker and a lot cheaper and a lot handier. And it's in any store. Add one teacup full to two gallons. Just sprinkle it around the ground.

BEDDOE: On those [crops] grown for fruit, seed, root, or **blossom**, such as com, wheat, tomatoes, apples, etc., you

use both nitrate and ammonia nitrogen at the proper times.

FWTK: On those [crops] grown for fruit, seed, root or **blossoms** (com, wheat, tomatoes, apples, etc.), both nitrate and ammonia is used.

FOLIAR FEED 1981: Student: When should we last foliar feed soybeans? Reams: About **5 weeks after blossoms are done**. Student: How about corn? Reams: Until it is well past the milk stage. You can **cut alfalfa when 50% of the blossoms are open**. You can spray the day before cutting.

FOLIAR FEED 1981: Reams insisted that grapes in certain areas had to be sprayed to deal with Blossom spiders. He suspected they bred in the sand and he never found a non-lethal way to deal with their silk binding up the **grape blossom**.

FWTK: When the nitrate runs out (after about forty days), the ammonia becomes available, and makes flowers, **blossoms** and fruit.

GARDENING: Many times **all the blossoms come** on at the same time [*peaches, pears or apples*] and they get frozen off because the soil chemistry's out. Those blossoms should come on over a 6 week period. And the first ones that come on are way down the stem so if they get frozen off, then a few more will come out, if they get frozen off a few more will come out, and then a few more will come out, and you can still have a bountiful crop of fruit providing you keep your soil chemistry correct.

PLANT FEED 1976: Alfalfa is a grass and if the 1-5-.5 ratio between your P205 and your potash gets higher than that on alfalfa, you know what's going to happen? It will **go to blossom when it is waist high**. **NOTE:** *In other places it is clear that Reams meant that the phosphate:potash ratio should not narrow to less than 4:1. In this document Reams then held out the possibility that alfalfa should grow 12 feet high.*

WHEELER: Alfalfa, lettuce or spinach that **goes to blossom** or bolts early indicates a fertility imbalance situation that may be worsened by weather extremes.

RETURN TO TOC

BLUE MOLD

AG LECTURES: I've seen tomato plants 6-8 inches rot off at the ground. It does something differently there. It doesn't make the bark stretch. What does it do? How does the copper work to keep the plants from rotting off at the ground? It's a germicide, it **kills the blue mold**.

AG LECTURES: The **blue mold** can't stand it. Copper is the greatest enemy blue mold ever had. Then it also makes the bark stretch in the plant and give you greater yields. It's a germicide.

AG LECTURES: Student: Copper sulfate [bluestone], how much per acre? Reams: For **blue mold**? Generally 6 oz per acre for 100 gallons of spray, providing your 100 gallons of spray would cover it [the acre]. If you're homogenizing it, it will cover a lot more than that. Whether or not your spray is homogenized or not, use the came concentration. Do you understand what I'm saying? It makes no difference whether or not your spray is homogenized or not, use the same concentration. But it goes a lot farther with a homogenized spray.

BEDDOE: In newly germinating beans a lack of phosphate of copper means that the cuticle of the plant will not stretch fast enough to keep up with the growth of the plant so the **blue mold that causes the damping off** disease will be allowed to exercise some destruction.

FOLIAR FEED 1981: Add copper sulphate for [to prevent] **blue mold**.

FOLIAR FEED 1981: Reams urges his farmer audience to foliar feed the soil PRE-PLANT so as to head off **blue mold**, cutworms, nematodes, wireworms, loopers, aphids, and other pests before they get a chance to cause harm.

PLANT FEED 1976: There's only one reason why **blue mold** is present on a young plant. For lack of copper---a deficiency in the plant.

PLANT FEED 1976: **Blue mold** points to a copper deficiency. [Adequate copper] allows bark to stretch.

RETURN TO TOC

BORON

ADVANCED AG: **Proper boron** prevents grain from molding and fruit from rotting.

ADVANCED AG: **Excessive boron** can be a problem for many years.

ADVANCED AG: **Too high boron** kills microbes.

ADVANCED AG: **Excessive boron** dehydrates the soil by killing microbes.

AG LECTURES: Student: What is the best way to get boron onto your fields? Reams: **Chicken manure is very rich in boron**. We're going to learn how to put it on via sprays a little later.

AG LECTURES: Reams: What would cause Black Heart in potatoes? Student: Boron deficiency? Reams: **Boron**

deficiency causes Black Heart and it also causes them to split open in there. What causes the cabbage or lettuce when you cut it off at the ground to have a hole in the bottom? Student: Boron deficiency.? Reams: What is the best way to get boron onto your fields? Student: Chicken manure? Reams: Chicken manure is very rich in boron – yes.

AG LECTURES: Reams: Do you know one reason so many small grapes fall off the pod is because there is not enough manganese for all of them? Not enough manganese. Also, don't forget that I told you in the first course that **grapes like a lot of boron**, chicken manure. Pile it up, and they will really appreciate it. Student: Black heart is a lack of boron. Is it possible to get too much boron on potatoes and stuff like that? Reams: Not from chicken manure, no.

ANDERSEN: Boron is important for filling in hollow stems. It seems to have various functions, but there is little agreement among plant physiologists as to specifics. **Boron can cause strawberries to taste woody**. Boron deficiency causes black heart. Boron is best used where calcium also is being used. It is an effective biocide, but it must be used with caution.

BEDDOE: In a soil with 500 pounds per acre of chloride, chicken manure should not be used on the ground. The chicken manure is **high in boron** and with lack of plenty of water the stage would be set to convert ammonia nitrogen to nitrite nitrogen. If this were to happen it would severely burn the roots of any plants in the soil.

BEDDOE: Hollow stems on grasses and forage crops, such as alfalfa, are not normal. It is an expression of phosphate of **boron deficiency**.

BEDDOE: Excessive boron can be a problem. In too large amounts in the soil it works like a bactericide. it kills bacteria. In the strawberry excessive boron can make the berry develop a very woody center.

ENERGY RESEARCH: But if the carbons are low and you have an **excess of boron** in relation to calcium or a high salt or sulfur content, you can get ammoniation of the plant. What it does is simply kill them.

ENERGY RESEARCH: When you build a spray, you should always add calcium to it in some form if you are going to put boron in. That is to protect against ammoniation. Now, if you have plenty of calcium in the soil, you will be alright.

FOLIAR FEED 1981: Boron makes pith and is a germicide except in chicken manure because the calcium makes it non-toxic.

FOLIAR FEED 1981: Copper and **boron** in the same spray tank are a no-no because of cross purposes.

FWTK: Furthermore, healthy plants take a large part of the trace elements they need from the air. They supply magnesium, manganese, zinc. cobalt, copper, sulfur **and boron** in this way. Soil must contain proper mineral levels for this process to take place.

GARDENING: *[Hydroponic situation*] Now I said, "These bugs are sucking the sap out of these plants." He said, "What should I do about it." Well I said, "You **need a little boron**. You haven't got quite enough boron in the nutrient solution to kill them."

PLANT FEED 1976: Student: Would you use chicken manure on citrus? Reams: Yes, but never dig it in. Leave it on top of the ground. Why? Because the **boron will ammoniate** your trees. It will never hurt citrus if you leave it on top of the ground. Not only that, if you've got your calcium and phosphate, you'll never need to spray your grove. No bugs or insects in it . Spread it from tree trunk to tree trunk evenly.

REAMS/SKOW COOK: This grapefruit I am holding has a tight core in the middle. A lot of them are hollow enough that you can stick your thumb in the middle. What does that mean when it's got a hollow in the middle? Student: Too little mineral. Reams: Yes, but what mineral? Student: Boron? Reams: That's a **boron deficiency** whenever they have it. But this grapefruit is almost perfect in its boron content.

SKOW: Plants also have enzymes. These are small protein units that act as on-scene engineers in the cell building business. They take raw materials, such as earth minerals, and see to it that they reach the right stem, root, bud, flavor, or whatever. Indeed, how enzymes create hot spots to attract essential cell building materials — iron, nitrogen, **boron, for instance** — so that they can be linked to the right molecules in plant cells must be considered a miracle. Equally a miracle is the fact that most farm crops are 95% sunshine, air and water, and only 5% earth minerals.

SUCROSE: ...by first noting some things that will decrease yield: 15. an oversupply of nitrogen salts, potash salts , magnesium salts, calcium, sulfur, **boron**, and others.

WHEELER: Calcium can also tie up or keep plants from taking up trace minerals such as boron. According to Hands-On Agronomy, excess calcium can hide magnesium. If Neal Kinsey is correct in this respect, too much calcium fools the reader by concluding that magnesium is in the correct range whereas it actually is in excess.

WHEELER: Boron functions as a regulator in the plant's metabolism of carbohydrates and hormones. Hollow hearts in vegetables have generally been associated with boron shortages. Alfalfa has been identified as particularly needing boron. Generally, boron is not available in high pH soil or soil low in organic matter.

RETURN TO TOC

BRIX

ADVANCED AG: **Brix is a shortcut** to measuring your mineral content.

ADVANCED AG: Calcium nitrate can **greatly increase Brix** and yield of alfalfa.

ADVANCED AG: Reams: **Any other Brix questions**? Student: What about grapefruit? Reams: It's the same as oranges. Should be in the top group, sometimes it isn't. The law says it's got to have Brix of 9.25 in order to ship it (which is too tart).

ADVANCED AG: The **Brix reading should be the same throughout the plant**, unless the soil is low in TDN.

AG LECTURES: Reams: If you're cutting alfalfa [or other grasses], the best thing to do is is to start about 4 o'clock in the morning and cut them and then about 10 o'clock start putting them in your harvester. Student: One thing. Your nitrates would be too high. The sun hasn't shown on it at 4 o'clock in the morning and you may poison your cattle, right? Reams: No, **not if there's a high sugar content [Brix] you won't**. You'll poison the cattle because there's low sugar content in it. You will never poison the cattle with a high sugar content.

AG LECTURES: Cucumbers, squashes, green beans, bell peppers, hot peppers, rutabagas, turnips, onions should have **between 6 & 8 Brix**.

ANDERSEN: Squeeze the juice from the stalk next to an ear and take a refractometer reading. **If the Brix level is 8 or above** and Bmaintains this reading for 24 hours a day, there will seldom be any noticeable damage to the ear silks by adult rootworm beetles. However, if this reading drops below 8, there will be progressively greater silk damage as the reading gets lower and lower. It is important to make sure that the reading is a "true" reading and not one in a dehydrated condition, which would give a false impression. This reading can be a valuable tool in management because, **regardless of the beetle population**, if the reading in the stalk next to the ear is 8 Brix or above throughout the day and night, spraying an insecticide would be unnecessary and a waste of money.

ANDERSEN: An ear of corn at 24 Brix with corn ear worms inevitably will have leaf or stalk refractometer readings below 12. Grapes at **18 Brix with insect infestation inevitably will have cane or leaf refractometer readings below 12 Brix**.

ANDERSEN: The **Brix reading of these [high nitrogen, high potash] plants would be lower** and, therefore, these plants would be less desirable to animals and more susceptible to storage rot.

ANDERSEN: The belief that healthy soil grows weeds equally as well as the desired crop is based on the misconception that the soil in question is healthy. Evaluating the refractometer reading of the plants, both weeds and crops, growing in the soil tells the observer whether the soil is truly healthy. In this case, one will find that the refractometer readings of both the crop and the weeds are about the same, **probably in the 4 to 8 Brix range**. Neither the crops nor the weeds are well balanced nutritionally at these Brix levels, but the conventional soil test and nutrient standard may indicate that this is a "healthy" soil. In any event, It is not!

BEDDOE: A dairy cow which is eating alfalfa that has a **16 Brix sugar level** will need only 10-l2 pounds of l2 Brix grain mix to produce 100 pounds of milk. But the same cow eating 7 Brix alfalfa will require 30 pounds of the same grain to produce 100 pounds of milk; besides that, the cow is very vulnerable to disease.

FRANK: Headings:I said [to Skow], I've got potato beetles on my potatoes." He said, "Oh? Well, **you don't have high Brix potatoes**." I said, "High Brix, what do you mean?" He said, "Well, the sugars aren't high enough." And so, it kind of went from there and we started soil testing, and we started seeing phenomenal results right away.

FWTK: Alfalfa hay, which should measure twelve to 14% sugar content, is often only six to 8 **Brix**. **NOTE:** *Be wary of wrong comparison because in various places Reams says that a Brix reading is 1/2 sugar.*

FWTK: The average reading you will find in oranges is nine to 10 Brix, but it **should be sixteen to 18 Brix**.

PLANT FEED 1976: Eight dollars a pint for green raw chlorophyll. You may have some trouble in learning how to do it. If you do decide to market, let me know and I'll help you, but you've got to have a sugar content in comfrey of about 5 1/2 or 6 [remember that Reams considered Brix to be half sugar] or it will spoil on you. Even 7 is not too high for comfrey.

SAIT: Andersen: The Reams test will reflect what kind of weed you will see in the field, what kind of soil compaction and tilth you will see, and **what kind of Brix readings you will see** in the crop.

SAIT: Andersen: Let's take sweet com as an example. You may take a reading of the ear and you may have 24 Brix, yet the com borers are running rampant. What you will find with that sweet com is that, if you take a reading of the stem or the main roots, you **will have a Brix reading of 4 or 5**. What's happening is that nature is moving all of the carbohydrates into the ear in an attempt to reproduce the species, so it's a fictitious level in the cob.

SKOW: Vitamin B-12 added to sprays on a regular basis not only improve flavor, it also presides over **improved Brix readings**.

SKOW: There is not one chemical of organic synthesis---pesticide, fungicide, herbicide---that can raise anything **even one Brix degree**, and therein lies a distinction.

WHEELER: [**Higher Brix plants**] will produce more alcohol from fermented sugars and be more resistant to insects, resulting in a decreased insecticide usage.

WHEELER: However, although plants may grow at the higher ERGS levels, the bacterial populations may not function well enough to **result in high Brix readings** along with the potentially higher production.

RETURN TO TOC

BROADCAST

AG LECTURES: Reams: What is a "soil" top-dressing? Student: **Something you broadcast on the soil** to make a late change adjustment to. What is the difference between that and a side-dressing? Reams: There is a lot of difference. Top-dressing is any plant food containing more than 16 units of nitrogen products. It does not contain any appreciable phosphate. If it contains phosphate it's a side-dressing. If your soil is low in potash you could apply some as a part of the top-dressing.

AG LECTURES: Do you dress the sides of the row with manure? You put it in the row, put your compost in the row. Now your manure, **you broadcast it**.

ANDERSEN: If we can at least get a foot in the door with inexpensive banding, then farmers see the results, and they begin to see the potential for improvement. Maybe they will be able to **afford to broadcast** after these improvements. We simply have to work with whatever parameter we are given. It is **undeniably better to broadcast**, but what happens when we can't afford the luxury?

BEDDOE: The best results come when you **broadcast the fertilizers** before planting; then placing them down the middle of the row when the crop is up. It is usually better to apply nitrogen in two applications: one before planting, and one after the crop is up. A single larger application results in a loss of energy in the soil.

FRANK: With a drip tape underneath plastic, you can't do as much as you can with the **broadcast**, but you can change that little micro climate right around the roots and you can do a lot of good with that.

FRANK: We must supply all minerals that are deficient including trace minerals and rare earth elements that are not even measured on the soil test. These minerals must be included in the yearly **broadcast of minerals**.

FWTK: Orchards and groves should be fertilized from tree to tree, so the **fertilizers should be broadcast**. This broadens the magnetic field and extends the spread of the roots, which results ultimately in higher yields.

RETURN TO TOC

BROCCOLI

ADVANCED AG: It is best to plant **broccoli**, cauliflower, and cabbage on 30 inch rows raised on beds or mounds.

ADVANCED AG: While cabbage should routinely yield 20 tons, **broccoli** may be half that because it comes off as several cuttings and is much lighter.

ADVANCED AG: Keeping the carbohydrate *[Brix]* high in **broccoli** allows you to break it off instead of cutting. It is not good if it won't break.

ADVANCED AG: You should sell your **broccoli** to the plant *[processor*] except the third and last cutting can be bunched for sale to stores.

AG LECTURES: You certainly want to use anionic plant food on lettuce, cabbage, cauliflower, **broccoli**.

ENERGY RESEARCH: When you build a spray for leaf crops you don't want to be adding manganese to it unless you are raising it for seed. Leaf crops would include spinach, lettuce, cabbage, cauliflower, and **broccoli**, things like that.

FOLIAR SEMINAR 1983: On cabbage, cauliflower, **broccoli,** strawberries, lettuce, and others, keep manganese low or they go to seed.

FRANK: We use a 2-5-0.2 fish from Dramm that is acidified with phosphoric acid. It is a great foliar spray but it is also strongly reproductive so do not use on growth dominated crops such as cabbage, spinach, **broccoli**, or cauliflower.

SKOW: Some farm crops go directly to the dinner table. In crops where the calcium has been replaced by potassium---lettuce, **broccoli**, Brussels sprouts, spinach---this causes heart trouble and kidney disease.

SKOW: If you know what a healthy crop looks like, then you can measure your success. When you go to a grocery store to buy cauliflower or **broccoli**, examine the produce to see if it has a hollow area in the stem. If it has such a spot, it has a boron deficiency.

SKOW: Hollow stem is the favorite indicator *[of boron deficiency]*, not only for alfalfa, but also for cauliflower and **broccoli**. This may or may not be the case, there being so many other possible deficiencies, any one of which can affect the color.

RETURN TO TOC

BUYING/SELLING

ADVANCED AG: When **buying calcium**, there is no way to know if one batch is higher in energy than another batch of the same type.

AG LECTURES: Student: How do you go about **marketing** that quantity? Reams: Through your supply houses, your grocery chain will take all you've got if they are high quality strawberries that will hold up, won't rot, red all over, no hollow heart, and high sugar content.

AG LECTURES: One of the greatest causes of farming failure is because the farmer **buys stuff like fertilizers** he already has enough of and doesn't buy what he really needs. So ignorance is the greatest cause of failure because he simply doesn't know.

AG LECTURES: It isn't fair to you to **sell top quality produce at the same price they're buying junk for**. It's not fair to you. And if you don't know what you've got, no one is going to tell you.

AG LECTURES: Just ask the person who is **selling lime**, he has an analysis on it. Tell him you want agricultural lime---calcium carbonate, calcium oxide, or basic slag.

ANDERSEN: Animals that are fed alcohol are certain to need more mineral supplementation which is convenient if you are [unscrupulous and] **selling both**.

BEDDOE: When **buying lime**, the farmer has to be on guard against buying dolomitic lime. Some states allow the packaging of dolomite under the label called "Agricultural lime." So be careful what you purchase. For a lime to be acceptable, it is best to have a magnesium content less than 5%.

BEDDOE: Average com seed will weigh approximately 56 pounds per bushel. Optimum com can run as high as 66 pounds per bushel. With this information it can be seen that high quality seed com is 17% heavier than the average quality seed. Not only is it heavier per bushel, but also as we said earlier there will be fewer seed per unit weight. This principle will be seen in most all **seed buying** and sowing [selling?] situations the farmer is involved in.

ENERGY RESEARCH: It is important to know who is making it if you are **buying a commercial product** [i.e., foliar spray] and whether they really do know or not whether it was put together correctly.

FOLIAR SEMINAR 1983: Make sure when **buying liquid fertilizers** that they contain no chlorides.

FRANK: Buying direct from the producer in bulk is one way to significantly cut down on your costs. This not only cuts out the expense of the middleman, it also means there is much less packaging and processing costs.

PLANT FEED 1976: When that banana puts food in each of those fingers, it will put the same amount in every one - mineral content. So if you **buy small bananas you will get more mineral** than you will buying big bananas.

PLANT FEED 1976: On the side of some refractometers you'll notice a small thermometer. In testing fruit juices for home use, you do not need to pay any attention to the thermometer. But, if you're **buying juices commercially** for canning in thousands and thousands of gallons, It is very important to pay attention to your thermometer.

PLANT FEED 1976: I'm telling you that the public doesn't mind **paying for top quality produce** if it tastes good, but what. they do hate to buy is trash for their family---junk. The housewife wants her family to have the very best. Let me tell you something else about good foods, they cost more, but you eat a lot less of them. *[Reams led up to this with a story about how as a young man he was able to sell mineralized black-eyes for 15 cents a pound when his competitors could only get 7 or 8 cents a pound. As the season went on, their peas dropped to 2 cents and Reams was able to get 10 cents as he sold all he could grow.]*

REAMS/SKOW COOK: *[Reams was in a market in Hot Springs and for 50 cents each bought two bushels of grapefruit that he noticed had hard rinds]* Top-quality fruit won't rot; they'll form a shell like wood around it. The friends I was staying with thought I was crazy, buying junk, trash---but when they tasted them, they said, that's the best grapefruit I've ever eaten in my life." Sure they were the best, or **I wouldn't have bought them**.

SKOW: It is safe to say that 75% of the monocalcium phosphate [from factory acid treated rock phosphate] reverts back to stable tri-calcium phosphate within 90 days. In some soils the reversion takes place within hours. As soil conditions worsen, release of nutrients from rock phosphate worsens, and the chemical amateur becomes **married to buying** [*N-P-K*] salt fertilizers, each go-round worsening still further the structure of that soil.

WHEELER: The momentum of giant national and multi-national manufacturing companies assures the continued sale and use of toxic materials for a long time to come. Many of the chemical companies are now **buying seed companies** so they can breed plants which tolerate their chemicals.

RETURN TO TOC

CABBAGE

ADVANCED AG: Celery or **cabbage with rotten core** has boron deficiency.

ADVANCED AG: Cabbage should be planted 20,000 plants to the acre and 20 **mature cabbage** should weigh 50 pounds.

AG LECTURES: There are certain crops that need a lower temperature than others, i.e. **cabbage**, lettuce, escarole, romaine, onions, English peas, garden peas, radishes, beets.

AG LECTURES: Reams: What causes the **cabbage** or lettuce when you cut it off at the ground to have a hole in the bottom? Student: Boron deficiency.? Reams: Yes and what is the best way to get boron onto your fields? Student: Chicken manure? Reams: Chicken manure is very rich in boron.

BEDDOE: On crops that are grown for their leaves or stalk, **such as cabbage**, lettuce, celery, grasses, etc., you use nitrate nitrogen.

ENERGY RESEARCH: When you build a spray for leaf crops you don't want to be adding manganese to it unless you are raising it for seed. Leaf crops would include spinach, lettuce, **cabbage**, cauliflower, and broccoli, things like that.

FOLIAR FEED 1981: Add soft rock phosphate to homogenized spray to achieve sticker effect on waxy leaves like **cabbage**.

FOLIAR SEMINAR 1983: On **cabbage,** cauliflower, broccoli, strawberries lettuce & others, keep manganese low or they will go to seed.

FOLIAR SEMINAR 1983: Potash on **cabbage** helps develop a larger caliber stem & more sap movement.

FRANK: We use a 2-5-0.2 fish from Dramm that is acidified with phosphoric acid. It is a great foliar spray but it is also strongly reproductive so do not use on growth dominated crops such as **cabbage**, spinach, broccoli, or cauliflower.

FWTK: Reams ag shows the way to **20 tons of cabbage** per acre.

GARDENING: Do you know in order to be US #1 cabbage you got to grow 19 **cabbages** to weigh 50 lbs.? Why? So some will be ½ lb. some will be 2 lbs. And this is the size the housewife wants.

PLANT FEED 1976: You want your good plants to reach their climax of nutrients at the stage you wish to eat them, i.e. **cabbages grown correctly** should be low in manganese. If manganese was too high in the cabbage or lettuce field, it will go to seed long before it heads up.

PLANT FEED 1976: Commercial farmers should keep their manganese low if they are growing such as **cabbage**, head lettuce, broccoli, escarole, or romaine so that they don't bolt on you. On the other hand, you want to keep a high manganese if you grow such as wheat, corn, peanuts, or soybeans. It is important to zero in on this for economics. However, you really pay little attention to this as a backyard grower because soil analysis expenses can run away on you.

PLANT FEED 1976: If your crop is still not growing as fast as it could or if it has a blue color---anytime you see the crop begin to have a bluish tint to it---you get a soil analysis even if you had one a week ago because it means the nitrogen is too low, especially **on cabbage**, wheat, or oats. So many things in your grain growing and your truck growing will show a blue tint meaning it needs more fertilizer.

PLANT FEED 1978: Starting with depleted land even if you apply everything I say, you will be lucky to get **10 tons of cabbage to the acre**. However, you should get 20 tons the second year. Be sure and tell the brokers what you have and when it is coming as it takes them a couple of years to know you are a grower. If your cabbage is high quality and high Brix, they will be bidding against each other soon.

SKOW: Sodium nitrate isn't used too often anymore. It is used more in the food industry and the price has taken it out of the marketplace. It is a negatively charged element. It would prove useful on lettuce, celery, spinach and **cabbage crops**.

SKOW: Crops that need a lot of calcium are alfalfa---unless you're going to harvest the crop for seeds---lettuce, **cabbage**, broccoli, Brussels sprouts and spinach. If you want really crisp lettuce, calcium confers that crispness to the outer cell wall.

RETURN TO TOC

CALCIUM-MAGNESIUM RATIO

AG LECTURES: You who can get basic slag *[for calcium]* from the iron mills, it is an excellent product, even though they may use dolomite. It's perfectly alright to use it, because the heat of the red hot iron **burns the magnesium out of it**. **ANDERSEN:** If the calcium level is less than 2,000 pounds per acre, there will be possible energy-reserve deficiencies, weakened skin and cell strength, bruising susceptibility of fruit, soil compaction—especially if there is a **narrow calcium-to-magnesium ratio (7:1)**—weakened stems or stalks, and grass-weed problems. Further related to the calcium-to-magnesium ratio is the fact that a narrow ratio reduces nitrogen efficiency, requiring additional applications of that nutrient.

ANDERSEN: Adding high-calcium lime, one in which the **calcium carbonate** component is extremely dominant to a **high-magnesium** soil might actually lower the pH.

ANDERSEN: People often blame compaction on heavy equipment and frequent traffic across the soil. These things

do cause compaction of soils with **calcium-to-magnesium ratios of less than 7:1**. They do not cause compaction of soils with calcium-to-magnesium ratios of 7:1 or more and less than 70 parts per million of sodium. Compaction is a phenomenon of physics (particle attraction/repulsion) and aeration.

BEDDOE: Excesses of magnesium can cause soil compaction and loss of aeration. **Magnesium should be kept in the correct ratio to calcium** (Ca 7:1 Mg)

BEDDOE: Excess magnesium can be reduced by liming to keep it in an oxide form so it is insoluble.

BEDDOE: When buying lime, the farmer has to be on guard against buying dolomitic lime. Some states allow the packaging of dolomite under the label called "Agricultural lime." So be careful what you purchase. For a lime to be acceptable, it is **best to have a magnesium content less than 5%.**

FRANK: Limestone with a high magnesium content is called dolomite. It is not normally recommended because it provides too much magnesium and **imbalances the calcium-to-magnesium ratio**.

FRANK: Here is the pattern on the Morgan soil test to shoot for if nutrient density is your goal: **Calcium to Magnesium ratio from 7-15:1.**

PLANT FEED 1976: Dolomite is a **calcium oxide and magnesium oxide** [mixture] containing approximately 35% magnesium oxide. One of the fastest ways in the world to go out of the business of farming is to add dolomite to your soil.

REAMS/SKOW COOK: Red beets have something besides calciums, they are **quite high in magnesium**.

SKOW: An **unbalanced equilibrium of calcium and magnesium** permits organic residues to decay into alcohol, a sterilant to bacteria; and into formaldehyde, a preservative of cell tissue.

SKOW: Calcium and magnesium should be about 7:1. Most farmers have a 3:1 or even a 1:1 ratio. Any ratio narrower than 5:1 means problems beyond instant comprehension. It means compacted soils, bacteria that can't proliferate, and weed takeover — in short, a marginal production sequence. For every pound of water-soluble magnesium in the soil, one pound of nitrogen is released straight into the air. This means that until you get the ratio correct, you are going to have to add increasing amounts of nitrogen to grow a crop that will support payment of bills.

SKOW: An unbalanced equilibrium of **calcium and magnesium** permits organic residues to decay into alcohol, a sterilant to bacteria; and into formaldehyde, a preservative of cell tissue.

SKOW: A soil **high in magnesium and low in calcium** can test above 6.5, but will be entirely inadequate for the growth of alfalfa...

WHEELER: In the traditional Reams model the **Ca:Mg ratios would be 7:1** (some say 10:1) to indicate a well-balanced soil. Narrower Ca:Mg ratios, say, 4:1, indicate compaction. The tighter the soil the less drainage and the less favorable the soil for microbes.

WHEELER: It may be necessary to loosen tight soils or break hardpan. If the **soil magnesium level is too high relative to the calcium level**, the desired improvement in soil structure and aeration will probably not be permanent.

WHEELER: What lime do I use? The first choice, in most situations, would be a fine grind of a **high-calcium lime** with as **little magnesium as possible**.

WHEELER: Magnesium, like calcium, is now being considered as a primary nutrient. It is an integral part of chlorophyll making it essential for photosynthesis. ☑ **NOTE:** *Reams strongly warned against magnesium supplementation, possibly because of its ability to drive nitrogen out of soil, plant, and animal.*

RETURN TO TOC

CALCIUM CARBONATE

ADVANCED AG: Some sources of carbon: sawdust, manure, **calcium carbonate**, sludge, compost, roots, green manure, etc.

ADVANCED AG: Calcium carbonate will not tie up potassium if applied with chicken manure because of the added bacterial content.

AG LECTURES: Just ask the person who is selling lime, he has an analysis on it. Tell him you want agricultural lime---**calcium carbonate**, calcium oxide, or basic slag.

ANDERSEN: Adding high-calcium lime, one in which the **calcium carbonate** component is extremely dominant to a high-magnesium soil might actually lower the pH. This can also happen in high-sodium soils.

ANDERSEN: Calcium carbonate (CaCO3), though not technically considered an organic chemical, is preferable to dehydrated lime (calcium oxide, CaO), hydrated lime (calcium hydroxide, Ca(OH)2), or even gypsum (calcium sulfate, CaSO4), if one is seeking the nutrient calcium.

ANDERSEN: Reams used **calcium carbonate**, never dolomite. He observed that sufficient magnesium would be available if he balanced the calcium, phosphate, and microorganisms and then applied fertilizer quantities of Sul-Po-Mag.

BEDDOE: Beet lime is a **high grade calcium carbonate** limestone flour that has been used in the sugar beet processing during sugar making. After it has been used it is accumulated as a by product. It is available for agriculture and is usually very, very cheap. It has one other advantage; it has a higher level of phosphate than ordinary lime due to the process it went through.

BEDDOE: Carbonate molecules attached to the calcium start a carbon dioxide bubbling reaction when worked on by water and bacterial action. This opens up the soil and will make it more granular so that it does not bake hard when dry.

BEDDOE: Making Sprays Anionic: 1. Use Calcium hydroxide (hydrated lime) or **carbonate forms of calcium**. The carbonate form of calcium has an advantage in that it contains the carbon complexes. These can help the plant get more water out of the air.

ENERGY RESEARCH: Student: Is **calcium carbonate** biologically active carbon? Skow: Not by itself. It has to be worked on by bacteria. Very little of that will stand in suspension in water. Practically none unless you have a good ammonia level in the soil. It will become soluble because that is how they make calcium nitrate.

FRANK: Avoid using nutrient elements compounded as carbonates or oxides. Examples of carbonates: **calcium carbonate**, iron carbonate and copper carbonate. Examples of oxides: Manganese oxide, iron oxide and copper oxide.

FRANK: Roots also absorb CO2, and root uptake is just as important to yields as leaf absorption of CO2. When you apply **calcium carbonate** to the soil, organic acids excreted by microbes in the root zone react with it to release more CO2 for root uptake.

SKOW: Carey Reams talked about calciums, plural. By calciums, plural, he meant that every kind of plant had calcium in it, but always in a different organic complex. Each affects a human being differently. Calcium sulfate has a different effect on Homo sapiens than **calcium carbonate**. Calcium from alfalfa and calcium from peppermint tea are each in a different complex. As a consequence, they affect the cells of the body differently. They have a different pH and a different energy potential. These observations prompt a question over whether we should use different calcium forms on the soil. The answer is, Yes!

SKOW: The next calcium on our roster is **calcium carbonate** — generally known as ag lime. In this compound the carbonate and the oxide are bonded together. Spread on an acre of soil, calcium carbonate usually is applied at between 500 pounds and two or three tons per acre. Sometimes dry blends use 100 to 150 or 200 pounds per acre very effectively. A warning is in order — again! Always get a sample from the quarry, and be certain the delivered product is the same as the sample. Some lime materials are toxic. **SKOW:** Calcium oxide and **calcium carbonate** also go together quite well. Generally speaking, lime from the pits means ag lime.

WHEELER: Reams taught that the energy content of any given fertilizer or chemical could be calculated by using a mathematical formula. In using his calculations, one can determine that the energy of a single atom of calcium may range from a low of 540 Milhaus units to a high of 20,959 Milhaus units. Correspondingly, a **single molecule of calcium carbonate** (high-calcium lime) ranges from a low of 30,544 to a high of 82,895 Milhaus units. This range is obviously quite extensive. With this understanding, it is easy to see how a product from one supplier responds in the soil very differently from supposedly the same product obtained from another supplier. This fact has been confirmed by farmers on countless occasions.

WHEELER: The standard source of calcium for soil for centuries **has been calcium carbonate**. In the authors' experiences, application of high-calcium lime to a soil above 7.0 pH has sometimes actually lowered the pH due to the complex biological and chemical processes found in living soil. A non-toxic program calls for viewing soils as to their available calcium content, rather than using the pH concept.

RETURN TO TOC

CALCIUM HYDROXIDE

AG LECTURES: Then what would you do? The crop was rotting in the field. With all these numbers that I have told you and yet the crop was rotting just as it matured. Student: Put some sulfur on? Reams: Sulfur or copper? Student: Too much sulfur. Reams: Too much sulfur, that's right. So what would you do? Student: Put calcium on it? Reams: **Calcium hydroxide, the hot lime**. Just about 100 lbs. to the acre will knock that sulfur right out of existence as far as availability to the plant is concerned. And in 3 days you've stopped the rot. Calcium hydroxide is the hot lime.

AG LECTURES: So what you've got here is not a single anion, but you got a **triple anion in calcium hydroxide**. In other words you have [figuratively] dynamite! The other molecule you have, three instead of one. You have a triple anion there. A double is powerful, but a triple is very powerful. Now, it was no problem at all when I got my soil

analysis to figure out how much it would take, two 50 lb. bags to an acre.

ANDERSEN: The term "hydrated lime" means that calcium oxide (CaO) has had water added to it to get Ca(OH)2. Its proper name is **calcium hydroxide**.

ANDERSEN: Sources of calcium are as follows: **Calcium hydroxide**—hydrated lime, quick lime; use with caution.

ANDERSEN: Calcium carbonate (CaCO3), though not technically considered an organic chemical, is preferable to dehydrated lime (calcium oxide, CaO), hydrated lime (**calcium hydroxide, Ca(OH)2**), or even gypsum (calcium sulfate, CaSO4), if one is seeking the nutrient calcium.

BEDDOE: Hydrated lime (also called slaked lime and **calcium hydroxide**): dry powder, 54% pure calcium, anionic. This is a "hotter" calcium source. It can make more soil heat because of the resistance it makes and it will then cause the soil to dry out. It is best used in the fall so that it can sit all winter long.

BEDDOE: Another interesting sidelight about calcium is that in some forms it can be very valuable to regulating soil temperatures. When the farmer encounters problems with cold weather, a substance called **calcium hydroxide** can be used to increase soil temperatures. It works this way because it creates a lot of resistance in the soil, therefore a lot of heat is produced. Using only a maximum of 200 pounds per acre can do wonders for warming the soil which will then increase the ERGS. This type of calcium is also good to counteract other problems that are becoming more prevalent today, such as excess acids from fertilizers, rain, and sulfur containing irrigation water.

ENERGY RESEARCH: This was in sandy soil and there was no calcium in the root zone so what happened? There wasn't anything there to provide some resistance to cause the plant to grow. So what I had to instruct them to do is find some **calcium hydroxide** and dribble it down between the rows so that we could get our positive and negative current going again. We had all positive and no negative and that doesn't work too well.

ENERGY RESEARCH: There is one other calcium source to consider and that is **calcium hydroxide**. Now how much? There are some things you need to know about calcium hydroxide. It is a very good product but you must first of all (it's a fine powder) put it into water (deionized or distilled) and stir it up and leave it set because it will get hot, too. You leave that for a couple of days in the container. Then take out a pint to two pints of that and put it in your 100 gallons of spray. This will be a saturated solution. Only a certain amount will stay in suspension and that is what you use.

FOLIAR FEED 1981: You should rarely use calcium in [foliar] spray unless **calcium hydroxide**.

FOLIAR FEED 1981: If the crop rots as it heads up, add **calcium hydroxide**.

FOLIAR FEED 1981: Add **calcium hydroxide** not calcium sulphate (gypsum).

FRANK: Limestone rock can be heated by fire. This drives off the carbon and leaves a very fine powder: calcium oxide. A certain amount of **water can be added to become calcium hydroxide**. Both of these forms of calcium are very hot chemically and aren't recommended very often. They are very strong on growth energy, but can burn plants and leaves. If you must use these forms, apply during dormancy and handle carefully.

SKOW: My formula follows: Put in water, a humate, **calcium hydroxide**, magnesium sulfate, Bo-Peep [ammonia], a special amine compound, castor oil, sodium carbonate and water — it has to be distilled water or good reverse-osmosis water---and seaweed extract.

WHEELER: Soil pH will rise from adding a liming material like calcium carbonate, calcium oxide, or **calcium hydroxide**. But pH will also rise if any positive ion is added. The major positive ions that attach themselves to the negative clay colloids [*see note below*] of your soil are calcium, magnesium, potassium and sodium. If you don't differentiate between ions and simply consider pH, you are falling into the pH trap and you may have imbalanced nutrients, particularly a shortage of calcium. Since the available calcium determines the total yield of your crop, you could be losing yield and test weight from being caught in the trap. So the first rule is: calcium is king and the second rule is: don't use pH to determine if you need to apply calcium.

NOTE: *"Clay colloids" are not the "chemical compound colloids" of Reams-Ag.*

RETURN TO TOC

CALCIUM OXIDE

ADVANCED AG: Use Aragonite on east coast for **calcium oxide**.

AG LECTURES: Just ask the person who is selling lime, he has an analysis on it. Tell him you want agricultural lime---calcium carbonate, **calcium oxide**, or basic slag.

ANDERSEN: The term "hydrated lime" means that **calcium oxide (CaO)** has had water added to it to get Ca(OH)2. Its proper name is calcium hydroxide. Dehydrated lime, burnt or calcined lime has had the water removed and is termed calcium oxide (CaO).

ANDERSEN: **Calcium oxide**, (burnt, dehydrated, or quick lime) CaO.

ANDERSEN: Calcium carbonate (CaCO3), though not technically considered an organic chemical, is preferable to

dehydrated lime (**calcium oxide, CaO**), hydrated lime (calcium hydroxide, Ca(OH)2), or even gypsum (calcium sulfate, CaSO4), if one is seeking the nutrient calcium.

BEDDOE: **Calcium oxide**: (also called unslaked lime or quick lime) CaO, dry powder, 71% pure calcium, anionic. This is really hot lime. It can burn plants.

FWTK: **Calcium oxide**, Aragonite [calcium carbonate] and basic slag are not always available in different parts of the country, but they have the advantage of being quickly available to the plants [if you can source them].

PLANT FEED 1976: Dolomite is a **calcium oxide** and magnesium oxide [mixture] containing approximately 35% magnesium oxide. One of the fastest ways in the world to go out of the business of farming is to add dolomite to your soil.

SKOW: **Calcium oxide** and calcium carbonate also go together quite well. Generally speaking, lime from the pits means ag lime.

WHEELER: Quick lime, CaO (46°/o Ca) — **Also called calcium oxide**, this dry product is very fast acting, contains readily available calcium and is loaded with energy. Use with caution or you can burn crops.

WHEELER: Soil pH will rise from adding a liming material like calcium carbonate, **calcium oxide**, or calcium hydroxide.

RETURN TO TOC

CALCIUM(s)

NOTE: *There is much ado about the term "calcium" in Reams agriculture. Most of the ag world thinks of calcium as simply calcium and Reams wanted his students to understand there are many forms of calcium and they usually react differently in the soil, hence "calciums" plural. While you will learn more by studying each individual calcium form in turn, you should come back here from time to time to refresh the "calciums" concept.*

AG LECTURES: Citrus requires the least sprays of any crop providing you keep the carbon contents of your soil, your phosphates and **calciums high enough** in your soil. You'll never have to spray.

ANDERSEN: The term "hydrated lime" means that calcium oxide (CaO) has had water added to it to get Ca(OH)2. Its proper name is calcium hydroxide. Dehydrated lime, burnt or calcined lime has had the water removed and is termed calcium oxide (CaO).

ANDERSEN: CALCIUM IS THE KING of elements. It is needed more than any other element by weight and volume. **Calcium is the foundation** of all biological systems and is the component that gives the living cell its capacitor characteristic via its place in the cell membrane.

ANDERSEN: Avoid products made with calcium chloride. The **liquid calciums** other than Biomin calcium [J. H. Biotech] can go in with the liquid nitrogen and preemergent herbicide or can be sprayed on after planting or in the first watering, whichever is most feasible.

BEDDOE: And of course the bacteria proliferates through the availability of the proper levels and ratios of phosphates, potassiums, **and calciums**, along with the humic carbon compounds.

BEDDOE: Calcium nitrate **helps other calciums become available** because of its nitric acid.

BEDDOE: Tillage practices directly affect the way carbons and colloids work to the surface to pick up the **precipitating calciums** and other minerals.

ENERGY RESEARCH: Liquid fish is a real nice thing to use from the stand point that it furnishes oil, amino acids, some nitrogen, phosphorus, potassium, a full array of trace minerals **and calciums**. This kind of formula can be used on practically any crop. Orchards, trees, grasses, grains, you name it.

ENERGY RESEARCH: Don't use ammonium sulfate if the **calciums** are below 1800 lbs per acre using the LaMotte method of testing.

ENERGY RESEARCH: You can force a lot of growth in the stalk with nitrogen (and even with **calcium**) and get a high uptake in the plant but you won't increase the mineral or raise the Brix. It still takes the phosphate.

ENERGY RESEARCH: When I use purified water in making a spray, it is far more effective than if I just used my well water which contains a **lot of calciums**.

FWTK-pH: Metallic substances, such as iron, sulfur and aluminum, are often the culprits that give low pH readings in soil where there is already an **over-supply of water-soluble calcium**.

GARDENING: The **calciums in your soil** can increase the milk yield by as much as 200% and also if your pasture soils have enough minerals and calcium in it, whenever you put the feed in the trough to milk the cows, they won't even eat it. They'll just stand there waiting to be milked, because the grass will have so much more nutrient.

PLANT FEED 1976: I advise putting chicken manure raw on the soil if your soil analysis shows your **calciums**, phosphates, and potash are where they should be and won't go out of kilter.

PLANT FEED 1976: Try to build your pasture grass **calciums** over a 2 year period. You should work on having

4500-4800 pounds of water soluble calciums.

REAMS/SKOW COOK: Red beets have something besides **calciums**, they are quite high in magnesium. So is watercress. Watercress has high magnesium in it, and so do some mangoes.

REAMS/SKOW COOK: There are more than a quarter million different types of **calciums**. They can be divided into seven classes.

SKOW: Carey **Reams talked about calciums, plural**. By calciums, plural, he meant that every kind of plant had calcium in it, but always in a different organic complex. Each affects a human being differently. Calcium sulfate has a different effect on Homo sapiens than **calcium carbonate**. Calcium from alfalfa and calcium from peppermint tea are each in a different complex. As a consequence, they affect the cells of the body differently. They have a different pH and a different energy potential. These observations prompt a question over whether we should use different calcium forms on the soil. The answer is, Yes!

SKOW: The basic source for all the **liquid calciums** that are sold in gallon jugs is calcium nitrate.

RETURN TO TOC

CARBOHYDRATE

ADVANCED AG: **Carbohydrate** makes the leaf thicker and its inherent stickiness holds more calcium.

ADVANCED AG: Sugar cane will not increase in height or bulk from November to March. However, the Brix, or **carbohydrate**, should increase from 12 to 30 because the plant gradually throws out water over those months.

ADVANCED AG: Unit weight is a guide to **carbohydrate content** [think of heft].

ANDERSEN: This [burning out the soil] is why anhydrous ammonia should not be used directly on the soil. Instead, it should be mixed with water to form aqua ammonia and a **carbohydrate** like sugar or molasses to help retain it in the soil, and some humic acid to help chelate it for better use rather than reducing further the soil's already depleted humic acids.

ANDERSEN: It is quite simple to get carbon into a fertilizer mix. Carbon is in carbohydrates. **Common carbohydrates** are sugar, molasses, humic acid, humates, fish meal, seaweeds, algae, yeasts, enzymes, biological brews, whey, and so on.

BEDDOE: High quality crops have a resistance to disease, will not be bothered by insects as much, and will not rot as easily. Therefore, they will store longer and have much higher protein, mineral, oil and **carbohydrate levels**.

BEDDOE: If livestock are grazing on properly fertilized pastures, their grain consumption will drop; the fact being the animals will be getting their **carbohydrates** in the grass.

BEDDOE: All elements in molecular structure are the same size under the same temperature and pressure. Take a look at (Avogadro's Law in Chapter 1). If this were not true we would not have a standard of weights and measures. And if it were not true then a crop could not increase its sugar content while not increasing in size; and there could be no way of determining the **amount of carbohydrate a plant can contain**.

ENERGY RESEARCH: If there is a carbon deficiency there is a C02 deficiency which will result in a **carbohydrate deficiency** and an oxygen deficiency which will result in decreased aerobic microbial life which will result in increased toxicity, reduction of carbon cycle and finally sterile soil, loss of the magnetic field, and a favorable environment for all types of pests both above and below the ground.

FOLIAR SEMINAR 1983: Heat is generated from **carbohydrates** and carbohydrates require phosphate to be created.

FOLIAR SEMINAR 1983: There are more starches in root crops and more **carbohydrates** in leaf crops.

FRANK: Plants, the producers, offer bacteria **carbohydrates** they have produced which the bacteria use as an energy source. In return bacteria, the decomposers, digest soil minerals and rock powders to obtain nutrients which go to the plants and ultimately into the foods we eat.

FWTK: High quality crops have a resistance to disease, will not be bothered by insects as much, and will not rot as easily. Therefore, they will store longer and have much higher protein, mineral, oil and **carbohydrate levels**.

PLANT FEED 1976: How marry citrus leaves does it take to furnish the **normal amount of carbohydrate** for one orange? [50 is the answer, see *LEAVES*]

SAIT: Andersen: Let's take sweet com as an example. You may take a reading of the ear and you may have 24 Brix, yet the com borers are running rampant. What you will find with that sweet com is that, if you take a reading of the stem or the main roots, you will have a Brix reading of 4 or 5. What's happening is that **nature is moving all of the carbohydrates** into the ear in an attempt to reproduce the species, so it's a fictitious level in the cob.

SAIT: Andersen: In many of our conventional soil systems the crop residues comprise an extremely high lignin fiber and **very low carbohydrate** or free sugar. Lignin takes a lot of energy to break down, and the humus production is limited by this problem.

SKOW: The Brix reading is simply the **carbohydrate concentration** in 100 pounds of juice stated as a percentage.

Although the Brix reading is loosely called a sugar index, it is really much more. For the higher the carbohydrate content in a plant, the higher the mineral content, the oil content and the protein quality. For instance, 100 pounds of a fruit with a Brix of 20 translates into 20 pounds of crude carbohydrate if the fruits were juiced and dried to zero moisture. The 20 pounds---which also represents the Brix reading---can be divided by two to factor out the actual sugar content, in this case ten pounds.

WHEELER: Boron functions as a regulator in the plant's **metabolism of carbohydrates** and hormones.

WHEELER: Try gently pulling on a medium-size corn root to see if the root bark will separate and slip off easily like a stocking. This would indicate weakness caused by excessive salts **in relation to carbohydrates** and humus and could provide a situation where nematodes could easily penetrate.

RETURN TO TOC

CARBON

ADVANCED AG: Some sources of **carbon**: sawdust, manure, calcium carbonate, sludge, compost, roots, green manure, etc.

ADVANCED AG: Add soft rock phosphate before lime to prevent moisture loss which is slowed via **magnetism of carbon**.

AG LECTURES: And what happens when you use a chelate on a **carbonate soil**, high calcium soil? It sheds the leaf off. Many times this happens naturally in your soil and you don't want it to. Therefore the alfalfa leaf sheds off, you start to mow and the leaves all fall off. This material has been chelated and you don't want this to happen in a high carbonate soil. We are going to learn more about that later when we study soils and how to prevent it. But do not use a chelate in a high carbonate soil.

AG LECTURES: Just ask the person who is selling lime, he has an analysis on it. Tell him you want Agricultural lime---calcium **carbonate**, calcium oxide, or basic slag.

AG LECTURES: The raw manure creates a heat in the soil. If you have a dry year what happens? It releases too much moisture and you're really suffering from a drought. But compost does just the opposite, it draws the moisture from the air and holds it in the ground. How does it do that? **The carbon content**, it's not going through a heat, actually it cools the soil.

AG LECTURES: Carbon determines your chlorophyll.

AG LECTURES: Citrus requires the least sprays of any crop providing you keep the **carbon** contents of your soil, your phosphates and calciums high enough in your soil. You'll never have to spray.

AG LECTURES: When you see a crop that has no sheen on it or a grove or an orchard, that the leaves do not have a waxy sheen to, you're going to see a grove or orchard or crop that is **low in carbon**.

ANDERSEN: Reams used calcium **carbonate**, never dolomite.

BEDDOE: Acids (cations) coming into contact with bases (anions) are heat and energy producing because of the resistance between the anions and cations. Whatever organic or inorganic substance there happens to be in the soil also takes part in this chemical action and can be affected by it. These types of reactions, if too strong, can cause calcium and phosphate **as well as carbon** to be oxidized to the point of leaving a very low plant food bank account of soluble nutrient.

BEDDOE: Beet lime is a high grade calcium **carbonate** limestone flour that has been used in the sugar beet processing during sugar making.

ENERGY RESEARCH: But if the **carbons are low** and you have an excess of boron in relation to calcium or a high salt or sulfur content, you can get ammoniation of the plant. What it does is simply kill them.

ENERGY RESEARCH: Student: How high is high enough [phosphate]? Skow: I wish I could give you an absolute answer but it is not possible because the phosphate in the soil has to be worked up in the soil in relation to the what? What key thing can you do to increase your TDN (total daily nutrient) more? What has to be there? **Carbon, there you go**.

FOLIAR FEED 1981: Don't use herbicides, cultivate your weeds out so that **they add carbon** to the soil.

FRANK: Roots also absorb CO2, and root uptake is just as important to yields as leaf absorption of CO2. When you apply calcium **carbonate** to the soil, organic acids excreted by microbes in the root zone react with it to release more CO2 for root uptake.

FRANK: Avoid using nutrient elements compounded as carbonates or oxides. **Examples of carbonates**: calcium carbonate, iron carbonate and copper carbonate.

PLANT FEED 1976: Use the moldboard plow every year, because the **carbon keeps rising to the top**, making the topsoil more narrow and more narrow.

SKOW: Let's consider a soil with anaerobic bacteria quite high. Aluminum could flip- flop in such a situation, but probably remain low. The soil would be sour and highly alkaline---with lots of calcium unable to release its energy

due to a lack of air flow, **carbon** and water circulation.

SKOW: My formula follows: Put in water, a humate, calcium hydroxide, magnesium sulfate, Bo-Peep [ammonia], a special amine compound, castor oil, sodium **carbonate** and water — it has to be distilled water or good reverse-osmosis water — and seaweed extract.

SKOW: Calcium oxide and calcium **carbonate** also go together quite well. Generally speaking, lime from the pits means ag lime.

SKOW: Calcium sulfate has a different effect on Homo sapiens than calcium **carbonate**.

SUCROSE: Keep plenty of **water-soluble, ionized carbon** so the crop will not have to depend upon its entire supply of **carbon from the air**. Keep the carbon/nitrogen ratio equalized for greatest yield of sucrose.

WHEELER: In the soil, some nutrients tend to rise while calcium and others tend to move downward. A soil left undisturbed will stabilize from the top down in the following layers: **carbon**, magnesium, phosphate, potash, sulfur, aluminum, manganese and calcium.

WHEELER: Trash is often left lying on the soil surface with little effort given to incorporation into the soil. Residue left in this manner will actually rust, similarly to rusting equipment with the **beneficial carbon being lost** to the atmosphere.

RETURN TO TOC

CARROT

BEDDOE: A California **carrot** is known for its sweetness, while a Texas carrot is often times just the opposite. The secret is in the soil, not just geography. Better tasting carrots can be grown in any state, if soil nutrients are managed properly. The flavor and sweetness of top quality fruits and vegetables can give them a decided marketing advantage.

FOLIAR SEMINAR 1983: You will have healthier cows & better milk if you can obtain and incorporate **carrot pulp** into their feed.

FOLIAR SEMINAR 1983: Many areas of the US need to supplement with iodine if they are growing **carrots**.

FOLIAR SEMINAR 1983: If potatoes or **carrots** split open, there is too much nitrogen and not enough phosphate.

FOLIAR SEMINAR 1983: A farmer who builds his soil to Reams-Ag standards can grow 30 tons of **carrots** per acre.

FRANK: Duane dug his 3 Brix **carrots** near the end of May and the children would not eat them. He applied a broadcast mix at our suggestion and in the fall dug 13 Brix carrots.

FWTK: If they offered a horse or cow **some carrots** with a sugar content of 12% Brix and some with 7% Brix, the animal would eat those with the highest sugar content.

GARDENING: Phosphate is what determines the amount of sugar that's in the leaf and in the **carrot**, in the potato, in the beet and everything else.

PLANT FEED 1976: If you want to know why Texas **carrots taste like dirty dish water**, its because of the natural high chlorine content in the soil. That's why the Texas vegetables are so tasteless. It doesn't hurt wheat or corn, but it will go into leafy vegetables.

RETURN TO TOC

CATALYST

AG LECTURES: Student: What does aluminum do for soil? It's not a soil nutrient or plant food nutrient. What does it do for soil? Why is it important? Is it important? **Is it a catalyst**? Reams: No sir, but you're getting mighty warm.

ANDERSEN: Molybdenum is a **catalyst for iron** in the bark or epidermis, is important in the integrity of bark or plant skin, and gives a transparent look to the sheen on the bark.

BEDDOE: During this prenatal period, Sul-Po-Mag will also **react as a catalyst** for phosphate of copper uptake.

BEDDOE: Other **fertilizer materials that can be used as catalysts** in certain situations include: ammonium sulfate, ammonium thiosulfate, ammonium phosphate, calcium sulfate, calcium nitrate, potassium sulfate, and potassium nitrate.

BEDDOE: Increasing ERGS is done by the **use of catalysts**. The main catalyst is the fertilizer called single superphosphate also known as 0-20-0.

BEDDOE: ...it is even assumed that potassium is more important than phosphate. This conclusion is drawn from a fact that is almost always overlooked. That is that **phosphate is a catalyst**, and therefore is recycled in the plant, leaving little in the plant residue to be picked up by analysis.

ENERGY RESEARCH: Zinc is used to control many types of blight. **It is also a minor catalyst** for Sul-Po-Mag and copper**.**

PLANT FEED 1976: Student: Can you give a particular rate on ERGS for how much superphosphate to use? Reams:

It's a variable according to your temperature. How much superphosphate you should use to raise your ERGS? 2 lbs. per thousand square feet at any one time should be a. maximum at about 100 lbs. per acre. You are not using it for the phosphate---you are **using it as a catalyst**.

SAIT: Andersen: For example, using liquid calcium with Vitamin B12 and sugar is primarily a **chemical catalyst** to make calcium available, but introducing a microbial or enzyme-based material as a **biological catalyst**.

SKOW: Under most modern agronomy systems, unused phosphates perish, so to speak, by being locked up and made unavailable, a **not too proper role for a catalyst**.

SUCROSE: ...possibility that the decrease in yield could possibly be a deficiency of one of these three elements or of an **elementary catalyst** that joins them together to make sucrose? It could not be hydrogen or oxygen because these two elements come from water, so then the deficient element is carbon **or its catalyst**.

RETURN TO TOC

CATIONIC

ADVANCED AG: Tomatoes that appear all vine can be induced to blossom with **cationic substances such as vinegar**.

ADVANCED AG: Interestingly, water (hydrogen + oxygen) can be "pulled" in anionic-**cationic directions**.

AG LECTURES: Anionic plant food makes growth, **cationic plant food makes fruit**. So now you're going to change it from anionic to cationic.

AG LECTURES: You would not ever want to use a chelate on alfalfa. Why? Student: **Anionic instead of cationic**? Reams: That's not the reason, but it's a true statement. Why? If, say you were growing out in Colorado, California, Arizona, Idaho, Nevada, you would not use chelates there. Why? Student: The calcium is high out there? Reams: The calcium is high. That's exactly the right answer. Calcium is high.

AG LECTURES: Reams: I've talked to you now about side-dressing and replacement of side-dressing. Is there anything else you want to know about side dressings? Student: Which should we use? Reams: Depends on what you are growing. Anionic plant food produces stalk and **cationic produces seed**.

ANDERSEN: According to Reams' concept of energy, calcium is classified as the kingpin of growth (anionic) energy and manganese is classified as the kingpin of **fruit (cationic) energy**.

ANDERSEN: When Reams discussed applying a fertilizer or material such as vinegar, superphosphate, or thio-sul to set fruit, he stated that a **cationic material should be added**.

BEDDOE: In the third arrangement. isotopes, the ratio between the anions and cations can switch between either the anionic dominance or the **cationic dominance**. The direction they switch is the result of the influence of the line of least resistance. In other words, an isotope element will go either anionic **or cationic depending** on the environment it is placed in.

BEDDOE: There are three main sources for base (anionic), or sweet plant food elements in soil chemistry. They are potassium (potash), calcium, and chlorine. All other plant foods will be considered an **acid reacting (cationic), or sour plant food** element.

ENERGY RESEARCH: About grasses. Basically Reams' opinion is, no potash in the spray, no manganese in the spray, **no cationic nitrogen** or ammonia. Now he does use Bo-peep *[ammonia]* despite what he says there.

FWTK: This plant food enters the seed and roots in two forms, anionic and **cationic**.

PLANT FEED 1976: The liver manufactures the substance called bile which is alkaline, which is anionic. When **cationic foods touch the anionic bile from the liver, energy is given off because of resistance**. That's what we live on. That's what we're studying today. How to produce the most food with the highest nutrient value (TDN - total daily nutrient) required to maintain a plant or animal.

SKOW: All forms of manure are **cationic without exception**. This includes composts.

SKOW: Any molecule or atom will seek synchronization halfway between the lowest and the highest value for anions and cations on the Milhaus Unit scale. Halfway between 500 and 999 **on the cationic scale is 750**.

SKOW: So I told the tomato grower to purchase apple cider vinegar for carbon ***[cationic energy?]***. A half gallon of vinegar with a quart of Bo-Peep *[ammonia]* in 20 gallons of water made a perfect spray for the crop *[that had no blossoms]*

RETURN TO TOC

CAULIFLOWER

ADVANCED AG: It is best to plant broccoli, **cauliflower**, and cabbage on 30 inch rows raised on beds or mounds.

AG LECTURES: You certainly want to use anionic plant food on lettuce, cabbage, **cauliflower**, broccoli.

ENERGY RESEARCH: When you build a spray for leaf crops you don't want to be adding manganese to it unless you are raising it for seed. Leaf crops would include spinach, lettuce, cabbage, **cauliflower**, and broccoli, things

like that.

FOLIAR SEMINAR 1983: On cabbage**,** **cauliflower**, broccoli, strawberries, lettuce & others, keep manganese low or they will go to seed.

FRANK: We use a 2-5-0.2 fish from Dramm that is acidified with phosphoric acid. It is a great foliar spray but it is also strongly reproductive so do not use on growth dominated crops such as cabbage, spinach, broccoli, or **cauliflower**.

SKOW: Hollow stem is the favorite indicator *[of boron deficiency]*, not only for alfalfa, but also for **cauliflower** and broccoli. This may or may not be the case, there being so many other possible deficiencies, any one of which can affect the color.

WHEELER: Any time you see cellular structural degradation or distortion of a plant, the plant is not operating on full efficiency. Conditions---**hollow heart in cauliflower**, split pit in peaches, undeveloped nut meats, etc.---are all signs of the nutritionally imperfect situation.

RETURN TO TOC

CELERY

ADVANCED AG: **Celery** or cabbage with rotten core has boron deficiency.

ADVANCED AG: **Celery** requires anionic nitrogen and should be planted on the level so close together that it will blanch itself.

BEDDOE: On crops that are grown for their leaves or stalk, such as cabbage, lettuce, **celery**, grasses, etc., you use nitrate nitrogen.

FWTK: On crops grown for their leaves or stalk such as cabbage, lettuce, **celery**, grasses, etc., nitrate nitrogen should be used.

SKOW: Sodium nitrate isn't used too often anymore. It is used more in the food industry and the price has taken it out of the marketplace. It is a negatively charged element. It would prove useful on lettuce, **celery**, spinach and cabbage crops.

RETURN TO TOC

CELLULOSE

ADVANCED AG: If you add hard rock phosphate and **cellulose** (sawdust) to composting you get excellent release.

ADVANCED AG: Breaking down the **cellulose** in such as Banyan tree leaves is very difficult and requires much energy.

ANDERSEN: An important structural use of sugar is in the **formation of cellulose**. Cellulose or fiber is the material that gives plants their rigidity, from the oat stem to the tree trunk.

ANDERSEN: If **cellulose is nitrated** it forms nitrocellulose, which is used in the manufacture of explosives, collodion, and lacquers. Add excess potash to alfalfa, displacing calcium, and you will have ”gunpowder hay” by the formation of potassium nitrate and nitrocellulose, which form when phosphate is insufficient to catalyze the proper formation of protein and other metabolites.

BEDDOE: In other words, the **cellulose structure** of the plant structure is what has the stabilized molecular structure. It is this stabilized molecular structure that has the formed patterns of frequency unique for a given species.

ENERGY RESEARCH: Cobalt it is very important for the formation of bark and **cellulose**.

PLANT FEED 1978: The **cellulose or fiber** of the plant is where most colloids are.

PLANT FEED 1978: Younger plants have less **cellulose**.

SKOW: A cornstalk has **cellulose**, a form of carbon [*Andersen above disagrees with this*]. If you break it down, the breakdown products will include sugars.

WHEELER: Our conclusion is that our methods described above allow or force the plant to **produce more cellulose** and hemicellulose because of the large amounts of sugars available. This is why we downplay crude protein and emphasize Brix (sugars or carbohydrates).

RETURN TO TOC

CHELATE

ADVANCED AG: Economics [circa 1981] are starting to look better for adding **chelates**.

ADVANCED AG: Albion labs achieved significant crop increase with **manganese chelate**.

AG LECTURES: The next thing I would add into that spray, in most areas of the U.S. would be some iron chelate. Let me give you **some warning about the use chelated materials**. There are times when you do not use them in the ratios that I give you, i.e. you would not ever want to use a chelate on alfalfa. Why? Student: Anionic instead of

cationic? Reams: That's not the reason, but it's a true statement. Student: Why? Reams: Say you were growing out in Colorado, California, Arizona, Idaho, Nevada, you would not use chelates there. Why? Student: Well, the calcium is high out there. Reams: The calcium is high. That's exactly the right answer. Calcium is high. So what happens when you use a chelate in a high calcium soil? It loses its leaves, all the leaves fall off. Student: Why? Reams: Because it thins the protoplasm that holds the leaf onto the stalk.

ANDERSEN: This [burning out the soil] is why anhydrous ammonia should not be used directly on the soil. Instead, it should be mixed with water to form aqua ammonia and a carbohydrate like sugar or molasses to help retain it in the soil, and some humic acid **to help chelate it** for better use rather than reducing further the soil's already depleted humic acids.

ANDERSEN: EDTA chelate—not preferred; **many better chelates are available** [for most minors].

BEDDOE: Iron sources include soft rock phosphate, basic slag, iron sulfate, molasses, and **various chelated irons** as can be used in foliar applications.

BEDDOE: Chelate--A molecule with an extra electron riding along. This extra electron works like a claw, which is the meaning of the **Greek word chelate**. All matter is made up by interlocking of one chelated electron (claw) with another.

BEDDOE: The aerobes [aerobic bacteria] in the soil convert everything possible into protein molecules. This is because they absorb mineral energy and **chelate (link) it into their bodies amino acid structure** just like your body links mineral energy from your food into usable amino acid chelates.

BEDDOE: Other ingredients that can be used if needed [*in foliar sprays*] are: Manzate for the manganese chelate, Zineb or the **zinc chelate**, Vitamin B-1 for the **enzymes**.

ENERGY RESEARCH: OK, the **next one is chelate**. We have a number of them on the market. They have an extra electron on them. They have a slightly negative charge and the thing you have to watch out with them is this. Chelates are fine in low calcium soils. In other words, soils below 2000 1bs of available calcium If you have a high calcium soil and you start using such as an iron chelate, manganese chelate, copper chelate, watch out. You will completely defoliate the crop.

ENERGY RESEARCH: What can you use in place of an **iron chelate**? You use iron sulfate solution. Just take your time and take the iron sulfate or manganese sulfate and mix them in water first. Then put them in you spray tank and you will be alright and it's pretty hard to do the harm I talked about using the chelates.

FOLIAR FEED 1981: In cold weather a little **molybdenum chelate** added to the complete spray can hold back damage in fruit trees, vines, and grains. It forms a protective film over the bark. If used on alfalfa, hold back the manganese.

FOLIAR FEED 1981: Also add **iron chelate** or iron sulphate [to soybean foliar formulas].

FOLIAR SEMINAR 1983: As molybdenum appears to ride in with potassium, the best molybdenum results will show on crops like hay, where potassium is restricted. You can use 1 gram of **molybdenum chelate** in 100 gallons of foliar feed.

PLANT FEED 1976: Chelate is an atom with extra electron,. **chelates interlock** to make matter.

SKOW: A **chelate is an element that carries an extra electron**. Iron chelates are simply iron plus an amino acid. Normally iron has a strong positive charge, but when bonded to an amino acid, the resultant compound has a slightly negative charge. This makes for easy transport into a plant.

RETURN TO TOC

CHERRY

ADVANCED AG: For every 3-4 sweet **cherry trees**, you need a sour one to pollinate.

BEDDOE: Without phosphate of copper, the bark of some trees, such as peaches, plums, cherries, apples and pears, will show splitting. This problem is **especially detrimental to cherries** and peaches, as it allows bacterial infections (called gumosis) to enter the tree and can be fatal to entire orchards.

SKOW: Working with nursery crops, flowers for market, strawberries, apples, pears and **cherries**, agronomists started answering these growth cycle requirements with seaweed extracts many years ago, all with successes that were spectacular, erratic, and rejected. There were things that could be done with the leaf that proved next to impossible when working with complexed soils.

SKOW: B-12, available as an injectable for animals, works quite well, 15 to 22cc per acre. The presence of B-12 in the foliar spray has something to do with chelation of calcium and making it more available. Indirectly it has an impact on fruit quality. I have worked with one cherry grower who had significant improvement in his **cherry crop** after spraying B-12, albeit alone several times during the growing season.

RETURN TO TOC

CHICKENS/EGGS

ADVANCED AG: Antibiotics are not needed to raise **chickens** on a large scale.
AG LECTURES: To keep your **chickens** young and happy put one quart of lecithin per hundred pounds of feed.
AG LECTURES: If you feed **chickens** citrus pulp it will make the eggs bitter.
AG LECTURES: You can tell the difference in the **taste of eggs** if you just grind the corn every day. Cracked corn, wheat, rye, or oats lose their vitamins within four days and this affects the taste of the egg negatively.
AG LECTURES: Reams **egg story**: Mass supplier gets three times the average price because they 1) crack grains daily, 2) add lecithin, 3) add 25% fresh grass clippings.
ANDERSEN: Such an awareness [Reams lessons about biological life] allows one to notice that a particular flock of **chickens cackles more** than or at a different pitch from another flock, and encourages the sensitivity to observe that one hen house is two degrees cooler than another without looking at a thermometer.
BEDDOE: **Chickens** are the best fed of all the agricultural animals and this is reflected in the manures.
PLANT FEED 1976: Student: What is cage manure? Reams: If is from **chickens that are in cages** and have no shavings or sawdust mixed in with their droppings.
RETURN TO TOC

CHIRON SPRAYER

AG LECTURES: Student: If you use these chemicals with the **Chiron sprayer**, is there a danger of exposure to the fog that it generates? Reams: Yes, there is. Student: Then you have to wear rubber gloves? Reams: You should wear rubber gloves and a gas mask if you use these sprays, yes. Some people don't, but I wouldn't take any risk with it. But if you know how to use a Chiron and use it wisely, you can stay out of the mist completely. That is true of most any other spray machine. Watch the wind direction and wind drafts. If the wind is shifting from every direction, don't spray that day.
ENERGY RESEARCH: The Chiron is the Cadillac of all foliar sprayers. The one we have is a good substitute but it **is not in the same realm as a Chiron**. This one here is only $1,400 versus the Chiron at $11,000. The Chiron is a good sprayer and I will explain why a little later because I know a party over here in Wisconsin that has one and long ago it paid for itself.
ENERGY RESEARCH: Reams talks about a homogenizing sprayer and I am at a loss to know about that completely. He says that is the principle that the Chiron sprayer works on. Theoretically, if something is truly homogenized, it shouldn't separate when put into a container. It should stay uniform throughout the solution. If we run it through a **Chiron sprayer**, it does separate back out again so I don't know for sure, his concept of that. All I do know, and I think he is trying to explain it in the best terms he knows how, is there is still something different in the way the Chiron affects the spray than any other current machine on the market.
FOLIAR FEED 1981: Reams spoke at length on track 071 about how a **Chiron sprayer** could pay for itself with savings from much more efficient nutrient applications.
FOLIAR FEED 1981: Skow: There is nothing like the **Chiron** [pronounced Shy-ron by Reams].
FOLIAR FEED 1981: I know of no other machine that can increase your profits like a [**Chiron**] spraying machine.
FWTK: Reams recommends using a sprayer that homogenizes the spray and sprays a mist, which is then spread out with the air current. The purpose of misting is to get the particles to the size a plant can absorb, and to help it reach the bottom of the leaf. The sprayer he recommends using is called a **Chiron Sprayer**, which they make in West Germany. This type of sprayer is much more effective for foliar feeding than a boom sprayer.
PLANT FEED 1976: I need to show you something about your row crop farming. It's a spray machine called a **Chiron Sprayer**. It's manufactured in Germany for about $5,000. It's the only spray machine in the world. that homogenizes the spray in big amounts, really homogenizes it.
PLANT FEED 1976: If you are using the **Chiron sprayer**, there's a chain that hangs down onto the tank and drags on the ground. Let that chain drag all times. If you don't, enough static electricity will build up in that tank to make it blow up.
PLANT FEED 1978: You can do a fabulous job of farming if you use the **Chiron** with your nutritional spray.
PLANT FEED 1978: Never, never run your Chiron sprayer empty as it will beat itself to pieces.
PLANT FEED 1978: You use the same foliar feed mix concentration **with a Chiron** as with any other brand of sprayer. The benefit is that the foliar feed goes much further.
SKOW: Using a conventional sprayer, usually 20 gallons of water to the acre is correct. A mist blower---such as a **Chiron sprayer**---would work best with a pint of phosphoric acid in 100 gallons of water.

NOTE: *Reams was so overwhelmingly convinced of the superiority of the Chiron sprayer that he participated in efforts to import the machines and give them an important part in Reams Ag. However, such was not to be. About*

*the time of his death, the West German manufacturer dropped the line and they have gradually disappeared from the scene. The few quotes in this document are only a fraction of the testimony Reams gave to the device and its apparent important homogenizing action prior to ordinary fogging [as done by current machines]. Perhaps they only highlight that his students might not have mastered all he wanted them to know about the machine. Imagine the luck of the farmer who snares one from an auction of dusty machinery in a long-ignored barn---and knows what he has discovered. [See Entry **FOLIAR**]*

RETURN TO TOC

CHLORDANE

FOLIAR FEED 1981: 4 pounds of 5% **chlordane** per 100 gallons of water will destroy all sand flies, mites, fleas and ticks.

FOLIAR FEED 1981: Chlordane, Dieldrin, Black Leaf 40, or pyrethrin for grasshoppers. The last two are nutritional sprays.

FOLIAR FEED 1981: Use 2 pounds of 10% **chlordane** in 100 gallons for wire worm and grasshoppers.

GARDENING: There's a way to handle grasshoppers, raccoons, wild hogs, deer, rabbits, and many other pests that try to put you out of business. All you need to do is take one of those plastic jugs and cut the top out of it. Then get some 65-75% **chlordane**, pour it into the jug, get yourself some ordinary laths or sticks and half submerge them in the liquid chlordane. The next night, turn each of the sticks over and push them in the ground all around your garden. The odor of chlordane will keep all the animals out, all the moths out.

NOTE: *The National Pesticide Information center reports that in 1988, all chlordane uses, except its use for fire ant control in power transformers, were voluntarily canceled in the United States. This was 3 years after Reams' death. It should be obvious to all that Reams did not use chlordane for killing purposes in many cases, but only for its smell that drove away pests. If anyone is aware of a strong-smelling, but safe, alternative please let me know. Orthene, which is commonly available, has been mentioned as having a horrible smell and might do the job, but so far there is not enough evidence to fully recommend it.*

NOTE: *Although a quick read might make one think that Reams somehow "pushed" toxicity such as chlordane---the truth is far from there and in that case is more about bad smell than killing. His true focus was on helping farmers succeed. Although Reams knew that the higher order agriculture he taught would ultimately produce crops needing no chemical "help," he had to sheperd the struggling farmer as he transitioned. I suggest you read Reams' words carefully and look for clues such as his comment that while some things like Black Leaf 40 are sold as insecticides, Reams saw them as nutritional help to a growing crop. Similarly, his suggestion that copper sulfate could stop Blue Mold, rot, and other fungal troubles was really rooted in his understanding that all disease is a mineral deficiency and plants with adequate copper were not troubled with Blue Mold, rot, or fundal trouble.*

RETURN TO TOC

CHLORIDE & CHLORINE

ADVANCED AG: Chlorine is a gas and chloride is not.

ADVANCED AG: The reasons for nematodes include high nitrogen, high salts, low aerobic bacteria, **excess chlorine**, etc.

ADVANCED AG: Skow: Basically speaking, we would like to have **chlorides at zero**.

ADVANCED AG: Reams used to buy unsalable oranges and use them in lieu of fertilizer because it was cheaper than fertilizer and because the citric acid **would remove chloride** from groves.

ADVANCED AG: It is possible to ammoniate a grove by creating nitrification via adding chicken manure if the **chlorides are too high**. This is dependent on the moisture status.

AG LECTURES: Student: You said the reason for [nematodes] is too much salt in the soil? Reams: Yes. Student: Which particular kind is it, the chlorides? Reams: **It can be a chloride**, it can be ammonia salts, nitrogenous salts, calcium salts, iron chloride salts, yes, it can be many different kinds of salts.

ANDERSEN: Avoid products made with calcium **chloride**.

ANDERSEN: Nutrients and compounds in the soil that are considered alkaline include calcium, magnesium, **chlorine**, sodium, potassium, salts, ashes, and aldehydes.

ANDERSEN: When someone tells you that the chlorine from muriate of potash just evaporates into the air, you will know better because the molecular weight of chlorine gas (Cl2) is 70, compared to the lighter weights of H20 (18), C02 (44), N2 (28), and 02 (32), which are the major components of air. Thus, because **chlorine gas is heavier than air**, it will remain close to the ground.

ANDERSEN: Now, when someone tells you that the **chlorine from muriate of potash** just evaporates into the air, you will know better because the molecular weight of chlorine gas (Cl2) is 70, compared to the lighter weights of H20 (18), C02 (44), N2 (28), and 02 (32), which are the major components of air. Thus, because chlorine gas is heavier than air, it will remain close to the ground.

ANDERSEN: A & L Laboratories set 3 ppm or 6 pounds per acre as the desired level of chlorine on their soil test.

BEDDOE: In a soil with **500 pounds per acre of chloride**, chicken manure should not be used on the ground.

BEDDOE: Muriate of Potash is one fertilizer that ought to be completely outlawed. It contains **40-50% chloride**. It is Potassium Chloride. The chloride ion interferes with bacteria proliferation and causes a replacement of sugar and oil in the chlorophyll. Chlorine is even worse, for in as little as .1 ppm it can kill soil bacteria.

FRANK: How much sodium/**chlorides** should be in soil? Not much. A few lbs. per acre is sufficient.

FRANK: How much growth energy does a few lbs. of **sodium chloride** provide? Very little.

FWTK: Fertilizers containing urea, potassium nitrate (**containing chlorides**) and anhydrous ammonia should be avoided because of their effect on the soil.

FWTK: Muriate of potash is one fertilizer that ought to be completely outlawed, because it contains **forty to 50% chlorine.** It is actually potassium chloride. It takes only two parts per million of chlorine to kill all bacteria. More than 90% of the potash used in this country is muriate of potash.

GARDENING: Well I said, "You need a little boron. You haven't got quite enough in order to kill them. And the second thing is, you need a little chlorine in the water. **Chlorine is an essential plant food and essential food for people.** Clorox, but it has to be a lot more dilute.

PLANT FEED 1976: Another way [to eliminate excess chlorine] is to add high amounts of lime - 8-9 tons of lime per acre and oxidize the chlorine. The number of pounds of **chlorine in your soil can be oxidized** by the correct number of pounds of ordinary agricultural lime, but. never use dolomite.

PLANT FEED 1976: If you want to know why Texas carrots taste like dirty dish water, its because of the **natural high chlorine** content in the soil. That's why the Texas vegetables are so tasteless. It doesn't hurt wheat or corn, but it will go into leafy vegetables.

SKOW: **Chlorides also account for cosmetic growth**, which may or may not explain the enchantment many growers have with potassium chloride. It works, but works has to be interpreted loosely. The response is both obvious and temporary — and costly in the long run.

SKOW: Muriate of potash is one fertilizer that ought to be completely banned. It **contains 40 to 50% chlorine** and is actually potassium chloride. It takes only two parts per million of chloride in water to completely kill all bacteria. So 200 pounds per acre of muriate of potash is fifty times more chloride than it takes to kill all bacteria.

SKOW: **Calcium chloride will pass a current** because the compound has an electrolyte built in.

WHEELER: Through continued use of this soil "killer," **[chlorine]** the desired aerobic microbial life has been seriously depleted and/or changed in character.

WHEELER: Compaction has induced the anaerobic bacteria supposedly found only in the lower levels of the soil to populate the majority of the soil bed. **Potassium chloride** isn't the only culprit. Herbicides, pesticides, and other farm chemicals also contribute to the decrease of proper soil life.

RETURN TO TOC

CHLOROPHYLL

AG LECTURES: Carbon determines your **chlorophyll**.

AG LECTURES: Did you ever see corn that you had trouble getting the **chlorophyll green enough**? And you put on more nitrogen and it still looked pale? The more you put on, well it would make it grow, but it just didn't look waxy, a sheen.*[See SHEEN Entry]*

ANDERSEN: Iron draws energy to the leaf by absorbing heat from the sun; it makes the leaf darker, thus absorbing more energy. It will increase the waxy sheen of the crop. Iron is necessary for the **maintenance and synthesis of chlorophyll** and RNA metabolism in the chloroplasts.

BEDDOE: Muriate of Potash is one fertilizer that ought to be completely out-lawed. It contains 40-50% chloride. It is potassium chloride. The chloride ion interferes with bacteria proliferation and causes a **replacement of sugar and oil in the chlorophyll**. Chlorine is even worse, for in as little as .1 ppm it can kill soil bacteria.

BEDDOE: Many assume that it is necessary because **magnesium is used in the making of plant chlorophyll**, and many see a response when they add it to the soil. So it may be difficult for some to accept the fact that the problem with magnesium is usually that it is used in excessive amounts in soil applications.

BEDDOE: As the sun strikes the leaf several things begin to take place. First the chloroplasts, where the sugars are made, begin to expand as the anions of the sun's energy **hit the iron within the chlorophyll** and produce heat within the chloroplast.

PLANT FEED 1976: Student: I've got 10 acres of comfrey I've been trying to get rid of. Reams: You ought to start making c**omfrey chlorophyll** if you have ten acres of it. It retails for about 8 dollars a pint. Student: Is there a market for it? Reams: Yes, there is, if you prepare it correctly. Eight dollars a pint for green raw chlorophyll. You may have some trouble in learning how to do it. If you do decide to market, let me know and I'll help you, but you've got to have a sugar content in comfrey of about 5 1/2 or 6 [remember that Reams considered Brix to be half sugar] or it will spoil on you. Even 7 is not too high for comfrey.

SKOW: The other key to the success of this spray program is the use of magnesium sulfate which speeds up metabolic processes and helps make sure there is **enough magnesium for the chlorophyll molecule** to keep the process of photosynthesis rolling to produce simple sugars.

WHEELER: Lack of nitrogen, generally recognized through the light green coloration in plants, is thought to be associated with a **lack of chlorophyll** in the leaves.

WHEELER: Magnesium, like calcium, is now being considered as a primary nutrient. It is an **integral part of chlorophyll** making it essential for photosynthesis. **NOTE:** *Reams strongly warned against magnesium supplementation, possibly because of its ability to drive nitrogen out of soil, plant, and animal.*

RETURN TO TOC

CITRUS

ADVANCED AG: Apple or **citrus trees always bear** because they have both male and female blossoms.

AG LECTURES: Reams: **Citrus trees that have a waxy sheen on them don't need to be sprayed**, why? Student: They are healthy? Reams: They're healthy, but what is it that makes a citrus tree not have to be sprayed if it has a waxy sheen on it? Kind of like a bald headed man. If a bug lights on it, it slides off. He has a job getting his feet to hold on there. But there's another reason besides that. I've seen a moth light 15 times on a leaf and finally get up and try another leaf and it does the same thing. Finally she flies out and goes somewhere else. Let me tell you something else about a citrus leaf. The citrus leaf has citric acid in it and it's hot stuff. If a bug bites a citrus leaf with citric acid in it he gets a hot foot and he doesn't like that at all. He's not even going to start there because it will burn him up. Citrus requires the least sprays of any crop providing you keep the carbon contents of your soil, your phosphates and calciums high enough in your soil. You'll never have to spray.

AG LECTURES: In 1939 I wrote an article about the salts that were accumulating in the fields and **in the citrus groves**. And I predicted that in 15 years the citrus industry would be in great difficulty. This was before WW II. I missed it by 2 years. In 13 years they were in great difficulty, because this salt was built up in the soil from their fertilizers, synthetic fertilizers.

BEDDOE: Citrus do not really require the help of Sul-Po-Mag.

BEDDOE: The **citrus farmers who survived** the massive freezes of the early 1960s were the ones who had been following Dr. Reams's recommendations.

ENERGY RESEARCH: If **citrus leaves** tend to fall off if you touch them, that is a potassium availability problem.

FWTK: Citrus includes all members of their kind: for example grapefruit, lemons, oranges, tangerines and limes all have the frequency of .0009.

GARDENING: There are **citrus groves** in Florida that are 60-70 years old now that have never had a spraying machine in the grove.

PLANT FEED 1976: Student: Would you use chicken manure **on citrus**? Reams: Yes, but never dig it in. Leave it on top of the ground. Why? Because the boron will ammoniate your trees. It will never hurt citrus if you leave it on top of the ground. Not only that, if you've got your calcium and phosphate, you'll never need to spray your grove. No bugs or insects in it . Spread it from tree trunk to tree trunk evenly.

PLANT FEED 1976: In pecans, the base exchange is about every 3 years. **Citrus is about 18 months** but a radish has no base exchange---none. Until it starts to go to seed. Most plants will not have a base exchange until it starts to blossom or fruit or both. In other words it maintains the same cells to perform the same duties that long.

PLANT FEED 1976: Let me give you some **rules about citrus** and peaches and things of that nature. These are general rules but quite accurate. How marry citrus leaves does it take to furnish the normal amount of carbohydrate for one orange? How do you know when your grove is producing a maximum crop of citrus? What is the criteria for citrus, peaches, pears, [clusters of] grapes, apples - how do you know when the tree has produced its capacity load? So many leaves per fruit. Fifty leaves per fruit.

RETURN TO TOC

COLLOID

ADVANCED AG: Colloidal phosphate stops lime from leaching.

ADVANCED AG: **Colloidal phosphate** doesn't need bacteria but it helps.

AG LECTURES: The tree has **more colloids in it**. The vine doesn't have enough colloids in it to hold it up, so it's got to climb on something. It's the colloidal properties in phosphate form that makes the difference.

ANDERSEN: Reams used soft rock phosphate rather than acidized or hard rock phosphate. Although he was not opposed to hard rock phosphate, he preferred to use soft rock phosphate **because it was colloidal**. Colloidal particles are the key to biological systems. They do not tie up as readily as do non-colloidal materials.

ANDERSEN: The desired minimum level of phosphate in the soil using the Reams test is 400 pounds. Obtaining this level through the use of acid phosphates is highly unlikely. **Soft rock, being a colloidal clay material**, does not tie up readily into insoluble tri-calcium phosphate as do the acid phosphates.

BEDDOE: The fastest and best way to get chemical **compound colloids** onto your soil is the use of soft rock phosphate. Manures such as cow and horse with the urine, and baby chick, sheep, goat, and rabbit are very high in the proper colloids.

BEDDOE: **Colloidal phosphate** will prevent calcium from leaching down in the soil.

BEDDOE: Tillage practices directly affect the way carbons **and colloids** work to the surface to pick up the precipitating calciums and other minerals.

BEDDOE: Air is probably the most important **source of the colloids**. These air-borne colloids come from the oceans of the world. If it were not for the ocean, life would not have been able to exist for as long as it has because of the lack of mineral distribution. Remember that **80% of plant foods come from the air** and colloids are an important part of that.

ENERGY RESEARCH: There are **two different kinds of colloids** and we will be talking about them quite a little. One strictly refers to size, the finest of the grain, and then there is what we call an organic compound colloid which contains a large number of elements that until recently could not be separated from each other.

FRANK: Soft rock phosphate is this **colloidal clay impurity**. What were the impurities? Clay and trace minerals. It has proven to be one of the best phosphate fertilizers for organic and biological growers.

FRANK: On the **clay colloid** [see note below] is adhered a certain amount of calcium, some potassium, some magnesium, and some sodium.

FWTK-pH: Colloidal materials in the soil samples often cloud the readings until they are difficult to read accurately. A little instruction would get you over this hurdle. The **colloidal content of the soil** also affects the pH reading of sandy soils. The colloids in the soil are very important and must not be overlooked. Colloids are insoluble and without them there would be no life upon this planet.

FWTK: The phosphate and other nutrients in soft rock phosphate are in **colloidal compounds**. Compound colloids are not water soluble, but they stand in suspension in water and create the impression that they are.

GARDENING: The density of the **colloidal particles in the soil** should reach down at least 6 inches deep. When your topsoil equals 6 inches, you will have some of the finest gardening soil in the world.

PLANT FEED 1976: There are **two kinds of colloids**, one which is a measurement of size and one is an organic compound in which each molecule constitutes a complete solar system within itself.

PLANT FEED 1976: The flame photometer is **valuable for testing colloids** simply because 100% of colloids are available to the plant, unlike ordinary elements which may or may not be available. However, you have to know that what you are testing are colloids.

PLANT FEED 1978: The cellulose or fiber of the plant is where **most colloids are**.

PLANT FEED 1978: **Colloid compounds** cannot be poisonous because your system cannot break them down.

WHEELER: The major positive ions that attach themselves to the negative clay colloids [see note below] of your soil are calcium, magnesium, potassium **and sodium**.

NOTE: *"Clay colloids" are not the "chemical compound colloids" of Reams-Ag.*

RETURN TO TOC

COLOR

AG LECTURES: **Carbon determines the color**, that's right. Did you ever see oranges after the fruit matures they start turning green again? Did you ever see that? You know oranges turn a golden yellow in the winter time then in the summer turn green again? Why did it turn green in the summer time again after it had been a golden yellow orange color in the winter? Student: Lack of carbon? Reams: That's right. If you have have plenty of carbon in your soil, those oranges will stay their golden color all summer long. Not only that, peaches will have a better color, alive, glossy, just a mouth watering color to them. Because the carbons are controlled in the soil.

ANDERSEN: Look at the pith of the weed. **What color is it**? Is the stem hollow? The healthier the weed, the higher the Brix reading, the more solid the stem and the more pearly white its pith, and the less insect damage it will have.

ENERGY RESEARCH: The use of a homogenizing sprayer is preferred for the elements will stay intact in each droplet. Also the heavier specific gravity elements will move to the outer most orbit of each molecule, therefore they will show up first in the plant by **visual signs like darker color**.

PLANT FEED 1976: If your crop is still not growing as fast as it could or if it has a **blue color**---anytime you see the crop begin to have a bluish tint to it---you get a soil analysis even if you had one a week ago because it means the nitrogen is too low, especially on cabbage, wheat, or oats. So many things in your grain growing and your truck growing will show a blue tint meaning it needs more fertilizer.

SKOW: In reading what a field has to say, **color is of maximum importance**, and can range from one extreme to another. According to problems encountered, plant color can go from blue-greens to pale yellows, a bright green being preferred with a black blue-green being the harbinger of trouble.

SKOW: **Blue tint** in corn leaves means a nitrogen deficiency.

SKOW: When a field has a metallic sheen, the crop will be healthy. On small grain, a **golden color is something devoutly to be wished**. It isn't seen very often, but when it shows up it brings real excitement.

SKOW: Green grapes have a pearly **white transparent color**.

WHEELER: It is generally held that a clear, distinct line separating the **blue and white fields** [in the refractometer viewscreen] indicates a more acid condition while a fuzzy line indicates better calcium levels and a more alkaline condition.

WHEELER: Lack of nitrogen, generally recognized through the **light green coloration** in plants, is thought to be associated with a lack of chlorophyll in the leaves.

NOTE: *The blue crop tint that Reams speaks of may sometimes manifest as purple.*

RETURN TO TOC

COMFREY

ANDERSEN: An excellent plant to include in the pasture mix is **comfrey** in 6 x 6 grids, which adds nutrition and healing substances to the pasture. Protein levels of 25% to 30% are reasonable with good soil nutrition as well as a more balanced calcium-to-phosphorus ratio (2:1) than alfalfa has. **NOTE:** *Here Andersen is speaking of the ratio in the comfrey itself.*

PLANT FEED 1976: Student: I've got 10 acres of comfrey I've been trying to get rid of. Reams: You ought to start making comfrey chlorophyll if you have ten acres of it. It retails for about 8 dollars a pint. Student: Is there a market for it? Reams: Yes, there is, if you prepare it correctly. Eight dollars a pint for green raw chlorophyll. You may have some trouble in learning how to do it. If you do decide to market, let me know and I'll help you, but you've got to have a sugar content in comfrey of about 5 1/2 or 6 [remember that Reams considered Brix to be half sugar] or it will spoil on you. Even 7 is not too high for comfrey.

NOTE: *In 2001, the United States Food and Drug Administration issued a warning against internal usage of herbal products containing comfrey, and eventually banned comfrey products intended for internal use in humans only.*

RETURN TO TOC

COMPACTION

AG LECTURES: Reams: What is it in the soil that **causes soil compaction**? I am not asking what breaks it, I am asking what causes it? Student: Is it nitrogen? Reams: Sodium, it's sodium in the soil that causes soil compaction. Now, how do you break this soil compaction? Have you ever seen a field plowed in great big clods? Turned over and it rains and rains and it's still in clods? That's high sodium content. Now how do you break this soil compaction? What breaks it up? Student: Soft rock phosphate? Reams: Soft rock phosphate, that is correct. Not baking soda, but baking powder, crude baking powder.

AG LECTURES: Reams: A lot of people get out there and cultivate, just to be cultivating when it doesn't even need it. Do you realize that? Does it make sense? Are they saving money? Student: They're tearing up the roots. Reams: They're tearing up the roots? How deep should you cultivate when you cultivate? I am talking about row crops now or truck crops. The answer is just as shallow as you can cultivate it actually. Very, very thin, very thin, unless you have a very high sodium content **[causing compaction]** and have to cultivate deeper.

AG LECTURES: Student: Where is the sodium on the strata? Reams: It's all through – it's equal, it's hard, it's what makes soil hard like a brick. It really makes it hard.

ANDERSEN: People **often blame compaction on heavy equipment and frequent traffic** across the soil. These things do cause compaction of soils with calcium-to-magnesium ratios of less than 7:1. They do not cause compaction of soils with calcium-to-magnesium ratios of 7:1 or more and less than 70 parts per million of sodium.

Compaction is a phenomenon of physics (particle attraction/repulsion) and aeration.

ANDERSEN: Using the Reams soil test, we can predict accurately **whether soil compaction is present** in the field.

ANDERSEN: I would add a soil conditioner to the preemergent or first spray, or anywhere there is known **soil compaction**.

ANDERSEN: Grasses often have shallow, dense root systems that are attempting to loosen **compacted** soil.

BEDDOE: Excess sodium levels can contribute to **soil compaction**.

BEDDOE: Sprinkler irrigation **may mean soil compaction**, but plant foods can be delivered to the soil nicely through many types of sprinkles.

FWTK: Sodium is the element in the soil that **causes soil compaction**. The use of soft rock phosphate will counteract this high sodium, and will pulverize the soil. Dr. Reams has seen hardpan, like the Mississippi Valley has (so hard that the soil is like a rock), on which soft rock phosphate has been used. The soft rock phosphate pulverized the soil and made it just as loose as a farmer could wish it to be.

FWTK: The use of herbicides is not recommended by Dr. Reams, herbicide ties up the phosphate of carbon in the soil, **causing more soil compaction**, and decreasing the depth of the topsoil.

PLANT FEED 1976: So the thing that makes soil **compact tight** is sodium. Don't forget that. How do you break that sodium? You use phosphate---the baking powder---the soft rock phosphate. Don't ever confuse the soft rock phosphate with your super phosphate or your triple super phosphate. It mist be soft rock phosphate, because hard rock phosphate will break down over many years while soft rock phosphate is baking powder, right now available.

SAIT: Andersen: The Reams test will reflect what kind of weed you will see in the field, **what kind of soil compaction** and tilth you will see, and what kind of Brix readings you will see in the crop.

SKOW: Clay soils high in magnesium and low in calcium cement together tightly, are **subject to compaction** and clodding, crust over easily and prevent the insoak of water and the recovery of capillary water during the dry periods of the season.

WHEELER: Compaction has induced the **anaerobic bacteri**a supposedly found only in the lower levels of the soil to populate the majority of the soil bed. Potassium chloride isn't the only culprit. Herbicides, pesticides, and other farm chemicals also contribute to the decrease of proper soil life.

WHEELER: Potassium does not have the same electro-chemical properties as calcium and does not provide the same support to the clay structure. The excessive potassium can result in structural collapse of the soil which can affect the fertility and **increase compaction**.

NOTE: *Reams was adamant that soil compaction always traced back to excessive sodium. You can see that many of his students did not closely follow his thinking.*

RETURN TO TOC

COMPOST

ADVANCED AG: One ton per acre of good **compost** will equal about three tons of raw manure.

ADVANCED AG: Some sources of carbon: sawdust, manure, calcium carbonate, sludge, **compost**, roots, green manure, etc.

ADVANCED AG: Student: Can you add hard rock phosphate **to compost**? Reams: Yes, about 200 pounds to the ton.

AG LECTURES: Reams: What is the **primary benefit of adding compost** over [instead of] manures whenever you disc them in or plow them under. Student: It is immediately available. Reams: That's one thing, but what is the something else I am trying to get across to you? It doesn't burn the plants. The raw manure creates a heat in the soil. If you have a dry year what happens? It releases too much moisture and you're really suffering from a drought. But compost does just the opposite, it draws the moisture from the air and holds it in the ground. How does it do that? The carbon content, it's not going through a heat, actually it cools the soil. What form is the nitrogen in the compost? Ammoniacal nitrogen and what does it do to the soil? Not only warms, but cools. It controls the temperature. Student: How does it do that? Reams: By refrigeration. Yes, in other words when you heat ammonia it freezes, when you freeze it, it boils, it's a contrary substance. If it wasn't true you couldn't use it for a refrigerant, do you realize that? That alone is worth everything you are paying for all the courses, just to know that one factor if you use it.

AG LECTURES: Student: If you don't **disc compost** or manure in, the sun takes the value out of it, right? Reams: Not the chicken manure it doesn't. The sun does not destroy the nutrient of manures, but it does of compost.

AG LECTURES: Have a **lot of compost** in the soil where you grow tomatoes.

ANDERSEN: In any event, keep the materials in the aerobic zone for maximum effect. Keep the raw manure to a minimum. If you farm in the west, **buy compost rather than manure**. If you farm in the Midwest or East, make compost or at least treat your liquid manure before applying it to the soil. Manure must be composted in the soil, if

not before.

ANDERSEN: **Good compost** has no identifiable organic-matter residue, ash, or sticky, putrefied pockets. It is nontoxic to earthworms, plants, animals, and soils.

ANDERSEN: If you are using compost or manure from an animal whose diet is not mineralized as well as it should be, the manure and **subsequent compost will lack** the same minerals that the animal does.

BEDDOE: Some claim that **high grade composts** and manures will give an analysis four times what is present when the bacteria are as active as necessary, and all the evidence points to the confirmation of this idea.

BEDDOE: **Compost**, because of the aerobic bacteria it contains, is one of the best tools to use in controlling nematodes. It also has a great moisture -holding capacity.

ENERGY RESEARCH: About the only known way to have some affect on this [high mag problem] is to basically have a **compost and manure program** and a very effective rotation program and just try to continue to row crop it.

FRANK: Compost and manure are actually potent suppliers of potassium to the soil. When **compost is over-applied**, potassium rises to become excessive. When potassium is excessive, calcium is hindered and results in poor quality produce. When potassium is excessive [as shown by soil test], **do not apply compost or manure**...period.

FRANK: On the clay colloid [see note below] is adhered a certain amount of calcium, some potassium, some magnesium, and some sodium. **When compost is applied** the potassium is released into the soil solution. It then pushes some of the calcium off the clay colloid into the soil solution. Calcium is then taken up by growing plants. A continuous supply of potassium over time will imbalance the soil with respect to calcium.

FWTK: **Compost is one of the best ways** to control nematodes, because of the aerobic bacteria it contains, and because of its moisture-holding capacity. Aerobic bacteria will feed on nematode eggs.

SAIT: Graeme: Yes, it's much the same with compost production. Your compost will only be as good as the ingredients it contains. The home gardener's lawn clipping compost is a prime example. If they were to add rock phosphate, humic acid, animal manure and molasses to the clippings, their **end compost would be far more productive**.

SKOW: Plant foods that cause seed production are ammoniacal nitrogen, phosphorus, metal trace nutrients, manures **and composts**.

SKOW: The way most organic material in a raw form is managed is not the most beneficial to the soil. **Composting is still the best procedure** for most such materials destined for soil application.

SKOW: All forms of manure are cationic without exception. **This includes composts**.

WHEELER: ORP readings indicate whether your soil is oxidizing (aerobic decomposition) **or reducing (composting)**.

WHEELER: Another approach would be **to add compost** or manure to stimulate microbial action on the calcium.

NOTE: *"Clay colloids" are not the "chemical compound colloids" of Reams-Ag.*

RETURN TO TOC

COPPER

ADVANCED AG: Sul-Po-Mag makes **copper available**.

AG LECTURES: But the copper makes the bark elastic. Just like a little boy that out grows his britches, they're too tight. It makes the bark elastic and lets the sap flow. Therefore gives you a greater yield. I've seen a 300% increase in yield just because **copper was added**.

AG LECTURES: Then what would you do? The crop was rotting in the field. With all these numbers that I have told you and yet the crop was rotting just as it matured. Student: Put some sulfur on? Reams: **Sulfur or copper**? Student: Too much sulfur. Reams: Too much sulfur, that's right. So what would you do? Student: Put calcium on it? Reams: Calcium hydroxide, the hot lime. Just about 100 lbs. to the acre will knock that sulfur right out of existence as far as availability to the plant is concerned. And in 3 days you've stopped the rot. Calcium hydroxide is the hot lime.

AG LECTURES: The Blue Mold can't stand it. **Copper is the greatest enemy Blue Mold ever had**. Then it also makes the bark stretch in the plant and give you greater yields. It's a germicide.

AG LECTURES: What happens to young plants or onions or peppers, beans, tomatoes – row corps; whenever there's a **copper deficiency**? What happens to your young plants? They rot off at the ground.

ANDERSEN: Ragweed, for example, is generally indicative of a phosphate/potash imbalance, but, more specifically, it indicates a **copper problem**.

ANDERSEN: **Copper is the key to elasticity in the plant.** It is an important constituent of many proteins like ascorbic acid oxidase, cytochrome oxidase, diamine oxidase, and polyphenol oxidase. Copper is an important

nutrient for many microbes, such as Aspergillus niger. It controls molds and often alleviates perceived zinc deficiencies. Copper interacts with iron and manganese.

BEDDOE: The parts of the reserve soil TDN are calcium, phosphate, potassium (potash), nitrate nitrogen, ammonia nitrogen, iron, and **copper**.

BEDDOE: In excessive amounts **copper will prevent the soil bacteria** from developing and proliferating

BEDDOE: Citrus are very sensitive to having **too much copper uptake**. It will not bother the plant itself, but it will make the skin on the fruit split. Citrus do not really require the help of Sul-Po-Mag.

ENERGY RESEARCH: Common electrolytes are iron, aluminum, **copper**, and one of the other ones that you will see a lot written about is magnesium and they get a wonderful response. Now the only reason they get a response is that the plant is constipated. And if any of you have had that problem you know that if you can get it moving again, that you feel better. So there is a time and a place once in awhile, where it is beneficial, where a crop stunned or not doing well and looks like it isn't growing satisfactory, and this is particularly important if you have some herbicide damage and you want to flush it out.

ENERGY RESEARCH: If you have a high calcium soil and you start using such as an iron chelate, manganese chelate, **copper chelate**, watch out. You will completely defoliate the crop.

ENERGY RESEARCH: Zinc is used to control many types of blight. It is also a minor catalyst for Sul-Po-Mag **and copper.** It helps to make the acetic acid in the root to keep it from rotting.

FOLIAR FEED 1981: Add **copper** for tight bark *[to relieve]*.

FOLIAR FEED 1981: Copper and boron in the same spray tank are a no-no because of cross purposes.

FWTK: Furthermore, healthy plants take a large part of the trace elements they need from the air. They supply magnesium, manganese, zinc. cobalt, **copper**, sulfur and boron in this way. Soil must contain proper mineral levels for this process to take place.

FWTK: It is recommended that elements such as manganese, zinc, **copper** and iron be applied by means of a foliar spray.

FRANK: Examples of carbonates: calcium carbonate, iron carbonate and **copper carbonate**. Examples of oxides: Manganese oxide, iron oxide and **copper oxide**.

FRANK: Crops with an outside bark over xylem tubes such as trees, alfalfa, or sunflowers may have a **copper deficiency** which doesn't allow the bark to stretch, making foliar nutrition futile.

GARDENING: All plant food with the exception of nitrogen, must go into that tree or plant in phosphate form, phosphate of iron, phosphate of zinc, **phosphate of copper** and so forth.

PLANT FEED 1976: There's only one reason why blue mold is present on a young plant. **For lack of copper**---a deficiency in the plant.

PLANT FEED 1976: Blue mold and copper deficiency. [**adequate copper] allows bark to stretch]**.

SKOW: The electrolyte is always a conductor of electricity — usually iron, **copper**, zinc, etc. The most important one is nitrogen because no crop will grow without it. Even if a cell needs iron, copper or zinc, it can't affect formation of the cell until nitrogen is present.

SKOW: Copper — or the lack thereof — is most frequently noted when fruit trees do not produce. They do not produce because the bark cannot stretch. When the bark cannot stretch, sap can't flow. This situation can be remedied at times by applying copper sulfate, but many times that device will not work. Again, a nitrogen or phosphate deficiency might be identified as the cause. In other words, there may be enough phosphate to accommodate the basic functions of the plant, but not enough to handle copper and iron needed from a standpoint of energy. There are a couple of products on the market that might be helpful. One is Sul-Po-Mag. It contains sulfur, potassium and magnesium, and **it makes copper available** to the plant.

WHEELER: Trace nutrients come premixed in fertilizers, can be requested as additions to custom mixes, and can be purchased in both dry and liquid forms. Most can be obtained in the sulfate form, **as found in copper sulfate** or iron sulfate, or in the oxide form as found in magnesium oxide. These are the most popular and least expensive forms. These forms, however, aren't of the highest energy nor are these the most biologically available forms. Other forms such as amino, citrate or humic acid types are more easily assimilated by the plant.

WHEELER: Copper is largely associated with plant enzymes. It regulates plant bark "stretchiness." It may be somewhat immobile in higher pH soils. Copper is known for its fungicidal qualities. Energy values will vary depending upon the source.

RETURN TO TOC

CORN

ADVANCED AG: Some types of alfalfa, **corn**, or soybeans require less water than others. Experiment and discover them.

ADVANCED AG: On **corn**, the dying off of main tap roots with maturity is normal.

ADVANCED AG: After corn reaches the milk stage, its need for water lessens.

AG LECTURES: Student: If you're applying your chicken manure to your soil, would it make any difference in the amounts you put on for **corn**, peanuts or soybeans? Reams: No it doesn't.

AG LECTURES: Did you ever take a leaf of alfalfa, sugar cane **or corn and examine it closely** and see little black dots in it? Have you noticed that or on the stem? Have you seen little black dots appear on the stem of alfalfa? Did you really look that close? That's too much potassium in the soil. How many have seen those little black dots? Have you noticed it on peach leaves, orange leaves, any crop?

AG LECTURES: Did you ever see **corn that you had trouble getting the chlorophyll green enough**? And you put on more nitrogen and it still looked pale? The more you put on, well it would make it grow, but it just didn't look waxy, a sheen.*[See SHEEN Entry]*

AG LECTURES: Student: You said a 4 to 1 P and K for grasses, do you consider alfalfa a grass? Reams: Yes, sugar cane too is a grass. **Corn is not a grass**.

AG LECTURES: Student: I had a farmer tell me he **sprayed his corn** when it was just coming up with Atrazine, at the rate of 1/3 pound per acre. And he said it didn't kill the weeds, but it just stunted them enough that the corn grew up away from the weeds.

AG LECTURES: On corn, wheat and soybeans, there's one other ingredient you should use on any crop that you're growing for the grain. It's manganese. Manganese is the element of life and without manganese there's not any life. Therefore the lack of manganese can cause a great loss of yield in the long run.

AG LECTURES: Generally **plant corn** in the bottom of a furrow so you can pull the soil and any grass to it. One time cultivation after corn is planted in 20 inch rows or double rows, should be sufficient. But you should have all of your nutrients down in the soil before you plant your crop. Do not try to get by with side dressing, which you might [however] have to do in the emergency case of an extremely heavy rain. But even then at 6 or 8 inch corn, you can evaluate what type top dressing you'll need and apply it accordingly.

ANDERSEN: The **plugging [in a corn stalk]** is caused by many things—chemical toxicity such as herbicides, putrefaction products of an anaerobic soil,

ANDERSEN: An ear of corn at 24 Brix with **corn ear worms** inevitably will have leaf or stalk refractometer readings below 12.

ANDERSEN: The corn plant just described is typical of those found throughout the United States today. Is this normal? Yes, if normal means commonplace. No, if normal means perfect health. Most **farmers have been taught that corn has brace roots to prevent the plant from falling over**. Actually, brace roots are the plant's emergency response in order to exchange nutrients and prevent starvation and death.

BEDDOE: Potassium is what determines the caliber of a **corn stalk** or the caliber of an alfalfa stem.

BEDDOE: Probably **corn has one of the highest demands for ammonia nitrogen**, so it is a good idea to work up to 200 lbs. per acre for its needs at 40-50 days from sprouting.

ENERGY RESEARCH: The oats that we had in here earlier had what I call a waxy sheen to the leaf. Those leaves get a waxy sheen like some house plants and **when you get a corn field** that looks like that or a bean field or an oats field, you have come a long way.

ENERGY RESEARCH: Tomorrow we will be discussing the use of different sprays when the **corn is in silk stage**. There are specific sprays you can go in and spray corn at that stage especially with a mist blower on a highboy. It's theoretically possible if you can get the foliar spray on the silks of the corn early, you can increase your yield from 10 to 30 percent.

FWTK: Part of the commercial yields achieved with the Reams program are: 20 tons per acre of alfalfa at 28% moisture; **200 bushels of corn per acre** as a starting point...

FWTK: In **corn, for example**, the ERGS should be the highest from the time it tassels to the dying of the silk, in order to produce a maximum crop.

GARDENING: And the concept of high sugar turning to alcohol and disrupting worm cycles is **true on corn crops**, cane crops, anything. When corn silk comes out if it is high in carbon, hydrogen and oxygen which forms the sugar, it's going to be high in the corn itself and you should notice little teensy dots that looks like nectar on the silk. But if that silk is dry and you don't see those little drops of nectar on it, little teeny drops like a diamond that sparkle in the dew drop, then you are going to have worms in your corn.

GARDENING: There are farmers today, commercial farmers, producing 40-60 bushels of **corn per acre** and, and just think they're doing wonderful. They ought to be ashamed of their selves if they're not producing 200 bushels per acre.

PLANT FEED 1976: Plants are very much like animals in a barnyard. Lets consider a goose and a horse. You can feed them both on green grass alone and they'll live a long time. You can **feed. them both on corn** and oats and

they'll live a good long time, but you put them both on hay, and the goose won't live. That's what you can do for plants---just don't give weeds the vital minerals they need and you'll get rid of the plants you don't want. Nothing difficult about that is there? That's what you're here for---to learn how to keep from using poisonous sprays.

PLANT FEED 1976: If you want to know why Texas carrots taste like dirty dish water, its because of the natural high chlorine content in the soil. That's why the Texas vegetables are so tasteless. It **doesn't hurt wheat or corn**, but it will go into leafy vegetables. **PLANT FEED 1976:** I advise you to put corn in 20" rows. It you actually have enough nutrients in the soil to support corn, in 20" rows, 8" apart in the row. Now, if you did that, look how much more you'll get. But let me tell

you this - when you plant it that thick, you won't get ears 16-18" long---only about 6-12" long, but a lot more of them. This is the way to increase the yield. Something else about this: the com being so thick like that will shade out the grass. You won't have any grass problem.

SKOW: Let's assume we have **corn stover in the root bed**. This stalk has a magnetic charge. At one time this charge was superb because it accomplished the task of building a stalk. It was able to attract. Now the carbon in the soil has to pull it apart. That soil carbon has to be constructed by bacteria as amino acids. The sequence for action is at once simple and complicated in the extreme. Bacteria have a stronger magnetic force than the corn stover. As they break down the corn residue, they lose their electrical charge. In a weaker form the breakdown product becomes an amino acid first, finally carbon.

SKOW: One of these young investigators crossed over into this **cornfield** without permission. As a consequence he was asked promptly what he was doing. He said, "I'm out here getting a bug count for Monsanto, and your field is on my block." It had rained, and the com borers were all dead. He asked why they were dead, and then he looked down and saw a little water, "Oh, well," he said, "I guess they drowned." Three or four weeks later a new hatch was out and the insects were all dead again. The reason is that when you have insects in a field that has high energy and a high sugar content in the crop, alcohol is produced. A human being can consume alcohol with moderation. An excess can cause diarrhea, but diarrhea in a human being is nothing compared to the same malaise in an insect.

WHEELER: Try gently **pulling on a medium-size corn root** to see if the root bark will separate and slip off easily like a stocking. This would indicate weakness caused by excessive salts in relation to carbohydrates and humus and could provide a situation where nematodes could easily penetrate.

RETURN TO TOC

COTTON/COTTONSEED

AG LECTURES: Ants really love **cottonseed meal**. So if you must add cottonseed meal, you better add a little [harmless] fumigant with it. I would suggest snuff.

AG LECTURES: Cottonseed meal is not a top-dressing.

AG LECTURES: Cottonseed meal is a wonderful fertilizer if you can get it. It's got about everything in it. It's a good fertilizer, it's a good top-dressing. **NOTE:** *There are places in the literature where Reams says that top-dressings should be synthetic and surely cottonseed meal is not synthetic.*

AG LECTURES: There are two kinds of **cottonseed meal**. There's one that's had the cottonseed oil removed and one that isn't. Be sure you get the one with the oil in it and that's also rich in Vitamin E.

ANDERSEN: University personnel tell farmers that they cannot generate much nitrogen bacteria activity without legumes. However, research in 1942 revealed that "root-nodule bacteria of lucerne grew equally well under lucerne and **under cotton**.

BEDDOE: Production of 4 bales [of **cotton**] per acre is not out of reason if the farmer understands the technique through Biologic Ionization *[Reams-Ag]*.

BEDDOE: If a fertilizer is 50% organic, that means that 50% of the nitrogen comes from a fertilizer source containing carbon such as dried blood, **cottonseed meal**, or synthetic organics like urea. The law does not apply to the phosphate and potash in a fertilizer, both of which may be synthetic. Yet this fertilizer could be called 100% organic despite the fact that it contains many synthetics, simply because all of its nitrogen content comes from organic sources.

ENERGY RESEARCH: In the southern states growing cotton, they are having a terrible time with a lot of plant and **no cotton**. That doesn't do you much good. They keep pouring on the nitrate nitrogen and that's where the crux of the problem is. All they need do is to incorporate a little ammonium sulfate into their fertility program or a little ammonium nitrate and they would get along just fine. For some reason or another they haven't picked up on that yet.

FWTK: If a fertilizer is 50°/o organic, 50°/o of the nitrogen comes from a fertilizer containing carbon such as dried blood, **cottonseed meal** or synthetic organic like urea.

FWTK: Part of the commercial yields achieved with the Reams program are: 20 tons per acre of alfalfa at 28% moisture; 200 bushels of corn per acre as a starting point; 100 bushels per acre of soybeans; **two bales of cotton per acre**...

PLANT FEED 1976: Every time I've ever used **cottonseed** meal, I've used about 100 lbs. of tobacco dust per thousand pounds to keep the ants and parasites out or it.

PLANT FEED 1976: You put **cottonseed** meal out there and a ground mole will go from one and of the row to the other and plow up everything. But you put your tobacco dust in it and they won't. That's a secret. Put about 100 lbs. of tobacco dust to every 1,000 lbs. of cottonseed meal, mix it thoroughly and the beetles and bugs [or ants] won't get in it.

PLANT FEED 1976: Student: What is a good yield for **cotton**? Reams: I'd get at least 4 bales to the acre. I'd he ashamed if I didn't do that.

SKOW: Hardwood ashes are a source of potash, as are tobacco stems, pecan hulls, **cottonseed hulls**---but if you put cottonseed on the field, look for insect problems. The way to solve that one is to mix cottonseed with tobacco stems. **NOTE:** *The wording makes me think that Reams was thinking of whole cottonseed meal with oil and Skow was considering the dry hulls.*

RETURN TO TOC

COVER CROP

ADVANCED AG: Rye **cover crops** can have huge roots that penetrate deeply. Don't plant in mucky spring fields if your tractor could bog.

ADVANCED AG: Cover crops can greatly help your phosphorous levels.

AG LECTURES: One of the finest things in the world to do to keep your soil warmer in the winter is to **grow a cover crop**. It can be oats, barley, wheat, rye, you name it.

AG LECTURES: Another **cover crop to use occasionally** is Castor beans, a crop of Caster beans about every 5 years, short term. Now let me tell you about your Castor beans. That's something you can plant real early in the year, and they'll come up and start to grow like mad. About the time they get this high, just cut them in and plant your corn. You got a lot of oil in the ground. Don't wait until they go to seed, if you do, you'll be fighting Castor beans the rest of the year.

ANDERSEN: With the fall program, I would sow a cover crop. Oats are my preference because they help increase soil phosphate availability and freeze off so they do not get out of hand in the spring. **Any cover crop is better than none.** When spring or the next crop season arrives, get another Reams soil test. Inevitably, there will have been a change from the previous test.

BEDDOE: In the absence of a source of good chicken manure, a second-best is the **use of cover crops** and soil innoculants.

BEDDOE: Incidentally, many times just the **cutting of a cover crop can excite the soil** by stimulating the roots of the plants to activity which in turn activated the soil to energy production.

BEDDOE: Cover crops not only have good top growth for green manure for turning back in the soil, but also have a large and prolific root system that are rich in carbons. One of the cheapest forms of biologic carbon is from the recycled roots of the plants.

FOLIAR FEED 1981: Do not cultivate in a grove or orchard but do get a **winter cover crop** in.

FWTK-pH: Many times the **cutting of a cover crop** can thus excite the soil.

FWTK: Unsterilized chicken manure, because of antibiotics applied to soils that are not sterile from chlorine, is one of the finest ways to create a healthy living soil. Without a source of good chicken manure, a second-best is the **use of cover crops** and soil inoculants.

PLANT FEED 1976: Student: If you have chlorine already in the soil, what can you do with it? Reams: Don't put any more on for one thing. But grow a. heavy, heavy **cover crop** and plow it in green or mow it while it is very green.

SKOW: The **best cover crop is oats or wheat**. Sometimes red clover is indicated if poverty soil is to be reclaimed. Rye grass allowed to grow over eight or nine inches tall in spring will actually do more harm than good for the immediate crop year. The massive root system in the top two or three inches of soil is beyond belief unless seen.

WHEELER: With the recent emphasis on "cash crop" farming (farming which grows only crops to sell for cash rather than to use as feed for livestock), farmers have seriously neglected humus levels. They no longer have animal manures to spread back on the fields, and they often fail to add organic matter back in the **form of cover crops**. Consequently, soil organic matter and humus levels have decreased dramatically on conventional farms in the past 50 years.

WHEELER: Although many legumes are primary forage or feed staples, they **also make excellent cover crops**. These cover crops, also known as "green manure" crops, are important in many ways other than just their nitrogen-fixing abilities. They play a crucial role in soil aeration, erosion control, and crop rotation, to name a few.

WHEELER: Always get a **cover crop** in somewhere, somehow each season.

*[See Entry **GREEN MANURE**]*
RETURN TO TOC

COWS

ADVANCED AG: **Dairy cows** without sheen on their hair have worms.

ADVANCED AG: **Cow** manure does not need composting because its not hot enough to damage.

AG LECTURES: If you are **feeding the cow** a lot of alfalfa, you need to feed some wheat to offset the tendency of alfalfa to make the blood too thick. If you thin the blood a little, the cow will produce a lot more milk.

AG LECTURES: How can you tell when cattle are mineral deficient---just by the looks of the animal? Student: The oil in their hair? Reams: Yes, but how can you tell when there's **not enough mineral for the cow** long before other signs show? The answer is if there is no kink in the tail, the tail hangs straight. Student: I never saw a kinky cow's tail. Reams: O yes, a healthy a cow has a little kink in the tail right up at the body there.

AG LECTURES: Reams: If you're cutting alfalfa [or other grasses], the best thing to do is is to start about 4 o'clock in the morning and cut them and then about 10 o'clock start putting them in your harvester. Student: One thing. Your nitrates would be too high. The sun hasn't shown on it at 4 o'clock in the morning and **you may poison your cattle, right**? Reams: No, not if there's a high sugar content [*Brix*] you won't. You'll poison the cattle because there's low sugar content in it. You will never poison the cattle with a high sugar content.

ANDERSEN: An observant individual notices that **cows in a particular group hold their ears higher** and look more contented than those in another group. These are all examples of "seeing what you are looking at."

ANDERSEN: Farmers know that the feed rations of turkeys are different from those of feeder pigs, which are different from those of lactating sows, gestating sows, baby pigs, **lactating dairy cows, dry cows, baby calves, feeder cattle**, work horses, race horses, colts, veal calves, mink, alligators, trout, and monkeys. One needs to provide a different feed ration for every type of organism in nature and for every stage of growth of each organism.

ANDERSEN: A refractometer reading of 20 for the milk will never be achieved by **feeding milk cows** today's typical feed or feed rations. A value of this magnitude would require feedstuffs with at least an equivalent refractometer value. Grain would be sprouted or at least soaked for 48 hours before feeding, long-stemmed hay having at least a 20 Brix refractometer reading would be liberally provided, and clean water would always be available.

ANDERSEN: The pH of **cow urine** should be around 7.4. If the pH is much higher than this, there is a possibility that the rumen is malfunctioning, allowing too much free ammonia to pass into the blood. If the pH is too low, the rumen possibly is not functioning properly because of too much acid, which may inhibit nutrient assimilation. This often results from too much acidic feed, like grains and silage, in proportion to hay. Consequently, the cow does not chew her cud enough to produce sufficient saliva to buffer the rumen pH.

ANDERSEN: You can also check milk with a conductivity meter. According to some authorities, **cows' milk** should be about 5,700 ERGS. Above 6,800 ERGS, there are probably mastitis problems.

BEDDOE: A dairy cow which is eating alfalfa that has a 16 Brix sugar level will need only 10-l2 pounds of l2 Brix grain mix to produce 100 pounds of milk. But **the same cow** eating 7 Brix alfalfa will require 30 pounds of the same gain to produce 100 pounds of milk; besides that, the cow is very vulnerable to disease.

BEDDOE: The fastest and best way to get chemical compound colloids onto your soil is the use of soft rock phosphate. **Manures such as cow** and horse with the urine, and baby chick, sheep, goat, and rabbit are very high in the proper colloids.

BEDDOE: The lower the calcium in the food, the less energy the animal or man gets from that food. For example, a **dairy cow which is eating alfalfa that has a 16 Brix sugar level will need only 10-12 pounds of 12 Brix grain** mix to produce 100 pounds of milk. But the same cow eating 7 Brix alfalfa will require 30 pounds of the same grain to produce 100 pounds of milk; besides that, the cow is very vulnerable to disease.

ENERGY RESEARCH: The interesting thing about that aspect [**dying cows**] was when we examined the alfalfa crop the leaves on the alfalfa and the stems were covered solid almost with little black dots. This is an indication of an excess of potassium nitrate...**FOLIAR SEMINAR 1983:** **Cow** and steer manure has more carbons than other manures.

FOLIAR SEMINAR 1983: You will have **healthier cows** & better milk if you can obtain and incorporate carrot pulp into their feed.

FWTK: If they offered a horse or **cow** some carrots with a sugar content of 12% Brix and some with 7% Brix, the animal would eat those with the highest sugar content.

GARDENING: The calciums in your soil can increase the milk yield by as much as 200% and also if your pasture soils have enough minerals and calcium in it, whenever you put the feed in the trough to **milk the cows**, they won't even eat it. They'll just stand there waiting to be milked, because the grass will have so much more nutrient.

GARDENING: You can take grass that's high in sugar [Brix] and one that isn't and offer it to a horse **or a cow** and they'll eat the one that's high in sugar. And they've never had a day of chemistry in their life.

PLANT FEED 1976: Student: Your aerobic bacteria in the soil makes nitrogen like a **cow makes milk**, right? Reams: That's true.

PLANT FEED 1976: I want to talk to you about Hoof and Mouth disease. It's one of the easiest things In the world to get rid of. It's a mineral deficiency. Simply a mineral deficiency and a number of ways to handle it. The best way in the world ls to have a vat of dry chicken manure 2-3 feet deep. **Let the cows wade through water first**, then through the chicken manure each day and the aerobic bacteria will clean their feet in a week. It will get every bit of that out. In their mouth, they'll have a drawing feeling and they'll lick their feet. Gets the bacteria in their mouth and that will get their mouth well. It's a calcium deficiency in the soil that brings it about to start with.

SKOW: The animal manure that yields the most humus for the soil is the one provided by the bovine species. This is because **cow and steer manure has a fiber content** that is not broken down as much as, say, pig manure.

WHEELER: There is a certain amount of that NPN (non-protein nitrogen) molecule that is urea. If you're **feeding a cow** beyond 17-18 percent protein, particularly if it's conventionally raised, you're feeding urea to cows. And you can't feed urea to dairy cows and keep them around; it's impossible.

RETURN TO TOC

CULTIVATION/TILLAGE

AG LECTURES: Reams: A lot of people get out there and cultivate, **just to be cultivating** when it doesn't even need it. Do you realize that? Does it make sense? Are they saving money? Student: They're tearing up the roots. Reams: They're tearing up the roots? How deep should you cultivate when you cultivate? I am talking about row crops now or truck crops. The answer is just as shallow as you can cultivate it actually. Very, very thin, very thin, unless you have a very high sodium content [causing compaction] and have to cultivate deeper.

AG LECTURES: The closer you can plant your rows together, **the less cultivating you need**. That's a very important factor.

AG LECTURES: So as you begin to work with these soils and cultivation of soils, be sure you don't cultivate just because somebody else is. **Cultivate when you need it**. And it is this shadow that will stop more grass from ever getting started than anything in the world. So the closer you can put the crops together, the closer you can put the rows together, the less cultivating you are going to have to do. Student: Do you recommend any minimum width apart? Reams: Well corn, I like to plant 20 inch rows. Student: That's about as close as you want it? Reams: That's right, about 20 inch rows. You can work it out one time then. Student: Like beans or so, you can put a little closer? Reams: No. Beans are a little different crop. You need a little bit more room on beans than you do corn.

AG LECTURES: Generally plant corn in the bottom of a furrow so you can pull the soil and any grass to it. **One time cultivation** after corn is planted in 20 inch rows or double rows, should be sufficient.

AG LECTURES: The lower the quality, the less the quantity. And there's no exception to it. So watch your soil temperatures. It has **much to do with your cultivation program**. Don't be in too big a hurry to plant in the spring of the year, but get your soil ready. Get the problems out of the way. Do you know there won't be a weeks difference in the corn that you planted 3 weeks ago and the one you planted 3 weeks from now? Actually there won't be over 10 days difference in it if that much. And the yield will be that much greater.

AG LECTURES: Reams: There's one point I haven't discussed yet in planting your crops and that is, under cultivation and over cultivation. It's just as **important to cultivate at the right time** as it is not to cultivate at all. You can cultivate too early or you can cultivate too late. What is one of the primary factors on good timing of cultivation? Student: Water content of the soil? Reams: On some soils your gumbo soils, that would be true, yes. Or your soil was so wet you couldn't get in there---your muck soils, yes. That is one factor. But what is another one that is a primary factor on your cultivation? We have discussed it now I just want to know if you know what it is. Student: Breaking the crust is one of the things. Reams: The sodium content of your soil, that is correct. In other words, you must get your soil aerated. Now that is, when you first start this program, you're going to have a little problem with aeration. But the program moves along, and you'll have less and less trouble with aeration.

AG LECTURES: Reams: What are some of the factors that determine **whether we should cultivate or not**? Student: Weeds? Reams: Weeds are one. Student: To break that top crust? That's right. When that crust form, you want to break that crust on the top of the ground.

ANDERSEN: Timely **tillage** is very effective at oxygenating the soil.

ANDERSEN: A further alteration would be to apply the herbicide in a band over the row on the planter and then

cultivate the middles of the rows. Eventually, all herbicides and insecticides will be eliminated from the program. They do as much as or more than anything else to inhibit the regeneration of the biological system in the soil.

BEDDOE: Cultivation practices can tell how deep a potential soil may be. Or how much of a drainage problem may be encountered. The moisture-holding quality of the soil can be affected by the way the soil is cultivated. Cultivation can also affect soil texture, in other words, the fineness or coarseness of the soil. It can give an indication of the calcium content also. The **more calcium present in some soils the easier it will be to cultivate** and the better the soil will crumble.

BEDDOE: The only exception to the use of the moldboard plow is in a tree crop situation as in mature orchards, groves, and vineyards. **In these cases do not cultivate at all**. Just apply the plant nutrients to the ground between the trees and vines. The reason for this non-cultivation is to not cause the loss of energy from the plants bleeding through roots that get cut by cultivation equipment.

ENERGY RESEARCH: One thing that can make the soil pH go up is just the lack of air. As that pH goes up nutrients become unavailable and the quickest way to solve that problem is to **go out and cultivate**. How many of you have noticed after you cultivate there seems to be a good spurt of growth?

FOLIAR FEED 1981: Don't use herbicides, **cultivate your weeds out** so that they add carbon to the soil.

FRANK: In the past farmers would cultivate grain crops in order to combat weeds. With increasing acreage, farmers found it easier to spray herbicides rather than **to cultivate**.

FWTK: A few weeds in a crop, on land that is properly fertilized, will not affect the yield, because there is enough plant food for both the weeds and the crop. Actually, a few weeds that are **easily cultivated under** can produce 20 to 50 lbs. of nitrogen per acre.

GARDENING: **Gardeners practice wrong cultivation sometimes**. You can get more crop quicker by planting your rows east and west than you can north and south. If you plant your rows north and south, the plants are feeding out from under each other. And if you plant them east and west, they're eating out of the middle between the two rows. And, and therefore they have more food, and they'll come in as much as two weeks earlier and just as good.

WHEELER: Even in this day of chemical control, many farmers find they have better weed control with cultivation. The benefit of air introduced into the soil is often an unexpected plus. The air assists the development of root mass and supplies microbial life with needed oxygen.

NOTE: *There are two meanings for cultivation, stirring the soil and also husbandry practice.*

RETURN TO TOC

DECAY

AG LECTURES: Did you ever stick your hand into a bale of hay and it felt hot, warm? Did you ever stick your hand in another bale of hay and it felt cold? Even at the same [*ambient*] temperature? I have and the one that was hot inside was rotting, **decaying because it had a low sugar content**.

SKOW: An unbalanced equilibrium of calcium and magnesium permits organic residues to **decay into alcohol**, a sterilant to bacteria; and into formaldehyde, a preservative of cell tissue.

SKOW: If this crop is turned in before it achieves eight or nine inches of growth, it adds nitrogen. Allowed to grow beyond that limit, the effect on the nitrogen supply will be negative. **Decay will rob nitrogen** from the planted crop. This is true even if the rye was planted in the fall.

SKOW: Magnesium, pound for pound, can raise the pH up to 1.4 times higher than calcium. A soil high in magnesium and low in calcium can test above 6.5, but will be entirely inadequate for the growth of alfalfa, for the growth of legume bacteria, and above all, for maintenance of an environment necessary to **decay organic crop residues into humus**.

WHEELER: To moldboard plow residue 8 to 10 inches deep in this soil condition is to almost guarantee that there **will be little decay** system and no new humus formed.

RETURN TO TOC

DEFICIENCY

ADVANCED AG: Celery or cabbage with rotten core has **boron deficiency**.

AG LECTURES: What happens to young plants or onions or peppers, beans, tomatoes – row corps; whenever there's a **copper deficiency**? What happens to your young plants? They rot off at the ground.

AG LECTURES: Student: Going back to the tomatoes, you get these brown spots on the tomato with the black spot in the middle. They call it anthracnose. Reams: Yes, it is a **copper deficiency**.

AG LECTURES: Reams: What would cause Black Heart in potatoes? Student: Boron deficiency? Reams: **Boron deficiency** causes Black Heart and it also causes them to split open in there. What causes the cabbage or lettuce

when you cut it off at the ground to have a hole in the bottom? Student: Boron deficiency.? Reams: What is the best way to get boron onto your fields? Student: Chicken manure? Reams: Chicken manure is very rich in boron – yes.

ANDERSEN: With apples, the opposite seems to occur. An apple with apple scab fungus will itself have a low refractometer reading (below 12); however, the leaves on the branch supporting the sick apple will have very high refractometer values (above 12 or even in the upper 20s). In any event, there is a mineral imbalance/**deficiency** in the crop.

BEDDOE: Hollow stems on grasses and forage crops, such as alfalfa, are not normal. It is an expression of phosphate of **boron deficiency**.

BEDDOE: When there is a **deficiency in available boron**, the pith does not completely fill.

ENERGY RESEARCH: If there is a carbon **deficiency** there is a CO2 **deficiency** which will result in a carbohydrate **deficiency** and an oxygen **deficiency** which will result in decreased aerobic microbial life which will result in increased toxicity, reduction of carbon cycle and finally sterile soil, loss of the magnetic field, and a favorable environment for all types of pests both above and below the ground.

FOLIAR SEMINAR 1983: Hollow stems in any crop is a **boron deficiency**.

FOLIAR SEMINAR 1983: Different size grapes indicates a **manganese deficiency**.

FOLIAR SEMINAR 1983: Watermelon with white seeds points to a **manganese deficiency**. They will take longer to mature.

PLANT FEED 1976: When you see peach, orange, apple or other trees with the bark leaking out sap and crystallizing, that means there is a **phosphate deficiency** first. Second, a **copper deficiency**. Or phosphate of copper.

PLANT FEED 1976: Blue mold points to a **copper deficiency**.

PLANT FEED 1976: I want to talk to you about Hoof and Mouth disease. It's one of the easiest things In the world to get rid of. It's a **mineral deficiency**. Simply a mineral deficiency and a number of ways to handle it.

PLANT FEED 1976: The weaker the sap in the plant - the less minerals it can take in from the air. I believe farmers are the finest doctors in the world. If you grow good produce, people are less likely to become sick. You only have one cause of illness: **mineral deficiency**.

REAMS/SKOW COOK: What does that mean when it's got a hollow in the middle? Student: Too little mineral. Reams: Yes, but what mineral? Student: Boron? Reams: That's a **boron deficiency** whenever they have it.

SKOW: Light green or pale green moss on a tree is sometimes an indication of iron deficiency. **It could and it could not be iron deficiency**. Remember, every nutrient enters a plant in a phosphate form. There simply may not have been enough phosphate to usher in the iron. So the iron may be there, albeit stalled in the plant's own horse latitudes. This is the major shortfall of leaf analysis.

SKOW: Manganese is a prime requirement for getting a good seed fill. This is especially true for stone fruit, peaches and apricots, for instance. Housewives who purchase grocery store fruit often encounter rotted centers, always a sign of **manganese deficiency**.

SKOW: Blue tint in corn leaves means a **nitrogen deficiency**.

SKOW: In developing a foliar program, maximum attention must be given to the thickness of leaves, how well leaves stand up, the degree of wilt, and so on. A thin or weak leaf suggests a **nutrient deficiency**, or low TDN — total digestive nutrients.

SUCROSE: ...possibility that the decrease in yield could **possibly be a deficiency** of one of these three elements or of an elementary catalyst that joins them together to make sucrose? It could not be hydrogen or oxygen because these two elements come from water, so then the deficient element is carbon or its catalyst.

RETURN TO TOC

DENSITY

ADVANCED AG: Reams: When growing asparagus, increase count [*planting density*], use commercial calcium nitrate and harvest in morning.

ADVANCED AG: The greater the **density of the soil** without humus, the greater the specific gravity.

ADVANCED AG: The lesser the **density of the soil nutrients**, the smaller the yield and the greater the density of the soil nutrients, the greater the yield. Calcium is always key.

ANDERSEN: The greater the **soil-nutrient density**, the greater the crop yield, provided there is adequate moisture.

BEDDOE: When homogenization is accomplished, the end result will give a solution that has a **greater density**, while the molecule enlarges and increases in porosity. It is this porosity that sets the stage for a shrinkage that locks the molecule on the antennae of the leaves at the time it contacts them.

BEDDOE: The greater the **density** of the non-humus soil, the greater the specific gravity of the soil.

BEDDOE: **Density**--Concentration of matter. measured by the mass per unit volume.

ENERGY RESEARCH: If you run out of calcium, the plant will still continue to grow but the cell will be weakened and there will be an increase in the amount of water in that cell. If there is an increase in the amount of water, what happens to the test weight of the grain? It goes down. In other words, the **specific gravity or the density is less**.

ENERGY RESEARCH: The greater the **soil nutrient density**, the greater the crop, providing you add the water.

ENERGY RESEARCH: You can change the color of plants by increasing the **density of nutrient** in the plant which we have observed up here *[at the lectern]*with the two different oat plants of the same variety but yet we have evidently succeeded in getting more nutrient available to the one plant. As the intensity of the color increases, that tells you also that the plant has the ability to draw more nutrient to it magnetically.

FRANK: This **variation of nutrient density** in green beans applies to all produce. To get true nutrient dense foods you must first fix your soil.

FRANK: Here is the pattern on the Morgan soil test to shoot for if **nutrient density** is your goal: Humus: Ignore this---when the minerals are right this will automatically correct.

FRANK: Duane: If you want a full discussion of **nutrient density**, we're referencing foods with more nutrition, higher both of the minerals, the phytonutrients and even those essential sugars that science is discovering how significant the sugars are for cellular health. **NOTE:** *Frank's entry may be as good a definition of food nutrient density as we are likely to see. On the other hand, Reams' known definition of density as "Quantity of anything per unit of volume or area" should be kept in mind.*

GARDENING: The **density** *[depth?]* of the colloidal particles in the soil should reach down at least 6 inches deep. When your topsoil equals 6 inches, you will have some of the finest gardening soil in the world.

PLANT FEED 1976: The greater the **density of the soil** without humus. the greater the specific gravity.

PLANT FEED 1976: Density definition: how far apart the particles are which make the energy in the soil for plant growth It is the distance apart that matters. Suppose you have a strip of fog one mile wide, 10 feet deep and 30 miles long. I am talking about fog that is dense---100% vapor. How much water is in the fog visable to the eye would there be in gallons? I am using fog as a metaphor for density of plant food. If the fog was at saturation, there would be less than a bathtub full. There is more water in the air that you don't see than you do see. That little bit you do see is just a little steam blown up hundreds of times. This is density. The **less the density of your soil nutrients, the less the yield. The greater the density, the greater the yield**.

SKOW: Keep in mind the fact that carbon has an important *[should we say critical?]* role in holding nutrients in a given area. It also has the potential for increasing the **nutrient density** during the growing season by extracting nutrients from ionized air.

SKOW: As we waltz our way through the many lessons Carey Reams left behind, the shoulders he stood on keep coming into view. For instance, the forgotten scientists who first worked out the color-metric test as a measure of dry ions rate a mention. They discerned that a certain volume created a certain **density of color.** They tested nitrogen in the soil and in urine within the parameters of this theory. They developed the test that linked nitrate nitrogen to the color blue, a test now part of the standard LaMotte procedure. They were able to do this because they figured out how many molecules it took to provide density. The computations by Reams confirm the entire procedure, and it is the colormetric concept that now stands ready in the wings to serve a more scientific mainline agriculture.

RETURN TO TOC

DOLOMITE

AG LECTURES: Student: If you find the agricultural lime in the area is up to the **dolomite strain**, would you use the dolomite? Reams: Don't use it. Student: Where do you go from there? Reams: If you can not get it [non-dolomitic lime] from your area, you may have to have it shipped in from Florida or somewhere else. Just don't use dolomite.

AG LECTURES: In **dolomite** you have your magnesium and you have your calcium. Those 2 things are together, but they are separate. They're not bonded together. What nitrogen will do is destroy this combination. In other words it will X it out, turn it loose into your air, into bubbles. Then your calcium will slowly become available. About 18 months later, providing you've got enough very expensive nitrogen in your soil.

ANDERSEN: Reams used calcium carbonate, **never dolomite**. He observed that sufficient magnesium would be available if he balanced the calcium, phosphate, and microorganisms and then applied fertilizer quantities of Sul-Po-Mag.

ANDERSEN: Avoid using **dolomite** fertilizers or additives.

BEDDOE: Magnesium is the enemy of nitrogen. This is important to remember. Every pound of magnesium available in soil chemistry will release a pound of nitrogen. This is why **dolomite is not used as a soil**

amendment. It is 35% Magnesium Carbonate. Sometimes Magnesium is used in certain forms for the purpose of reducing nitrogen content in and around certain plants. Otherwise if the soil is worked properly, the plant can get all the magnesium it needs on its own.

BEDDOE: The second **problem with dolomite** is that the calcium does not become available in the soil for at least 18 months.

FRANK: Limestone with a high magnesium content is called **dolomite. It is not normally recommended** because it provides too much magnesium and imbalances the calcium-to-magnesium ratio.

FWTK: There are five basic sources of calcium for agricultural purposes. The most common source is ground limestone. Then **there is dolomite - which we do not use**, gypsum (calcium sulfate), calcium oxide, Aragonite and basic slag.

PLANT FEED 1976: Dolomite is a calcium oxide and magnesium oxide [mixture] containing approximately 35% magnesium oxide. One of the fastest ways in the world to **go out of the business of farming is to add dolomite** to your soil.

PLANT FEED 1976: The Experiment Stations say you should always use magnesium oxide as dolomite with lime. They get anywhere from $1 to $4 a ton for every one that is used. Three dollars is a good average. **You don't want dolomite, period**. The Experiment station will have to think up some other gimmick to get their operating funds.

PLANT FEED 1976: Another way [to eliminate excess chlorine] is to add high amounts of lime - 8-9 tons of lime per acre and oxidize the chlorine. The number of pounds of chlorine in your soil can be oxidized by the correct number of pounds of ordinary agricultural lime, but. **never use dolomite**.

SKOW: The refractometer — in its subtle way — **warns against the use of dolomite** limestone. When purchasing limestone, no product should be used on the soil if it contains more than 5% magnesium. If the source says the information isn't available, then request a laboratory analysis or look elsewhere. I have in mind a bunch of Michigan farms on which the wrong limestone was spread at the rate of two tons per acre. Years later, those fields still won't grow a crop. That's why it is mandatory to check the analysis.

WHEELER: Reams suggested you **avoid dolomite for three reasons**. The most impressive one has to do with nitrogen release. Magnesium is antagonistic to nitrogen as seen in the use of Epsom salts as a treatment for nitrate poisoning in cattle or an Epsom salt spray on fruit trees to stop apple drop due to nitrate-weakened stems. When the magnesium releases from dolomite, it can cause nitrogen to release as a gas.

RETURN TO TOC

DRAINAGE

ADVANCED AG: **Flood system drainage** in flat land by ditching can serve dual purpose as irrigation. Water can be kept six inches below the ground surface and the crops are actually planted in raised beds.

AG LECTURES: Reams: If you hang clothes on a line, and there's a wind blowing, do they dry quicker with the wind blowing or without it? Student: Blowing? Reams: Yes, a blowing wind also dries the soil out. So **your air drainage has much to do with your soil moisture**.What can you do about it? Student: Plant windbreaks? Reams: Yes, windbreaks help. But what can hold that moisture in? Student: Protoplasm? Reams: Exactly right---protoplasm. So I am now asking how it does that. Student: It ties it up too well? Reams: Yes, but the real reason is that a crust is formed. The air can't get in and out so easily to dry. After the wind dies down you have to cultivate that crust.

BEDDOE: Cultivation practices can tell how deep a potential soil may be. Or **how much of a drainage problem may be encountered**.

BEDDOE: Calcium has a mellowing effect on the soil structure. It **improves drainage** by opening up the soil.

BEDDOE: Drainage problems may have to be addressed in some dry land areas where alkali mineral salts have been accumulating. The **best solution is to try and establish drainage** and then use heavy green manure crops. As the bacteria and carbons increase in number and activity, the salts will be taken out of solution and no longer be a problem.

BEDDOE: **Drainage is a must**. Many lands have been farmed so poorly that there is a hard pan layer a foot or two below the surface that prevents the water from penetrating. If the land has enough slope it will run off. If the land is level, then there will be standing water and potential for plants to drown. Drainage factors will also determine how a field will survive when excessive rain or high water is encountered.

WHEELER: In the traditional Reams model the Ca:Mg ratios would be 7:1 (some say 10:1) to indicate a well-balanced soil. Narrower Ca:Mg ratios, say, 4:1, indicate compaction. The **tighter the soil the less drainage** and the less favorable the soil for microbes.

RETURN TO TOC

ELECTROLYTE

ADVANCED AG: A top dressing, if needed, is used during the growing season to **provide electrolyte**.

AG LECTURES: Reams: Sulfuric acid is an **electrolyte**.

AG LECTURES: Student: What does aluminum do for soil? It's not a soil nutrient or plant food nutrient. What does it do for soil? Why is it important? Is it important? Is it a catalyst? Reams: No sir, but you're getting mighty warm. Student: Is it a conductor? **Reams: Right---it is an electrolyte.** It's like little transformers in there. Picks up the electrical charge and makes the soil carry an extra bit of current through the soil.

BEDDOE: Since **nitrogen is an electrolyte**, remember to not band it close to the plant. The electric fields need to be kept away from the plant, so that the magnetism is away from the plant. This will assure that the roots are drawn out into the middle of the rows. The more topsoil the roots are directed through, the better the exposure to soil mineral energy.

BEDDOE: Since **nitrogen is the important electrolyte**, it is important that it is present in all foliar sprays in a small amount if nitrogen is not needed in the plant, but in larger amounts if extra is needed by the plant.

ENERGY RESEARCH: Common electrolytes are iron, aluminum, copper, and one of the other ones that you will see a lot written about is magnesium and they get a wonderful response. **NOTE:** *Skow may have meant to say that the list is of **metals**, not electrolytes. Also notice that in Ag Lectures we find Reams calling aluminum an electrolyte when he probably meant aluminum compounds act as an electrolyte.*

SKOW: Calcium chloride will pass a current because the compound has an **electrolyte built in**.

SKOW: The **electrolyte is always a conductor of electricity** — usually iron, copper, zinc, etc. The most important one is nitrogen because no crop will grow without it. Even if a cell needs iron, copper or zinc, it can't effect formation of the cell until nitrogen is present.

RETURN TO TOC

ENERGY

ADVANCED AG: When buying calcium, there is no way to know if one batch is **higher in energy** than another batch of the same type.

AG LECTURES: Reams: How could aluminum lead you astray in the soil? How could it fool you? Student: Make you think you have a nutrient when you really don't. Reams: How would that show on a soil analysis report? Student: **Indicate there's more energy than there really is**? Reams: That's right, you'd say there's more energy there. Now what makes energy? Student: Anions and cations. Reams: And how does that show on your chart? Student: As ERGS? Reams: No, not as ERGS. Student: pH? Reams: pH, that's right. It's a measure of the resistance. It can make you think you've got more resistance than you have got there. It can lead you astray. pH is always a measure of resistance. It can fool you, it can lead you astray.

AG LECTURES: Regardless whether the plant food comes from organic, inorganic or from nutritional sprays, the way that plant food enters the plant, **the energy is identical**.

ANDERSEN: An area may have much organic matter but very little actual humus because humus formation requires plenty of oxygen and energy for the correct microorganisms to work properly.

ANDERSEN: ERGS (energy released per gram of soil), measured in micromhos or microsiemens, represents the **amount of energy available** to the growing crops and microorganisms.

ANDERSEN: Iron draws energy to the leaf by absorbing heat from the sun; it makes the leaf darker, thus **absorbing more energy**.

ANDERSEN: Carey Reams, as an ag consultant, used pH in a different way. He looked at pH as a measurement of the resistance in the soil. He observed that the higher the pH, the greater the resistance there was and the more difficult it was **to get energy to flow**, particularly if the pH was somewhat alkaline, in the 8 or 9 range, resulting in nutrient imbalances. On the other hand, he observed that if the pH was moderately low, below 6, there was not enough resistance. This exchange allowed the energy to flow too readily, making it difficult to contain it *[and for the plant roots to grab it]*, again resulting in apparent nutrient imbalances. This seems to be a practical and workable use of pH, for it addresses the reality of how plants grow through energy exchange. In essence, pH is the result of the nutrient interaction, not the cause. When the nutrient ratios are balanced, the pH will stabilize automatically in the correct range.

ANDERSEN: According to Reams' concept of energy, calcium is classified as the kingpin of **growth (anionic) energy** and manganese is classified as the kingpin of **fruit (cationic) energy**.

BEDDOE: It is usually better to apply nitrogen in two applications: one before planting, and one after the crop is up. A single larger application results in a **loss of energy** in the soil.

BEDDOE: Homogenized foliar spray solutions have 10 times the effect of non-homogenized. Homogenization is

when each molecule within the spray contains all the elements in exactly the same solar system relationship. The process of homogenization is one of adding a **high degree of energy** to the molecule of plant food spray.

BEDDOE: Acids (cations) coming into contact with bases (anions) are heat and **energy producing** because of the resistance between the anions and cations.

BEDDOE: Fungi and bacteria have their part in bringing opposite forces into contact with each other to form **plant food energy**.

BEDDOE: Incidentally, many times just the cutting of a cover crop can excite the soil by stimulating the roots of the plants to activity which in turn **activated the soil to energy production**.

FRANK: Plants have a special ability to combine heat **energy**, light/electrical energy, mineral energy from soils and foliar sprays, mineral particles from the air, and atmospheric sourced CO2 into plant tissue and produce.

FRANK: Limestone rock can be heated by fire. This drives off the carbon and leaves a very fine powder: calcium oxide. A certain amount of water can be added to become calcium hydroxide. Both of these forms of calcium are very hot chemically and aren't recommended very often. They are very **strong on growth energy**, but can burn plants and leaves.

FRANK: Headings:We **checked the energy** with a meter [ERGS]. You buy a conductivity meter and anybody can do this and it's great to have one to check the energy in the soil and to see if that is the problem or if it's another problem.Well, in this case it was the problem. The energy was low. And so, we mixed up some soluble nutrients and we also used a foliar spray from International Ag Labs. And he called me 24 hours later, and he said, "Duane, you have to come see this. All those potato beetles moved out into the weeds."

PLANT FEED 1976: Density definition: how far apart the particles are which **make the energy** in the soil for plant growth It is the distance apart that matters.

SKOW: Calcium from alfalfa and calcium from peppermint tea are each in a different complex. As a consequence, they affect the cells of the body differently. They have a different pH and a **different energy potentia**l.

SKOW: Let's consider a soil with anaerobic bacteria quite high. Aluminum could flip- flop in such a situation, but probably remain low. The soil would be sour and highly alkaline — with lots of calcium **unable to release its energy** due to a lack of air flow, carbon and water circulation.

SKOW: When the bark cannot stretch, sap can't flow. This situation can be remedied at times by applying copper sulfate, but many times that device will not work. Again, a nitrogen or phosphate deficiency might be identified as the cause. In other words, there may be enough phosphate to accommodate the basic functions of the plant, but not enough to handle copper and iron needed **from a standpoint of energy**.

SUCROSE: Too much fertilizer applied at one time can result in a **quick release of energy without preserving this energy** in protein molecules. Most of the energy is lost unless harnessed by the protein molecules, which results in a decreased sucrose yield.

WHEELER: These *[chemical trace nutrient]* forms, however, aren't of the **highest energy** nor are these the most biologically available forms.

WHEELER: Quick lime, CaO (46°/o Ca) — Also called calcium oxide, this dry product is very fast acting, contains readily available calcium and is **loaded with energy**.

RETURN TO TOC

ENZYME

ANDERSEN: It is quite simple to get carbon into a fertilizer mix. Carbon is in carbohydrates. Common carbohydrates are sugar, molasses, humic acid, humates, fish meal, seaweeds, algae, yeasts, **enzymes**, biological brews, whey, and so on.

ANDERSEN: Manganese activates a **number of enzymes**, including some related to photosynthesis, and is an important component in chloroplasts.

ANDERSEN: Sulfate, on the other hand, can help enhance calcium availability, is needed in certain protein and **enzyme complexes**, and sometimes can aid in mellowing the soil.

ANDERSEN: Obviously, earthworms are not people, but our digestive systems and that of the soil depend on microorganisms and **enzymes**. Earthworms are good surrogates for determining potential hostility to these important digestive microorganisms and **enzymes**.

BEDDOE: Other ingredients that can be used if needed [*in foliar sprays*] are: Manzate for the manganese chelate, Zineb or the zinc chelate, Vitamin B-1 for the **enzymes**.

BEDDOE: Some potential benefits of potassium may include better stalk strength and lodging resistance. improved winter hardiness, more resistant to disease. increased protein and carbohydrate production. better sugar translocation, **enhanced enzyme functions** and cell division.

BEDDOE: In plants, manganese serves as an **enzyme activator**, helps break down carbohydrates, and metabolizes

nitrogen.

FOLIAR FEED 1981: Student: Will homogenization **destroy enzymes**? Reams: **What is an enzyme**? Student: Part of a vitamin. Reams: Homogenizing spraying will not destroy a vitamin.

FRANK: As an extra punch, Transplant Formula also supplies **quick acting enzymes** to jumpstart the whole process.

SAIT: Andersen: For example, using liquid calcium with Vitamin B12 and sugar is primarily a chemical catalyst to make calcium available, but introducing a microbial or **enzyme-based material** as a biological catalyst. We find that in certain situations one is more appropriate than the other. Anyway, I agree that it is best to use a combination of the Albrecht and Reams tests to get the full picture.

SKOW: The problem you run into is sodium, and the only way to counteract sodium is to add back plenty of compost, or Z-Hume, a liquid humate product with **enzymes added**.

SKOW: Plants also have enzymes. These are small protein units that act as on-scene engineers in the cell building business. They take raw materials, such as earth minerals, and see to it that they reach the right stem, root, bud, flavor, or whatever. Indeed, how **enzymes create hot spots** to attract essential cell building materials---iron, nitrogen, boron, for instance---so that they can be linked to the right molecules in plant cells must be considered a miracle.

SKOW: Humates are known to **stimulate plant enzymes** which further aid the production of simple sugars in the plant leaf.

WHEELER: Copper is largely associated with **plant enzymes**.

WHEELER: Trace minerals are a major part of an enzyme's characteristic. There are no enzymes that do not have a trace mineral which is a part of the **activity of that enzyme**.

WHEELER: Digestive enzymes are secreted out of the pancreas. In people the pancreas is particularly challenged, because the body is producing **all of the enzymes necessary** to digest the food instead of getting them out of the food that's consumed. There is what is known as an enzyme reserve. The body has only so much capacity to manufacture enzymes. By eating mostly cooked foods we use up this enzyme reserve faster than when we eat raw foods.

NOTE: *While Reams lectured extensively in his human health series about enzymes, he hardly touched on the subject in Reams-Ag. Perhaps his Ag students are trying to close the gap as there are over 200 enzyme mentions in their literature.*

RETURN TO TOC

ERGS (Energy released per gram per second)

ADVANCED AG: Reams speaking about when someone calls for help: "The **ERGS** is the first thing I would want to know."

ADVANCED AG: Skow: The **ERGS can be tested** in the office if need be.

ADVANCED AG: Figure your **baseline ERGS** in the forest or outside your fenced in land where you have not fertilized. The baseline should NOT vary that much year around.

ADVANCED AG: Measure the calcium in the area of the **baseline ERGS**. If acidic, you add the baseline to the test value. If alkaline, you subtract the baseline.

AG LECTURES: Reams: Which uses the most **ERGS of energy**---little plants or big plants? Student: Big ones? Reams: Yes, when they are big---now, at what stage does your production increase the most rapidly? Student: Silk stage? Reams: From the tassel to the dying of the silk. That is when your ERGS should be highest and you may need to use some superphosphate to keep it high enough.

AG LECTURES: Reams: Suppose you have soil that had 600 **ERGS**, what would that mean? Student: It means it's jumping? Reams: It means you'd have an extremely great loss of energy. Plants can't take it in that fast. Where would this energy be going? Student: Into the air? Reams: Into the air, that's right, but some of this energy could be being picked up by the bottom of the leaf.

AG LECTURES: Student: What is the **maximum ERGS that a plant can utilize**? Reams: About 200. If you've got 200 ERGS per gram of soil over that whole acre and your crop is at the climax, it can use that much and maintain it. But if it's greater than that, you have a terrific loss. You don't think soil chemistry is important? It's just like burning money if you get your ERGS too high.

ANDERSEN: Reams tested calcium, phosphate, potash, nitrate and ammoniacal nitrogens, **ERGS (conductivity in micromhos or microsiemens)**, and various trace elements.

ANDERSEN: ERGS (energy released per gram of soil), measured in micromhos or microsiemens, represents the amount of energy available to the growing crops and microorganisms. The reading must be interpreted in relationship to the inherent conductivity of the base soil due to salts and non-nutrient minerals. If the overall

reading gets above 1,000, there is generally a salt problem, energy loss and waste, and increased potential for root burn and nematode proliferation. If the ERGS level drops below 200, little or no crop growth is occurring. Late-season crop finishing is directly correlated to the ERGS level.

ANDERSEN: The calcium-humus-phosphate complex is the key to maintaining **stable soil ERGS** and crop quality. Without the humus component, the calcium and phosphate complex [together] to form [unavailable] tricalcium phosphate rendering both the calcium and the phosphate unavailable.

BEDDOE: ERGS---A measure of soil energy release equal to grams/sec. **ERGS are directly equal to conductivity units** on the conductivity meter, micromhos/cm/sec.

BEDDOE: While conductivity (**ERGS**) tells quantity, pH tells speed and magnetism.

BEDDOE: Check ERGS and nitrogen at planting time. This will give you one final check to see if the soil energy is shaping up as planned. **ERGS will tell you if there is enough energy** reaction going on in the soil to germinate and feed the seed properly.

BEDDOE: Conductivity of the foliar solutions should be approximately 1000 ERGS (micromhos) above what the water is that was used to make the solution. Ingredients that can be used to increase conductivity: 1. Seawater or brackish water-no more than 10% of the total solution. 2 Kelp, either liquid or powdered. This has been found to enhance the effect of herbicides so that the same effect could be obtained with using less product. 3. Vinegar.

BEDDOE: The **ERGS test** shows what value is obtainable from the nutrient that is in the soil; but it doesn't reveal its source. It is very important to know what is producing the ERGS reading. For instance, the ERGS could be coming from seawater, but the seeds wouldn't sprout in such a climate. If the ERGS in the soil are being created from elements that are not plant foods, then they are not counted in the calculations.

FOLIAR FEED 1981: Reams suggested that diatomaceous earth with an ERGS reading less than 30 not good. He wanted to see **60 ERGS or more**.

FRANK: If you go in there with a high nitrate, high potassium product, you will **probably push the ERGS up some**, but the health of the plant will simply go down very fast if you put on what is there in excess already.

FRANK: With this program, it seems that if you **keep the ERGS where it needs to be**, if you put in what needs to be put in, the ORP kind of takes care of itself.

FRANK: If you put out the right thing [fertility], you will **increase the ERGS** and you will increase plant performance.

FRANK: Headings:We checked the energy with a **meter [ERGS]**. You buy a conductivity meter and anybody can do this and it's great to have one to check the energy in the soil and to see if that is the problem or if it's another problem.Well, in this case it was the problem. The energy was low. And so, we mixed up some soluble nutrients and we also used a foliar spray from International Ag Labs. And he called me 24 hours later, and he said, "Duane, you have to come see this. All those potato beetles moved out into the weeds."

FWTK: Testing soil without using a test for water soluble plant foods will lead a farmer to believe his soil has plenty of the elements in which it may be most deficient. The basic tests included are for nitrate nitrogen, ammoniacal nitrogen, phosphate, potash, calcium, pH **and ERGS**.

FWTK: ERGS is a reading of how much plant food is available per second, per gram of soil. About **forty ERGS is the minimum** there should be even to plant a seed. Then, as the plants grow, the ERGS should increase. When the crop reaches its climax, the ERGS should also be at their climax. At the latest stage of growth, when production increases most rapidly, the desired level of ERGS is between 100 and 200. However, it can reach as high as 400 for a few days at a time. In corn, for example, the ERGS should be the highest from the time it tassels to the dying of the silk, in order to produce a maximum crop.

GARDENING: ERGS mean the amount of energy available per second, per gram of soil. As the plant grows the **ERGS level needs to increase** and if the level increases too quickly, the plant is too little to take them in and you've got a great loss. It's like burning your money.

PLANT FEED 1976: Student: Why don't you care about pH values? Reams: Why should I? I'll handle it in any soil. For example ,we are going to be **testing the ERGS** and whenever I know what my ERGS are I feel that is what the pH is.Student: So you can do it either way---in some things? Reams: No, ERGS is the only accurate way to do it.

PLANT FEED 1976: Suppose you have corn, Irish potatoes, wheat and just. about the time it. got ready to mature and there came a terrific rain and you tested the soil after the rain and you found the ERGS down between 40 and 50 but you need 200 ERGS for that last 2-4 weeks. Because in that time you can double your yield in your row crops.

PLANT FEED 1976: Student: Can you give a particular rate on ERGS for how much superphosphate to use? Reams: It's a variable according to your temperature. How much superphosphate you should use to raise your ERGS? 2 lbs. per thousand square feet at any one time should be a. maximum at about 100 lbs. per acre. You are not using it for the phosphate - you are using it as a catalyst.

SKOW: The term ERGS designates a reading of how much plant food in terms of chemical energy is available per

second per gram of soil. When planting, you should start out with around 40 ERGS; this is the minimum you should have to even plant a seed. Then, as these plants grow, the ERGS should increase as well. At the latest stage of growth, when production increases most rapidly, the desired level of ERGS is between 100 and 200.

SKOW: If the ERGS in the soil are being created by elements that are not plant foods, they then are not counted in the ERGS calculations. For example, if you have very low, or 0-0-0 readings on your soil test, but show an ERGS level of 1,000, these are not plant food ERGS.

SKOW: ERGS of pure sand and water will be less than 10 microsiemens. The **ERGS of a good natural woods earth soil will be 100 to 200 microsiemens**. If a soil has its nutrients tied up or complexed, then the ERGS will be low and plant growth reduced. Some crops such as corn may be pushed to greater yields by bringing the ERGS to 400 microsiemens. A baseline reading of ERGS may be established by gathering a soil sample in the early spring after the fall and spring rains before the bio-life has been activated with rising temperatures. Salt residues and underutilized plant nutrients results in baseline ERGS of 25 to 600 microsiemens. If soil ERGS equals 1200 microsiemens most plants won't survive.

WHEELER: ERGS — [equals] conductivity reading [of the soil].

WHEELER: When **ERGS are high**, e.g. 800 or higher, check to see if sodium is a factor. High-sodium soils can be more difficult to grow on. Very low sodium soils can benefit from applications of sodium for flavor enhancement of produce and soil texture.

WHEELER: Users of the Reams technology are finding that although the base reading concept is still valid, the **ranges of ERGS one has to work with may be much higher than the 200-400 range**. Part of the reason may be that the plant hybridization process has developed plants needing to consume or grow in the presence of high amounts of nitrogen which can result in higher ion counts. However, although plants may grow at the higher ERGS levels, the bacterial populations may not function well enough to result in high Brix readings along with the potentially higher production. Some of Dr. Wheeler's clients are running as high as 1,200-2,000 ERGS under plastic with drip irrigation and achieving excellent results.

NOTE: *It may take careful study, but the true student should gradually become aware that Reams considered excessive soil ERGS as a waste that would escape and only sometimes be captured by the undersides of the leaves. We should never forget that Reams seminars were generally directed toward how the farmer could be successful economically, not just grow abundant bins and bushels of superior crops.*

RETURN TO TOC

EROSION

AG LECTURES: A high sodium content is why you have erosion to start with. The harder the soil the more it washes. Why?

ANDERSEN: Proponents of conventional chemical programs cannot imagine farming without chemicals, nor do they comprehend that balancing soil and plant nutrition **corrects the problems of soil** compaction, **erosion**, hardpan, insect, disease, and weed infestations, and inferior commodity quality.

BEDDOE: This *[lime-soft rock phosphate]* bonding will also play a part in the prevention of water and **wind erosion** on any land it is applied to in the layered method.

FWTK-pH: The aerobes in the soil convert everything possible into protein molecules in spore form. This aerobic bacterial spore is nature's way of preventing plant food from leaching. This makes the soil quite gummy and also **helps prevent erosion**.

PLANT FEED 1976: Leaching is what happens to most fertilizers, **not erosion**.

WHEELER: These cover crops, also known as "green manure" crops, are important in many ways other than just their nitrogen-fixing abilities. They play a crucial role in soil aeration, **erosion control**, and crop rotation, to name a few.

WHEELER: In spite of the **negative aspects involving erosion** and power requirements, the moldboard plow can be beneficial. **NOTE:** *There is no record of Reams thinking the moldboard created erosion.*

RETURN TO TOC

FERTILE

COMMENTARY: *The paramagnetic concept espoused by Phil Callahan appears to have arrived after Carey Reams departed. Although many of Reams' students later eagerly adopted paramagnetism, there appears to be no audio or transcript indicating that Reams spoke of anything more than "magnetism," a term he was fond of. At its most simple explanation, a highly paramagnetic soil is considered capable of being a more fertile soil. Many soil consultants urged their clients to scatter stone dust measuring high native paramagnetic values, almost as a*

shortcut to higher fertility. Some three decades after his death, it is difficult to say with any certainty that Reams would have considered spreading paramagnetic dust the easy equivalent of careful soil building via his process of layering calcium, phosphate, and manure. Perhaps his main objection would be that even if two soils registered the same paramagnetism, one via dust scattering and one with a full TDN (Total Daily Nutrient), the old-fashioned soil would be the better place to raise food for animal and human. It is quite easy to imagine that those Reams-Ag farmers who followed his directions quickly realized that they had reached a fertility state making purchase of paramagnetic stone a useless and worthless expense. To reach the best decision, the wise young farmer should study both the ***MAGNETISM*** *and* ***PARAMAGNETIC*** *entries with their various quotes and the fertility thoughts listed below.*

ANDERSEN: Paramagnetism does not guarantee **fertile soil**, but it is a prerequisite for fertile soil. Sterile soils are diamagnetic; they are poor antennas.

ANDERSEN: From a physics viewpoint, we can say that fertile soil is a living biological system. Plants are antennas plugged into the soil and function in direct proportion to the stability of the energetic characteristics of the soil. These soil characteristics are directly correlated to the biological integrity of the soil. Therefore, **soil fertility is directly proportional to biological activity**.

BEDDOE: Unfortunately the average farmer or person thinks that when a substance is called a fertilizer it must be OK for the soil and will make it **more healthy and fertile**. They reason that most fanners produce "good crops" in their estimation. And that in

order for a bean to be a bean it has to have certain nutrients available. So if a bean grows, everything must have been there that was necessary. If vou are to farm successfully vou cannot succeed on those assumptions.

SAIT: Andersen: However, from a biological perspective, the **more fertile the soil is**, the higher the magnetic susceptibility. It must be made clear that this doesn't guarantee that the higher the magnetic susceptibility, the more fertile the soil, because it depends totally on what makes up that magnetic susceptibility. For example, you don't want a ferromagnetic situation; you want

the influence to be paramagnetic. High iron can introduce ferromagnetism to the picture.

SKOW: Highly fertile soils have positive magnetic susceptibility values and are said to be paramagnetic. Sterile soils have negative magnetic susceptibility values and are said to be diamagnetic. The fact that a soil is highly paramagnetic does not guarantee high fertility, but it does indicate high potential fertility.

WHEELER: A **healthy, fertile soil** is slightly attracted to a magnet and, therefore, is considered paramagnetic. This is a natural state of matter and is not the same as ferro-magnetism which explains the attraction of metal to a magnet.

RETURN TO TOC

FERTILIZER

ADVANCED AG: If you had an orange grove in south Florida you could use Napier grass because of the large amount of tonnage that you get off it. You get your mineral high enough for Napier grass and you **won't have to buy any fertilizer** or sprays for 20 years.

AG LECTURES: Organic fertilizer is rich in bacteria, aerobic bacteria.

AG LECTURES: [In orchards or groves] **Do not disk in any of the fertilizer**. Leave it right on top of the ground.

AG LECTURES: In 1939 I wrote an article about the salts that were accumulating in the fields and in the citrus groves. And I predicted that in 15 years the citrus industry would be in great difficulty. This was before WW II. I missed it by 2 years. In 13 years they were in great difficulty, because this **salt was built up in the soil from their fertilizers, synthetic fertilizers**.

ANDERSEN: The action of **humic fertilizers** was tested by the author in different soils. In all cases the effect was positive.

ANDERSEN: Reams used calcium carbonate, never dolomite. He observed that sufficient magnesium would be available if he balanced the calcium, phosphate, and microorganisms and then applied **fertilizer quantities of Sul-Po-Mag**.

ANDERSEN: In any program, it is a good idea to **split the fertilizer applications** and consider foliar feeding if it is feasible to do so.

ANDERSEN: Timely tillage is very effective at oxygenating the soil. Hydrogen peroxide can add oxygen to the soil, as can fluffing of the soil using **appropriate fertilizer materials**.

BEDDOE: Remember [**when blending fertilizers** to] use the best filler available and that may be just plain white sand.

BEDDOE: This type of calcium [calcium hydroxide] is also good to counteract other problems that are becoming more prevalent today, such as **excess acids from fertilizers**, rain, and sulfur-containing irrigation water.

BEDDOE: **Other fertilizer materials** that can be used as catalysts in certain situations include: ammonium sulfate, ammonium thiosulfate, ammonium phosphate, calcium sulfate, calcium nitrate, potassium sulfate, and potassium nitrate.

BEDDOE: Muriate of potash is **one fertilizer that ought to be completely outlawed**. It contains **40-50% chloride**.

FRANK: Avoid ashes on high calcium alkaline soils. **Ashes are wonderful fertilizers** but you must use them judiciously and at the right time. I like both hardwood and softwood ashes.

FWTK: The **best fertilizer for a crop** is the residues from that crop.

SUCROSE: Too **much fertilizer applied at one time** can result in a quick release of energy without preserving this energy in protein molecules. Most of the energy is lost unless harnessed by the protein molecules, which results in a decreased sucrose yield.

WHEELER: Trace nutrients **come premixed in fertilizers**, can be requested as additions to custom mixes, and can be purchased in both dry and liquid forms.

RETURN TO TOC

FIBER

ADVANCED AG: Skow: Is there a ratio between the organic matter and the humus? Reams: No, they are the same. Skow: But isn't humus what is left after they digest organic matter with acid? Reams: No, there is some **fiber** left.

ADVANCED AG: You will not lose any energy if you compost because although there is loss, you gain a lot more when the **fiber is broken down**.

ANDERSEN: An important structural use of sugar is in the formation of cellulose. Cellulose **or fiber** is the material that gives plants their rigidity, from the oat stem to the tree trunk.

ANDERSEN: The vast majority of farmers are not ready to convert completely to organic farming, and I doubt they ever will. At issue here is not philosophy, but rather regeneration of the soil and the quality of food **and fiber production**.

ANDERSEN: Much of **the fiber in typical alfalfa** is insoluble, and much of the protein is incomplete; many of the minerals are out of balance.

BEDDOE: The frequency of a plant **is in the fiber** and cell structure, not in the juice.

FOLIAR SEMINAR 1983: Horse manure is high in nitrogen & **undigested fiber**. This creates heat and can dry soils.

FRANK: Plants provide us with usable food, **fiber**, and energy in accordance with its genetic instructions.

SAIT: Andersen: It should always be remembered that the quality of your nutrition determines the quality of the fodder that you have to reincorporate into the soil and turn into organic carbon. In many of our conventional soil systems the crop residues comprise an **extremely high lignin fiber** and very low carbohydrate or free sugar. Lignin takes a lot of energy to break down, and the humus production is limited by this problem.

SKOW: The animal manure that yields the most humus for the soil is the one provided by the bovine species. This is because cow and steer manure has a **fiber content that is not broken down** as much as, say, pig manure.

WHEELER: It seems that you want lots of **cellulose and hemicellulose fiber** which can be digested by rumen bacteria, but not too much lignin fiber which is indigestible.

RETURN TO TOC

FISH

AG LECTURES: Aerobic bacteria have something about them **similar to what a fish does**, they can take oxygen out of the water, out of the soil moisture.

ANDERSEN: It is quite simple to get carbon into a fertilizer mix. Carbon is in carbohydrates. Common carbohydrates are sugar, molasses, humic acid, humates, **fish meal**, seaweeds, algae, yeasts, enzymes, biological brews, whey, and so on.

ANDERSEN: Many landscape and ornamental plants will respond to foliar feeding with seaweed, **fish**, vitamins, and dry solubles. Some, however, do not respond well to these feedings. Hybridization is the probable factor contributing to the non-response, just as hybridized corn does not respond as well as open-pollinated corn to foliar feeding.

ENERGY RESEARCH: **Liquid fish** is a real nice thing to use from the stand point that it furnishes oil, amino acids, some nitrogen, phosphorus, potassium, a full array of trace minerals and calciums. This kind of formula can be used on practically any crop. Orchards, trees, grasses, grains, you name it.

FRANK: I'm going to clarify what Inferno [the product] is--it's a **sulfuric acid based fish** with extra acidity, extra sulfuric acid, just a little bit to drop the pH a little lower.

FWTK: Along with the N-P-K and trace elements, other products such as sea kelp [*seaweed*], **fish** fertilizer, vinegar, and sometimes some gibberellic acid can be added to foliar sprays.

SKOW: Repeated sprays with **fish and seaweed** combinations in low amounts as a ten day program---especially in orchards---will gradually build up fruit-wood and root production for the following year.

SKOW: The idea of a good strawberry is to have less seed on it. There is a case where you **don't want to use very much fish** on strawberries.

RETURN TO TOC

FLOWERS

ADVANCED AG: Many farmers overlook a **local market for flowers**.

ANDERSEN: Bees **will work in flowers** whose nectar has refractometer readings of 7 Brix or higher. If the nectar is below 7 Brix, the bee expends more energy than it can possibly recover from the nectar. Even at 7 Brix, the nectar is of questionable value.

ANDERSEN: People **typically think of the flower in terms of its aesthetic qualities**, but in reality it is a highly specific reflector lens. Those who understand that energy precedes matter and that a seed is a compact unit of energy (an entire plant's s worth of energy) can appreciate that ovum and pollen production, with subsequent fertilization and zygote (fertilized "egg" developing into a mature seed) formation, requires a tremendous amount of energy.

BEDDOE: Copper deficiency symptoms appear as stunted growth, pale younger leaves, **lack of flower production**. and possibly wilting and death of leaf tips.

FOLIAR FEED 1981: Too much manganese on **flowers** can cause petals to shed.

FRANK: Crops with an outside bark over xylem tubes such as trees, alfalfa, or **sunflowers** may have a copper deficiency which doesn't allow the bark to stretch, making foliar nutrition futile.

FRANK: Consider the scenario where a tomato grows awesome vines all summer but **doesn't put on any flowers** or tomatoes. This does happen, and the cause is an insufficiency of reproductive energy.

FRANK: All nutrients applied to soils or in soils have an effect on the soils ability to raise a crop. These nutrients are divided into 2 types of energy--those that increase the growth of stalks, stems, and leaves, i.e. growth energy, and those that increase the **growth of flowers, blossoms, and pods** being set, i.e. reproductive energy.

FWTK: Ammonium nitrate has both nitrate and ammonia nitrogen in it. It can be used in the spring to supply the nitrate for the growth of the plant. When the nitrate runs out (after about forty days), the ammonia becomes available, and **makes flowers**, blossoms and fruit.

SKOW: In nature, colors are an integral component of bioelectromagnetics. The **various colors of flowers** act to "pump" the nectar radiations, thus intensifying the signals, which insects, particularly bees, and hummingbirds home in on.

SKOW: There are certain fertility elements that account for foliage, leaves, **flowers** and little else. I can grow com and get only a stalk, but no ear. I can grow tomatoes with picture pretty plants, but no fruit.

WHEELER: This frequency of testing makes economic and management sense for rapid-growing, high-value crops such as vegetables, fruits **and flowers**.

RETURN TO TOC

FOLIAR FEEDING

ADVANCED AG: Foliar feeding wont help ordinary trees because its only used when there is fruit.

AG LECTURES: Student: When corn is going from the tassel to the silk, is that a good time to **foliar feed**? Reams: Yes, that is an excellent time to use manganese. Student: How often? Reams: Well, once or twice anyway, but after the silk dies, it's too late.

AG LECTURES: If you must spray, why not add the nutrition right along with it? In other words, do two things at the same time. It's cheaper to add your minor elements in nutritional form than apply them to the soil.

ANDERSEN: In any program, it is a good idea to split the fertilizer applications and **consider foliar feeding** if it is feasible to do so. **ANDERSEN:** Apply a **foliar spray where appropriate**, according to the refractometer test. Forget the guessing; select according to refractometer increases.

ANDERSEN: Many landscape and ornamental plants **will respond to foliar feeding** with seaweed, fish, vitamins, and dry solubles. Some, however, do not respond well to these feedings. Hybridization is the probable factor contributing to the non-response, just as hybridized corn does not respond as well as open-pollinated corn to foliar feeding.

BEDDOE: Iron sources include soft rock phosphate, basic slag, iron sulfate, molasses, and various chelated irons as can be used in **foliar applications**.

BEDDOE: One of finest ways to add additional nitrogen to crops is through the leaves. **This is called foliar feeding**. Foliar feeding recognizes that a plant takes in up to 80% of its energy for growth out of the air through its leaves.

Since nitrogen is the important electrolyte, it is important that it is present in all foliar sprays in a small amount if nitrogen is not needed in the plant, but in larger amounts if extra is needed by the plant.

ENERGY RESEARCH: Some other things to **watch out for when foliar feeding**; If the pH of the water is extremely high or extremely alkaline, it probably is not going to be nearly as effective as far as being taken in by the leaf. Basically what you are looking for is something that is equivalent to fog that you can condense into water. That would be your ideal. The temperature of the water should be very close to the air temperature.

ENERGY RESEARCH: Tomorrow we will be discussing the use of different sprays when the corn is in silk stage. There are specific sprays you can go in and spray corn at that stage especially with a mist blower on a highboy. It's theoretically possible if you can get the **foliar spray on the silks of the corn** early, you can increase your yield from 10 to 30 percent.

FOLIAR FEEDING: You should rarely use calcium in **[foliar] spray** unless calcium hydroxide.

FOLIAR FEED 1981: Student: **When should we last foliar feed** soybeans? Reams: About 5 week after blossoms are done. Student: How about corn? Reams: Until it is well past the milk stage. You can cut alfalfa when 50% of the blossoms are open. You can foliar feed the day before cutting.

FOLIAR FEED 1981: Also add iron chelate or iron sulphate [to **soybean foliar formulas**].

FRANK: Crops with an outside bark over xylem tubes such as trees, alfalfa, or sunflowers may have a copper deficiency which doesn't allow the bark to stretch, **making foliar nutrition futile**.

FRANK: In alfalfa, we have seen yields triple when K-Mag *[proprietary?]* was applied to relieve poor xylem circulation. Another **circulation problem impairing successful foliar feeding**: The stems of alfalfa and small grains such as wheat or oats are often hollow, lacking adequate phloem tubes which carry nutrients from leaves to roots and other parts of the crop. With proper basic nutrition, you can create much larger phloem tube pathways, visible as pith in stalk cores. Look for solid stem alfalfa.

FRANK: And so, we mixed up some soluble nutrients and we also used a **foliar spray from International Ag Labs**. And he called me 24 hours later, and he said, "Duane, you have to come see this. All those potato beetles moved out into the weeds." And I said, "I DO have to see this." I drove up there and his potato patch was clean. I could not find one beetle in that potato patch, and that IS unusual. I mean, usually, you'll find one or two, but I couldn't find ONE.

FWTK: As mentioned earlier, plants have the ability to take in **nutrients through their leaves**. The ability of spray nutrients to be absorbed and utilized was proven by Dr. Reams when he sprayed uranium and plutonium on the leaf of a plant and traced them down through the roots and back up to where they became a part of the plant.

FWTK: It is recommended that elements such as manganese, zinc, copper and iron be **applied by means of a foliar spray**.

PLANT FEED 1976: One of the finest things you can plan to do on all of your crops, in order to get your nutrients and minors in, is to **spray it on with a homogenized sprayer** - under the leaf.

PLANT FEED 1976: That **[foliar feeding**] is the cheapest way to supply your minor elements, in nutritional sprays. It saves you a lot of work in soil analysis expense.

SAIT: Andersen: In plant growth there is the Yin (female) or acid energy, and there is also the Yang (male) or alkaline energy. Do you want to set fruit or do you want to get growth? If we want fruit and we have established a good calcium base, either locally or regionally, then **I can apply an acid-based foliar** and I can set fruit with that. There is a common problem with orchards and grapes, where we have one good year followed by a poor year. This is a nutritional problem.

SKOW: One of the biggest problems in maintaining nut trees is the failure to keep enough phosphate of manganese available to the tree. The best and cheapest way to supply these nutrients is via **foliar spray**.

SKOW: Manganese is a prime requirement for getting a good seed fill. This is especially true for stone fruit, peaches and apricots, for instance. Housewives who purchase grocery store fruit often encounter rotted centers, always a sign of manganese deficiency. **Foliar application can prevent the problem**. Manganese sulfate will do, but the key is its mix with phosphoric acid. Application must be started a year ahead of time.

SKOW: In developing a foliar program, maximum attention must be given to the thickness of leaves, how well leaves stand up, the degree of wilt, and so on. A thin or weak leaf suggests a nutrient deficiency, or low TDN — total digestive nutrients. The caliber of the stalk and stem is extremely important, as is the development of the root system. Field observation will reveal an under-developed root system when herbicides are used. These **shortfalls can be repaired with foliar sprays** and fertilization through irrigation systems.

WHEELER: It is important to consider using a **foliar nutrient or feed** with any type of insecticide whether synthetic or natural. Any plant under attack by insects is mobilizing its defenses. This requires nutrient and energy utilization. Wouldn't it be wise to give some "chicken soup" to your crop along with anti-insect treatment to aid in its recovery?

WHEELER: **Foliar sprays** and side dressing, applied about 40-45 days after emergence on corn, give the added reproductive energies needed to develop full ears and increase the potential for filling out second or third ears.
RETURN TO TOC

FREQUENCY

NOTE: *Be cautious about "frequency." While it is easy to set aside someone's use of the term as a stand in for periodic applications or timing, it is more difficult to distinguish when a writer or speaker uses the term loosely for* **suitability,** *such as saying a soil is on frequency for a certain plant. Also, you may notice that some competent Reams-Ag writers simply skip the subject or speak of something entirely different. This loose usage clouds the lessons that Reams clearly speaks in the "***PLANT FEED 1976"** *paragraphs below.*

ADVANCED AG: Asparagus appears as thought it might be in the fern family, but it is on the **frequency** of lilies.

AG LECTURES: Student: Why is it that you can't plant bell peppers and tomatoes close together? Reams: Because they hate each other. The **frequency is too far apart**. Or hot peppers either. Don't plant them close to tomatoes

AG LECTURES: And this spray *[we applied]* goes through this leaf and [it] takes out the nutrients that it wants and sends the rest down to the roots, down through the stump and [the plant] mixes it with other substances and sends it back up. And then it becomes a part of the plant, [on] the **frequency of the plant**.

AG LECTURES: In small garden crops you don't have to fool with **frequency**, but when you get into specialized planting then you want to **deal with frequency**, because it matters much and then you do not want to rotate crops. You want to plant the same crop on the same soils every year. Never rotate, because you're just simply rotating yourself out of business.

AG LECTURES: Student: You said that corn is not a grass, is sorghum a grass? Reams: Yes. Student: It is? What differentiates it? Reams: **Different frequency**. Corn is on a different frequency from your grasses. Actually, it has a frequency all its own, but you have many, many different kinds of corn.

BEDDOE: Every living thing **has a frequency** according to its kind. Frequency, in this sense, is the time it takes for one electron to make one complete cycle around one molecule of a substance.

BEDDOE: In other words, the cellulose structure of the plant structure is what has the stabilized molecular structure. It is this stabilized molecular structure that has the formed patterns of **frequency** unique for a given species.

BEDDOE: As the elements and compounds in the soil encounter each other with their **differing frequency ratios**, a resistance reaction begins between them.

BEDDOE: That is why this type of information would begin to reveal why growing crops of different frequency groups in rotation will set the stage for a poorer yield. **Crop residue will be of the frequency of the crop it came from**.

BEDDOE: Tomatoes and potatoes are both members of the nightshade family and so **have the same frequency** and can be grafted.

ENERGY RESEARCH: In other words it *[frequency]* is the length **of time for the molecules to travel around the nucleus of a cell or a body, so each individual species has a given frequency.**

ENERGY RESEARCH: The stump is where the nutrients are put on the **frequency of the plant**. It is located at the base of the plant. It is sometimes called the "Brain or Liver" of the plant.

FOLIAR FEED 1981: The more perfect you can make your foliar feed to the **frequency of the crop**, the more benefit you will get.

FRANK: Are plants more than an antenna but also a frequency generator that grasshoppers tune in to? Do grasshoppers need food to be on a specific frequency? Does fertility influence the **frequency generated by plants**? I don't know the answers to my questions and even if I did, I couldn't prove much. I am merely an uncredentialed soil guy trying to help people grow nutrient dense foods.

FRANK: Microscopic hairs on the leaf surface near the guard cells respond to the **frequency of added potassium**, temporarily triggering the guard cells to absorb moisture and open leaf stomates. By adding a little potassium in your spray, you can stimulate guard cells to temporarily become more turgid and open the stomates for increased intake of carbon dioxide.

FWTK: Every living thing has a **frequency**, according to its kind. **Frequency in this sense is the time it takes for one electron to make one complete cycle around one molecule of a substance.**

FWTK: Citrus includes all members of their kind: for example grapefruit, lemons, oranges, tangerines and limes all have the **frequency** of .0009.

FWTK: The best fertilizer for a crop is the residues from that crop. By farming the same crop year after year, the soil is built on the **frequency of that crop**. This is a part of achieving maximum yields.

FWTK-pH: All substances having like **frequencies** are of the same KIND, even though the molecular structure may

differ.

FWTK: If the mineral balance in the soil can be matched to suit the **frequency of the crop**, the plants will be fed as fast as they can assimilate the food. This will cut the number of days till harvest, improving the quality and yield in the process.

GARDENING: Out of a ton of soft rock phosphate, you get about 3 pounds of Min-Col and it is a colloidal substance in which is every molecule is a complete solar system within itself and it **fits any frequency**.

PLANT FEED 1976: All plants have a frequency. **Every living thing according to its kind, has its own frequency.** Just what is a frequency? The number of wavelengths per second. These terms are used the same as in the Bio-Physics field - the rules are the same, but the applications are different. Frequency for the range for humans is .0000024 for the male and .0000026 for the female, .Frequency is .000038 for the male dog and .000040 for the female dog, .Frequency is .000044 for a stud horse and .000046 for the mare. The frequency for citrus is .0009, an odd number for all other plants have even numbers. Frequency is how much time it takes for one electron to make one revolution (complete cycle around a molecule). Frequency is expressed as to time.

PLANT FEED 1976: In the stump of the plant lies the **secret of the frequency** of the plant. You may not change a frequency — the frequency of the top and the bottom of the plant must be the same, but the microns may be different. Micronage is the way the atoms are stacked together to make the frequency that makes the kinds and species. You cannot cross the kinds. You can bud citrus with citrus and apples with peaches. You can graft many nuts together---pecans with walnuts or hickory with pecan because they have the same frequency. Grafts will not take and live very long with unmatched frequencies There are plants and buddings of plants that if the frequency is very close, down to the micron and milli-micron of color, the buds will take very easy. But if not, it Is rather difficult to do. These are factors you must remember and it is the energy that does it.

NOTE: *In 2006, Bob Pike reported that during a visit to Reams' farmhouse in Pennsylvania circa 1984, he found Reams using an ordinary oscilloscope with a plastic overlay. When asked, Reams said that he was measuring the frequency of several plants to add to his notes of over 16,000 specific frequencies. Although at least one researcher claims to have duplicated the process, no standard method has come to light.*

FUNGI

ANDERSEN: Sources of phosphate are.: mycorrhizae **fungi**—varies with bioactivity, good.

ANDERSEN: One of the more important natural protectors and plant symbionts (companion organisms in which both plant and microbe benefit each other) is the **mycorrhiza group of fungi**.

ANDERSEN: The essence of the action of [mycorrhizal] fungi consists in supplying the plants with nitrogenous and carbonaceous elements of nutrition in some cases and, in others, in the supply of auxiliary nutrients or biotic substances, and more correctly with both. There is a great deal of data in the literature on the **significance of mycorrhizal fungi** in the nutrition of plants.

ANDERSEN: Vitamin K **suppresses the growth of fungi**, some bacteria, and the roots of higher plants. This correlates to Dan Skow's observation that animals fed moldy feed need vitamin K supplementation.

BEDDOE: **Fungi** and bacteria have their part in bringing opposite forces into contact with each other to form plant food energy.

BEDDOE: Storage rotting that is so prevalent today, and only being **treated with fungicides**, could be lessened by increasing the sugar/mineral content.

FOLIAR FEED 1981: There is no better **fungicide** than the nutritional spray copper sulphate.

FRANK: Soulless corporations offer "free" training to farmers and agronomists instructing them on the how to use and apply various **fungicides**, herbicides, and pesticides. This is not agronomy---it is marketing the culture of death and ultimately you are the victim.

SKOW: There is not one chemical of organic synthesis---pesticide, **fungicide**, herbicide---that can raise anything even one Brix degree, and therein lies a distinction. This reality reconfirms the proposition that insect and weed control are seated in fertility management, and not in using more powerful goodies from the devil's pantry.

SKOW: Calcium in the soil is very insoluble. It has to be acted upon by organic acids which are produced by plant roots, bacteria, yeasts and **fungi in the soil**.

WHEELER: Copper is known for its **fungicidal** qualities.

NOTE: *Whether coined by Skow, Walters, or both together, the "organic synthesis" is a classic quote that should live on for generations.*

RETURN TO TOC

GERMICIDE

AG LECTURES: How does the copper work to keep the plants from rotting off at the ground? **It's a germicide**, it kills the blue mold.

AG LECTURES: Copper is the greatest enemy Blue Mold ever had. Then it also makes the bark stretch in the plant and give you greater yields. It's a **germicide**.

FOLIAR FEED 1981: Boron makes pith and is a **germicide** except in chicken manure because the calcium makes it non-toxic.

FOLIAR SEMINAR 1983: Copper is a **germicide**. Too much will kill soil bacteria. It will cure mosaic in 24 hours.

SKOW: Boron is a natural **germicide**. It is used generally as a wash disinfectant.

NOTE: *Although Reams' frequent use of "germicide" is acceptable by any dictionary, his students apparently did not frequent the word as there is no mention in the student literature short that by Skow.*

RETURN TO TOC

GLANDS

ANDERSEN: *[Quoting Krasitnikov]* Plants . . . excrete various volatile and non-volatile substances with the aid of special **glands** or by guttation.

FWTK: Plants do not have glands, and their functions are not determined by time.

PLANT FEED 1976: Student: Do plants have **glands**? Reams: No, their growth is not determined by glands, nor a nervous system either. There is a plant intelligence, but it has "stumped" us all. Yes, there is intelligence. Student: (inaudible question). Reams: Yes, even music has an effect on them.

RETURN TO TOC

GRAIN

ADVANCED AG: Proper boron prevents **grain from molding** and fruit from rotting.

AG LECTURES: On corn, wheat and soybeans, there's one other ingredient you should use on **any crop that you're growing for the grain**. It's manganese. Manganese is the element of life and without manganese there's not any life.

AG LECTURES: Reams egg story: Mass supplier gets three times the average price because they 1) **crack grains daily**, 2) add lecithin, 3) add 25% fresh grass clippings.

ANDERSEN: If the pH is too low, the rumen possibly is not functioning properly because of too much acid, which may inhibit nutrient assimilation. This often results from too much acidic feed, **like grains** and silage, in proportion to hay.

ANDERSEN: Candida, commonly controlled by lactobacillus even in human systems, thrives in the excessively acid conditions brought about by **high-grain diets** in ruminants.

ANDERSEN: *[For high Brix milk]***, grain should be sprouted or at least soaked** for 48 hours before feeding, long-stemmed hay having at least a 20 Brix refractometer reading would be liberally provided, and clean water would always be available.

BEDDOE: A dairy cow which is eating alfalfa that has a 16 Brix sugar level will need only 10-l2 pounds of l2 Brix **grain** mix to produce 100 pounds of milk. But the same cow eating 7 Brix alfalfa will require 30 pounds of the same **gain** to produce 100 pounds of milk; besides that, the cow is very vulnerable to disease.

BEDDOE: If livestock are grazing on properly fertilized pastures, their **grain consumption will drop**; the fact being the animals will be getting their carbohydrates in the grass.

ENERGY RESEARCH: You want leaves early in the spring for your corn, soybeans, lettuce, romaine lettuce, cabbage or anything where you want growth. Even on your **small grain**, you want growth and that is when you use your nitrate nitrogen.

ENERGY RESEARCH: Liquid fish is a real nice thing to use from the stand point that it furnishes oil, amino acids, some nitrogen, phosphorus, potassium, a full array of trace minerals and calciums. This kind of formula can be used on practically any crop. Orchards, trees, grasses, **grains**, you name it.

ENERGY RESEARCH: If you run out of calcium, the plant will still continue to grow but the cell will be weakened and there will be an increase in the amount of water in that cell. If there is an increase in the amount of water, what happens to the **test weight of the grain**? It goes down. In other words, the specific gravity or the density is less.

ENERGY RESEARCH: For hot weather stress on crops, particularly on grass crops and **also on grains**, [For your foliar spray] you can put in 2 pounds per 100 gallons of Brewer's Yeast.

FRANK: The stems of alfalfa and **small grains** such as wheat or oats are often hollow, lacking adequate phloem tubes which carry nutrients from leaves to roots and other parts of the crop. With proper basic nutrition, you can create

much larger phloem tube pathways, visible as pith in stalk cores.

FRANK: In the past farmers would cultivate **grain crops** in order to combat weeds.

PLANT FEED 1976: So many things in your **grain growing** and your truck growing will show a blue tint meaning it needs more fertilizer.

SKOW: When a field has a metallic sheen, the crop will be healthy. **On small grain**, a golden color is something devoutly to be wished. It isn't seen very often, but when it shows up it brings real excitement.

RETURN TO TOC

GRAPEFRUIT

ADVANCED AG: Reams: Any other Brix questions? Student: **What about grapefruit**? Reams: It's the same as oranges. Should be in the top group, sometimes it isn't. The law says it's got to have Brix of 9.25 in order to ship it (which is too tart).

BEDDOE: As Reams continued to work for Porter, he began to realize greater and greater benefits from the use of soft rock. He found that the sugar levels in fruit would reach its highest level when 2000 lbs. of soft rock was applied to one acre. Later he discovered that this level applied to most farm crops, except **grapefruit trees which required 4000 lbs.** per acre.

BEDDOE: With **grapefruit the needs for phosphate are higher** than any other fruit tree. So apply soft rock any time during the year in smaller quantities. The goal is get the phosphate up to a level of 800 pounds in combination with 400 pounds of potassium.

FWTK: Citrus includes all members of their kind: for example **grapefruit**, lemons, oranges, tangerines and limes all have the frequency of .0009.

GARDENING: Why does the grapefruit tree have a bigger leaf than an orange tree? That is because a **grapefruit is larger and needs more sunlight to make enough sugar to make the grapefruit sweet**, so God gave it a bigger leaf. Now, when an orange tree or grapefruit tree has one fruit to each 50 leaves it has its maximum crop.

PLANT FEED 1976: **Grapefruit** should have about 800 lbs. per acre of water soluble phosphate.

REAMS/SKOW COOK: This grapefruit has a tight core in the middle. A lot of them are big enough that you can stick your thumb in the middle. What does that mean when it's got a hollow in the middle? Student: Too little mineral. Reams: Yes, but what mineral? Student: Boron? Reams: That's a boron deficiency whenever they have it. But **this grapefruit is almost perfect** in its boron content. I just wanted to show you that.

REAMS/SKOW COOK: [Reams was in a market in Hot Springs and for 50 cents each bought **two bushels of grapefruit** that he noticed had hard rinds] Top-quality fruit won't rot; they'll form a shell like wood around it. The friends I was staying with thought I was crazy, buying junk, trash---but when they tasted them, they said, "That's the best grapefruit I've ever eaten in my life." Sure they were the best, or I wouldn't have bought them.

RETURN TO TOC

GRAPES

AG LECTURES: Do you know one reason so many **small grapes fall off the pod** is because there is not enough manganese for all of them?

ADVANCED AG: If you follow Reams-Ag, you should harvest 7.5 tons of **grapes** the second year after planting and 30 tons per acre after 6 to 7 years.

AG LECTURES: I told you in the first course that **grapes like a lot of boron**, such as from chicken manure. Pile it up, and they will really appreciate it.

ANDERSEN: **Grapes at 18 Brix with insect infestation** inevitably will have cane or leaf refractometer readings below 12 Brix.

BEDDOE: In seedless watermelons **or grapes**, the stump of the plant will not allow manganese to go out into the fruit because of its micronage. Because there is no manganese, the fruit will not have seeds, as manganese is required to make them.

FOLIAR FEED 1981: Reams insisted that grapes in certain areas had to be toxic-sprayed to deal with Blossom spiders. He suspected they bred in the sand and he never found a non-lethal way to deal with their silk binding up the **grape blossom**.

FOLIAR SEMINAR 1983: **Grapes** need a lot of carbon & plenty of water.

FOLIAR SEMINAR 1983: Different size **grapes** indicates a manganese deficiency.

FWTK: In **seedless** watermelons or **grapes**, the stump of the plant will not allow manganese to go out into the fruit, because of its micronage. Because there is no manganese the fruit will not have seeds, as manganese is required to make them.

PLANT FEED 1976: How many citrus leaves does it take to furnish the normal amount of carbohydrate for one

orange? How do you know when your grove is producing a maximum crop of citrus? What is the criteria for citrus, peaches, pears, **[clusters of] grapes**, apples - how do you know when the tree has produced its capacity load? So many leaves per fruit. Fifty leaves per fruit.

PLANT FEED 1976: On **grape vines**, I don't know anything that will produce more grapes every year, than just chicken manure left on top of the ground, 6-8" deep and keep the weeds mowed down.

PLANT FEED 1978: You must **spray grapes** the first six weeks after they start blossom. You can use pyretheums, Black Leaf 40, snuff or various other treatments to deal with the Blossom spiders.

SAIT: Andersen: There is a common problem with orchards **and grapes**, where we have one good year followed by a poor year. This is a nutritional problem.

SKOW: Green grapes have a pearly white transparent color. They should run about 26 to 28 Brix on the refractometer, instead of 10 or 12, and be very sweet.

RETURN TO TOC

GRASS

ADVANCED AG: If you had an orange grove in south Florida you could use Napier grass because of the large amount of tonnage that you get off it. You get your mineral high enough for **Napier grass** and you won't have to buy any fertilizer or sprays for 20 years.

ADVANCED AG: Ratio of phosphate to potassium is 2-1 **except in grasses**. Ratio of phosphate to potassium in **grasses is 4-1**.

ADVANCED AG: Student: **Should you plant grass** in the vineyard rows? Reams: No, it will come on its own.

AG LECTURES: Student: You said a 4 to 1 P and K for grasses, **do you consider alfalfa a grass**? Reams: Yes, sugar cane too is a grass. Corn is not a grass.

AG LECTURES: Reams: Name 3 sources of getting carbon into the soil? Student: Sawdust? Reams: Sawdust is one, what is another one? Student: Grass roots? Reams: **Grass roots** is another, or crop roots.

AG LECTURES: Reams: One of the finest things you can grow in orchards is **Bermuda grass**. If you can't afford Bermuda grass, you can't afford the orchard. And then in the winter, sow rye in there. Student: How about Kentucky Fescue? Reams: It's very good too, but **Bermuda grass is far different, because it is a legume** and Kentucky Fescue isn't. Student: Is Bermuda an annual or a perennial? Reams: It's an annual.

AG LECTURES: Reams: Let me ask you a question, what is the **ratio for grasses and alfalfa between the P2O5 and K**? Student: You want 200 lbs. of potassium and 100 lbs of P2O5? Reams: No, that's not what we said in the last lecture, first course. What is the ratio for grasses? Sugar cane? 4 to 1, 4 parts phosphate to 1 potash is for grasses.

ANDERSEN: Using the Reams soil-testing method, this ratio should be 2 pounds of phosphate to 1 pound of potash for row crops and 4 pounds of phosphate to 1 pound of potash for alfalfa and **grass crops**.

ANDERSEN: Basically, as Carey Reams instructed, sour **grass** weeds like quackgrass are indicative of calcium deficiencies, at least qualitatively if not quantitatively.

ANDERSEN: Lawn and turf grasses require high calcium availability, in the range of 4,000 pounds per acre or more using the Reams soil test. Ideally, they also require a 4:1 phosphate to potash ratio using the Reams test. These levels of calcium, phosphate, and potash will maintain a **lush, vigorous grass growth** uninvaded by sour grass weeds like quack grass, or broadleaf weeds like dandelion and pigweed.

BEDDOE: On grasses you want a ratio of 4 parts phosphate and 1 part potassium. These **grass crops** have the ability to get practically all their potassium from the air.

BEDDOE: Hollow stems on grasses and forage crops, such as alfalfa, are not normal. It is an expression of phosphate of boron deficiency.

ENERGY RESEARCH: About grasses. Basically Reams' opinion is, no potash in the spray, no manganese in the spray, no cationic nitrogen or ammonia. Now he does use Bo-peep [ammonia] despite what he says there. He says no vinegar except on St. Augustine and Centipede grasses.

ENERGY RESEARCH: The phosphate to potash ratio for all crops, **except grasses**, should be two parts phosphate to one part potash. Grasses need four parts phosphate to one part potash.

FOLIAR FEED 1981: When building a **spray for grasses** (not grain crops) you should not add manganese, potash, vinegar, or cationic nitrogen. You should add anionic nitrogen, phosphate, calcium.

FWTK: All grasses, such as the Bermudas and fescues, and even sugar cane, can take most of their potassium from the air.

FWTK: Alfalfa hay, which should measure twelve to 14% sugar content, is often only six to 8 Brix. **NOTE:** *Be wary of wrong comparison because many places Reams says that Brix is 1/2 sugar.*

GARDENING: The calciums in your soil can increase the milk yield by as much as 200% and also if your pasture soils have enough minerals and calcium in it, whenever you put the feed in the trough to milk the cows, they won't even eat it. They'll just stand there waiting to be milked, because **the grass will have so much more nutrient**.

PLANT FEED 1976: **Alfalfa is a grass** and if the 1-5-.5 ratio between your P205 and your potash gets higher than that on alfalfa, you know what's going to happen? It will go to blossom when it is waist high. **NOTE:** *In other places it is clear that Reams meant that the phosphate:potash ratio should not narrow to less than 4:1. In this document Reams then held out the possibility that alfalfa should grow 12 feet high.*

PLANT FEED 1976: Something else about this: the com being so thick like that **will shade out the grass**. You won't have any grass problem.

SKOW: This means that for maximum yields a minimum of 400 pounds of phosphate and 200 pounds of potash is indicated. This ratio and level applies to all crops except grasses. **On grasses a ratio of four parts phosphate and one part potash** is correct. Alfalfa has the ability to take practically all its potash from the air. Therefore, it needs very little from the soil.

SKOW: When such soils have a high carbon content, the roots will travel through the soil rapidly. The best cover crop is oats or wheat. Sometimes red clover is indicated if poverty soil is to be reclaimed. **Rye grass allowed to grow over eight or nine inches tall in spring will actually do more harm** than good for the immediate crop year. The massive root system in the top two or three inches of soil is beyond belief unless seen. If this crop is turned in before it achieves eight or nine inches of growth, it adds nitrogen. Allowed to grow beyond that limit, the effect on the nitrogen supply will be negative. Decay will rob nitrogen from the planted crop. This is true even if the rye was planted in the fall.

SKOW: There are so many ways of testing soils and so many interpretations that the only thing we do know is that when you have a tendency to have higher phosphate and lower potassium, there seems to be quite an explosion in yield, **especially in grasses**. This also seems to be true in corn.

WHEELER: **Grasses can be brought under control** by raising biologically-active calcium levels. High-calcium lime and liquid calcium are excellent ways of raising calcium levels.

WHEELER: One way to bring the calcium-phosphate balance into line [in animal rations] prior to feeding minerals is to discontinue the practice of sowing straight alfalfa. You would be better off if you sowed an alfalfa-grass mixture. The alfalfa contributes the higher calcium levels **while the grasses contribute the higher phosphorus levels**.

RETURN TO TOC

GRASSHOPPERS

AG LECTURES: Student: Aerobic bacteria also eat live nematodes, right? Reams: Yes, **grasshoppers [if they get under the ground]**, ants, cockroaches, anything else they come across, worms.

FOLIAR FEED 1981: Chlordane, Dieldrin, Black Leaf 40, or pyrethrin for **grasshoppers**. The last two are nutritional sprays.

FOLIAR FEED 1981: Use 2 pounds of 10% chlordane in 100 gallons for wire worm and **grasshoppers**.

GARDENING: There's a **way to handle grasshoppers**, raccoons, wild hogs, deer, rabbits, and many other pests that try to put you out of business. All you need to do is take one of those plastic jugs and cut the top out of it. Then get some 65-75% chlordane, pour it into the jug, get yourself some ordinary laths or sticks and half submerge them in the liquid chlordane. The next night, turn each of the sticks over and push them in the ground all around your garden. The odor of chlordane will keep all the animals out, all the moths out.

WHEELER: Rare cases of plagues of locust or **grasshoppers** may still require some type of disease, predator or poison to stop the damage, yet perhaps even these have their purpose.

RETURN TO TOC

HARDPAN

ADVANCED AG: Phosphates can eventually break up **hardpan**. Reducing salt is also important.

ANDERSEN: Proponents of conventional chemical programs cannot imagine farming without chemicals, nor do they comprehend that balancing soil and plant nutrition corrects the problems of soil compaction, erosion, hardpan, insect, disease, and weed infestations, and inferior commodity quality.

ANDERSEN: Under a potash-and-nitrogen- based turf fertility program, you will eventually have to use pesticides and herbicides and engage in a continuous battle with seeding longevity, thatch build-up, **hardpan**, diseases, insects, moles, weeds, and increasing scrutiny from the Environmental Protection Agency and the Department of Natural Resources with regard to environmental contamination.

ANDERSEN: Grasses often have shallow, dense root systems that are attempting to loosen compacted soil. Broadleaf

weeds generally have long taproots that are attempting to relieve hardpan and gain access to nutrient reserves at lower depths in the soil, as well as to extend the electrical circuit of the soil/plant complex to greater depths

ANDERSEN: [*Analyzing a corn field*] Check for **hardpan** using a penetrometer, shovel, or brazing rod. This condition can be present in a sandy soil as well as in a clay soil. Notice that the roots pretty much stop at the **hardpan**.

BEDDOE: Whenever a soil is very hard, compact, or **hardpan**, the sodium content of the soil is too high. Sodium is the element in the soil which causes compaction. The use of soft rock phosphate will counteract this high sodium level, and help pulverize the soil.

FOLIAR SEMINAR 1983: Deciduous tree roots will grow at the ground surface if they are blocked by **hardpan** or rock.

FWTK: Sodium is the element in the soil that causes soil compaction. The use of soft rock phosphate will counteract this high sodium, and will pulverize the soil. Dr. Reams has seen **hardpan**, like the Mississippi Valley has (so hard that the soil is like a rock), on which soft rock phosphate has been used. The soft rock phosphate pulverized the soil and made it just as loose as a farmer could wish it to be.

PLANT FEED 1976: I've seen **hardpan** in the Mississippi Valley like a rock. Use this system *[Reams-Ag]* and it becomes as pulverized and nice as can be. The water will flow over it without clouding up with clay. However, it can get muddy if the water is flowing awfully fast.

PLANT FEED 1976: Whenever you have soil that is very hard, compact, almost like hardpan, **all hardpan** for that matter, the sodium content of the soil will be 1,400 lbs. per acre or more.

SKOW: Where there is **hardpan** there is no such thing as normal transportation of water up and down in the soil. A four inch **hardpan** loaded with salt is as tight as a dam across the river Nile.

SKOW: Hardpan is to soils what a pace of slow asses is to traffic on a mountain trail. It crushes progress to death. At about the 16 inch level in the com belt, at a six inch depth in the high plains, at a 24 inch depth in some alluvial areas, a layer four to eight inches thick develops, hard as a granite plug, and containing enough salts to keep it that way.

SKOW: The fertility program I design and teach will enable any willing farmer to lift the pall that often settles over a soil's potential. Starting the movement of subsoil moisture through the hardpan area is both a challenge and a reward. As salts dissolve and dilute out, it becomes the start of eventually **getting rid of the hardpan**.

WHEELER: Most tillage approaches can produce a plowpan or hardpan. The moldboard plow carries much weight on a very narrow edge of the plowshare. In wet conditions, the soil below the plowshare will smear. As it dries, it will seal, stopping water and air movement. Disks, chisel plows, field cultivators, and subsoilers can **all contribute to hardpan even in sandy soils**. As the soil is tilled, the small particles settle. When tillage is continued at the same depth, the particles settle just below the tilled level. These small particles keep filling the pore spaces until a hardpan is formed. This can be just as bad a hard pan as that caused by plowing when the soil is too wet.

WHEELER: It may be necessary to loosen tight soils or break hardpan. If the soil magnesium level is too high relative to the calcium level, the desired improvement in soil structure and aeration will probably not be permanent.

NOTE: *Wheeler seems to be on the side of big ag as far as hardpan. The Reams-Ag approach is to deal with the sodium overload.*

*[Also see Entry **COMPACTION**]*

RETURN TO TOC

HARVEST/MATURITY

ADVANCED AG: If you followed Reams-Ag, you **should harvest** 7.5 tons of grapes the second year after planting and 30 tons per acre after 6 to 7 years.

ADVANCED AG: On corn, the dying off of main tap roots **with maturity** is normal.

ADVANCED AG: Reams: When growing asparagus, increase count [*planting density*], use commercial calcium nitrate and **harvest in morning**.

ADVANCED AG: The **quicker** a plant or animal is grown, the higher the quality.

AG LECTURES: Reams: When you are setting a hen on eggs, which is the strongest chick? The one that hatches first is the strongest. Which one grows up the fastest, the one that is the strongest at first or the one that hatched last? Student: The last.? Reams: No, it is the first one, the healthiest. He grows up the fastest. And so it is with corn. The process of osmosis is not limited by time. The shorter length of time that you can bring things into production, the higher the yield. The quicker you can produce it the higher the yield. Why? Student: More goes into fruit and less into the plant? Reams: Yes, but the real reason is because it's not retarded. It's not hindered, it must have everything that it needs, including soil temperature, weather temperature and everything else. So **the shorter**

length of time that you can use to grow any produce, the higher the yield per acre.

AG LECTURES: Do you know there won't be a week's difference in the corn that you planted 3 weeks ago and the one you planted 3 weeks from now? Actually there won't be over 10 days difference in it if that much. And the yield will be that much greater. Do you know that oranges that come on the blossom over a 6-7 week period **will mature at the same time**? Do you know that peaches that blossom anywhere, we'll say over a 40 day period, will mature at the same time?

AG LECTURES: But let us suppose that you had this same soil, same problem and that you found out that the crop was already **nearing maturity**, ready to mature, but it was rotting in the field. Then what would you do? With all these numbers that I have told you and yet the crop was rotting just as it matured. Student: Put some sulfur on? Reams: Sulfur or copper? Student: Too much sulfur? Reams: Too much sulfur, that's right.

AG LECTURES: Reams: If you're cutting alfalfa [or other grasses], the best thing to do is is to start about 4 o'clock in the morning and cut them and then about 10 o'clock start putting them in your **harvester**.

AG LECTURES: You can dry corn and you've got many **extra weeks to harvest** good corn because it will not mildew. It's your poor quality corn that will mildew. Good corns will not mildew. I don't care how much rain falls on it or how much dew. The top quality corns will not mildew.

AG LECTURES: You apply 2 or 3 hundred pounds of this old motor oil and sawdust to the acre, you need to do that after you **harvest the crop**, or it won't hurt to put 500 lbs. to the acre, if you want to, but I am going to tell you, it will really do miracles

ANDERSEN: If you never record the moisture content, test weight, and nutritional value of your grain, you will not notice that after three years on a nutritional management program the required dry down is less, the test weight is greater, and the nutritional content (e.g., protein) is greater regardless of variety. Nor will you notice that the **maturity time of your crop is decreasing**.

ANDERSEN: Sulfate**,** the next item on the test, is not to be confused with elemental sulfur**.** Elemental sulfur can cause rot at **maturity of fruit** and can tie up or interfere with calcium.

ENERGY RESEARCH: Student: How long or how many times can you use manganese? Skow: This product you can use practically every time you spray on any crop that you want to **harvest the seed**.

FOLIAR FEED 1981: If foliar feeding **just before harvest**, leave out fish oil, copper, iodine, and molybdenum.

FRANK: Headings: That fall, I can't say we didn't have any potato beetles that year because we had just a couple here and there. I saw them. But, it didn't do any damage. Anyway, we **harvested** an average of 16 potatoes per hill.

FWTK: If the mineral balance in the soil can be matched to suit the frequency of the crop, the plants will be fed as fast as they can assimilate the food. This will cut the number of **days till harvest**, improving the quality and yield in the process.

FWTK-pH: Some forms of lime are slow acting and some become *water-soluble* very quickly. Unless these factors are thoroughly understood by the farmer, his **cost of production before harvest** will, in 96% of all cases, be greater than it should be.

GARDENING: Many people lose their crop because they fertilize the tree when it's in blossom. It flushes all the blossoms off. Tell them the time to fertilize deciduous trees, which shed leaves in the winter time, is **immediately after the crop is harvested**. Do not fertilize them again until the next crop is harvested and you'll have a bountiful crop.

PLANT FEED 1976: You want your good plants to reach their **climax of nutrients at the stage you wish to eat them**, i..e., cabbages grown correctly should be low in manganese. If manganese was too high in the cabbage or lettuce field, it would have gone to seed long before it headed up.

PLANT FEED 1976: **After you harvest the top**, if your soil is not sterile, your aerobic bacteria will convert those roots into heavy, heavy amounts of organic nutrients. Nature is trying to help you if you will let it.

PLANT FEED 1976: They planted the alfalfa and in 7 weeks it was 17 feet high. You couldn't see the orange trees! People from all over the world flew in by the hundreds to see that alfalfa. It was difficult to even get the alfalfa down---**let alone harvested**.

SKOW: Crops that need a lot of calcium are alfalfa---unless you're going to **harvest the crop for seeds**---lettuce, cabbage, broccoli, Brussels sprouts and spinach.

SUCROSE: Apply the fertilizers **as soon as possible after harvest**. Phosphates join with potash on the protein cation side only when the temperature is less than 70° F. for two hours or more. This union produces sugarcane with a larger barrel , being one factor that determines the caliber of the sugarcane and gives a greater yield.

WHEELER: Farmers have another option when potassium levels are high. Cropping of potassium-loving plants, such as alfalfa, removes the K in the **harvested crop** and it can be sold off the farm. **NOTE:** *This claim must be considered along with Reams' claim that alfalfa can get all its potassium needs from the air.*

WHEELER: Crops **harvested for their seed**, such as corn, wheat, tomatoes, and peppers, would require both growth

and fruit-producing fertilizers with the timing important---varying with the length of the growing season.
RETURN TO TOC

HAY

ADVANCED AG: Adequate boron helps **prevent mold from forming in hay** that has been pelletized. Generally, however, any mold that does form is a yeast mold that is not so harmful to animals.

AG LECTURES: Dry hay should not have a hollow stem. If it does, it has a low mineral content.

AG LECTURES: What I am trying to tell you is how to produce **higher protein hay**. You cannot let it lay out there and have high protein hay. You must cut it at the blossom stage and if you cut it at that stage, you must dehydrate it.

AG LECTURES: Did you ever stick your hand into a **bale of hay and it felt hot**, warm? Did you ever stick your hand in another bale of hay and it felt cold? Even on the same kind of temperature? I have and the one that was hot inside was rotting, decaying because it had a low sugar content. And one more thing too, it had a low protein content.

AG LECTURES: Reams: At **what percent moisture do you bale hay**? Student: 20-25%. Reams: 25-30 is good. About 28% makes the best hay with the highest sugar content. And it won't rot, won't go through a heat, not nearly so badly as the one with the low sugar content.

ANDERSEN: Add excess potash to alfalfa, displacing calcium, and you will have "**gunpowder hay**"...

ANDERSEN: Grain would be sprouted or at least soaked for 48 hours before feeding, **long-stemmed hay having at least a 20 Brix refractometer reading would be liberally provided**, and clean water would always be available

ANDERSEN: If the pH is too low, the rumen possibly is not functioning properly because of too much acid, which may inhibit nutrient assimilation. This often results from too much acidic feed, like grains and silage, **in proportion to hay**.

BEDDOE: For all types of crops except those grown for grass **or hay** the phosphate to potassium ratio should be 2 to 1. A1l the grass crops should have a 4 to 1 ratio.

FOLIAR FEED 1981: Be cautious of nitrogen toxicity in fresh cut alfalfa. It is **best fed as hay**.

FOLIAR SEMINAR 1983: As molybdenum appears to ride in with potassium, the best molybdenum results will show on **crops like hay**, where potassium is restricted. You can use 1 gram of molybdenum chelate in 100 gallons of foliar feed.

FWTK: Alfalfa hay, which should measure twelve to 14% sugar content, is often only six to 8 Brix. **NOTE:** *Be wary of wrong comparison because in various places Reams says that a Brix reading is 1/2 sugar.*

PLANT FEED 1976: Hay grass or Kentucky Blue grass, Napier grass and many of the other grasses are not legumes. Then you are going to have to keep spreading your manure to the point you have nitrogen readings of about 20 on your grasses and that is pretty sufficient.

PLANT FEED 1978: Potash should be thought of as an enemy by cattlemen because it causes a terrific **decrease in hay volume**.

PLANT FEED 1976: But if that cow eats like mad and eats it up in a hurry, that means the grass, **hay** or silage she's eating is too low in TDN.

SKOW: If there is a phosphate insufficiency, the plant can still uptake nutrients, but they will not be incorporated into the cell. The consequence is shrinkage. When the **crop is hay**, shrinkage can make the crop almost vanish.

SKOW: The yield increase *[using Reams-Ag]* will only be found if you **weigh the hay**, it will not be seen by the naked eye. One farmer said he saw no difference until he hauled his round bales off the field and found that he had trouble lifting the bales that had been sprayed.

RETURN TO TOC

HERBICIDES

ANDERSEN: Avoid products made with calcium chloride. The liquid calciums other than Biomin calcium [what is this. H. Biotech] can go in with the liquid nitrogen and **preemergent herbicide** or can be sprayed on after planting or in the first watering, whichever is most feasible.

ANDERSEN: The plugging [in a corn stalk] is caused by many things—chemical toxicity **such as herbicides**, putrefaction products of an anaerobic soil,

ANDERSEN: A further alteration would be to apply the herbicide in a band over the row on the planter and then cultivate the middles of the rows. **Eventually, all herbicides** and insecticides will be eliminated from the program. They do as much as or more than anything else to inhibit the regeneration of the biological system in the soil.

ANDERSEN: Each successive growth of [corn] brace roots indicates increased vascular plugging below. It is a rescue operation by nature. The plugging is caused by many things—**chemical toxicity such as herbicides**, putrefaction

products of an anaerobic soil, excess nitrogen, and premature death of vascular tissue—all related to lack of nutritional integrity. Proper farming practices can eventually correct these problems, making brace roots unnecessary.

BEDDOE: Even though one of the goals is to **work away from using pesticides and herbicides**, most fanners will not be able to dispense entirely with them immediately. Pests are natures disposal crews working to get rid of the poor quality plant life resulting from poor soils. In many situations some pesticides as well as herbicides may have to be used in order to provide stop-gap help while the soil and plant health is being turned around. It takes time to slow the soils degenerative process that has been so accelerated by man's ignorant practices.

BEDDOE: Some types of **herbicides tie up the available phosphates** in the soil. High levels of very active soil bacteria are a necessary ingredient to counteracting the herbicide residues.

BEDDOE: This [kelp in foliar sprays] has been found to enhance the **effect of herbicides** so that the same effect could be obtained with using less product.

BEDDOE: Never use **herbicides** in the sprayer you are using for foliar feeding. You could be sony sometime, even if you have gotten away with it for a time.

ENERGY RESEARCH: Skow: Everybody has the opinion that you have to put on **herbicides and insecticides to get a toxic buildup** in the soil. I am here to tell you that that is not true. You can get that by the ground crusting over and not getting air into it.

ENERGY RESEARCH: Common electrolytes are iron, aluminum, copper, and one of the other ones that you will see a lot written about is magnesium and they get a wonderful response. Now the only reason they get a response is that the plant is constipated. And if any of you have had that problem you know that if you can get it moving again, that you feel better. So there is a time and a place once in awhile, where it is beneficial, where a crop stunned or not doing well and looks like it isn't growing satisfactory, and this is particularly important if you have some **herbicide damage** and you want to flush it out.

ENERGY RESEARCH: I have one farmer out here that I have been working with and I have not gotten his permission to visit his farm with a group, but there has been **no herbicides used** and his field doesn't look any different than anybody else's.

FOLIAR FEED 1981: Don't use herbicides, cultivate your weeds out so that they add carbon to the soil.

FOLIAR SEMINAR 1983: Don't spray weeds because all **herbicides destroy your carbon**.

FRANK: In the past farmers would cultivate grain crops in order to combat weeds. With increasing acreage, farmers found it easier to **spray herbicides** rather than to cultivate.

FRANK: Coops typically use the very worst fertilizers that compromise soil health; potassium chloride, DAP, and anhydrous ammonia are the worst offenders. The continued use of these products creates a soil that is unhealthy and incapable of growing healthy plants. With weakened plants there is now a need for crop protection products like fungicides, **herbicides**, and various other pesticides. These other products are also sold by the coop for even greater profit at the farmers' expense. Many a farmer has fallen into this trap--they are sleepwalking when they should be careful stewards of their soil.

FRANK: Soulless corporations offer “free” training to farmers and agronomists instructing them on the how to use and apply various fungicides, **herbicides**, and pesticides. This is not agronomy—it is marketing the culture of death and ultimately you are the victim.

FWTK: The **use of herbicides is not recommended** by Dr. Reams, herbicide ties up the phosphate of carbon in the soil, causing more soil compaction, and decreasing the depth of the topsoil.

FWTK: An added factor for farmers trying to farm **without using as many herbicides** is that the farmer's ground in the spring will sprout the first crop of weed seeds, thus allowing time to work them out, and still plant on time.

PLANT FEED 1976: I am **not in favor of herbicides** for the killing of grasses and plants. If you will supply your plant with plenty of the kinds of nutrients it needs, you will not have to be bothered with pesky weeds because the crop will quench them out.

SKOW: The caliber of the stalk and stem is extremely important, as is the development of the root system. Field observation will reveal an under-developed root system **when herbicides are used**.

SKOW: There is not one chemical of organic synthesis---**pesticide, fungicide, herbicide**---that can raise anything even one Brix degree, and therein lies a distinction. This reality reconfirms the proposition that insect and weed control are seated in fertility management, and not in using more powerful goodies from the devil's pantry.

SKOW: In most farm situations, well water is best for making foliar sprays. It must be checked, of course, because the potential for **herbicide and insecticide contamination** is worsening year after year. Spring water is inherently dangerous, especially when herbicides have been used in the general vicinity.

WHEELER: When farmers inquire [at the extension office] about methods of raising better (more nutritious) alfalfa, the conventional answer comes back with recommending 0-0-60, keep the pH up, cut by the blossom, **herbicide**

the weeds, use 18 pounds of seed per acre, and all the other wrong or wrongly reasoned advice. The failure of standard forage fertility programs is appalling.

WHEELER: Compaction has induced the anaerobic bacteria supposedly found only in the lower levels of the soil to populate the majority of the soil bed. Potassium chloride isn't the only culprit. **Herbicides**, pesticides, and other farm chemicals also contribute to the decrease of proper soil life.

WHEELER: If the residue were cut and laid on the soil surface, the earthworms could carry some organic matter and minerals down into the soil. **Herbicides on the crop residues**, however, may disperse the earthworms.

RETURN TO TOC

HOGS/PIGS

ADVANCED AG: A source of bacteria for the land is always helpful. This includes **hog manure**, but go easy as it is high in sodium and ammonia.

AG LECTURES: Student: Is there any way to get rid of nut grass? Reams: Yes. The finest way to get rid of nut grass is to build a pen around it, fence it in. Then **put a hog in there** and he will get the last grain of it out. I've done that on big fields. Fattened a bunch of hogs on nut grass by fencing it in with hog wire. Don't eat the hog meat, just use him to get the nut grass out.

GARDENING: There's a way to handle grasshoppers, raccoons, **wild hogs**, deer, rabbits, and many other pests that try to put you out of business. All you need to do is take one of those plastic jugs and cut the top out of it. Then get some 65-75% chlordane, pour it into the jug, get yourself some ordinary laths or sticks and half submerge them in the liquid chlordane. The next night, turn each of the sticks over and push them in the ground all around your garden. The odor of chlordane will keep all the animals out, all the moths out.

PLANT FEED 1976: Then sell the pigs [who rooted out all your nut grass] at market and you've got a **fat hog** and a good flavor for pork lovers.

SKOW: The animal manure that yields the most humus for the soil is the one provided by the bovine species. This is because cow and steer manure has a fiber content that is not broken down as much as, say, **pig manure**.

SKOW: Potassium is essential for growth, but it is easy to fertilize with too much. Potassium in soil is fairly soluble. Calcium is fairly insoluble. Nature has ordered microorganisms into the soil to manage the ratios. But when chemicals of organic synthesis annihilate that valuable livestock in the soil, plants substitute potassium for calcium, always exacerbating disease problems, always setting up the ultimate embarrassment. Cows go down on bad feed. The classic signs and symptoms are bad kidneys. **Hogs become arthritic**. Dairy animals *[cows]* get mastitis and somatic cell counts go through the roof.

WHEELER: Liquid manure from a dairy that flushes their chlorine wash water into the pit tends to be putrefied rather than decomposed. How does it smell? **Hog manure tends to be salty** due to the amount of salt fed.

RETURN TO TOC

HUMIDITY

ADVANCED AG: The higher the **humidity**, the more water [foliar feed] gets on the crops and the less the humidity the less water [foliar feed] gets on the crops.

BEDDOE: Temperature and **humidity** affect how foliar feeding is applied.

BEDDOE: Be sure to gage strength and water amount by **humidity**. Try to do all spraying early in the morning before 8 o'clock.

In dry air or low humidity the best time to spray is between 2 am and 8 am Be sure to spray more gallons per acre with less concentration of nutrient in the spray. This means, be very aware of the humidity in relation to the concentration of the spray. The less the humidity the less the concentration and the more water sprayed per acre.

FRANK: Don't worry about morning dew on leaves if you're applying foliar nutrients. A correctly designed spray will break the surface tension of those droplets. The mist you apply, plus dew, will coat leaves with a glossy wet sheen. The leaves will sponge up both dew and nutrients within a half-hour of sunrise, **even with 70% humidity**.

FRANK: Winds should be 5 mph or less to reduce drift. Try to choose times when relative humidity is over 70% to reduce evaporation before spray reaches plant leaves. This is especially critical with aerial spraying, where volume per acre is usually less than 5 gallons and the spray drifts several feet before reaching leaves.

SKOW: Plants generally become susceptible to molds because of stress. This stress might be nothing more than **high humidity** and a lack of air flow.

SKOW: Carbon attracts moisture from the air, especially at night. If there is **high humidity in the air** and enough carbon in the soil, plants can get enough moisture from the air to fix a crop if there is at least 20 to 25% humidity.

SKOW: To build a foliar spray, the above element [phosphoric acid] comes first and then water. The amount of moisture in the atmosphere rates maximum attention. If the air is dry, the low end of the recommended amounts

should be used to construct the spray. Humid territory suggests a higher level of nutrients in solution. This translates to using half a pint to a pint of phosphoric acid per acre **when humidity is high**, and less than half a pint under dry conditions. Using a conventional sprayer, usually 20 gallons of water to the acre is correct. A mist blower---such as a Chiron sprayer---would work best with a pint of phosphoric acid in 100 gallons of water.

WHEELER: It is best to foliar spray in the mornings and evenings when **relative humidity is high** and generally not in the middle of the day.

NOTE: *Reams had unique ideas about irrigation, with a key point being that air consistently below 50-60 percent humidity can be a strong rival to the crops' needs. This rivalry often made underground drip or overhead irrigation (12' high in the case of corn) valuable. In addition, there are over one hundred places in the literature where Reams spoke at length to help his students understand how low humidity created a need for increased foliar application amounts. For instance, he cited a case where if a particular foliar mix was intended to be applied at 4 gallons per acre, 0%.10%. 15% humidity might mean only 2 gallons reached the plant and therefore twice as much was required. Warning: this did not imply to change the concentration of the computed tank mixture. The material that dried before reaching its target either went to the soil or the wind took it away.Finally, as you read through the humidity quotes you will find several by others in direct opposition to Reams' rules. I suggest listening to Reams.*

RETURN TO TOC

HUMUS

ADVANCED AG: The greater the density of the soil **without humus**, the greater the specific gravity of the soil.

ADVANCED AG: There is no ratio between **humus** and organic matter.

ANDERSEN: The calcium-**humus**-phosphate complex is the key to maintaining stable soil ERGS and crop quality. Without the **humus component**, the calcium and phosphate complex [together] to form [unavailable] tricalcium phosphate rendering both the calcium and the phosphate unavailable.

ANDERSEN: From a **humus chromatograph**, one can determine the status of the soil's humus. Active humus is "alive" and an integral part of the biosystem. Stable or inactive humus is not generally a factor in the biosystem and can sometimes be a liability because of its hydrophobic (water-repelling) properties, its possible content of toxic residues, and its required energy of activation.

ANDERSEN: An area may have much organic matter but **very little actual humus** because humus formation requires plenty of oxygen and energy for the correct microorganisms to work properly. If these conditions are not met, the crop residue, manure, and other organic materials are simply converted to ashes, alcohols, aldehydes, or other non-humus compounds.

ANDERSEN: If the farmer chooses to create a soil environment that is most conducive to pathogenic microbes such as fusarium, verticillium, parasitic nematodes, and mosaic viruses, he need only reduce the soil oxygen level, **degrade the humus**, destroy the soil structure, and maintain a continuous toxicity level..

BEDDOE: It [manganese] is an absolute requirement in seed production **and in humus**.

BEDDOE: The greater the density of the **non-humus soil**, the greater the specific gravity of the soil.

BEDDOE: An ideal soil is to be soft and mellow, and will not crust on top. It is without large lumps, and has a **6% to 10% humus content** and a 50% moisture holding capacity.

FRANK: Here is the pattern on the Morgan soil test to shoot for if *[produce]* nutrient density is your goal: **Humus**: Ignore this---when the minerals are right this will automatically correct.

PLANT FEED 1976: The greater the density of the soil **without humus**. the greater the specific gravity.

SAIT: Andersen: In many of our conventional soil systems the crop residues comprise an extremely high lignin fiber and very low carbohydrate or free sugar. Lignin takes a lot of energy to break down, and the **humus production is limited** by this problem.

SKOW: The animal manure that yields **the most humus for the soil** is the one provided by the bovine species. This is because cow and steer manure has a fiber content that is not broken down as much as, say, pig manure.

SKOW: This rootlet residue is rapidly **converted to humus and humic acids** which are powerful chelating agents and help the plant acquire plant foods more readily.

WHEELER: A good suggestion would be to cut and leave the last crop of an alfalfa field each fall as an **additional humus builder** or apply manures.

WHEELER: Try gently pulling on a medium-size corn root to see if the root bark will separate and slip off easily like a stocking. This would indicate weakness caused by excessive salts in relation to carbohydrates **and humus** and could provide a situation where nematodes could easily penetrate.

WHEELER: To moldboard plow residue 8 to 10 inches deep in this soil condition is to almost guarantee that there will be little decay system and **no new humus formed**.

RETURN TO TOC

HYBRID

ADVANCED AG: **Hybrid** corn will not match others in quality year after year.

ANDERSEN: **Hybrid grains**, because of their narrow nutrient preferences, i.e., nitrogen and potash, are possibly more susceptible to molding.

ANDERSEN: Many landscape and ornamental plants will respond to foliar feeding with seaweed, fish, vitamins, and dry solubles. Some, however, do not respond well to these feedings. **Hybridization is the probable factor** contributing to the non-response, just as hybridized corn does not respond as well as open-pollinated corn to foliar feeding.

ANDERSEN: A large industry has been built around the **hybridization** of both animals and plants. Traits or characteristics are coded for, or imprinted, in genes. Genes are combined into clusters, forming chromosomes.

ANDERSEN: Genetics is the basis of **modern hybrid seed selection**. Varieties have been selected and bred that produce the greatest volumes of crops using chemical fertilization, primarily nitrogen and potash. Little or no consideration has been given to the resultant feed value of imbalanced fertilization.

BEDDOE: **Hybrid** non-open pollinated com does not pick up cobalt; it is a food that will be deficient in vitamin B-12.

ENERGY RESEARCH: *[Skow speaking as a vet]* Nitrogen can carry potassium into the plant and this is essentially how we are growing seed corn nowadays. Visit with some of the seed corn growers. They produce the plant and it responds quite nicely to potassium and nitrogen. This is one of the key factors with the **current hybrids** and why it creates a veterinarian's nightmare or dilemma.

ENERGY RESEARCH: Student: Will these *[foliar feeds]* work on the **hybrids** or do we have to add more to it? Skow: It may if we got it worked down. The only one we have had any trouble with is **hybrid corn**. I have made a statement and have had not much response. We are only talking from a yield standpoint. From a quality standpoint, there has been a different response. But you see, most corn growers have only one thing in mind and that is bigger yield because that is what you get paid on.

PLANT FEED 1976: Frequency is time. The reason I selected citrus to discuss is that there is a cute little phenomenon about citrus different from all other plants. The male blossom petals of citrus have four petals and the female has either three or five petals. This does not hold true elsewhere in the plant realm. Yes, all wild lemon have three petals, but the domestic **hybrid lemon**, like the Myers, Californias, with various numbers in size, have the frequency of five for the female.

REAMS/SKOW COOK: Student: What about burpless cucumbers? Reams: The only real difference is that the chlorophyll goes all the way through. It is a very highly bred **hybrid cucumber**. I have seen them 30 inches long. Somehow they have bred for the chlorophyll to be all the way through. And it is the chlorophyll that prevents you from burping it later.

SKOW: If corn kernels are denting, not enough energy has been pulled in. If there is enough energy *[minerals]*, corn kernels won't dent, not even in **hybrid corn**.

WHEELER: Users of the Reams technology are finding that although the base reading concept is still valid, the ranges of ERGS one has to work with may be much higher than the 200-400 range. Part of the reason may be that the **plant hybridization process** has developed plants needing to consume or grow in the presence of high amounts of nitrogen which can result in higher ion counts.

COMMENTARY: *Careful study of multiple instances leads one to assume that Reams saw a clear distinction between "hybrid" and "cross-bred." For instance, one can buy "hybrid" seeds or one can plant two types of, say, corn, and allow them to cross fertilize. This critique will struggle to keep the two in their proper corners. Studying the old materials gives a clear picture that Reams felt different arrangements had different abilities to draw on nutrient reserves. In later life he freely admitted there was so much he did not know because the necessary research, study, and evaluation was still to be done.*

RETURN TO TOC

HYDROGEN

ADVANCED AG: While nitrogen is the main isotope, there is also **hydrogen** and oxygen.

ADVANCED AG: Interestingly, water (**hydrogen** + oxygen) can be "pulled" in anionic-cationic directions.

ANDERSEN: Farmers have been led to believe that pH changes only when lime is removed or added. This is simply not the case. pH merely indicates the relative **concentration of hydrogen**.

ANDERSEN: Nitrogen must be combined with carbon, **hydrogen**, and oxygen in order to form an amino acid. Amino acids are then combined, as discussed in the chapter on biology, to form proteins. This is rarely discussed in

connection with fertilization.

BEDDOE: ORP is the measurement of the level of **hydrogen ions** versus oxygen ions in the soil.

BEDDOE: Plants live on about 16 basic elements in addition to **hydrogen**, oxygen, and carbon. Nitrogen is one of those 16. It is the one that is usually thought of first even though it is no more important than any of the other 15.

FRANK: Here are the four elements you need to build a "battery" of magnetic energy in your spray solution: carbon, **hydrogen**, oxygen and nitrogen. Carbon is the conductor. Add hydrogen and oxygen (as water) to carbon, and you have the elements of sugars. Add nitrogen, and you have the makings of a rudimentary amino acid. You must include nitrogen to make the solution magnetic.

FWTK-pH: The principle of the pH theory is based upon the **structure of the hydrogen atom**. The positive hydrogen atom is composed of one negative ion and a nucleus (or center) with only one positive ion. The cation electron is rotating counterclockwise.

GARDENING: When corn silk comes out if it is high in carbon, **hydrogen** and oxygen which forms the sugar, it's going to be high in the corn itself and you should notice little teensy dots that looks like nectar on the silk. But if that silk is dry and you don't see those little drops of nectar on it, little teeny drops like a diamond that sparkle in the dew drop, then you are going to have worms in your corn.

PLANT FEED 1976: There is nothing made that is not made out of cations and anions or ions. These two put together in this ratio 1 to 1, equals **one atom of hydrogen**. You were taught that every molecule has an equal. number of protons and neutrons, if you had any chemistry at all. But that is wrong. It is not true.

SKOW: Unlike nitrogen, oxygen, **hydrogen** and carbon, calcium does not come from the air.

SKOW: Thus, an overall average value would be 1,000 *[Milhaus units]*, this for one **single atom of hydrogen**.

SUCROSE: ...possibility that the decrease in yield could possibly be a deficiency of one of these three elements or of an **elementary catalyst** that joins them together to make sucrose? It **could not be hydrogen** or oxygen because these two elements come from water, so then the deficient element is carbon or its catalyst.

WHEELER: Actually, the refractometer measures dissolved solids. In dealing with plant juices, the majority of solids are compounds manufactured from carbon, **hydrogen** and oxygen.

RETURN TO TOC

HYDROGEN PEROXIDE

ADVANCED AG: Reams: You need 2 gallons sulfuric acid per 100 gallons of spray. Skow: The other way to do it is hydrogen peroxide. Student: There is no sulfur in hydrogen peroxide. Reams: Anyway, sulfuric acid is cheaper than **hydrogen peroxide.**

AG LECTURES: Student: Blueberries need more calcium so you put gypsum on them is that right? Reams: Yes, that's the best form to put it on. Student: Suppose you didn't have any gypsum and you wanted to make some. How would you do it? Reams:

Sulfuric acid and calcium. Yes, just **hydrogen peroxide**. Pour some on some lime. Quick and easy isn't it?

ANDERSEN: Some people also will add some **hydrogen peroxide** to their program; this may help oxygenate the soil.

ANDERSEN: Timely tillage is very effective at oxygenating the soil. **Hydrogen peroxide can add oxygen** to the soil, as can fluffing of the soil using appropriate fertilizer materials.

ANDERSEN: Lactobacillus microorganisms produce **hydrogen peroxide**, as well as lactic acid, B-vitamins, and other metabolites that are valuable to the nutrition of animals and soil, as well as to the inhibition of pathogenic proliferation.

ENERGY RESEARCH: Here is a little formula that Dr. Reams has used in the past of spraying a 4% sulfuric acid solution on vine crops, trees and shrubs to get rid of the dead wood. It is kind of a method of making **hydrogen peroxide** and spraying it on.

FOLIAR FEED 1981: If you will wait several months so that interlaced pruning residue, small trimmed limbs, or other dead plant material has fully dried, you can spray them with a solution of 4% sulfuric acid in water. This mixture forms **hydrogen peroxide** and the trimmings will turn to dust.

FOLIAR FEED 1981: Dutch Elm disease is caused by a shortage of phosphate. Spraying the tree with a 4% **hydrogen peroxide** solution can stop the infestation.

WHEELER: Don't add hydrogen peroxide to concentrated mixtures. Always **add hydrogen peroxide to the water first**.

NOTE: *From Wikipedia: Sulfuric acid can be produced in the laboratory by burning sulfur in air and dissolving the gas produced in a hydrogen peroxide solution. There are other websites that claim hydrogen peroxide can be*

produced from sulfuric acid and water. A review of the entries here should make it clear that Reams felt he was on a strong chemical footing.

RETURN TO TOC

HYDROPONIC

ADVANCED AG: You can use a certain amount of muriate of potash if you are farming **hydroponically**.

ADVANCED AG: A **hydroponic book** will help you understand that the small amounts of nutrients in Reams-Ag foliars are very appropriate (too much nutrient may act as a roadblock).

FRANK: With the exception of seafood and **hydroponics**, food is a derivative from the soil.

FWTK: Bacteria break down the lime and disperse the colloidal phosphate throughout the soil. An understanding of this process should help the farmer realize that the only way to get a crop is with the soluble plant foods, because traditional methods are killing off the bacteria, i.e., "**growing hydroponically**."

GARDENING: [Reams working with a failing **hydroponics farmer**] I said, "Now take this little pair of scissors I have in the edge of this scope/microscope case, you go over and cut me some roots off of these plants, these little plants, or just bring me a plant for that matter." He brought me a plant, we cut some roots off, and we put it under the microscope and you couldn't see the root for the bugs sucking on it. And I said, "Friend your trouble is not in the solution, it's in the bugs in the solution." He said, "There's nothing in the hydroponic book about that!" I said, "Well, if there was, you wouldn't have needed to call me over here." Now I said, "These bugs are sucking the sap out of these plants." He said, "What should I do about it." Well I said, "You need a little boron. You haven't got quite enough boron in the nutrient solution to kill them. And the second thing is, you need a little chlorine in the water. Chlorine is an essential plant food and essential food for people. Clorox, but it has to be a lot more dilute."

GARDENING: I suppose I have rescued a thousand farmers who thought they could grow **hydroponically** in tanks and who got in trouble.

PLANT FEED 1976: Sterile soil is soil in which the salts turn the organic substance into more salt Just like the ocean does. Consequently, you are **farming hydroponically**, whether you believe it or not.

WHEELER: Although chemical fertilizers alone can be used to feed plants (**hydroponic farming** consists of growing plants in a water solution with no soil support), using them in this manner results in increased farming costs.

RETURN TO TOC

IMBALANCE

ANDERSEN: Carey Reams, as an ag consultant, used pH in a different way. He looked at pH as a measurement of the resistance in the soil. He observed that the higher the pH, the greater the resistance there was and the more difficult it was to get energy to flow, particularly if the pH was somewhat alkaline, in the 8 or 9 range, resulting in nutrient imbalances. On the other hand, he observed that if the pH was moderately low, below 6, there was not enough resistance. This exchange allowed the energy to flow too readily, making it difficult to contain it [and for the plant roots to grab it], again **resulting in apparent nutrient imbalances**. This seems to be a practical and workable use of pH, for it addresses the reality of how plants grow through energy exchange. In essence, pH is the result of the nutrient interaction, not the cause. When the nutrient ratios are balanced, the pH will stabilize automatically in the correct range.

ANDERSEN: With apples, the opposite seems to occur. An apple with apple scab fungus will itself have a low refractometer reading (below 12); however, the leaves on the branch supporting the sick apple will have very high refractometer values (above 12 or even in the upper 20s). In any event, **there is a mineral imbalance**/deficiency in the crop.

ANDERSEN: Ragweed, for example, is generally indicative of a **phosphate/potash imbalance**, but, more specifically, it indicates a copper problem.

FRANK: A continuous supply of potassium over time **will imbalance the soil** with respect to calcium

FRANK: Limestone with a high magnesium content is called dolomite. It is not normally recommended because it provides too much magnesium and **imbalances the calcium-to-magnesium ratio**.

PLANT FEED 1976: In this case where you've got too much potash, if you added more phosphate, that would **tend to correct the imbalance** if you added calcium proportionately to your phosphate. There's no ratio between calcium and phosphate in other words, it is a variable. Nature will make those corrections providing you have sufficient amount by volume.

SAIT: Andersen: The fact is that, if we have problems with insecticides, diseases and weeds, then we **have an imbalance** in that soil, regardless of what the conventional soil test figures might be telling us. Carey Reams showed that insect and disease problems are related to the Brix level of plants. He also showed that weeds are

evidence of **nutritional imbalance**---often involving calcium and phosphate deficits or potassium excesses.

SKOW: If you record an ERGS reading of 1,000 and a pH of 2, this situation could be caused by the sulfur or aluminum in the soil. The aluminum in bauxite is what affects the ERGS in this way. It is a very common condition in the state of Georgia. If sulfur is the problem, the soil will dry out. Aluminum will not do this. If you have this situation, we would **suspect one of these two imbalances**, because the pH is down. This is one time when it is important to know the pH. In this case, the way to drop the ERGS is to add lime.

SKOW: Some farm crops go directly to the dinner table. In crops where the calcium has been replaced by potassium---lettuce, broccoli, Brussels sprouts, spinach---this **potassium-calcium imbalance** causes heart trouble and kidney disease. Using the conventional N-P-K fertilization program, agronomy puts too much potassium in the system, and not enough organically soluble calcium.

WHEELER: Alfalfa, lettuce or spinach that goes to blossom or bolts early **indicates a fertility imbalance** situation that may be worsened by weather extremes.

WHEELER: If you don't differentiate between ions and simply consider pH, you are falling into the pH trap and you **may have imbalanced nutrients**, particularly a shortage of calcium.

RETURN TO TOC

INORGANIC

ADVANCED AG: Student: We raise organic beef and lamb and have trouble getting "organic" nitrogen for the pasture. Skow: I have no answer. I have no idea why putting sulfur on land is "organic" and yet putting nitrogen on land is considered "**inorganic**."

AG LECTURES: Regardless whether the plant food comes from organic, **inorganic** or from nutritional sprays, the way that plant food enters the plant, the energy is identical.

AG LECTURES: Student: Side dressing, what is that, potassium? Reams: A side dressing is any **inorganic** N-P-K. All three are used in side dressings.

ANDERSEN: ...microbes also increase the metabolism of amino acids in the roots by converting **inorganic nitrogen** to organic nitrogen compounds.

ANDERSEN: Every nutrient that passes into or out of the roots is mediated by the mycorrhiza. This is totally ignored by the **chemical, inorganic nutrient theorists** of conventional agriculture who paint starry eyed theories of soil/root nutrient exchange.

ANDERSEN: Such reports are based on the assumption that plant nutrition is **fundamentally inorganic**; readers are not told that this is true only under man-made situations. Under natural conditions, plant nutrition is biotic and organic. Use of the term organic in this context should not be confused with its use to describe organic farming.

BEDDOE: Acids (cations) coming into contact with bases (anions) are heat and energy producing because of the resistance between the anions and cations. Whatever organic or **inorganic** substance there happens to be in the soil also takes part in this chemical action and can be affected by it. These types of reactions, if too strong, can cause calcium and phosphate as well as carbon to be oxidized to the point of leaving a very low plant food bank account of soluble nutrient. *[See Entry **UNAVAILABLE**]*

BEDDOE: Yes, there are fertilizers that do not have the carbons, but when it comes to foods there is **no such thing as an "inorganic" food**. All food has carbon, hydrogen, and oxygen complexes, hence all food is only organic. It is unfortunate that there is this type of misunderstanding.

FWTK: The word organic has two meanings. The scientific meaning is a substance containing carbon, while an **inorganic substance** is one that does not contain carbon.

FWTK-pH: Heat created by acids coming into contact with bases is nature's way of growing crops. Whatever organic or **inorganic substances** there happen to be in the soil also take part in this chemical action.

GARDENING: When you add a synthetic fertilizer or certain synthetic fertilizers to your soil that is high in organic, the bacteria in the organic then **turns the inorganic salts into organic salts**.

PLANT FEED 1976: Plants do not live off ordinary or.**inorganic** fertilizers any more than you live off the food you eat. You live off the energy you get from the food you eat. Plants live off the energy from the fertilizer that you apply, not the fertilizer itself.

PLANT FEED 1976: Student: Are the synthetic fertilizers organic **or inorganic**? Reams: They can be either. You can have a synthetic organic, but can't have inorganic organic. For instance, NuGreen is one. Urimond is one. Urea is one. Those are synthetic organics.

SKOW: There is a chemistry involved whenever anything is put into the soil, **inorganic**, organic, salt form, whatever.

RETURN TO TOC

INSECTICIDE/PESTICIDE

ANDERSEN: No Atrazine had been applied to the field since 1984 or thereabouts. As a result, it was assumed, backed by industry insistence, that there should be no danger of Atrazine release stunting the oats. Consequently, last year no compensation was made in this field's oat-fertility program for Atrazine. The result was a 37 bushel per acre yield [whereas 130-150 was normal]. A sample of these oats was sent to A & L Laboratories for evaluation. Atrazine was isolated and determined to be the cause of the stunting. So much for the **propaganda that pesticides readily dissipate**. **NOTE:** *There is a tendency to let chemical names and purposes blur. Notice that Dr. Andersen, a well educated and respected physician of both plants and people refered to Atrazine (the herbicide) as a pesticide.*

ANDERSEN: Regardless of whether you follow an organic or a biological procedure, your success will be reflected in the refractometer reading of the commodity and its freedom from insects, diseases, and weeds. A wormy organic apple is substandard, **pesticides or no pesticides**.

BEDDOE: Even though one of the goals is to **work away from using pesticides and herbicides**, most fanners will not be able to dispense entirely with them immediately. Pests are natures disposal crews working to get rid of the poor quality plant life resulting from poor soils. In many situations some pesticides as well as herbicides may have to be used in order to provide stop-gap help while the soil and plant health is being turned around. It takes time to slow the soils degenerative process that has been so accelerated by man's ignorant practices.

FRANK: Soulless corporations offer "free" training to farmers and agronomists instructing them on the how to use and apply various **fungicides, herbicides, and pesticides**. This is not agronomy---it is marketing the culture of death and ultimately you are the victim.

SAIT: Humates have the capacity of binding **pesticides** and toxic chemicals in the soil.

SKOW: There is not one chemical of organic synthesis---**pesticide, fungicide, herbicide**---that can raise anything even one Brix degree, and therein lies a distinction. This reality reconfirms the proposition that insect and weed control are seated in fertility management, and not in using more powerful goodies from the devil's pantry.

WHEELER: Herbicides, **pesticides, and other farm chemicals** also contribute to the decrease of proper soil life.

RETURN TO TOC

IODINE

ADVANCED AG: The best way to supplement with **iodine** is to spray about 6 ounces per acre.

AG LECTURES: Student: I've heard people, even doctors, say that collards do not have any food value. Reams: Collards are very rich in **iodine** and in iron, very rich. They have more nutrient than cabbage.

ANDERSEN: Kelp or seaweed is a natural source of **iodine**, and it also is loaded with trace and rare earth elements along with vitamins and enzymes.

FOLIAR FEED 1981: If foliar feeding just before harvest, leave out fish oil, copper, **iodine**, and molybdenum.

FOLIAR SEMINAR 1983: Many areas of the US need to supplement with **iodine** if they are growing carrots.

SKOW: As a result, many nontraditional fertilizer materials have been discovered to be vital to soil regeneration and plant feeding. They include vitamins like B-12 and C; sugars like molasses, sucrose, and dextrose; trace elements like silicon and **iodine**; and even colors.

RETURN TO TOC

IONIZATION

ADVANCED AG: **Ionization** increases at night.

AG LECTURES: Nature is at work in plants forever and you're not supposed to try to make a plant do anything. What you are supposed to do is to co-operate with nature. In your soil program, one thing that you want to always keep in mind is your **ionization of your soil**. Keep your soil highly ionized. And you do this with the metallic particles that are in the soil.

AG LECTURES: Reams: How does the root grow? Student: **By ionization**, building, putting together? Reams: That's right, by ionization. In other words, the ionization of the soil builds the roots. As the root is built the process of osmosis takes the particles thru the plant.

AG LECTURES: You don't put salt on asparagus for nematode purposes. You **do it for ionization** and it increases the ionization enough and the nematode can't start. In other words, it tingles him and he doesn't like it.

BEDDOE: Fertilizing with manures is the preferred method in the **ionization program**, then testing soils to discover

their deficiencies, and using synthetics to make up the difference.

BEDDOE: Soil bacteria are also put together by the **process of ionization**; the same method that causes plants to grow. The process is similar to a metal electroplating. Conversely, the aerobic bacteria is taken apart by_the same method that is is formed, except the method is in reverse.

FWTK: As the seed begins to absorb moisture, the **process of ionization takes place**. Ionization is the process of either building something or taking it apart, ion by ion. This is done in plants just as silver, nickel, gold or chromium plating tanks.

FWTK: Without nitrogen in the soil, the electrical currents could not flow, and the **process of ionization**, by which plants are built, could not take place.

PLANT FEED 1976: Ionization is the process or either taking something apart ion by ion or putting it together ion by ion, one or the other. The exact same way in which silver, nickel, ch.ros1iu:m or copper plating happens in a plating tank.

PLANT FEED 1976: Down in Brazil, it takes; 9-10 months to grow corn. Up in the corn belt it takes about 5 months. Up in Alaska it takes 2 1/2 months or 6 weeks to 2 1/2 months. Because the **ionization of the earth is greater**.

SKOW: It is the function of our *[RBTI]* tests and our fertilization program to expand electromagnetic fields because strong fields hold nutrients in place. Moreover, the use of computed **ionization** for materials applied has the dual effect of keeping soil systems cooler in summer and warmer in winter, the ideal being a constant 70 F. temperature.

SKOW: The **ionization process** that governs crop production can be understood via analogy, abstraction and the arithmetic of the atoms. Taking the first, ionization is similar to the activity in an electroplating tank. You have a negative pole and a positive pole. Usually, powdered silver is introduced into the solution, with current taking on the role of guiding the plating material to the object to be plated. Usually a stirring device keeps the plating powder in suspension. Still, no plating will take place if the solution contains no electrolytes.

SKOW: Carey Reams at one time used uranium ore of a certain kind to increase the **rate of ionization** and cut down the growing time of a crop. If you want to increase ionization in your garden and get faster growth of vegetables, a trip to the local machine shop may be in order. They have neat iron filings you can spread around your garden. I suggest you clean them first to get rid of cutting oils that can load toxicity into your soil and cancel out the benefits of this new found trap for the equator to pole magnetic flow.

SKOW: When we study how Dr. Reams rated the different elements according to his biological theory of **ionization**, we have two complete opposites: one turning clockwise and one turning counterclockwise. This gives a tremendous energy release to the plant when these two elements are sprayed together. The problem has always been that when they were mixed, they formed tricalcium phosphate, which was not readily taken in by the plant.

RETURN TO TOC

IRON

ADVANCED AG: Basic slag contains **20% iron oxide**, however is slow release.

ADVANCED AG: Optimum iron is 40 pounds per acre.

AG LECTURES: You who can get basic slag from the **iron mills**, it is an excellent product, even though they may use dolomite.

AG LECTURES: Student: You said the reason for [nematodes] is too much salt in the soil? Reams: Yes. Student: Which particular kind is it, the chlorides? Reams: It can be a chloride, it can be ammonia salts, nitrogenous salts, calcium salts, **iron chloride salts**, yes, it can be many different kinds of salts.

ANDERSEN: Iron draws energy to the leaf by absorbing heat from the sun; it makes the leaf darker, thus absorbing more energy. It will increase the waxy sheen of the crop. Iron is necessary for the maintenance and synthesis of chlorophyll and RNA metabolism in the chloroplasts. It increases the thickness of the leaf, that will geometrically increase nutrient flow, resulting in a production increase geometrically. Forty pounds per acre is desired on the Reams test.

ANDERSEN: Molybdenum is a **catalyst for iron** in the bark or epidermis, is important in the integrity of bark or plant skin, and gives a transparent look to the sheen on the bark.

BEDDOE: The parts of the reserve soil TDN are calcium, phosphate, potassium (potash), nitrate nitrogen, ammonia nitrogen, **iron**, and copper.

BEDDOE: Therefore, iron is heavier than aluminum and **iron will also float on boiling lead**.

BEDDOE: Iron sources include soft rock phosphate, basic slag, iron sulfate, molasses, and various chelated irons as can be used in foliar applications.

BEDDOE: Metallic substances, **such as iron**, sulfur, and aluminum are often the culprits that give low pH readings in soil where there is already an over-supply of water soluble calcium.

ENERGY RESEARCH: Skow: Common electrolytes are **iron**, aluminum, copper, and one of the other ones that you will see a lot written about is magnesium and they get a wonderful response. Now the only reason they get a response is that the plant is constipated.

ENERGY RESEARCH: What can you use in place of an **iron chelate**? You use **iron sulfate solution**. Just take your time and take the iron sulfate or manganese sulfate and mix them in water first.

FOLIAR FEED 1981: If your nearby trees have lichen or moss, your farm probably **needs iron.**

FRANK: Avoid using nutrient elements compounded as carbonates or oxides. Examples of carbonates: calcium carbonate, **iron carbonate** and copper carbonate. Examples of oxides: Manganese oxide, **iron oxide** and copper oxide.

FRANK: Nitrogen. sulfur, **iron**, manganese are secondary elements and should be present in 10's of lbs. per acre.

FRANK: When **iron is low in a leaf** it will be thin and pale looking. By increasing iron in the leaf we increase the absorption of heat energy and thus increase the overall amount of energy accumulated by plants.

FWTK-pH: Therefore, iron IS heavier than aluminum, manganese is heavier than magnesium, and **iron will float on boiling lead**.

GARDENING: All plant food with the exception of nitrogen, must go into that tree or plant in phosphate form, **phosphate of iron**, phosphate of zinc, phosphate of copper and so forth.

SAIT: Andersen: If you have a **high iron content**, you should be careful of molasses because of its iron content.

SKOW: Indeed, how enzymes create hot spots to attract essential cell building materials — **iron**, nitrogen, boron, for instance — so that they can be linked to the right molecules in plant cells must be considered a miracle.

SKOW: Light green or pale green moss on a tree is **sometimes an indication of iron deficiency**. It could and it could not be iron deficiency. Remember, every nutrient enters a plant in a phosphate form. There simply may not have been enough phosphate to usher in the iron. So the iron may be there, albeit stalled in the plant's own horse latitudes. This is the major shortfall of leaf analysis.

WHEELER: Most [trace elements] can be obtained in the sulfate form, as found in copper sulfate or **iron sulfate**, or in the oxide form as found in magnesium oxide. These are the most popular and least expensive forms.

WHEELER: Calcium, boron, **iron**, magnesium and molybdenum tend to remain in the leaf after they are absorbed and have little tendency to translocate.

RETURN TO TOC

IRRIGATION

ADVANCED AG: Yes, an ideal (Reams-Ag) mineral content assumes **irrigation** is available.

ADVANCED AG: Flood system drainage in flat land by ditching can serve dual purpose as **irrigation**.

ADVANCED AG: Skow: Do understand that the ideal soil building we are discussing is for land that can be irrigated. If you **can't provide irrigation as needed**, you should consider scaling back to lower levels of phosphate and potash while keeping calcium as high as possible.

ADVANCED AG: **Irrigation** does not cost, it pays.

ADVANCED AG: You must increase the TDN to be in ratio (balance) with your **irrigation**.

AG LECTURES: If you're going to farm, be prepared for the worst that can happen. If you **don't have irrigation water**, get it ready.

AG LECTURES: We're going to study about **irrigation** today and one of the first things I want to tell you is that if you're going to be successful you must plan to have water, you must have water control.

AG LECTURES: One of the great mistakes that people make is failing to plan how to **irrigate** their farm. This is only one system we're talking about at the board now, but. I am going to show you 3 or 4 different systems of irrigation, depending on your water supply. There is a difference between irrigating in a high humidity area like Florida and a very low humidity area like Las Vegas.

AG LECTURES: One of the things need to calculate about your **irrigation** is maximum production, or you can't afford it. You know why more irrigation is not done? Because, they put the irrigation in and don't back up the acre with enough nutrients to pay for the irrigation system. In other words, you've got to have all the links in the chain. Don't let a short dry spell rob you of a third of your production.

AG LECTURES: In Japan they have used seawater to **irrigate** for centuries. It is complex to do, but it does work and I can show you how.

ANDERSEN: Every **irrigation** should contain some nutrient so that the soil ERGS stay above 200.

ANDERSEN: The use of salt fertilizers along with **high-salt irrigation water** raises the pH of the soil solution. This creates a situation in which calcium is not applied because the pH is near neutral, 7 or higher. This, in turn, results in calcium-deficient soils and plants, leading to a chain reaction of nutrient deficiencies and soil problems.

BEDDOE: This type of calcium is also good to counteract other problems that are becoming more prevalent today,

such as excess acids from fertilizers, rain, and **sulfur-containing irrigation water**.

BEDDOE: **Sprinkler irrigation** may mean soil compaction, but plant foods can be delivered to the soil nicely through many types of sprinkles.

BEDDOE: Concentrations of salt can be cut by **irrigation**, and fumigation can be used to control nematodes.

BEDDOE: A great deal of our typical soil treatment rests upon a series of ideas which are not true in the experience of those who work ecologically with the soil. These misconceptions include: **Irrigation** is vital to successful farming

FOLIAR FEED 1981: In those case where the crop is starving and there is no **irrigation**, use a sprayer instead of trying to feed through the soil.

SKOW: Field observation will reveal an under-developed root system when herbicides are used. These shortfalls can be repaired with foliar sprays and **fertilization through irrigation** systems.

SKOW: If the ERGS are low, this shortfall must be repaired if yields are to be maintained. The foliar route won't increase the ERGS of energy very much because it takes a volume of plant foods to handle that chore. Usually side-dressing and nutrient injection **via irrigation systems** are indicated.

WHEELER: Some of Dr. Wheeler's clients are running as high as 1,200-2,000 ERGS under plastic with **drip irrigation** and achieving excellent results.

COMMENTARY: *Reams had unique ideas about irrigation, with a key point being that air consistently below 50-60 percent humidity can be a strong rival to the crops' needs. This rivalry often made underground drip or overhead irrigation (12' high in the case of corn) valuable. It should also be noted that the Reams-Ag literature has 200+ irrigation mentions, the vast majority being by Reams and not his students. A very direct statement is, "If I wanted to be a high-income small farmer today I would look at irrigation before bothering to amend the soil to a high TDN." All the above notwithstanding, the archives of such as ACRES USA reveal cases of dryland farming, or as it is sometimes called, "farming with humidity." Dryland farming requires great skill in capturing winter moisture and conserving a scarce resource. And dryland farmers do not bother to hope for the yields that irrigation can bring. A little moisture can keep a plant alive, but it takes a great deal more to allow the plant to reach maximum production.*

RETURN TO TOC

ISOTOPE

ADVANCED AG: **Nitrogen is an isotope** that can switch from anionic (growth) to cationic (fruiting). While nitrogen is the main isotope, there is also hydrogen and oxygen. On the tapes, Reams can be heard muttering, "No" when a student suggests helium. Interestingly, water (hydrogen + oxygen) can be "pulled" in anionic-cationic directions.

ANDERSEN: Nitrogen acts as an "**isotope**," alternating between the nitrate form and the ammonium form.

BEDDOE: In the third arrangement. **isotopes**, the ratio between the anions and cations can switch between either the anionic dominance or the cationic dominance. The direction they switch is the result of the influence of the line of least resistance. In other words, an isotope element will go either anionic or cationic depending on the environment it is placed in. The isotope type elements are four, hydrogen, oxygen, nitrogen, and helium [?].

BEDDOE: The instability of **isotope substances** can create some aggravating problems, and if a farmer waits for visible signs in his crops before he takes action, the action he takes may not take care of the situation.

ENERGY RESEARCH: We have already discussed **one of the major isotopes** and it is the nightmare of all of them and that is nitrogen, Nitrogen has the ability to change it's charge from a negative to a positive. This is why you can do one thing one time and come right back and do it again and not get the same results because it may have switched on you. That's why when you go from one place to another and do different things, you will get a different response. For instance, if you have a real high calcium soil and you put on ammonia nitrogen and you want to make the soil to the point of producing seed, you are going to have to use more than normal amounts of ammoniacal nitrogen. Otherwise it will switch it all to nitrate nitrogen and you will just get more growth. Now that is great if you are producing alfalfa but if you want to produce wheat or barley or oats you don't want more growth after a certain point. Somewhere along the line you want some seed production.

FWTK-pH: Some elements are isotope elements. **Isotope elements or compounds** are those in which the anions and the cations change places in the atomic structure of the substance. The anion or cation in the **isotope elements or compounds** yields to the side with the greatest magnetic pull. One may have soil in excellent condition one day, and the next day it may be about as far out of balance as it can get. This is due the instability of the isotope substances. **NOTE:** *Reams is including the compound water here.*

FWTK: **Nitrogen is also an isotope element**. The nucleus and electron forces can change places. The element can be a cation or an anion, and can have either a positive or negatively charged nucleus. The anionic form is found in

nitrate nitrogen, and the cationic form is found in ammonia. Isotopes in the soil will follow the path of least resistance, i.e., yield to the greatest magnetic attraction.

FOLIAR FEED 1981: Nitrogen, Water And Oxygen Are The Three Isotopes [*according to the index*]. **NOTE: Actually**, a close listen reveals the **three isotopes to be nitrogen, hydrogen, and oxygen**. Isotopes flip depending on which way they are being pulled by other substances. Reams bluntly says that agricultural chemistry would be simplistic except for figuring what isotopes might do in a particular situation.

PLANT FEED 1976 AUDIOS: An isotope has ion forces [that] can change place, including calcium, potash and chlorine. **NOTE:** *Calcium, potash, and chlorine are NOT isotopes. This is a clear case where the transcriber mis-understood Reams' teaching.*

PLANT FEED 1976: An **isotope** is any substance in which the force on the nucleus and the force on the electron can change places.

NOTE: *There is some support for accepting helium as an isotope, but an understanding that helium is never a factor in Reams-Ag makes the point moot. However, it must be remembered that at all times standard physics isotopes and Reams-Ag isotopes are different creatures. Do not confuse the two.*

RETURN TO TOC

LEACHING

ADVANCED AG: [Student posed a miserable situation on the poorest of land to try to negate Reams claim that leaching could be stopped] Skow: Reams consistently states that if the Reams-Ag phosphate/lime/manure program is followed **no appreciable leaching** will take place.

ADVANCED AG: Your nitrogen **will not leach out** if you have followed Reams-Ag rules.

ANDERSEN: Phosphate will generally remain fairly stationary in the soil unless it is in a water-soluble form, **which can leach out**. **NOTE:** *Not according to Reams.*

BEDDOE: Soft rock phosphate, as was mentioned, is an excellent agent to holding plant food substances and **not allowing them to leach** away.

BEDDOE: Sandy soils will respond faster to this program [Reams-Ag] because the possible chlorine in the soil will **leach out more quickly** and also because of improved aeration. The bacteria will then be able to do its work more efficiently and more rapidly.

BEDDOE: Because it [urea] contains carbon, it does not have as high a **susceptibility to leaching** and will be taken up by plant and bacterial structure quite easily.

ENERGY RESEARCH: The result of magnesium application is that magnesium will replace the carbon in the sugars, thus destroying them which makes it possible for the nitrogen and oxygen **to combine and leach** which gives off energy which results in free nitrogen which may result in nitrate toxicity.

FWTK: They [compound colloids] are 100% available to plants, and they **will not leach out** of the soil.

FWTK: Sandy soils will respond faster to this program [Reams-Ag] because the chlorine in the soil will **leach out more quickly**, and because of improved aeration. Thus, the bacteria will be working.

PLANT FEED 1976: Leaching is what happens to most fertilizers, much more than erosion. The calcium, soft rock phosphate, chicken manure program will bring an end to your leaching and you've immediately laid the foundation for a heavy thick topsoil.

WHEELER: Plant food originating from such a source [composted manure or plant remains] usually is rather stable in the soil, **doesn't leach out** and, in fact, is the primary reason why soil is able to hold water. This material is called humus.

WHEELER: According to soil fertility consultant Neal Kinsey [who claims to not know what Brix is], soils less than 60 percent calcium will not be open enough to **leach what may be in excess**. **NOTE:** *This is clearly a case where Wheeler has abandoned any effort to explain Reams-Ag and has elected to support cation balancing theory.*

WHEELER: Sandy soils can be particularly difficult to work with in maintaining potassium levels. Having little or no clay content, they do not hold potassium well. Potassium **will easily leach out of the root zone** and be lost.

NOTE: *It is most interesting to review where Reams is adamant that his program will stop leaching and simultaneously review where some of his "students" so casually adopt conventional ag thinking.*

RETURN TO TOC

LEAVES

ADVANCED AG: You want to grow watermelons, not big thick vines and you need **50 leaves per fruit**.

ADVANCED AG: Leaves determine your yield, 50 leaves per plant.. However, that is not true on tomatoes

ADVANCED AG: Skow: Close mowing peas (legumes) in an orchard with dolomitic soil will put a glossy **sheen on the leaves** by releasing magnesium to the air.

AG LECTURES: How many have seen those little black dots [indicating excess potassium]? Have you noticed it on **peach leaves, orange leaves**, any crop?

AG LECTURES: So what happens when you use a chelate in a high calcium soil? It [alfalfa] loses its leaves, **all the leaves fall off**. Why? Because it thins the protoplasm that holds the leaf onto the stalk. Nothing to hold it on. The leaf is held onto the stalk by protoplasm. Did you ever break a leaf off and look at it about 3 minutes later under a glass and you saw a little jelly-like substance form in there? It's that little jelly-like substance that holds that leaf on the plant. And what happens when you use a chelate on a carbonate soil, high calcium soil? It sheds the leaf off.

AG LECTURES: When you see a crop that has no sheen on it or a grove or an orchard, that the leaves do not have a waxy sheen to, you're going to see a grove or orchard or crop that is low in carbon.

AG LECTURES: Lets take an orange grove. The trees are 15-20 feet high, producing 1,000 boxes to the acre. You would need 30 gallons of spray to cover an acre, homogenized. That's a lot of space, **that's a lot of leaves** and that's a lot of trunk.

ANDERSEN: With apples, the opposite seems to occur. An apple with apple scab fungus will itself have a low refractometer reading (below 12); however, the **leaves on the branch supporting the sick apple will have very high refractometer values** (above 12 or even in the upper 20s). In any event, there is a mineral imbalance/deficiency in the crop.

BEDDOE: It is this type of reaction heat from anion-cation encounters that causes burning and dehydration of the roots. The result can be seen as a sudden **die back in the leaves** because of reversing the normal osmotic flow.

BEDDOE: An excess [of manganese] will cause plants that are being grown for **leaves to bolt**.

BEDDOE: One of finest ways to add additional nitrogen to crops is **through the leaves**. This is called foliar feeding. Foliar feeding recognizes that a plant takes in up to 80% of its energy for growth out of the air through its leaves.

ENERGY RESEARCH: If **citrus leaves** tend to fall off if you touch them, that is a potassium availability problem.

FRANK: The stems of alfalfa and small grains such as wheat or oats are often hollow, lacking adequate phloem tubes which **carry nutrients from leaves to roots** and other parts of the crop.

GARDENING: Why does the grapefruit tree have a bigger leaf than an orange tree? That is because a grapefruit is larger and needs more sunlight to make enough sugar to make the grapefruit sweet, so God gave it a bigger leaf. Now, when an orange tree or grapefruit tree has **one fruit to each 50 leaves it has its maximum crop**. If you want to know how many bushels of oranges you have, all you have to do is count the leaves, divide them by 50, and there's about 200 oranges to about, roughly about 100 oranges per bushel and you know how many bushels you're gonna have next year.

SKOW: In developing a foliar program, maximum attention must be given to the **thickness of leaves**, how well leaves stand up, the degree of wilt, and so on. A thin or weak leaf suggests a nutrient deficiency, or low TDN — total digestive nutrients.

WHEELER: Lack of nitrogen, generally recognized through the light green coloration in plants, is thought to be associated with a **lack of chlorophyll in the leaves**.

RETURN TO TOC

LEGUME

ADVANCED AG: Legumes are better in magnesium soils, however **don't add magnesium to legumes**.

ADVANCED AG: Skow: **Close mowing peas (legumes)** in an orchard with dolomitic soil will put a glossy sheen on the leaves by releasing magnesium to the air.

AG LECTURES: Reams: One of the finest things you can grow in orchards is Bermuda grass. If you can't afford Bermuda grass, you can't afford the orchard. And then in the winter, sow rye in there. Student: How about Kentucky Fescue? Reams: It's very good too, but **Bermuda grass is far different, because it is a legume** and Kentucky Fescue isn't. Student: Is Bermuda an annual or a perennial? Reams: It's an annual.

AG LECTURES: Okra i**s a legume**. Black-eye Peas are legume. Peanuts are a legume, Bermuda grass is a legume. Only a different kind, from the peas or peanuts.

ANDERSEN: University personnel tell farmers that they **cannot generate much nitrogen bacteria activity without legumes**. However, research in 1942 revealed that "root-nodule bacteria of lucerne grew equally well under lucerne and under cotton. The sap of corn enhances the virulence of the root-nodule bacteria of peas. Perhaps this is due, in part, to the sugars found in corn sap. "Root-nodule bacteria of lucerne grow well under timothy grass, cotton, and rye grass."

ANDERSEN: Cobalt is necessary for nitrogen fixation, especially in **legumes**' root nodules.

BEDDOE: Excess magnesium can be reduced by liming to keep it in an oxide form so it is insoluble. Also **green**

manure legume crops, such as peas, can be of help.

ENERGY RESEARCH: Student: You said you were going to say something about Vitamin C yesterday. Skow: OK, vitamin C. This is one we have come up with and **have found to be very successful in legume crops**. That means peas, string beans, alfalfa and bell peppers.

FOLIAR FEED 1981: You may need to **foliar spray some magnesium** on legumes if nitrogen too high. I have never seen a case where magnesium was needed to release excess nitrogen on alfalfa.

PLANT FEED 1976: [*Reams explaining how chicken (cage) manure is OK, but chicken litter with sawdust is not]* Has too much potash in it. Keep your potash **off your legumes** and grasses.

SKOW: Magnesium, pound for pound, can raise the pH up to 1.4 times higher than calcium. A soil high in magnesium and low in calcium can test above 6.5, but will be entirely **inadequate for the growth of alfalfa, for the growth of legume bacteria**, and above all, for maintenance of an environment necessary to decay organic crop residues into humus.

SKOW: This man [professor Albrecht] of classroom and laboratory, a born teacher, knew, too, that contrary to early admonitions that **legumes "left the soil better than they found it**," wasn't always true. Legumes, overdone, could — instead of leaving the soil with an abundance of stored nitrogen — leave it as impoverished as a share-cropper's land following a life-time of following a "one-crop system." ☑ **NOTE:** *Although it is easy to visualize Skow's point, do notice that it is not in line with Reams' "no rotation" suggestions.*

WHEELER: Sulfur is needed in protein and amino acid formation, in the **formation of nodules on legumes**, and in many other plant processes. It is also used, both in combination with a calcium product or by itself, to make calcium energies available to plants.

WHEELER: If the plant is **a legume, such as alfalfa**, clover, soybeans, peas, or dry beans, root examination should include nodule observation.

RETURN TO TOC

LETTUCE

AG LECTURES: There are certain crops that need a lower temperature than others, i.e. cabbage, **lettuce**, escarole, romaine, onions, English peas, garden peas, radishes, beets.

AG LECTURES: What causes the cabbage **or lettuce** when you cut it off at the ground to have a hole in the bottom? Student: Boron deficiency.? Reams: What is the best way to get boron onto your fields? Student: Chicken manure? Reams: Chicken manure is very rich in boron – yes.

AG LECTURES: Reams: Would you ever use manganese on cabbage or lettuce? Student: No. You're not working toward seed. Reams: That's right. You only use it where you're growing a mature seed. Would you use it on green beans? You would, yes, if you don't you'll have skinny looking beans. Yes, you need it in the beans, because nature is trying to leave offspring there. But in the cabbage you just want the head of it. You don't want it to bolt. Otherwise it will burst open and go to seed the same day it heads up almost. I've seen **lettuce bolt almost before it heads up** because there was too much manganese in the soil.

AG LECTURES: You certainly want to use **anionic plant food on lettuce**, cabbage, cauliflower, broccoli. You want to use anionic plant foods on those.

BEDDOE: What is not realized, is that hollow stems on grasses and forage crops, such as alfalfa, are not normal. It is an expression of phosphate of boron deficiency. In fact any hollowing of stems **such as in lettuce** and the hollow black centers of potatoes is a boron deficiency.

BEDDOE: On crops that are grown for their leaves or stalk, such as cabbage, **lettuce**, celery, grasses, etc., you use nitrate nitrogen.

BEDDOE: On crops such as cabbage, **lettuce**, grasses, or anything that is grown for the leaves or stalk, the nitrogen needs to be of the nitrate type. If the wrong type of nitrogen is used and the soil is unable to switch it properly, then these type of plants will
go to seed instead of continuing the leafy growth.

ENERGY RESEARCH: You want leaves early in the spring for your corn, soybeans, **lettuce, romaine lettuce**, cabbage or anything where you want growth. Even on your small grain, you want growth and that is when you use your nitrate nitrogen. That is why it is important in your spray formulas to have some form of nitrate nitrogen.

ENERGY RESEARCH: When you build a spray for leaf crops you don't want to be adding manganese to it unless you are raising it for seed. Leaf crops would include spinach, **lettuce**, cabbage, cauliflower, and broccoli, things like that.

FOLIAR SEMINAR 1983: On cabbage cauliflower, broccoli, strawberries, **lettuce**, and others, keep manganese low or they go to seed.

FWTK: On crops grown for their leaves or stalk such as cabbage, **lettuce**, celery, grasses, etc., nitrate nitrogen should be used.

PLANT FEED 1976: If manganese is too high in the cabbage or **lettuce field**, it will go to seed long before it heads up.

SKOW: Sodium nitrate isn't used too often anymore. It is used more in the food industry and the price has taken it out of the marketplace. It is a negatively charged element. It would **prove useful on lettuce**, celery, spinach and cabbage crops.

SKOW: Some farm crops go directly to the dinner table. In crops where the calcium has been replaced by potassium---**lettuce**, broccoli, Brussels sprouts, spinach---this potassium-calcium imbalance causes heart trouble and kidney disease. Using the conventional N-P-K fertilization program, agronomy puts too much potassium in the system, and not enough organically soluble calcium.

WHEELER: Alfalfa, **lettuce** or spinach that goes to blossom or bolts early indicates a fertility imbalance situation that may be worsened by weather extremes.

RETURN TO TOC

LIME

ADVANCED AG: If everything starts to rot its too much sulfur **not enough lime**.

ADVANCED AG: Add soft rock phosphate **before lime** to prevent moisture loss via magnetism of carbon.

ADVANCED AG: **Add lime** if your manure slurry pit is anaerobic.

ADVANCED AG: Maple syrup trees benefit from phosphate, **lime**, and Sul-Po-Mag.

AG LECTURES: Just ask the person who is **selling lime**, he has an analysis on it. Tell him you want Agricultural lime –calcium carbonate or calcium oxide or basic slag.

AG LECTURES: Calcium hydroxide is the **hot lime**.

AG LECTURES: Reams: Name 3 sources of getting carbon into the soil? Student: Sawdust? Reams: Sawdust is one, what's another one? Student: Grass roots? Reams: Grass roots is another, or crop roots. What's the third one? Student: What about your carbonates? **Your lime?** Reams: Yes, but I was thinking of all of your carbonates, lime. It just **goes in with the lime** as carbonates. These are factors that you need to know and use and measure.

AG LECTURES: Student: If you find the **agricultural lime** in the area is of the dolomite strain, would you use the dolomite? Reams: Don't use it. Student: Where do you go from there? Reams: If you can not get it [non-dolomitic lime] from your area, you may have to have it shipped in from Florida or somewhere else. Just don't use dolomite.

AG LECTURES: Student: Suppose you didn't have any gypsum and you wanted to make some. How would you do it? Reams:

Sulfuric acid and calcium. Yes, just hydrogen peroxide. **Pour it on some lime**. Quick and easy isn't it?

AG LECTURES: Or you can buy **burnt lime** because anytime you burn lime you burn the magnesium out of it.

ANDERSEN: Adding **high-calcium lime**, one in which the calcium carbonate component is extremely dominant to a high-magnesium soil might actually lower the pH. This can also happen in high-sodium soils.

ANDERSEN: The term "**hydrated lime**" means that calcium oxide (CaO) has had water added to it to get Ca(OH)2. Its proper name is calcium hydroxide. Dehydrated lime, burnt or calcined lime has had the water removed and is termed calcium oxide (CaO).

ANDERSEN: Calcium oxide, (burnt, dehydrated, or **quick lime**) CaO.

ANDERSEN: Calcium carbonate (CaCO3), though not technically considered an organic chemical, is preferable to **dehydrated lime** (**calcium oxide, CaO**), hydrated lime (calcium hydroxide, Ca(OH)2), or even gypsum (calcium sulfate, CaSO4), if one is seeking the nutrient calcium.

ANDERSEN: **Sugar-beet lime**—fair [calcium source], depending on area of the county and the soil it is going on; inferior to CaCO3.

BEDDOE: Calcium oxide: (also called **unslaked lime** or quick lime) CaO, dry powder, 71% pure calcium, anionic. This is really hot lime. It can burn plants.

BEDDOE: **Beet lime** is a high grade calcium carbonate **limestone flour** that has been used in the sugar beet processing during sugar making.

BEDDOE: When buying **lime**, the farmer has to be on guard against buying dolomitic lime. Some states allow the packaging of dolomite under the label called "Agricultural lime." So be careful what you purchase. For a lime to be acceptable, it is best to have a magnesium content less than 5%.

BEDDOE: Colloidal phosphate will prevent calcium from leaching down in the soil. Every ton of soft rock phosphate will pick up and hold in the topsoil **6 tons of lime**.

BEDDOE: The fertilizers that are applied will stay there until the crop uses them up. In a good fertilizing program, this is the reason that soft rock phosphate **and lime** should be applied first, before any other elements.

ENERGY RESEARCH: Student: How do you get the potassium down? Skow: **Add lime**. It is very strange how it will come into line. When the potassium goes down and the lime comes up a very interesting phenomenon happens. For some strange reason the weed problems you've been having are no longer a problem.

FOLIAR SEMINAR 1983: Plow roughly with moldboard plow in fall, **adding lime** & phosphates. This will double the root zone.

FRANK: **Limestone rock** can be heated by fire. This drives off the carbon and leaves a very fine powder: calcium oxide.

FRANK: The Morgan soil test has concluded time and time again that gypsum [calcium sulfate] is not the tool of choice to raise a low calcium soil. It flat out doesn't work. **Limestone works very consistently**. This information doesn't show up when using a Mehlich 3 soil test.

FWTK-pH: Some **forms of lime** are slow acting and some become water-soluble very quickly.

PLANT FEED 1976: Another way [to eliminate excess chlorine] is to **add high amounts of lime** - 8-9 tons of lime per acre and oxidize the chlorine. The number of pounds of chlorine in your soil can be oxidized by the correct number of pounds of **ordinary agricultural lime**, but. never use dolomite.

SKOW: This is one time when it is important to know the pH. In this case, the way to drop the ERGS is to **add lime**.

SKOW: The next calcium on our roster is calcium carbonate---generally known as **ag lime**.

SKOW: A warning is in order — again! Always get a sample from the quarry, and be certain the delivered product is the same as the sample. **Some lime materials are toxic**.

SKOW: Generally speaking, **lime from the pits means ag lime**.

WHEELER: **Quick lime**, CaO (46°/o Ca) — Also called calcium oxide, this dry product is very fast acting, contains readily available calcium and is loaded with energy. Use with caution or you can burn crops.

RETURN TO TOC

HIGH-CALCIUM LIME

ANDERSEN: Adding **high-calcium lime**, one in which the calcium carbonate component in extremely dominant to a high-magnesium soil might actually lower the pH.

ANDERSEN: The major conceptual aspects of Reams's teachings involve the use of fertilizers. Reams advocated applying several tons of **high-calcium lime** and a ton of soft rock phosphate per acre, as well as several tons of chicken manure.

ANDERSEN: Reams noticed that two lots of the same kind of material, such as two different sources of **high-calcium lime**, can have different energy levels.

ANDERSEN: In most of the cases where calcium is listed as a correcting material for the weed, the first choice of material to provide this is **high-calcium lime**, calcium carbonate, which should preferably be applied in fertilizer quantities, e.g., 100 to 300 pounds per acre, on a regular basis.

BEDDOE: Remember [when blending fertilizers to] use the best filler available and that may be just plain white sand. Beet lime or **high-calcium lime** could be used also for the added benefit of the calcium.

BEDDOE: Basic slag is a good liming material, unfortunately it is not as readily available as it used to be. It is a by-product of the steel making industry. If available it takes only 500 lbs. to equal the effects of 1 ton of **high-calcium lime**.

BEDDOE: Such items as **high-calcium lime** contain carbonates that become sources of available carbon.

FRANK: Carbonized limestone starts with finely ground, **high-calcium limestone**. To that is added a small amount of powdered humates, some sugar, and some liquid humates.

SKOW: That is why **high-calcium lime** is indicated, one with no more than 5% magnesium evident in its test content. A good calcium source is calcium sulfate, better known as the compound gypsum. Calcium nitrate is an excellent source of water soluble calcium for spray application or touch up work. It is usually too expensive to be a whole source of calcium.

SKOW: Even farmers who use generous amounts of compost on their crop acres still need **high-calcium lime** because it just isn't there, pH notwithstanding.

SKOW: These lessons were not lost on Reams. His native Florida inspired a memorable response to the question, And what do you think about soil in Florida? The answer: It would be a good place for some! Many of the acres he engineered were little better than Albrecht's naked colloidal clay. They were white sand, and as an agricultural engineer he had literally to titrate on the needed nutrients in the right balance. During most of his life he was guided by the Morgan Universal Testing Systems and the LaMotte procedures. The first thing he did was apply approximately one ton of soft rock phosphate. In those days the cost was $5 to $10 a ton. The next thing he did was apply **high-calcium lime**, and then he usually laced the fields with several tons of cage layer chicken manure, not broiler litter. To set this complex assortment of soil nutrients and microbial food in motion, he added 200 pounds of

ammonium sulfate per acre. That was his plan, to build a base magnetic field over the soil and to enhance life in the soil. In other areas of the country, soils are much better than blowsand, and therefore the fertility management program of necessity has to be different.

WHEELER: Grasses can be brought under control by raising biologically-active calcium levels. **High-calcium lime** and liquid calcium are excellent ways of raising calcium levels.

WHEELER: What lime do I use? The first choice, in most situations, would be a fine grind of a **high-calcium lime** with as little magnesium as possible.

WHEELER: High-calcium lime can be applied at most any pH, but is usually reserved for a pH of 7 or below. When the pH is above 7, gypsum (calcium sulfate) is preferred. This assumes that the high pH is due to sodium, magnesium or potassium. If the soil really is calcitic (very high in calcium), then the additions of sulfur forms other than gypsum would be best.

RETURN TO TOC

MAGNESIUM

ADVANCED AG: [**Excessive] magnesium** is the most expensive thing to fix.

ADVANCED AG: Spray sulfuric acid to fix **magnesium problems**.

ADVANCED AG: Legumes are better in magnesium soils, however **don't add magnesium to legumes**.

ADVANCED AG: Skow: Close mowing peas (legumes) in an orchard with dolomitic soil will put a glossy sheen on the leaves by **releasing magnesium** to the air.

AG LECTURES: You who can get basic slag from the iron mills, it is an excellent product, even though they may use dolomite. It's perfectly alright to use it, because the heat of the red hot iron **burns the magnesium out of it**. Or **you can buy burnt lime because anytime you burn lime you burn the magnesium out of it. So you have nothing to fear in that.**

AG LECTURES: In dolomite **you have your magnesium** and you have your calcium. Those 2 things are together, but they are separate. They're not bonded together.

ANDERSEN: Reams used calcium carbonate, never dolomite. He observed that **sufficient magnesium would be available** if he balanced the calcium, phosphate, and microorganisms and then applied fertilizer quantities of Sul-Po-Mag.

ANDERSEN: Adding high-calcium lime, one in which the calcium carbonate component in extremely dominant to a **high-magnesium soil** might actually lower the pH. This can also happen in high-sodium soils.

ANDERSEN: People often blame compaction on heavy equipment and frequent traffic across the soil. These things do cause compaction of soils with **calcium-to-magnesium ratios of less than 7:1**. They do not cause compaction of soils with calcium-to-magnesium ratios of 7:1 or more and less than 70 parts per million of sodium. Compaction is a phenomenon of physics (particle attraction/repulsion) and aeration.

BEDDOE: Yes, **magnesium is a necessary mineral** in the function of the plant, but the **plant can usually get all the magnesium it needs just from the atmosphere** when the TDN is at an adequate level.

BEDDOE: Many assume that it is necessary because **magnesium is used in the making of plant chlorophyll**, and many see a response when they add it to the soil. So it may be difficult for some to accept the fact that the problem with magnesium is usually that it is used in excessive amounts in soil applications. Yes, magnesium is a necessary mineral in the function of the plant, but the plant can usually get all the magnesium it needs just from the atmosphere when the TDN is at an adequate level.

FOLIAR SEMINAR 1983: Magnesium is a no-no because plants get all they need from the air and it is such an enemy of nitrogen.

FWTK: Furthermore, healthy plants take a large part of the trace elements they need from the air. **They supply magnesium**, manganese, zinc. cobalt, copper, sulfur and boron in this way. Soil must contain proper mineral levels for this process to take place.

FWTK: Therefore, iron IS heavier than aluminum, manganese IS **heavier than magnesium**, and iron will float on boiling lead.

PLANT FEED 1976: Dolomite is a calcium oxide and **magnesium oxide** *[mixture]* containing approximately 35% magnesium oxide.

PLANT FEED 1976: Student: Yesterday you said that the plants **breathed their magnesium from the air**---which carries the most magnesium, hot air or cold air? Reams: It doesn't make a lot of difference. Maybe I can aneuer your question by asking one. Which air carries the greater electrical charge, hot or cold? The cold air does. Does that answr your question?

REAMS/SKOW COOK: Red beets have something besides calciums, they are **quite high in magnesium**. So is watercress. Watercress has high magnesium in it, and so do some mangoes.

SKOW: The other **key to the success of this spray program is the use of magnesium sulfate** which speeds up metabolic processes and helps make sure there is enough magnesium for the chlorophyll molecule to keep the process of photosynthesis rolling to produce simple sugars.

SKOW: An unbalanced equilibrium of calcium and **magnesium** permits organic residues to decay into alcohol, a sterilant to bacteria; and into formaldehyde, a preservative of cell tissue.

SKOW: A soil **high in magnesium** and low in calcium can test above 6.5, but will be entirely inadequate for the growth of alfalfa...

SKOW: My formula follows: Put in water, a humate, calcium hydroxide, **magnesium sulfate**, Bo-Peep [ammonia], a special amine compound, castor oil, sodium carbonate and water — it has to be distilled water or good reverse-osmosis water — and seaweed extract.

WHEELER: **Magnesium is antagonistic to nitrogen** as seen in the use of Epsom salts as a treatment for nitrate poisoning in cattle or an Epsom salt spray on fruit trees to stop apple drop due to nitrate-weakened stems. When the magnesium releases from dolomite, it can cause nitrogen to release as a gas.

WHEELER: A soil left undisturbed will stabilize from the top down in the following layers: carbon, **magnesium**, phosphate, potash, sulfur, aluminum, manganese and calcium.

SUCROSE: An oversupply of **water-soluble magnesium** displaces carbon in the protein molecule and converts nitrogen into a gas, thus decreasing the probable protein molecule count which decreases sucrose yield.

NOTE: *Magnesium sulfate is highly soluble in water whereas calcium sulfate (gypsum) is only moderately soluble in water. It is important to remember this when listening to Reams talk about the necessity of liming dolomitic soils (i.e., high magnesium). He is trying to help the student understand how to let nature (via rain) remove some of the excess magnesium.*

RETURN TO TOC

MAGNETISM

NOTE: *Reams' use of "magnetism" is far more inclusive than a simple horseshoe magnet might imply. Remember that one of his fundamental teachings is that LIKE ATTRACTS LIKE, the exact opposite of high school teaching. Many of Reams' magnetism comments concerned creating a foliar feed that would be attracted to plant leaves, particularly the underside where the stomta are. To this end he envisioned plant sprays containing nitrogen and being drawn to plant leaves which always contained nitrogen. Think simple stickiness and you will have the idea.*

ADVANCED AG: Add soft rock phosphate before lime to prevent moisture loss which is slowed via **magnetism of carbon**.

ADVANCED AG: If your topsoil is properly **magnetized**, you do not need to worry about losing nitrogen---it will stay there.

ADVANCED AG: If your soft rock phosphate and lime are put on properly, you can chisel plow without harming your **magnetism**.

ANDERSEN: Any time electricity is considered, **magnetism must also be considered** because it is inherent in every electrical field. When an electrical current (I) is generated, a magnetic field also is generated.

BEDDOE: While conductivity (ERGS) tells quantity, pH tells speed **and magnetism**.

BEDDOE: Since nitrogen is an electrolyte, remember to not band it close to the plant. The electric fields need to be kept away from the plant, so that **the magnetism is away from the plant**. This will assure that the roots are drawn out into the middle of the rows.

FOLIAR FEED 1981: Adding 10% saltwater (ocean water) to the tank before adding any other ingredients will **increase the magnetism** (stickiness).

FWTK: There is an electrical charge passing over the face of the earth, from the south **magnetic pole**, southeast of Capetown, South Africa, to the north magnetic pole, just below the Hudson Bay. This charge runs over and through the crust of the earth. It is this charge that moves the needle of a compass, and it is the same force passing through the earth that attracts ionized plant food inside the seed.

SKOW: When we increase carbon, the soil becomes more **magnetic**.

RETURN TO TOC

MANGANESE

ADVANCED AG: Albion labs achieved significant crop increase with **manganese chelate**.

ADVANCED AG: **Manganese is the element of life** and raises electrical charge in the seed.

ADVANCED AG: **Manganese availability** can be dependent on adequate calcium.

AG LECTURES: You **only use it [manganese] where you're growing a mature seed.** Would you use it on green beans? You would, yes, if you don't you'll have skinny looking beans. Yes, you need it in the beans, because nature is trying to leave offspring there.

AG LECTURES: Do you know one reason so many small grapes fall off the pod is because there is not enough manganese for all of them? **Not enough manganese**.

AG LECTURES: On corn, wheat and soybeans, there's one other ingredient you should use on any crop that you're growing for the grain. It's manganese. **Manganese is the element of life** and without manganese there's not any life. Therefore the lack of manganese can cause a great loss of yield in the long run. So it's a good idea to add manganese to your nutritional spray.

ANDERSEN: According to Reams' concept of energy, calcium is classified as the kingpin of growth (anionic) energy and **manganese is classified as the kingpin of fruit (cationic) energy**. People consequently assume that these materials must be separated and applied at distinctly different times. The point to remember is that every cell of every living organism requires both growth and fruiting energy. Every living cell needs both calcium and manganese. Consequently, manganese is needed to get healthy growth, and calcium is needed to get healthy fruit.

ANDERSEN: Carbon Strata No. 1, Magnesium Strata No. 2, Phosphate Strata No. 3, Potash Strata No. 4, Aluminum Strata No. 5, Zinc Strata No. 6, **Manganese Strata No. 7**, Iron Strata No. 8, Copper Strata No. 9, Calcium Strata No. 10. These rankings were given by Carey Reams in his short courses.

ANDERSEN: Manganese activates a number of enzymes, including some related to photosynthesis, and is an important component in chloroplasts. **Manganese brings the electrical charge into the seed**, creating the magnetic force to draw the other elements into the seed. Manganese seems to be closely correlated to iron and copper; it is very important for seed quality and germination.

BEDDOE: **Without manganese there would be no reproduction** in any of the species on this earth. This is because the germ's ability to function is absolutely dependent on whether or not a phosphate form of manganese has been made available during seed development. Any seedless fruit is seedless because of the lack of phosphate of manganese, either due to its lack in the soil or because of the unique genetic characteristics of the bud union preventing the passing of phosphate of manganese into the plant

BEDDOE: Amount [of manganese] per acre that should show in the soil test is approximately **2-3 lbs.per acre.**

BEDDOE: **Manganese Deficiency**: Split pit development in stone fruit, Sunken eyes in potatoes, Poor seed development. An excess will cause plants that are being grown for leaves to bolt.

ENERGY RESEARCH: What can you use in place of an iron chelate? You use iron sulfate solution. Just take your time and take the iron sulfate or **manganese sulfate** and mix them in water first. Then put them in you spray tank and you will be alright and it's pretty hard to do the harm I talked about using the chelates.

ENERGY RESEARCH: Manganese Sulfate and basic slag are excellent materials for getting **manganese into the soil on a long term basis**.

ENERGY RESEARCH: Student: How long or how many times can you use **manganese**? Skow: This product you can use practically every time you spray on any crop that you want to harvest the seed.

FOLIAR FEED 1981: Bell peppers have a "placenta." This requires **manganese.**

FRANK: Avoid using nutrient elements compounded as carbonates or oxides. Examples of carbonates: calcium carbonate, iron carbonate and copper carbonate. Examples of oxides: **Manganese oxide**, iron oxide and copper oxide.

FRANK: That evening I listened to an old cassette from Dr. Reams and here is what he said in paraphrase: "**You shouldn't eat a seedless watermelon because they are deficient in manganese**. They are bred to block the entrance of manganese into the melon. This lack of manganese is what causes the melon to be seedless. Actually the roots do pick up manganese but there is a blockade that will not allow the manganese to enter the plant. In order to get rid of the manganese, plants dissipate it into the melon as heat energy."

FRANK: When considering the overall influence of growth vs. fruiting energy in soil, the primary reproductive energy comes from phosphorous. **Manganese gets honorable mention**, but phosphorous is the big one.

FWTK: In seedless watermelons or grapes, the stump of the plant **will not allow manganese** to go out into the fruit, because of its micronage. Because there is no manganese the fruit will not have seeds, as manganese is required to make them.

FWTK-pH: Therefore, iron is heavier than aluminum, **manganese is heavier than magnesium**, and iron will float on boiling lead.

PLANT FEED 1976: You want your good plant to reach its climax of nutrients at the stage you wish to eat it, i.e. cabbages grown correctly **should be low in manganese.** If manganese was too high in the cabbage or lettuce field,

it will go to seed long before it heads up.

REAMS/SKOW COOK: Also eat bell peppers – rich, rich, rich source of vitamin A, very rich. Also keep the seed and add to soup for **manganese**. Excellent, excellent foods raw.

SKOW: One of the biggest problems in maintaining nut trees is the failure to keep enough **phosphate of manganese** available to the tree. The best and cheapest way to supply these nutrients is via foliar spray.

SKOW: If we have one pound of manganese per acre, it may take 500 pounds of calcium to serve up the energy needed to capture that manganese. A low test weight on a crop means that the soil was not working correctly to **capture the necessary manganese**.

SKOW: Manganese is a prime requirement for getting a good seed fill. This is especially true for stone fruit, peaches and apricots, for instance. Housewives who purchase grocery store fruit often encounter rotted centers, always a **sign of manganese deficiency**. Foliar application can prevent the problem. Manganese sulfate will do, but the key is its mix with phosphoric acid. Application must be started a year ahead of time.

SUCROSE: Unless the **manganese joins with phosphate**, growth cannot continue. Phosphate of manganese forms the seed in all forms of life. When the conditions for reproduction cease, growth stops. The plant takes in manganese for seed only in the form of phosphate of manganese.

WHEELER: In the soil, some nutrients tend to rise while calcium and others tend to move downward. A soil left undisturbed will stabilize from the top down in the following layers: carbon, magnesium, phosphate, potash, sulfur, aluminum, **manganese** and calcium.

WHEELER: Seed **lacking in manganese will often rot** in the soil rather than sprout.

RETURN TO TOC

MANURE

ADVANCED AG: Some sources of carbon: sawdust, **manure**, calcium carbonate, sludge, compost, roots, green manure, etc.

ADVANCED AG: Add lime if your **manure slurry** pit is anaerobic.

ADVANCED AG: One ton per acre of good compost will equal about three tons of **raw manure**.

ADVANCED AG: It is possible to ammoniate a grove by creating nitrification via adding **chicken manure** if the chlorides are too high. This is dependent on the moisture status.

AG LECTURES: Reams: What is the primary benefit of adding compost over manures whenever you disc them in or plow them under. Student: It is immediately available. Reams: That's one thing, but what is the something else I am trying to get across to you? It doesn't burn the plants. The **raw manure creates a heat in the soil**.

AG LECTURES: Student: If you're applying your **chicken manure** to your soil, would it make any difference in the amounts you put on for corn, peanuts or soybeans? Reams: No it doesn't. Just put down what you can afford. If you're using the litter, use about 4 tons to the acre, but if it's **cage manure**, one ton to the acre or ton and a half to the acre. I am talking about the dry or comparatively dry that stacks up under the cages.

AG LECTURES: Student: What is the best way to get boron onto your fields? Reams: **Chicken manure** is very rich in boron.

AG LECTURES: Student: So you're taking land that's 0-0-0 trace 0 and you're putting this on, first phosphate, calcium, potash, **chicken manure** in that order, then you should plow it in right? Reams: Yes. That is for farm crops, but not on orchards or groves. Do not disc in any of the fertilizer in orchards or groves.

AG LECTURES: Student: If you don't disc compost or manure in, the sun takes the value out of it, right? Reams: Not the chicken manure it doesn't. **The sun does not destroy the nutrient of manures**, but it does of compost.

ANDERSEN: An area may have much organic matter but very little actual humus because humus formation requires plenty of oxygen and energy for the correct microorganisms to work properly. If these conditions are not met, the crop residue, **manure**, and other organic materials are simply converted to ashes, alcohols, aldehydes, or other non-humus compounds.

ANDERSEN: Reams advocated applying several tons of high-calcium lime and a ton of soft rock phosphate per acre, as well as **several tons of chicken manure**. These recommendations are conceptual relative to today's applications. They were developed several decades ago in different conditions from today's. Experience has shown that if smaller amounts of these materials are applied, we often get better results.

ANDERSEN: In any event, keep the materials in the aerobic zone for maximum effect. **Keep the raw manure to a minimum**. If you farm in the west, buy compost rather than manure. If you farm in the Midwest or East, make compost or at least treat your liquid manure before applying it to the soil. Manure must be composted in the soil, if not before. This takes energy, microorganisms, calcium, and oxygen, which, for the most part, are scarce in most soils. Manures also add salt, which is another burden to the soil.

BEDDOE: In a soil with 500 pounds per acre of chloride, **chicken manure should not be used** on the ground. The

chicken manure is high in boron and with lack of plenty of water the stage would be set to convert ammonia nitrogen to nitrite nitrogen. If this were to happen it would severely burn the roots of any plants in the soil.

BEDDOE: In the absence of a source of **good chicken manure**, a second-best is the use of cover crops and soil innoculants.

BEDDOE: Some, I am sure, will wonder what the difference is between steer manure and cow-dairy manure. The **cow-dairy manure is usually a better manure** for two reasons. One is the way the cows are fed, and two, this manure usually has much higher levels of urine residues which cart carry higher levels of phosphate.

BEDDOE: Fertilizing with manures is the preferred method in the ionization program, then testing soils to discover their deficiencies, and using synthetics to make up the difference.

BEDDOE: Cow manure is lowest in nitrogen, but tends to be much higher in carbon complexes that stimulate bacterial action and water holding capacity which will increase nitrogen over period of time. **Chicken manure** is usually the highest analysis of all the manures available.

ENERGY RESEARCH: Manures in general have a tendency to acidify the soil and ideally for most crops we like the pH in the 6.4 6.8 range. The reason is that when you get into that range, your nitrous ammonis bacteria become active and take nitrogen from the air.

ENERGY RESEARCH: Boron is used when there is a problem with hollow stemmed crops and hollow heart or black heart. The safest form is **chicken manure**. Calcium should be used with it.

FRANK: Compost and manure are actually potent suppliers of potassium to the soil. When compost is over-applied, potassium rises to become excessive. When potassium is excessive, calcium is hindered and results in poor quality produce. When potassium is excessive [as shown by soil test], **do not apply compost or manure**...period.

FWTK: Potash can be supplied from many sources. Some of the good ones are sulfate of potash, Chilean nitrate of potash, hardwood ashes, tobacco stems, pecan hulls, rice hulls, sawdust, wheat or oat straw and **chicken manure**.

FWTK: Reams recommends **fertilizing with manures**, then testing them [the soil] to see their deficiencies, and using synthetics to make up the difference.

GARDENING: One of the easiest, cheapest, most economical fertilizers today to use in farming and gardening most crops is **chicken manure**. It's always available and plentiful. It's very rich in nitrogen and potassium and in practically all the minerals.

PLANT FEED 1976: Student: Would you use **chicken manure** on citrus? Reams: Yes, but never dig it in. Leave it on top of the ground.

PLANT FEED 1976: I advise putting **chicken manure raw on the soil** if your soil analysis shows your calciums, phosphates, and potash are where they should be and won't go out of kilter.

PLANT FEED 1976: *[Reams explains how **chicken (cage) manure is OK**, but chicken litter with sawdust is not]* Has too much potash in it.

SAIT: Graeme: Yes, it's much the same with compost production. Your compost will only be as good as the ingredients it contains. The home gardener's lawn clipping compost is a prime example. If they were to add rock phosphate, humic acid, **animal manure** and molasses to the clippings, their end compost would be far more productive.

SKOW: Potash can be obtained from many things. Some good sources are sulfate of potash, Chilean nitrate of potash, hardwood ashes, tobacco stems, pecan hulls, sawdust, wheat or oat straw, and **chicken manure**.

SKOW: Plant foods that cause seed production are ammoniacal nitrogen, phosphorus, metal trace nutrients, **manures** and composts.

SKOW: The animal **manure that yields the most humus** for the soil is the one provided by the bovine species. This is because cow and steer manure has a fiber content that is not broken down as much as, say, pig manure.

SKOW: Poultry manure from caged layers (not litter) has lots of trace minerals, but it is low in carbon content. This means application to a low organic matter soil could worsen the situation even though there are a **lot of bacteria in the manure**. Bacteria without food soon die out.

SUCROSE: Keep the applied plant food, before it forms into protein, in ratio with the amount of water present in the soil. When there is too much water, the plant food protein forms much more slowly and the result is less available plant food in storage. When there is not enough water, **raw manure salts** may burn the roots.

WHEELER: A good suggestion would be to cut and leave the last crop of an alfalfa field each fall as an additional humus builder or **apply manures**.

WHEELER: Reams recommended the use of **poultry manure** because of its microbial content. Other manures can be beneficial, depending upon the condition of the manure. If possible, compost the manure before using it.

NOTE: *It appears a few of Reams' disciples are reluctant to follow his thoughts on manure. Jon Frank may have*

it right with his warning to avoid potassium-rich manure if the potassium level is already testing high. Another key point is that Reams is quite clear that raw manure should be composted if the intent is to dig it in. If it is to be left on the surface (his preferred method), then several weeks should pass before planting.

RETURN TO TOC

MANURE, GREEN

ADVANCED AG: Some sources of carbon: sawdust, manure, calcium carbonate, sludge, compost, roots, **green manure**, etc.

BEDDOE: Cover crops not only have good top growth for **green manure** for turning back in the soil, but also have large and prolific root systems that are rich in carbons.

BEDDOE: Drainage problems may have to be addressed in some dry land areas where alkali mineral salts have been accumulating. The best solution is to try and establish drainage and then use **heavy green manure** crops. As the bacteria and carbons increase in number and activity, the salts will be taken out of solution and no longer be a problem.

BEDDOE: Excess magnesium can be reduced by liming to keep it in an oxide form so it is insoluble. Also **green manure legume crops**, such as peas, can be of help.

WHEELER: These cover crops, also known as "**green manure**" crops, are important in many ways other than just their nitrogen-fixing abilities.

WHEELER: The alfalfa farmer is returning nothing [to the soil] while the corn farmer is returning only the root mass developed during the year. This is poor organic matter practice, and it is why recent emphasis has been given to growing cover crops which will at least provide a **green manure to return to the soil**. A good suggestion would be to cut and leave the last crop of an alfalfa field each fall as an additional humus builder or apply manures.

WHEELER: These cover crops, also known as "**green manure**" crops, are important in many ways other than just their nitrogen-fixing abilities.

NOTE: *Not all Reams-Ag consultants freely use "green manure" as a term. More than likely, some, apparently Reams himself, used "cover crop" while thinking of the benefits of green manure. See COVER CROP*

RETURN TO TOC

MICROBIAL

ANDERSEN: Phosphate will generally remain fairly stationary in the soil unless it is in a water-soluble form, which can leach out. Combine this with a sugar to help stabilize it and make it more **inviting for microbial assimilation**.

ANDERSEN: As a result of wrong agricultural practices and crop rotation, the soil becomes infested with **harmful microbial forms** [emphasis added].

ANDERSEN: Salts create a hypertonic, dehydrating environment, which draws water out of the cells, thereby **stopping the microbial growth** or even killing the microbe.

BEDDOE: Use only products that **improve the microbial life** in the soil as well as feed the crop,

ENERGY RESEARCH: If there is a carbon deficiency there is a C02 deficiency which will result in a carbohydrate deficiency and an oxygen deficiency which will result in **decreased aerobic microbial life** which will result in increased toxicity, reduction of carbon cycle and finally sterile soil, loss of the magnetic field, and a favorable environment for all types of pests both above and below the ground.

FRANK: Limestone is the main form of calcium to raise low levels of available calcium. One drawback is the **need for microbial digestion**.

FWTK: Some techniques for aerating the soil have yielded significant bushel increases, because they are **improving the microbial life** in the soil.

SAIT: Andersen: For example, using liquid calcium with Vitamin B12 and sugar is primarily a chemical catalyst to make calcium available, but **introducing a microbial** or enzyme-based material is a biological catalyst.

SAIT: Andersen: It is possible to build a good biological system **without a microbial inoculation**, simply by the use of fish, seaweed, humic acid, composts and sugar.

SKOW: The first thing he *[Reams]* did was apply approximately one ton of soft rock phosphate. In those days the cost was $5 to $10 a ton. The next thing he did was apply high-calcium lime, and then he usually laced the fields with several tons of cage layer chicken manure, not broiler litter. To set this complex assortment of soil nutrients **and microbial food** in motion, he added 200 pounds of ammonium sulfate per acre.

SKOW: Trillions, maybe even quadrillions of **unpaid microbial workers** are the key to the organic matter, humus, carbon, fertilizer equation, with the much maligned anerobes *[anaerobes?]* leading the way.

SKOW: I have found that as you bring the phosphorus-potassium ratio in line, there are fewer weeds, better aeration

and **more microbial life** figures.

WHEELER: Through continued use of this soil "killer," [*chlorine*] the desired **aerobic microbial life** has been seriously depleted and/or changed in character.

WHEELER: The air *[introduced by cultivation]* assists the development of root mass and **supplies microbial life** with needed oxygen.

WHEELER: Another approach would be to add compost or manure to **stimulate microbial action** on the calcium.

WHEELER: When nutrients are low on a CEC test they usually need to be added. When the calcium percentage shows less than 60 percent, many (most?) **microbial products**, including humic acid, don't work that well. Microbes need calcium to live. ☑ **NOTE:** *Reams-Ag does not measure calcium as a "percent."*

RETURN TO TOC

MINERALS

ADVANCED AG: Brix is a shortcut to measuring your **mineral content**.

ADVANCED AG: Alfalfa takes more **mineral** from the air and requires less potassium from the soil.

ADVANCED AG: You **get your mineral high** enough for Napier grass and you won't have to buy any fertilizer or sprays for 20 years.

AG LECTURES: Reams: The higher the sugar content, the **higher the mineral content** and the higher the sugar and mineral content, the less bugs you have.

AG LECTURES: Dry hay should not have a hollow stem. If it does, **it has a low mineral content**.

AG LECTURES: **There is no mineral in the sweet potato here**, it's as light as a cork. Also, there's too much sulfur in this ground and when there's too much sulfur it rots. This is Black Rot and lack of calcium in the soil is what causes it and there's too much sulfur there.

AG LECTURES: Reams: How would you **check the mineral content** of 4 foot high growing alfalfa? Student: The refractometer? Reams: Suppose you didn't have your refractometer? Suppose you were in lespedeza or corn or any other field? Student: Could you do it by checking the pith? Reams: Exactly right.

ANDERSEN: With apples, the opposite seems to occur. An apple with apple scab fungus will itself have a low refractometer reading (below 12); however, the leaves on the branch supporting the sick apple will have very high refractometer values (above 12 or even in the upper 20s). In any event, **there is a mineral imbalance/deficiency in the crop**.

ANDERSEN: During their life, plants excrete through their roots various organic and **mineral substances** which attract microorganisms.

ANDERSEN: Animals that are fed alcohol are certain to need more **mineral supplementation** which is convenient if you are selling both.

ANDERSEN: If you are using compost or manure from an animal whose diet is not mineralized as well as it should be, the manure and the subsequent compost **will lack the same minerals** that the animal does.

BEDDOE: Storage rotting that is so prevalent today, and only being treated with fungicides, could be lessened by increasing the **sugar/mineral content**.

BEDDOE: The more topsoil the roots are directed through, the better the exposure to soil **mineral energy**.

BEDDOE: This means that as an element, nitrogen will follow the line of least resistance dictated by the other **available minerals** in the soil, especially calcium.

BEDDOE: If it were not for the ocean, life would not have been able to exist for as long as it has because of the **lack of mineral distribution**.

ENERGY RESEARCH: Liquid fish is a real nice thing to use from the stand point that it furnishes oil, amino acids, some nitrogen, phosphorus, potassium, a **full array of trace minerals** and calciums.

ENERGY RESEARCH: To be successful in foliar feeding one must either [*already*] have or *[pre*]**apply the basic minerals** to the soil, those being calcium, phosphate, and potash.

ENERGY RESEARCH: You can force a lot of growth in the stalk with nitrogen (and even with calcium) and get a high uptake in the plant but **you won't increase the mineral** or raise the Brix. It still takes the phosphate.

ENERGY RESEARCH: Student: How come most of the [trace element] minerals have sulfate added to them? Skow: The **sulfate is mainly a mineral salt**, and that is the only way they are water soluble.

FRANK: Duane: If you want a full discussion of nutrient density, we're referencing foods with more nutrition, **higher both of the minerals**, the phytonutrients and even those essential sugars that science is discovering how significant the sugars are for cellular health.

FRANK: You can add taste to the tomato by **putting out other rock minerals**.

FRANK: Here is the pattern on the Morgan soil test to shoot for if nutrient density is your goal: Humus: Ignore

this---**when the minerals are right** this will automatically correct.

FRANK: We **must supply all minerals that are deficient** including trace minerals and rare earth elements that are not even measured on the soil test. These minerals must be included in the yearly **broadcast of minerals**.

FRANK: The best use of mycorrhizea is to use it on low fertility soils where **remineralizing** with phosphorous is not economical.

FWTK: Furthermore, healthy plants take a large part of the trace elements they need from the air. They supply magnesium, manganese, zinc. cobalt, copper, sulfur and boron in this way. **Soil must contain proper mineral levels** for this process to take place.

The heavier beans are the most nutritious since they **contain the most minerals**.

GARDENING: The calciums in your soil can increase the milk yield by as much as 200% and also if your pasture soils **have enough minerals** and calcium in it, whenever you put the feed in the trough to milk the cows, they won't even eat it. They'll just stand there waiting to be milked, because the grass will have so much more nutrient.

GARDENING: One of the easiest, cheapest, most economical fertilizers today to use in farming and gardening most crops is chicken manure. It's always available and plentiful. It's very rich in nitrogen and potassium and **in practically all the minerals**.

PLANT FEED 1976: When that banana puts food in each of those fingers, it will put the same amount in every one - mineral content. So if you **buy small bananas you will get more mineral** than you will buying big bananas.

PLANT FEED 1976: The weaker the sap in the plant - the **less minerals it can take in from the air**. I believe farmers are the finest doctors in the world. If you grow good produce, people are less likely to become sick. You only have one cause of illness: mineral deficiency.

PLANT FEED 1976: I want to talk to you about Hoof and Mouth disease. It's one of the easiest things In the world to get rid of. **It's a mineral deficiency. Simply a mineral deficiency** and a number of ways to handle it.

PLANT FEED 1976: That's what you can do for plants---just **don't give weeds the vital minerals** they need and you'll get rid of the plants you don't want. Nothing difficult about that is there? That's what you're here for---to learn how to keep from using poisonous sprays.

REAMS/SKOW COOK: If you would grow a highly organic – no, not organic, **highly mineralized pepper**, and then you stuff it, it will look just like you picked it off of the bush after it's stuffed. It will not wrinkle or shrink up and look like an accident waiting for a place to happen.

SAIT: Andersen: Sucrose is the primary carbohydrate in both sugar and molasses, but the difference is that there are **other minerals present in molasses**.

SKOW: Although the Brix reading is loosely called a sugar index, it is really much more. For the higher the carbohydrate content in a plant, the higher the **mineral content**, the oil content and the protein quality.

WHEELER: If the residue were cut and laid on the soil surface, the earthworms could carry some organic matter and **minerals down into the soil**. Herbicides on the crop residues, however, may disperse the earthworms.

WHEELER: This is why we suggest locating and using **free or inexpensive, nearby natural minerals** where possible. Lime or marl are part of the mineralization process and usually have to be purchased, but gravel or kiln dust may be available for the hauling. Basic slag from industry is an underused possibility.

WHEELER: Calcium can also tie up or **keep plants from taking up trace minerals** such as boron.

RETURN TO TOC

MINERAL ENERGY

BEDDOE: This alteration would be what takes place in the forming molecular substance of plants that do not have all the **mineral energy** necessary to properly supply the developing plant.

BEDDOE: The building process toward healthy soils, plants, and animals is one of increasing electro-magnetism resulting in increasing RESERVE **MINERAL ENERGY** (vital force) or maintaining high RESERVE **MINERAL ENERGY**.

BEDDOE: The aerobes [*aerobic bacteria*] in the soil convert everything possible into protein molecules. This is because they absorb **mineral energy** and chelate (link) it into their bodies amino acid structure just like your body links **mineral energy** from your food into usable amino acid chelates.

BEDDOE: The more topsoil the roots are directed through, the better the exposure to soil **mineral energy**.

BEDDOE: When this [*moldboard plowing*] is done, it will allow the phosphates along with the carbons to move toward the surface again picking up more **mineral energy** and moving to the topsoil.

BEDDOE: Plants receive their energy from two sources. First from the soil. And second from the atmosphere around it. 20% of **mineral energy** comes from the soil and 80% comes from the atmosphere. The more efficient the energy

from the soil the more efficient the plant **extracts mineral energy** from the air.

BEDDOE: The larger the plant gets, the more attraction there will be for more plant food mineral, providing the **mineral energy** is available to the plant.

BEDDOE: And of course the faster **mineral energy** moves into a plant means that the magnetic attraction for greater and greater amounts of **mineral energy** increases faster. The end result is quality.

FRANK: Plants have a special ability to combine heat energy, light/electrical energy, **mineral energy** from soils and foliar sprays, mineral particles from the air, and atmospheric sourced CO2 into plant tissue and produce.

COMMENTARY: *Dr. Beddoe, perhaps uniquely, uses the term, "mineral energy" 43 times. While the term is undefined in his "New Language" definitions, this line from Page 12 of his book indicates that he interchanges "mineral energy" with the "mineral" that Reams always used.* "In the concepts of Biologic Ionization, then, all disease is the result of a mineral deficiency or loss of mineral energy, whether plant, animal, or human. The cause is mineral energy deficiency while the effect is the disease, whether manifest in plants, animals or humans."

RETURN TO TOC

MINERALS FROM AIR

ADVANCED AG: Grass takes potassium right **out of the air**.

AG LECTURES: Remember, alfalfa has the ability to take practically **all its potash from the air**.

AG LECTURES: Just one cigarette did that because that plant [Defenbachia] cannot stand potassium. **It takes it from the air**. So whenever you see the tip point of the leaf dead and crisp and dry on the side or little black dots on the leaf, that's too much potassium for the amount of P2O5.

AG LECTURES: But compost does just the opposite, it **draws the moisture from the air** and holds it in the ground.

AG LECTURES: I told you about those tomato plants that I grew under a vacuum under glass and I measured everything I started with and in the final analysis I had **80% more in this plant than I put into it** to start with by actual measure.

ANDERSEN: Carey Reams repeatedly asserted that **plants absorb much nutrition from the air**. But they can do this only if the plant is a good conductor and if the soil acts as a good electrical ground.

BEDDOE: And it is more than just nitrogen and oxygen that the **plant takes from the air**. A vast amount of trace elements exist in the atmosphere due to the cleansing action of the oceans of the world.

BEDDOE: For example, deciduous fruit trees do not need more than a total of 40 lbs. per acre total nitrogen because they can get **most of their nitrogen out of the air**.

BEDDOE: Air is probably the most important source of the colloids. These air-borne colloids come from the oceans of the world. If it were not for the ocean, life would not have been able to exist for as long as it has because of the lack of mineral distribution. Remember that **80% of plant foods come from the air** and colloids are an important part of that.

BEDDOE: One of finest ways to add additional nitrogen to crops is through the leaves. This is called foliar feeding. Foliar feeding recognizes that **a plant takes in up to 80% of its energy for growth out of the air** through its leaves. Since nitrogen is the important electrolyte, it is important that it is present in all foliar sprays in a small amount if nitrogen is not needed in the plant, but in larger amounts if extra is needed by the plant

FRANK: Plants have a special ability to combine heat energy, light/electrical energy, mineral energy from soils and foliar sprays, **mineral particles from the air**, and atmospheric sourced CO2 into plant tissue and produce.

FWTK: [Reams grew] one tomato plant in white sand. He carefully weighed everything that went into the growing process, every gram of plant food, water and soil. After growing the plant for twelve weeks in a glass dome, he removed it. and dehydrated it in a vacuum. An analysis of the soil and plant showed that he had supplied only 20% of the increase in the plant. Through research he found that many plants have the ability to take in **nutrients from the air**.

FWTK: Furthermore, healthy plants take a large part of the **trace elements they need from the air** They supply magnesium, manganese, zinc. cobalt, copper, sulfur and boron in this way. Soil must contain proper mineral levels for this process to take place.

PLANT FEED 1976: Student: What about all the minor elements that are there? Reams: God will supply **most of those in the air**. Student: Why don't plants take more of them from the air now? Reams: They're not healthy enough. In other words, you know the sap of plants is similar to the gastric juice of people? Well, there are saps and gastric juices that are very weak. The weaker the gastric juice - the sicker the person becomes. The weaker the sap in the plant - the less minerals it **can take in from the air**. I believe farmers are the finest doctors in the world. If you grow good produce, people are less likely to become sick. You only have one cause of illness: mineral deficiency.

PLANT FEED 1976: Student: Is there any mineral the plants **cannot get from the air**? Reams: Yes, calcium,

potassium[?], phosphate, potash[?] - those are the main ones they can't get from the air.

SUCROSE: Keep plenty of water-soluble, ionized carbon so the crop will not have to depend upon its entire supply of **carbon from the air**. Keep the carbon/nitrogen ratio equalized for greatest yield of sucrose.

NOTE: *Reams claims in various places that certain crops can get all the potassium they need from the air. It is therefore strange that in* **PLANT FEED 1976:** *, he denies they can. My guess is that this is one of his famous mis-speaks that a properly prepared audience should have called him on so that he could say, as he frequently did, "Thank you for correcting me."*

RETURN TO TOC

MOISTURE

ADVANCED AG: It is possible to ammoniate a grove by creating nitrification via adding chicken manure if the chlorides are too high. This is **dependent on the moisture** status.

ADVANCED AG: Add soft rock phosphate before lime to **prevent moisture loss** which is slowed via magnetism of carbon.

ADVANCED AG: Plow in the fall to stop erosion. Plow roughly as possible so as to **retain moisture**.

AG LECTURES: Aerobic bacteria have something about them similar to what a fish does, they can take oxygen out of the water, **out of the soil moisture**.

AG LECTURES: Reams: The carbons hold the **moisture** and take it out of the air.

AG LECTURES: The raw manure creates a heat in the soil. If you have a dry year what happens? It releases too much moisture and you're really suffering from a drought. But compost does just the opposite, it **draws moisture from the air** and holds it in the ground.

AG LECTURES: Reams: At **what percent moisture** do you bale hay? Student: 20-25%. Reams: 25-30 is good. About 28% makes the best hay with the highest sugar content. And it won't rot, won't go through a heat, not nearly so badly as the one with the low sugar content.

AG LECTURES: Sawdust also has carbon which causes the soil to **hold moisture**.

AG LECTURES: Reams: The carbons **hold the moisture** and take it out of the air.

AG LECTURES: But one of the great mistakes in growing corps is that the farmer does not regulate his TDN or ERGS in the soil **with the moisture content**.

ANDERSEN: The greater the soil-nutrient density, the greater the crop yield, provided there is **adequate moisture**.

ANDERSEN: Carbon is the **governor of moisture**. One part biocarbon holds four parts water. The biologically active carbon (humus) content of the soil determines its sustainability, efficiency, and productivity. The greater the amount of carbon, the greater the energy reserve.

ANDERSEN: If you never **record the moisture content**, test weight, and nutritional value of your grain, you will not notice that after three years on a nutritional management program the required dry down is less, the test weight is greater, and the nutritional content (e.g., protein) is greater regardless of variety. Nor will you notice that the maturity time of your crop is decreasing.

BEDDOE: Sulfur is a very active material, because when it contacts the **soil moisture** and bacteria it has the effect of sulfuric acid.

BEDDOE: The **moisture-holding quality** *[capacity?]* of the soil can be affected by the way the soil is cultivated

BEDDOE: An ideal soil is to be soft and mellow, and will not crust on top. It is without large lumps, and has a 6% to 10% humus content and a **50% moisture holding capacity**.

BEDDOE: The problem with urea is that if it is used where there is **not good moisture control**, the potential is then very high for causing excess nitrogen salts around the plant and having a reverse osmosis problem develop, causing the plants to begin to dehydrate and die back.

BEDDOE: Side-dressings can be of either a liquid or granular type. In determining whether to use liquid or granular, be sure to take into account whether you have the **ability to control the moisture**. When using liquid types, the moisture must be very carefully watched because of the rapid reactions in the soil.

BEDDOE: This magnetic bond will not permit any leaching or erosion to take place. It **will hold the soil nutrients and moisture**, preventing the rain, sun or wind from taking them out.

FOLIAR SEMINAR 1983: Denting in dried corn can indicate a need for phosphate and manganese. You must also keep the carbon up for **moisture**.

FRANK: Microscopic hairs on the leaf surface near the guard cells respond to the frequency of added potassium, temporarily **triggering the guard cells to absorb moisture** and open leaf stomates

FRANK: I had to create a new classification for beans less than 4 Brix. I called them *Deficient*. With dry matter so low, what you are **really getting is a lot of moisture** that just look like a green bean but is mostly only water.

FWTK: As the seed begins to **absorb moisture**, the process of ionization takes place.
FWTK: Reams advises that farmers periodically make a soil test on all crops, because nitrogen fluctuates with the weather. An **increase in soil moisture** results in a decrease in the nitrogen in the soil analysis.
FWTK-pH: Excessive heat causes the roots to sweat or to be dehydrated. **Moisture flows out instead of in**.
PLANT FEED 1976: The nitrogen content of the soil is in direct ratio to the **amount of moisture** that the soil contains at all tines.
PLANT FEED 1976: Reams: What is it that causes a loss of moisture in the soil? What is it about the soil that causes a fast loss of moisture in the soil? Student: Heat? Reams: What causes excessive heat in the soil? Loss of ammoniacal nitrogen. In other words, a quick change in soil chemistry means a **loss of moisture**.
PLANT FEED 1976: Student: What about dried beans? Reams: I don't know how you would **get any moisture out** of dried beans. Student: Can you test them any way for the sugar content? Reams: You could test while they are still green. At the climax of greeness they should have 6-6 1/2% (12-13 Brix). That is the hull, bean and all. The same on green or blackeye peas.
SKOW: **Carbon attracts moisture from the air**, especially at night. If there is high humidity in the air and enough carbon in the soil, plants can get enough moisture from the air to fix a crop if there is at least 20 to 25% humidity.
SKOW: For instance, 100 pounds of a fruit with a Brix of 20 translates into 20 pounds of crude carbohydrate if the fruits were juiced and dried to **zero moisture**.
SKOW: Starting the movement of subsoil **moisture through the hardpan** area is both a challenge and a reward.
SKOW: In addition to temperature, moisture will keep a soil from total synchronization. **Moisture will fluctuate** considerably in any topsoil. It cycles up and down in the soil over a 24 hour period.
SKOW: The gravitational pull of the moon **causes moisture to rise** in the subsoil. So does atmospheric pressure, which allows the soil to take a deep breath, once a day, exhaling and inhaling much like a human being, putting moisture on the ridgehill and monitoring plant uptake. If a carbon product will hold water, the farmer is entitled to great expectation.
WHEELER: The ideal ORP range is between 25 and 29. Soils with a reading lower than 20 can be said to be greatly lacking oxygen due to its use in the composting process. Such soils are characterized as poor growth mediums. Seeds planted in these soils may tend to rot as there will be an **excess of moisture**.
WHEELER: Keep in mind that **changes in relative moisture** levels can change the dilution of the juices and influence Brix readings.
WHEELER: The reason why it's so effective is they usually use it with something like comfrey. It's a great plant to grow, except that it's a **high-moisture plant**. Because it's a wide leaf, you can't dry it down as easily as alfalfa.
RETURN TO TOC

MOLD/MILDEW

ADVANCED AG: Adequate boron is very helpful in keeping grains from **molding**.
ADVANCED AG: Adequate boron helps **prevent mold from forming** in hay that has been pelletized. Generally, however, any mold that does form is a yeast mold that is not so harmful to animals.
AG LECTURES: Student: Going back to the tomatoes, you get these brown spots on the tomato with the black spot in the middle. They call it anthracnose. Reams: Yes, it is a copper deficiency. Student: Is it the same thing in alfalfa? Reams: No, alfalfa can be too much potassium. Student: [Potassium] causes anthracnose? Reams: No, I've never seen anthracnose as such on grass. It may be mislabeled, but it's **generally a mold**. It can be too much potassium, it can be a lack of iron. You have to examine some of these things under glass to really evaluate them.
AG LECTURES: One thing about the growing of vegetables is this, never, ever grow more than you can market. I'm talking about fresh produce. You can dry corn and you've got many extra weeks to harvest good corn because it **will not mildew**. It's your poor quality corn that will mildew. Good corns will not mildew. I don't care how much rain falls on it or how much dew. The top quality corns will not mildew.
ANDERSEN: Vitamin K suppresses the growth of fungi, some bacteria, and the roots of higher plants. This correlates to Dan Skow's observation that **animals fed moldy feed need vitamin K** supplementation.
ANDERSEN: copper controls **molds** and often alleviates perceived zinc deficiencies.
ANDERSEN: In today's commercial corn, **molds and their resultant mycotoxins are the rule** rather than the exception. This problem can be traced directly to inferior soil management, and it causes real problems in feed assimilation, rumen function, and animal health.
ANDERSEN: Candida, commonly controlled by lactobacillus even in human systems, thrives in the excessively acid conditions brought about by high-grain diets in ruminants. The problem is exacerbated by the mycotoxins produced by the Candida. Mycotoxins, like aflatoxins, are **produced by molds in moldy feeds**, compounding the suppression of desirable rumen bacteria. Hybrid grains, because of their narrow nutrient preferences, i.e., nitrogen

and potash, are possibly more susceptible to molding.

BEDDOE: Copper controls **mold** and fungi.

ENERGY RESEARCH: Do not use calcium in the spray with copper sulfate. It will cause the copper sulfate to change to copper oxide, **which will not kill mold** and it will precipitate right to the bottom of the tank and that will plug up your screen.

ENERGY RESEARCH: Copper Sulfate is used to **control molds**.

PLANT FEED 1978: With mold in corn, you should **examine for copper,** calcium, or manganese deficiency.

SKOW: I have had a lot of farms spray on four pounds of copper sulfate to the acre in 20 gallons of water after the crop came off in the fall. As a consequence, these farmers are having **a lot less mold troubles** the following year. Plants, generally, become susceptible to molds because of stress. This stress might be nothing more than high humidity and a lack of air flow.

*[See Entry **BLUE MOLD**]*
RETURN TO TOC

MOLYBDENUM

ADVANCED AG: Molybdenum is valuable on grasses. **Molybdenum** causes harder bones and harder kernels. A trace is needed, perhaps 3 grams per acre. Soft rock phosphate is a natural source. Allows cattle to grow faster.

ANDERSEN: Molybdenum is a catalyst for iron in the bark or epidermis, is important in the integrity of bark or plant skin, and gives a transparent look to the sheen on the bark.

ANDERSEN: Out-of-roundness of the [corn] stalk indicates phosphate, potash, and **molybdenum** deficiencies.

ANDERSEN: Sulfur can **inhibit molybdenum assimilation** and reduce nitrogen fixation. It is a component of many proteins and plant oils.

BEDDOE: It ***[molybdenum]*** has one primary benefit. It makes the grain kernel harder by making calcium more available. In animals it appears to make the bones denser. It is best used in the foliar sprays. Molybdic acid is used in the foliar formula in very, very small (milligram) amounts. Soil tests showing 3 grams per acre would show enough.

ENERGY RESEARCH: Molybdenum can be used with soap on fruit trees and grapes during cold times to shield them from frost carnage. It is a catalyst for iron in the bark or epidermis. If deficient the bark will become sharp like a husk and have a low TDN. It gives the transparent look to the sheen on the bark. If deficient then the sheen will look cloudy.

FOLIAR FEED 1981: In cold weather a little **molybdenum chelate** added to the complete spray can hold back damage in fruit trees, vines, and grains. It forms a protective film over the bark. If used on alfalfa, hold back the manganese.

FOLIAR FEED 1981: If foliar feeding just before harvest, leave out fish oil, copper, iodine, and **molybdenum**.

FOLIAR SEMINAR 1983: As molybdenum appears to ride in with potassium, the **best molybdenum results** will show on crops like hay, where potassium is restricted. You can use 1 gram of molybdenum chelate in 100 gallons of foliar feed.

WHEELER: Calcium, boron, iron, magnesium and **molybdenum** tend to remain in the leaf after they are absorbed and have little tendency to translocate.

RETURN TO TOC

MOTH

AG LECTURES: All [pest] worms are laid by **some kind of a moth** or a beetle.

AG LECTURES: Worms have to have a moth or beetle or something on that order to propagate them. Like a butterfly in a cocoon.

AG LECTURES: Reams: Citrus trees that have a waxy sheen on them don't need to be sprayed, why? Student: They are healthy? Reams: They're healthy, but what is it that makes a citrus tree not have to be sprayed if it has a waxy sheen on it? Kind of like a bald headed man. If a bug lights on it, it slides off. He has a job getting his feet to hold on there. But there's another reason besides that. I have **seen a moth light 15 times on a leaf** and finally get up and try another leaf and it does the same thing. Finally she flies out and goes somewhere else. **NOTE:** *While supportive of but not mentioned by Reams, some entomologists have explored the idea that the moth's ovipositor can readily detect the difference between a sick plant as opposed to a healthy plant and that the ovipositor will not excrete eggs on the latter.*

AG LECTURES: For general farming if it is during the moth season and it's your first year, but you haven't got your minerals and nutrients up high enough, then it's a very good idea to use a small amount of Cystox or some other

spray, but 1/10th the amount will do the job just as well.

FOLIAR SEMINAR 1983: Watch your fruit trees for **moths that sting fruit and lay worm eggs**. Foliar feed every 2 weeks during rapid growth.

GARDENING: The **moth knows by instinct** that where she stings the plant leaf and lays her eggs a small drop of sap will come out of the plant. And these little worms will eat on that sap until they get big enough to eat the leaf.

GARDENING: The odor of chlordane [see] will keep all the animals out, **all the moths out**.

PLANT FEED 1976: If you have a lot of sugar in the plant and the bug bites it or the **moth lays its eggs there** or punctures it in the least, this sugary sap will leak out in a day or so when the worms hatch.

RETURN TO TOC

MYCORRHIZA

ANDERSEN: One of the more important natural protectors and plant symbionts (companion organisms in which both plant and microbe benefit each other) is the **mycorrhiza group of fungi**.

ANDERSEN: The essence of the action of [mycorrhizal] fungi consists in supplying the plants with nitrogenous and carbonaceous elements of nutrition in some cases and, in others, in the supply of auxiliary nutrients or biotic substances, and more correctly with both. There is a great deal of data in the literature on the **significance of mycorrhizal fungi** in the nutrition of plants.

ANDERSEN: Sources of phosphate are.: **Mycorrhiza fungi**—varies with bioactivity, good.

FRANK: As phosphorous rises to the optimum level, commercial phosphate is taken out of the program. Here is what I don't suggest; apply low doses of phosphorous, use mycorrhizea, and hope for the best. This approach keeps the soil depleted for a long time and rarely yields nutrient dense produce. If you want nutrient dense foods you must get available phosphorous to around 175 lbs. as fast as you can. At this level of available phosphorous, **mycorrhiza go dormant** and aren't much use to roots. The best use of mycorrhizea is to use it on low fertility soils where remineralizing with phosphorous is not economical.

NOTE: *It is strange that Reams never mentioned mycorrhiza fungi and his student Arden Andersen suggested it for many uses. Perhaps the answer lies in Jon Frank's comment that phosphate should be rapidly added full well knowing it would cause the mycorrhiza to go dormant. Frank, like Reams, teaches that nutriend dense food requires phosphorous supplementation.*

RETURN TO TOC

NATURE

ADVANCED AG: **Nature will always** follow the line of least resistance.

AG LECTURES: As we gather here to **study more about nature**, not how to force nature, but how to co-operate with nature, try to recall as much as you can from the course first and apply it and co-ordinate it with this course so it will be easier for you.

AG LECTURES: You only use it [manganese] where you're growing a mature seed. Would you use it on green beans? You would, yes, if you don't you'll have skinny looking beans. Yes, you need it in the beans, because **nature is trying to leave offspring there**.

AG LECTURES: **Nature is at work in plants forever** and you're not supposed to try to make a plant do anything. What you are supposed to do is to co-operate with nature. In your soil program, one thing that you want to always keep in mind is your ionization of your soil. Keep your soil highly ionized. And you do this with the metallic particles that are in the soil.

ANDERSEN: One needs to provide a different feed ration for **every type of organism in nature** and for every stage of growth of each organism.

ANDERSEN: Over the past fifty or more years, agriculture has functioned, officially anyway, in a paradigm whose philosophy says that nature is flawed and must be controlled with man-made materials. This **paradigm has placed agriculture in a state of constant war with nature**, continuously battling pests and diseases.

ANDERSEN: Each successive growth of [corn] brace roots indicates increased vascular plugging below. **It is a rescue operation by nature.** The plugging is caused by many things—chemical toxicity such as herbicides, putrefaction products of an anaerobic soil, excess nitrogen, and premature death of vascular tissue—all related to lack of nutritional integrity. Proper farming practices can eventually correct these problems, making brace roots unnecessary.

BEDDOE: Pests are **nature's disposal crews** working to get rid of the poor quality plant life resulting from poor soils.

BEDDOE: This aerobic bacterial spore protoplasm is **natures way** of preventing plant food from leaching as well as

holding it in a very easily usable form.

BEDDOE: Earthworms are **natures way of trying to build the soil**. When it is built to the maximum the bacteria take over the full load and the worms move on to where they are needed.

BEDDOE: Recent research has shown that many of the plants we call weeds have significant amounts of the elements (especially calcium) that the very soil they grow on is deficient in. It just may be that **nature is trying to tell us something**, besides helping us.

ENERGY RESEARCH: Nature will always follow the line of least resistance.

FRANK: All you have to do is meet nature's requirements. This means you need to craft a soil that is adequately mineralized and energized to grow very healthy plants. Nature has been doing this for a long, long time. **We just need to copy nature** and speed up the process.

FRANK: The rules and **principles that nature operates under** are well worth studying. When we let nature teach us her secrets we can succeed far beyond our imagination.

FWTK-pH: Heat created by acids coming into contact with bases is **nature's way** of growing crops. Whatever organic or inorganic substances there happen to be in the soil also take part in this chemical action. Too much heat at such a time burns the roots, releases too much nitrogen, promotes oxidation of calcium and phosphate, and will leave a very low plant food bank account.

FWTK-pH: The aerobes in the soil convert everything possible into protein molecules in spore form. This aerobic bacterial spore is **nature's way of preventing plant food from leaching**. This makes the soil quite gummy and also helps prevent erosion.

GARDENING: So in understanding and working with plants, you need to know something about the **nature of the plant**.

PLANT FEED 1976: In this case where you've got too much potash, if you added more phosphate, that would tend to correct the imbalance if you added calcium proportionately to your phosphate. There's no ratio between calcium and phosphate in other words, it is a variable. **Nature will make those corrections** providing you have sufficient amount by volume.

PLANT FEED 1976: After you harvest the top, if your soil is not sterile, your aerobic bacteria will convert those roots into heavy, heavy amounts of organic nutrients. **Nature is trying to help you** if you will let it.

PLANT FEED 1976: In May each year in the north temperate zone there is a terrific shedding of young fruit off the tree. This appears normal because it seems the tree has taken on more young fruit than it can take care of so it drops it on the ground. If you will take those drops and dissect them, you will find that most of it is deformed, **Nature has dropped off the deformed**. But if you begin to dissect it and find it perfect, then there's not enough plant food. It's too late to do anything about it this year. This is the process we're going to work on by calculating the energy for our plants.

SAIT: Andersen: Let's take sweet com as an example. You may take a reading of the ear and you may have 24 Brix, yet the com borers are running rampant. What you will find with that sweet com is that, if you take a reading of the stem or the main roots, you will have a Brix reading of 4 or 5. What's happening is that **nature is moving all of the carbohydrates into the ear** in an attempt to reproduce the species, so it's a fictitious level in the cob.

SKOW: The childish belief that complicated life processes can be serviced with simplistic N-P-K fertilization and **anti-nature farm management** should suggest that man is indeed, happy in ignorance.

SKOW: In nature, colors are an integral component of bioelectromagnetics. The various colors of flowers act to "pump" the nectar radiations, thus intensifying the signals, which insects, particularly bees, and hummingbirds home in on.

SKOW: Remember, all elements in a molecular structure are the same size under the same temperature and pressure. The center core of an element tells whether it is an anion or a cation, and **nature will follow the line of least resistance**.

SUCROSE: Since **nature knows no laws except that of supply and demand**, there must be something lacking in the soil that is used by the sugarcane to make **sucrose**, that causes a decrease in yield.

WHEELER: Nature is very forgiving and, if we will do our part by reducing or eliminating those inputs which negatively effect the soil, she will do her part in rejuvenation.

RETURN TO TOC

NEMATODES

ADVANCED AG: The **reasons for nematodes** include high nitrogen, high salts, low aerobic bacteria, excess chlorine, etc.

ADVANCED AG: The reasons for cut worms and root worms are the same as for **nematodes**, Aerobic bacteria will eat them for lunch.

ADVANCED AG: If you want to **prevent nematodes**, you should create an environment promoting aerobic bacteria.

AG LECTURES: Another thing that doesn't work very well is earthworms, **which are nematodes**, in orange groves, because the citric acid in the roots is very difficult for the nematodes who can't live in citrus soils or any other soil that's too dry.

AG LECTURES: Organic fertilizer is rich in bacteria, aerobic bacteria. You know what their favorite breakfast is? Nematode eggs. Boy, **they can eat up more nematode eggs than the nematodes can lay**. And make fertilizer out of it. Those little bugs can eat up more nematodes in 3 minutes than can be hatched out in 3 weeks. Isn't that a simple way to handle nematodes?

AG LECTURES: Student: Aerobic bacteria also **eat live nematodes**, right? Reams: Yes, grasshoppers, ants, cockroaches, anything else they come across, worms.

AG LECTURES: There's **one reason that nematodes attack plants and only one**. What is that? There's too much salt in the soil. No other reason, but too much salt in the soil. The nematode cannot attack the root until the salt weakens the root, until the bark will slide off and then he gets in. He cannot attack the root until this happens. Now, you apply too much nitrogen what happens to the roots? Student: The bark slides off. Reams: Yes, but something else happens to a lot of the roots, even before the bark slides off. What happens? If you get too much nitrogen on radishes, turnips, or sweet potatoes, what happens? Student: Break open. Reams: They split open, that's right, they split open and that root does the same thing. And then you've said to the nematode, I've built you a house, furnished you room and board. Won't you please, please move in? And he does.

AG LECTURES: **Nematodes bear their own young and lay eggs**. Worms have to have a moth or beetle or something on that order to propagate them. Like a butterfly in a cocoon.

AG LECTURES: All [pest] worms are laid by some kind of a moth or a beetle. However, there are **nematodes that bear young** and there are **nematodes that lay eggs**.

AG LECTURES: Student: How **long did you say the nematodes get**? Reams [tongue-in-cheek]: I've seen them 6 feet long. Student: What's the diameter? Reams: Oh, big around as an earthworm. Earthworm is a nematode too, did you know that? Snake is a type of a nematode also. It's all in the reptile family. **NOTE:** *It appears that neither the audience nor the transcriptionist caught Reams little joke.]*

ANDERSEN: If the soil does not include enough desirable microbes like mycolytic bacteria, which kill fusarium, verticillium, and rhizoctonia fungi, or hyphomycetes fungi, **which kill undesirable nematodes**, or perhaps actinomycetes, which digest fodder and synthesize vitamin B12 for plant uptake, the soil is not regenerating or producing to its potential.

ANDERSEN: If the farmer chooses to create a soil environment that is most conducive to pathogenic microbes such as fusarium, verticillium, **parasitic nematodes**, and mosaic viruses, he need only reduce the soil oxygen level, degrade the humus, destroy the soil structure, and maintain a continuous toxicity level...

ANDERSEN: If the overall ERGS reading gets above 1,000, there is generally a salt problem, energy loss and waste, and increased potential for root burn and **nematode proliferation**.

FWTK: The presence of nematodes in the soil, shows that there is a sick crop. The nematodes would not be there if the crop was fit for animal or human use. **Nematodes attack plants for one reason**, and that is that there is too much salt in the soil. Once the soil dehydrates the root, the bark will slide off it, allowing the nematode to enter the plant. It cannot attack the root until this happens.

FWTK: A level of 400 lbs. of phosphate and 200 lbs. of potash will keep the **nematodes** from living in the soil.

GARDENING: Reams: I inspected 80 acres where a third of the onions were dying. When I inspected one and found **teeming nematodes**, the university people present said they did not know that nematodes would eat onions. I pointed out that the quality was so low that the nematodes would indeed eat onion. What I am trying to tell you is that worms, bugs, nematodes, etc. only strike at the poorest of poor produce.

SKOW: Root rot, **nematodes**, maggots and root worms, all are problems that noticeably subside once the [aerobic] bacteria culture is established. It is unique in that all of the nutrients that are necessary to establish the specialized bacteria are included in the product. This is a common problem with many bacteria products on the market today. Many times very good bacterial products are applied to the soil only to find a very hostile environment, such as lack of nutrient, air or water, which makes it practically impossible for them to establish.

WHEELER: Try gently pulling on a medium-size corn root to see if the root bark will separate and slip off easily like a stocking. This would indicate weakness caused by excessive salts in relation to carbohydrates and humus and could provide a situation where **nematodes could easly penetrate**.

RETURN TO TOC

NITRATE

ADVANCED AG: Nitrate causes apple to shed, **don't add nitrate** to deciduous trees before fruit is off.

ADVANCED AG: Reams: When growing asparagus, increase count [*plant density*], use **commercial calcium nitrate** and harvest in morning.

ADVANCED AG: On potatoes you would be better off to use Chilean **nitrate of potash** with ammonium sulfate as a side dressing instead of 0-20-0 (if you have plenty of ammonia nitrogen).

AG LECTURES: Reams: If you're cutting alfalfa [or other grasses], the best thing to do is is to start about 4 o'clock in the morning and cut them and then about 10 o'clock start putting them in your harvester. Student: One thing. **Your nitrates would be too high**. The sun hasn't shown on it at 4 o'clock in the morning and you may poison your cattle, right? Reams: No, not if there's a high sugar content [*Brix*] you won't. You'll poison the cattle because there's low sugar content in it. You will never poison the cattle with a high sugar content.

AG LECTURES: Student: So how do you get the salt out of the soil? Reams: Add your phosphates, potassium and other things to get them high enough. Potash is always a salt. **Calcium nitrate** is a salt, sulfate of ammonia is a salt. Nitrate of soda is a salt.

ANDERSEN: If he [*Reams*] discussed applying a fertilizer or material such as calcium or **nitrate nitrogen** (like in forage or leaf crops) to get mostly growth without fruit, he stated that an anionic material should be added. In reality, more growth or expanding-energy (Yang) material was needed. **NOTE:** *No records indicate that Reams knew or understood Andersen's Yin/Yang terms.*

ANDERSEN: Nitrogen acts as an "isotope," alternating between the **nitrate form** and the ammonium form.

BEDDOE: On those *[crops*] grown for fruit, seed, root, or blossom, such as com, wheat, tomatoes, apples, etc., **you use both nitrate** and ammonia nitrogen at the proper times.

BEDDOE: On crops that are grown for their leaves or stalk, such as cabbage, lettuce, celery, grasses, etc., you **use nitrate nitrogen**.

BEDDOE: **Calcium nitrate** helps other calciums become available because of its nitric acid.

BEDDOE: The parts of the reserve soil TDN are calcium, phosphate, potassium (potash), **nitrate nitrogen**, ammonia nitrogen, iron, and copper.

BEDDOE: Other fertilizer materials that can be used as catalysts in certain situations include: ammonium sulfate, ammonium thiosulfate, ammonium phosphate, calcium sulfate, **calcium nitrate**, potassium sulfate, and **potassium nitrate**.

ENERGY RESEARCH: The interesting thing about that aspect [dying cows] was when we examined the alfalfa crop the leaves on the alfalfa and the stems were covered solid almost with little black dots. This is an indication of an excess of potassium nitrate... **NOTE:** *Perhaps the transcriptionist inadvertently inserted "nitrate" as Reams never said that---he always blamed black spots on excess potassium.*

ENERGY RESEARCH: In the southern states growing cotton, they are having a terrible time with a lot of plant and no cotton. That doesn't do you much good. They keep pouring on the **nitrate nitrogen** and that's where the crux of the problem is.

ENERGY RESEARCH: The result of magnesium application is that magnesium will replace the carbon in the sugars, thus destroying them which makes it possible for the nitrogen and oxygen to combine and leach which gives off energy which results in free nitrogen which may result in **nitrate toxicity**.**FRANK:** If you go in there with a **high nitrate**, high potassium product, you will probably push the ERGS up some, but the health of the plant will simply go down very fast if you put on what is there in excess already.

FWTK: On those [*crops*] grown for fruit, seed, root or blossoms (com, wheat, tomatoes, apples, etc.), **both nitrate** and ammonia is used.

FWTK: Fertilizers containing urea, **potassium nitrate** (containing chlorides) and anhydrous ammonia should be avoided because of their effect on the soil.

FWTK: **S**ome of the good ones [*potash sources*] are sulfate of potash, **Chilean nitrate of potash**, hardwood ashes, tobacco stems, pecan hulls, rice hulls, sawdust, wheat or oat straw and chicken manure.

PLANT FEED 1976: Student: My corn ls about 2 feet high now and my nitrogen is down to about 30 pounds per acre. What do I do now? Reams: Increase your ERGS. Student: Increase my ERGS? Reams: Yes, use a top-dressing---in this case, **ammonium nitrate**.

SKOW: **Calcium nitrate** is an excellent source of water soluble calcium for spray application or touch up work. It is usually too expensive to be a whole source of calcium.

SKOW: The idea of a good strawberry is to have less seed on it. There is a case where you don't want to use very much fish on strawberries. You want to use mainly your phosphoric acid, ammonia, and **calcium nitrate**.

SKOW: **Sodium nitrate** isn't used too often anymore. It is used more in the food industry and the price has taken it

out of the marketplace. It is a negatively charged element. It would prove useful on lettuce, celery, spinach and cabbage crops

WHEELER: Magnesium is antagonistic to nitrogen as seen in the use of Epsom salts as a treatment for **nitrate poisoning** in cattle or an Epsom salt spray on fruit trees to stop apple drop due to **nitrate-weakened stems**.

RETURN TO TOC

NITROGEN

ADVANCED AG: If your topsoil is properly managed with Reams principles, your **nitrogen will not leach away**.

ADVANCED AG: If your topsoil is properly magnetized, you **do not need to worry about losing nitrogen**---it will stay there.

ADVANCED AG: **Nitrogen is an isotope** that can switch from anionic (growth) to cationic (fruiting).

AG LECTURES: What form is the nitrogen in the compost? **Ammoniacal nitrogen** and what does it do to the soil? Not only warms, but cools. It controls the temperature. Student: How does it do that? Reams: By refrigeration. Yes, in other words when you heat ammonia it freezes, when you freeze it, it boils, it's a contrary substance. If it wasn't true you couldn't use it for a refrigerant, do you realize that? That alone is worth everything you are paying for all the courses, just to know that one factor if you use it.

AG LECTURES: Top-dressing is any plant food containing more than 16 units of **nitrogen products**. It does not contain any appreciable phosphate. If it contains phosphate it's a side-dressing. If your soil is low in potash you could apply some as a part of the top-dressing.

ANDERSEN: **Nitrogen acts as** an "isotope," alternating between the nitrate form and the ammonium form.

ANDERSEN: If he [*Reams*] discussed applying a fertilizer or material such as calcium or **nitrate nitrogen** (like in forage or leaf crops) to get mostly growth without fruit, he stated that an anionic material should be added.

ANDERSEN: University personnel tell farmers that they **cannot generate much nitrogen** bacteria activity without legumes. However, research in 1942 revealed that "root-nodule bacteria of lucerne grew equally well under lucerne and under cotton.

ANDERSEN: Each successive growth of [corn] brace roots indicates increased vascular plugging below. It is a rescue operation by nature. The plugging is caused by many things—chemical toxicity such as herbicides, putrefaction products of an anaerobic soil, **excess nitrogen**, and premature death of vascular tissue, all related to lack of nutritional integrity. Proper farming practices can eventually correct these problems, making brace roots unnecessary.

ANDERSEN: The criteria for good compost production are a good mix of organic materials, i.e., manure, straw, leaves, sawdust, food scraps, and so on, to get a 20:1 to 30:1 **carbon-to-nitrogen ratio**...

BEDDOE: Probably corn has one of the **highest demands for ammonia nitrogen**, so it is a good idea to work up to 200 lbs. per acre for its needs at 40-50 days from sprouting.

BEDDOE: If there is **not enough nitrogen** then the electrical flow from soil to plant will be deficient. Yet increasing the nitrogen out of ratio to the amount of mineral energy available will put too much water into the crop and thus reduce quality to quite an extent

BEDDOE: A soil with excellent amounts of aerobic bacteria will have plenty of available **ammonia nitrogen** being produced by the bacteria.

BEDDOE: In a soil with 500 pounds per acre of chloride, chicken manure should not be used on the ground. The chicken manure is high in boron and with lack of plenty of water the stage would be set to **convert ammonia nitrogen to nitrite nitrogen**. If this were to happen it would severely burn the roots of any plants in the soil.

BEDDOE: On those [crops] grown for fruit, seed, root, or blossom, such as com, wheat, tomatoes, apples, etc., you **use both nitrate and ammonia nitrogen** at the proper times.

ENERGY RESEARCH: About grasses. Basically Reams' opinion is, no potash in the spray, no manganese in the spray, no **cationic nitrogen or ammonia**. Now he does use Bo-peep *[ammonia]* despite what he says there.

ENERGY RESEARCH: You can force a lot of growth in the stalk **with nitrogen** (and even with calcium) and get a high uptake in the plant but you won't increase the mineral or raise the Brix. It still takes [*requires*] the phosphate.

ENERGY RESEARCH: You want leaves early in the spring for your corn, soybeans, lettuce, romaine lettuce, cabbage or anything where you want growth. Even on your small grain, you want growth and **that is when you use your nitrate nitrogen**. That is why it is important in your spray formulas to have some form of nitrate nitrogen.

ENERGY RESEARCH: You can **force a lot of growth in the stalk with nitrogen** (and even with calcium) and get a high uptake in the plant but you won't increase the mineral or raise the Brix. It still takes the phosphate.

FOLIAR FEED 1981: Be cautious of **nitrogen toxicity** in fresh cut alfalfa. It is best fed as hay.

FOLIAR SEMINAR 1983: Magnesium is a no-no because plants get all they need from the air and it is such an **enemy of nitrogen**.

FOLIAR SEMINAR 1983: If potatoes or carrots split open, there is **too much nitrogen** and not enough phosphate.

FWTK: Without **nitrogen in the soil**, the electrical currents could not flow, and the process of ionization, by which plants are built, could not take place.

FWTK: A few weeds in a crop, on land that is properly fertilized, will not affect the yield, because there is enough plant food for both the weeds and the crop. Actually, a few weeds that are easily cultivated under **can produce 20 to 50 lbs. of nitrogen** per acre.

FWTK-pH: Heat created by acids coming into contact with bases is nature's way of growing crops. Whatever organic or inorganic substances there happen to be in the soil also take part in this chemical action. Too much heat at such a time burns the roots, **releases too much nitrogen**, promotes oxidation of calcium and phosphate, and will leave a very low plant food bank account.

FRANK: You **must include nitrogen** to make the solution magnetic. We typically build our foliar sprays using a carbon source such as sugar, liquid fish and RL-37 from seaweed.

GARDENING: All plant food **with the exception of nitrogen**, must go into that tree or plant in phosphate form, phosphate of iron, phosphate of zinc, phosphate of copper and so forth.

PLANT FEED 1976: If your crop is still not growing as fast as it could or if it has a blue color---anytime you see the crop begin to have a bluish tint to it---you get a soil analysis even if you had one a week ago because it means the **nitrogen is too low.**

PLANT FEED 1976: All plants can take all the magnesium they need out of the air. You do not have to add magnesium to any crop that I have seen, anywhere in the world. Unless the farmer had added **so much nitrogen** he had to add Epsom Salts in order to release the nitrogen to keep it from burning the roots.

PLANT FEED 1976: Student: Your aerobic bacteria in the soil **makes nitrogen like a cow makes milk**, right? Reams: That's true.

SKOW: Calcium and magnesium should be about 7:1. Most farmers have a 3:1 or even a 1:1 ratio. Any ratio narrower than 5:1 means problems beyond instant comprehension. It means compacted soils, bacteria that can't proliferate, and weed takeover — in short, a marginal production sequence. For every **pound of water-soluble magnesium in the soil, one pound of nitrogen is released** straight into the air. This means that until you get the ratio correct, you are going to have to add increasing amounts of nitrogen to grow a crop that will support payment of bills.

SKOW: Blue tint in corn leaves means a **nitrogen deficiency**.

SKOW: Plant foods that cause seed production are **ammoniacal nitrogen**, phosphorus, metal trace nutrients, manures and composts.

SKOW: The electrolyte is always a conductor of electricity — usually iron, copper, zinc, etc. The most important one is nitrogen because no crop will grow without it. Even if a cell needs iron, copper or zinc, it can't affect formation of the cell **until nitrogen is present**.

SUCROSE: Keep plenty of water-soluble, ionized carbon so the crop will not have to depend upon its entire supply of carbon from the air. Keep the **carbon/nitrogen ratio** equalized for greatest yield of sucrose.

SUCROSE: An oversupply of water-soluble magnesium displaces carbon in the protein molecule and **converts nitrogen into a gas**, thus decreasing the probable protein molecule count which decreases sucrose yield.

WHEELER: Reams suggested you avoid dolomite for three reasons. The most impressive one has to do with **nitrogen release**. Magnesium is antagonistic to nitrogen as seen in the use of Epsom salts as a treatment for nitrate poisoning in cattle or an Epsom salt spray on fruit trees to stop apple drop due to nitrate-weakened stems. When the magnesium releases from dolomite, it can cause nitrogen to release as a gas.

WHEELER: Although many legumes are primary forage or feed staples, they also make excellent cover crops. These cover crops, also known as "green manure" crops, are important in many ways other than just their **nitrogen-fixing abilities**.

NO-NO

ADVANCED AG: There are some crops that ordinarily are a **no-no**. Only grow tomatoes under contract to a canning company. Soy beans are no-no because someone else determines the price.

ANDERSEN: Sources of phosphate are: ■ Soft rock phosphate, good. ■ Hard rock phosphate, good. ■ Superphosphate——0-20-0, specialty. ■ Triple super phosphate——**0-46-0, no-no**. ■ Di-ammonium phosphate—18-46-0, **no-no**.

FOLIAR FEED 1981: Copper and boron in the same spray tank are a **no-no** because of cross purposes.

FOLIAR SEMINAR 1983: Muriate of potash is a **no-no** because it has huge amounts of chlorine that kill your soil bacteria.

FOLIAR SEMINAR 1983: Magnesium is a **no-no** because plants get all they need from the air and it is such an enemy of nitrogen.

RETURN TO TOC

NUTRIENT

ADVANCED AG: A hydroponic book will help you understand that the **small amounts of nutrients** in Reams-Ag foliars are very appropriate (too much nutrient may act as a roadblock).

AG LECTURES: Student: How can you measure how much **nutrient it's going to take out of the soil** when it gets some of the nutrients out of the air? Reams: You're not interested in how much it takes out of the air, care less about that. All you want to know about is how much you have to put back in the soil.

AG LECTURES: Student: If you don't disc compost or manure in, the sun takes the value out of it, right? Reams: Not the chicken manure it doesn't. The **sun does not destroy the nutrient** of manures, but it does of compost.

AG LECTURES: Student: What does aluminum do for soil? It's **not a soil nutrient or plant food nutrient**. What does it do for soil? Why is it important? Is it important? Is it a catalyst? Reams: No sir, but you're getting mighty warm. Student: Is it a conductor? Reams: Right---it is an electrolyte. It's like little transformers in there. Picks up the electrical charge and makes the soil carry an extra bit of current through the soil.

AG LECTURES: But you should have **all of your nutrients down** in the soil before you plant your crop. Do not try to get by with side dressing, which you might [however] have to do in the emergency case of an extremely heavy rain.

ANDERSEN: Alfalfa and small grains commonly have hollow stems. Farmers are told that this is a genetic trait. However, a few years of proper nutrition can fill in those stems, raising both the yield and **nutrient content of the crop**.

ANDERSEN: The **nutrient ration** that is suitable for ocean *[seawater]* plants would be deadly for freshwater plants or alfalfa.

ANDERSEN: Carey Reams, as an ag consultant, used pH in a different way. He looked at pH as a measurement of the resistance in the soil. He observed that the higher the pH, the greater the resistance there was and the more difficult it was to get energy to flow, particularly if the pH was somewhat alkaline, in the 8 or 9 range, resulting in **nutrient imbalances**. On the other hand, he observed that if the pH was moderately low, below 6, there was not enough resistance. This exchange allowed the energy to flow too readily, making it difficult to contain it *[and for the plant roots to grab it]*, again resulting in apparent **nutrient imbalances**. This seems to be a practical and workable use of pH, for it addresses the reality of how plants grow through energy exchange. In essence, pH is the result of the **nutrient interaction**, not the cause. When the **nutrient ratios** are balanced, the pH will stabilize automatically in the correct range.

ANDERSEN: **Nutrients** and compounds in the soil that are considered alkaline include calcium, magnesium, chlorine, sodium, potassium, salts, ashes, and aldehydes.

ANDERSEN: The greater the **soil-nutrient density**, the greater the crop yield, provided there is adequate moisture.

ANDERSEN: *[Non Reams-Ag]* "Experts" often scoff at the suggestion of using **very small amounts of nutrients** for fertilization.

BEDDOE: The ERGS test shows what value is obtainable from the **nutrient that is in the soil**; but it doesn't reveal its source.

BEDDOE: Acids (cations) coming into contact with bases (anions) are heat and energy producing because of the resistance between the anions and cations. Whatever organic or inorganic substance there happens to be in the soil also takes part in this chemical action and can be affected by it. These types of reactions, if too strong, can cause calcium and phosphate as well as carbon to be oxidized to the point of leaving a very low plant food bank account of **soluble nutrient**.

ENERGY RESEARCH: The stump is where the **nutrients** are put on the frequency of the plant.

ENERGY RESEARCH: As that pH goes up **nutrients become unavailable** and the quickest way to solve that problem is to go out and cultivate.

GARDENING: The banana, when it grows those bananas, it puts the **same amount of nutrient** in every banana whether it's a big one or little one.

FOLIAR FEED 1981: Reams spoke at length on track 071 about how a Chiron sprayer could pay for itself with savings from much more efficient **nutrient applications**.

FRANK: Duane: And they don't have energy enough to be picking up enough minerals to build strong enough cell walls to resist the insect attacks, which is--it's not just about the strong cell walls. But, **if a plant has enough nutrients**, the insects don't attack it.

FRANK: An ordinary submerged sump pump in the tank, lying on its side, is an easy way to spin the solution. You're moving a liquid armature through the earth's magnetic field. The rotating mix accumulates electrons, building the magnetic charge in your spray solution. Recirculating the solution through the pump **also homogenizes nutrients**

for a uniform blend.

FWTK: The phosphate **and other nutrients** in soft rock phosphate are in colloidal compounds.

GARDENING: The calciums in your soil can increase the milk yield by as much as 200% and also if your pasture soils have enough minerals and calcium in it, whenever you put the feed in the trough to milk the cows, they won't even eat it. They'll just stand there waiting to be milked, because the grass will have **so much more nutrient**.

PLANT FEED 1976: You want your good plants to reach its **climax of nutrients** at the stage you wish to eat it , i.e. cabbages grown correctly should be low in manganese. If manganese was too high in the cabbage or lettuce field, it will go to seed long before it heads up.

PLANT FEED 1976: That's what we're studying today. How to produce the most food with the **highest nutrient value** (TDN - total daily nutrient) required to maintain a plant or animal.

PLANT FEED 1976: You do not rotate *[orchard and vineyard]* crops---but *[you must]* **put the nutrient back in the soil**.

PLANT FEED 1976: After you harvest the top, if your soil is not sterile, your aerobic bacteria will convert those roots into heavy, heavy amounts of **organic nutrients**.

PLANT FEED 1976: I am not in favor of herbicides for the killing of grasses and plants. If you will supply your plant with plenty of the kinds of **nutrients it needs**, you will not have to be bothered with pesky weeds because the crop will quench them out.

SAIT: Andersen: I agree that humates can provide an invaluable boost to fertility, but, if overused, they are capable of **tying up valuable nutrients**.

SKOW: Remember, **every nutrient** enters a plant in a phosphate form.

SKOW: Humid territory suggests a higher level of nutrients in solution. This translates to using half a pint to a pint of phosphoric acid per acre **when humidity is high**, and less than half a pint under dry conditions.

SKOW: One of the biggest problems in maintaining nut trees is the failure to keep enough phosphate of manganese available to the tree. The best and **cheapest way to supply these nutrients** is via foliar spray.

SKOW: Plant foods that cause seed production are ammoniacal nitrogen, phosphorus, **metal trace nutrients**, manures and composts.

WHEELER: **Trace nutrients** come premixed in fertilizers, can be requested as additions to custom mixes, and can be purchased in both dry and liquid forms.

WHEELER: In the soil, **some nutrients tend to rise** while calcium and others tend to move downward.

WHEELER: Magnesium, like calcium, is now being considered as a **primary nutrient**. It is an integral part of chlorophyll making it essential for photosynthesis. **NOTE:** *Reams strongly warned against magnesium supplementation, possibly because of its ability to drive nitrogen out of soil, plant, and animal.*

RETURN TO TOC

DENSITY, NUTRIENT

FRANK: Frank: If you want **a full discussion of nutrient density**, we're referencing foods with more nutrition, higher both of the minerals, the phytonutrients and even those essential sugars that science is discovering how significant are for cellular health.

FRANK: This **variation of nutrient density** in green beans applies to all produce. To get true nutrient dense foods you must first fix your soil.

FRANK: Here is the pattern on the Morgan soil test to shoot for if *[produce]* **nutrient density** is your goal: Humus: Ignore this---when the minerals are right this will automatically correct.

FRANK: Duane: If you want a full discussion of **nutrient density**, we're referencing foods with more nutrition, higher both of the minerals, the phytonutrients and even those essential sugars that science is discovering how significant the sugars are for cellular health. **NOTE:** *Frank's entry may be as good a definition of food nutrient density as we are likely to see. Reams died in 1985, and the phrase, a halfuearted attempt to displace "Brix" became popular in the new millenium to help sell produce. On the other hand, Reams' known definition of density as "Quantity of anything per unit of volume or area" should be kept in mind.* [*see **DENSITY***]

RETURN TO TOC

NUTS

ANDERSEN: Dan Carlson showed that he could accelerate the time cycle of growth and fruiting in **nut trees**, getting the equivalent of several years of growth and development in one year, with fruiting in two years.

ENERGY RESEARCH: One crop that it is very important to maintain the manganese level is **pecans, walnuts, and almonds**. Spray, spray, spray, and spray some more with manganese.

FOLIAR FEED 1981: Remember to add manganese to your base foliar formula on **nut trees.**

PLANT FEED 1976: In **pecans**, the base exchange is about every 3 years. Citrus is about 18 months but a radish has no base exchange---none. Until it starts to go to seed. Most plants will not have a base exchange until it starts to blossom or fruit or both. In other words it maintains the same cells to perform the same duties that long.

SKOW: One of the biggest problems in maintaining **nut trees** is the failure to keep enough phosphate of manganese available to the tree. The best and cheapest way to supply these nutrients is via foliar spray.

RETURN TO TOC

OIL

ADVANCED AG: **20 gallons of oil per acre** mixed in about a ton of sawdust will put carbon in the soil.

AG LECTURES: There's one more thing I haven't told you about soils that I should tell you. And that is, if you can get oil, old motor oil, real cheaply, and you get a bunch of sawdust and begin to mix this old motor oil up with sawdust. You apply 2 or 3 hundred pounds of this old motor oil and sawdust to the acre, you need to do that after you harvest the crop, or it won't hurt to put 500 lbs. to the acre, if you want to, but I'm going to tell you, it'll really do miracles. One of the great things in soil today, it loses it's oil capacity because of the synthetic fertilizers used by yourself and your neighbors. What your neighbors use affects your farm too. So I would use old oil, 3-500 pounds of sawdust, something like that per acre, with the old oil in it. Did you ever see an old poor piece of ground, so poor that it couldn't do anything but make a used car lot out of it? In about 3 years there were weeds 20 feet high, couldn't hardly find the cars for the weeds. What happened? It was the old oil, rust and iron it got out of it, out of those old automobiles. Student: How much oil for the 2-3 hundred pounds? Reams: I'd saturate it, make it like it would be a good floor moping material. It does wonderful things for your soil.

AG LECTURES: In the corn meal mush, **add some cooking oil**. There's not enough oil in our corn today, because the sugar is too low

RETURN TO TOC

ORANGE

ADVANCED AG: If you had an **orange grove** in south Florida you could use Napier grass because of the large amount of tonnage that you get off it. You get your mineral high enough for Napier grass and you won't have to buy any fertilizer or sprays for 20 years. All you've got to do is mow, mow, and mow. But I will tell you something, you'll have to mow every 10 days. Because you mow it off when it's a foot high and in 10 days it's waist deep. If you go 20 days you'll have trouble finding the trees even if they're 20 feet high. I am telling you, wet, rain or shine, you've got to keep that machine going in there. *[See Entry **COVER CROP**]*

ADVANCED AG: Reams used to buy **unsalable oranges** and use them in lieu of fertilizer because it was cheaper than fertilizer and because the citric acid would remove chloride from groves.

AG LECTURES: Did you ever take a leaf of alfalfa, sugar cane or corn and examine it closely and see little black dots in it? Have you noticed that or on the stem? Have you seen little black dots appear on the stem of alfalfa? Did you really look that close? That's too much potassium in the soil. How many have seen those little black dots? **Have you noticed it on** peach leaves, **orange leaves**, any crop?

AG LECTURES: Reams: Which is sweeter, a big banana or a little banana off the same stalk? Student: Little one. Reams: Right, the smallest one is sweeter. The banana puts the same amount of everything in every banana, mineral wise. **So does an orange tree**.

AG LECTURES: Lets take an **orange grove**. The trees are 15-20 feet high, producing 1,000 boxes to the acre. You would need 30 gallons of spray to cover an acre, homogenized. That's a lot of space, that's a lot of leaves and that's a lot of trunk.

AG LECTURES: Carbon determines the color, that's right. Did you ever see **oranges after the fruit matures they start turning green again**? Did you ever see that? You know oranges turn a golden yellow in the winter time then in the summer turn green again? Why did it turn green in the summer time again after it had been a golden yellow orange color in the winter? Student: Lack of carbon? Reams: That's right. If you have have plenty of carbon in your soil, those oranges will stay their golden color all summer long. Not only that, peaches will have a better color, alive, glossy, just a mouth watering color to them. Because the carbons are controlled in the soil.

FWTK: Citrus includes all members of their kind: for example grapefruit, lemons, **oranges**, tangerines and limes all have the frequency of .0009.

FWTK: Part of the commercial yields achieved with the Reams program are: **1.000 boxes or oranges per acre.**

FWTK: The average reading you will find in **oranges** is nine to 10 Brix, but it should be sixteen to 18 Brix.

GARDENING: Why does the grapefruit tree have a **bigger leaf than an orange tree**? That is because a grapefruit is larger and needs more sunlight to make enough sugar to make the grapefruit sweet, so God gave it a bigger leaf.

Now, when an orange tree or grapefruit tree has one fruit to each 50 leaves it has its maximum crop.

PLANT FEED 1976: How many citrus leaves does it take to furnish the **normal amount of carbohydrate for one orange**? How do you know when your grove is producing a maximum crop of citrus? What is the criteria for citrus, peaches, pears, [clusters of] grapes, apples - how do you know when the tree has produced its capacity load? So many leaves per fruit. Fifty leaves per fruit.

PLANT FEED 1976: Tell me, how do you rotate a peach orchard? **An orange grove**? Apple orchard? A grape vineyard? Well, if you don't rotate those, why rotate anything else? You do not rotate crops---but *[you must]* put the nutrient back in the soil.

PLANT FEED 1976: When you see peach, **orange**, apple or other trees with the bark leaking out sap and crystallizing, that means there is a phosphate deficiency first. Second, a copper deficiency. Or phosphate of copper.

PLANT FEED 1976: I supervised for Minute Maid, a 40 acre field of alfalfa which they said would not grow, **and a young orange grove** that was about 3 1/2 years old, the trees up to my ears. They planted the alfalfa and in 7 weeks it was 17 feet high. You couldn't see the orange trees! People from all over the world flew in by the hundreds to see that alfalfa. It was difficult to even get the alfalfa down - let alone harvested. They said no more alfalfa for us.

PLANT FEED 1976: If you've got enough sugar in the juice of the fruit all the way to the **top of the orange**, it can freeze solid and thaw out and still be good on the tree. If there's a lot of water and a lack of sugar, the expansion is so great it tears up the tissue of the fruit and It will dehydrate and be ruined forever. Since 1938 I have not had any citrus groves to be damaged by cold whatsoever. In 1962-63, the coldest winters of the century — in which about 45% of all the groves in Florida were permanently destroyed, the groves I serviced never lost — most of them never lost the leaves. They never had to be pruned and they harvested 98% of their fruit. The others were bulldozed out right up to the rows I serviced.

PLANT FEED 1976: Let me **show you something about an orange** while they are here on the table and we can see the top of the orange where the stem goes in. Look straight down toward the fruit. If that orange grove has plenty of minerals there'll be a perfect. star. That star will have thick and fat "fingers." They are fat and round and 3 dimensional if the grove is well-mineralized. It is not the same way for apples, but oranges can have a distinct readout. The skinnier those are, the more deficient the soil is in minerals. You may see four or even three, which shows lesser minerals. Usually if there are only two they fall from the tree. Such a grove is really deficient.

SKOW: That **sugar content of an orange** or a lemon or a watermelon can be measured by its shelf life is nothing but confirmation of Brix values. A high Brix orange will simply dehydrate, keeping a hard shell. One with a low Brix value will decay.

RETURN TO TOC

ORP (Oxidation Reduction Potential)

FRANK: With this program, it seems that if you keep the ERGS where it needs to be, if you put in what needs to be put in, the **ORP kind of takes care of itself**.

WHEELER: ORP readings are obtained using the ORP meter and calculating the result based upon the soil's pH. **ORP readings indicate whether your soil is oxidizing (aerobic decomposition) or reducing** (composting).

WHEELER: Six portable instruments deserve mention for farmer use: refractometer, pH, ERGS, sodium, and **ORP meters**, and the new magnetic susceptibility meter developed by Dr. Philip Callahan.

NOTE: *While Reams was surely aware of ORP, he chose to not incorporate the concept into his Reams-Ag.*

RETURN TO TOC

OSMOSIS

ADVANCED AG: gibberellic acid can be used to speed up **osmosis**.

ADVANCED AG: The **process of osmosis** is not limited by time UNTIL seed sets. Prior to that the plant can grow very rapidly if the TDN is available.

ADVANCED AG: The rate of **osmosis** is not a constant. It can be increased if you work to be sure everything the plant needs is there if the photosnythesis is correct.

AG LECTURES: The process of **osmosis is not limited by time**. The shorter length of time that you can bring things into production, the higher the yield. The quicker you can produce it the higher the yield. Why? Student: Goes into fruit and less into the plant. Reams: Right, also because it's not retarded. It's not hindered, it must have everything that it needs, including soil temperature, weather temperature and everything else. So the shorter length of time that you can use to grow any produce, the higher the yield per acre.

AG LECTURES: Reams: How does the root grow? Student: By ionization, building, putting together? Reams: That's right, by ionization. In other words, the ionization of the soil builds the roots. As the root is built the **process**

of osmosis takes the particles through the plant.

AG LECTURES: Reams: How does the **process of osmosis work**? Student: Photosynthesis? Reams: No, not on photosynthesis. Photosynthesis is the process of osmosis in reverse. Student: Absorption of water? Reams: Yes, absorption of water, but by what? By squeeze method. Just pushed it on up, squeeze, squeeze, squeeze method. That's the way it gets up there. Isn't it interesting to know how plants feed?

BEDDOE: Osmosis is used to refer to the movement of the sap of a plant up from the roots toward the leaves.

BEDDOE: The problem with urea is that if it is used where there is not good moisture control, the potential is then very high for causing excess nitrogen salts around the plant and having a **reverse osmosis problem** develop, causing the plants to begin to dehydrate and die back.

BEDDOE: When more energy [foliar feed] is sprayed on the plant than the plant can use, a lot of the mineral salts will be deposited in the soil around the roots. If there is not enough water being provided in the soil, it could start a **reverse osmosis process** and damage the plant.

FOLIAR SEMINAR 1983: The **process of osmosis** is not limited by time, fertilizer governs speed of growth.

[***track down more osmosis quotes]

RETURN TO TOC

PARAMAGNETIC

COMMENTARY: *The paramagnetic concept espoused by Phil Callahan appears to have arrived after Carey Reams departed. Although many of Reams' students later eagerly adopted paramagnetism, there appears to be no audio or transcript indicating that Reams spoke of anything more than "magnetism," a term he was fond of. At its most simple explanation, a highly paramagnetic soil is considered capable of being a more fertile soil. Many soil consultants urged their clients to scatter stone dust measuring high native paramagnetic values, almost as a shortcut to higher fertility. Some three decades after his death, it is difficult to say with any certainty that Reams would have considered spreading paramagnetic dust the easy equivalent of careful soil building via his process of layering calcium, phosphate, and manure. Perhaps his main objection would be that even if two soils registered the same paramagnetism, one via dust scattering and one with a full TDN (Total Daily Nutrient), the old-fashioned soil would be the better place to raise food for animal and human. It is quite easy to imagine that those Reams-Ag farmers who followed his directions quickly realized that they had reached a fertility state making purchase of paramagnetic stone a useless and worthless expense. To reach the best decision, the wise young farmer should study both the **MAGNETISM** and **FERTILE** entries with their various quotes and the paramagnetic thoughts listed below.*

ANDERSEN: Carey Reams repeatedly asserted that plants absorb much nutrition from the air. But they can do this only if the plant is a good conductor and if the soil acts as a good electrical ground. To be a good ground, the soil must be highly paramagnetic; this means that the soil is a good antenna for solar and cosmic radiation. Paramagnetism does not guarantee fertile soil, but it is a prerequisite for fertile soil. Sterile soils are diamagnetic; they are poor antennas. Paramagnetism is achieved by both the mineral composition and the physical structure or form of the materials in the soil. The **microorganisms are responsible for creating structured materials in the soil that are paramagnetic.**

ANDERSEN: First we must lay the foundation *[to build a Reams-Ag soil]*. This includes the calcium, necessary to establish the capacitor characteristic, and the base minerals, necessary to initiate the magnetic susceptibility characteristic (antenna), particularly the **paramagnetism** Phil Callahan noted in his research.

ANDERSEN: The quality of the soil is related to its mineral balance, humus content, moisture, and particularly its microorganism activity. The mineral provides the structural components, resulting in a **substantial paramagnetic value.**

ANDERSEN: Remember that **oxygen is a strong paramagnetic nutrient** and that adequate oxygenation of your soil enhances the soil's paramagnetism.

SKOW: Highly fertile soils have positive magnetic susceptibility values and are **said to be paramagnetic**. Sterile soils have negative magnetic susceptibility values and are said to be diamagnetic. The fact that a soil is highly paramagnetic does not guarantee high fertility, but it does indicate high potential fertility.

WHEELER: A third phenomenon is the **paramagnetism** of the soil itself. A healthy, fertile soil is slightly attracted to a magnet and, therefore, is considered paramagnetic. This is a natural state of matter and is not the same as ferro-magnetism which explains the attraction of metal to a magnet.

WHEELER: Six portable instruments deserve mention for farmer use: refractometer, pH, ERGS, sodium, and ORP meters, and the new **magnetic susceptibility meter** developed by Dr. Philip Callahan.

RETURN TO TOC

PASTURE

ADVANCED AG: If you have no pith at all in **pasture grasses** or alfalfa, you have boron deficiency.

AG LECTURES: That **pasture will be perpetual** except for your calcium and phosphates. That juice *[from sickle-bar mowed grass]* will drop onto this ground and go back in and supply you with enough TDN for 2 more crops.

ANDERSEN: An excellent plant to include in the **pasture mix** is comfrey in 6 x 6 grids, which adds nutrition and healing substances to the pasture.

ANDERSEN: The practice of intensive rotational grazing is regaining popularity and sophistication. With proper management of both the **pasture nutrition** and the grazing rotation, maximum production from both land and cattle can be obtained, as well as optimized animal health.

BEDDOE: If livestock are grazing on **properly fertilized pastures**, their grain consumption will drop; the fact being the animals will be getting their carbohydrates in the grass.

BEDDOE: If a pasture has had this nutrient program *[Reams-Ag]* applied to one section of it, the cattle will all eat on that section because it has a higher sugar content and therefore a higher mineral content. If **livestock are grazing on properly fertilized pastures, their grain consumption will drop**; the fact being the animals will be getting their carbohydrates in the grass.

FWTK: If a **pasture has had this nutrient program applied** to one section of it, the cattle will all eat on that section, because it has a higher sugar content and therefore a higher mineral content. If livestock are grazing on properly fertilized pastures, their grain consumption will drop because the animals will be getting their carbohydrates in the grass.

GARDENING: The calciums in your soil can increase the milk yield by as much as 200% and also if your **pasture soils have enough minerals** and calcium in it, whenever you put the feed in the trough to milk the cows, they won't even eat it. They'll just stand there waiting to be milked, because the grass will have so much more nutrient.

PLANT FEED 1976: Try to build your **pasture grass** calciums over a 2 year period. You should work on having 4500-4800 pounds of water soluble calciums.

PLANT FEED 1976: I've serviced **pastures** and the man's cattle on the other side or the pasture would get sore necks from sticking their heads through the fence to get at the better grass. If you'll keep your grass real good, really sweet with a lot or sugar in it along the fence row, your cattle will keep it down so you won't ever have to spray the grass in the fence row. They'll take out every bit or it.

RETURN TO TOC

PEACH

AG LECTURES: Did you ever take a leaf of alfalfa, sugar cane or corn and examine it closely and see little black dots in it? Have you noticed that or on the stem? Have you seen little black dots appear on the stem of alfalfa? Did you really look that close? That's too much potassium in the soil. How many have seen those little black dots? **Have you noticed it on peach leaves**, orange leaves, any crop?

AG LECTURES: One thing that makes **peaches** and apricots so excellent whenever they're dehydrated naturally is that the vitamins are still in there with natural dehydration.

FOLIAR FEED 1981: Brown rot in **peaches** traces to excess sulfur, except it is not enough to rot the whole fruit.

RETURN TO TOC

PEPPERS, BELL

ADVANCED AG: **Bell peppers** may be a tough market to break into because the existing growers have it saturated.

AG LECTURES: I want to tell you something about growing **bell peppers**. You can grow bell peppers under this standard and I mean they are big ones. They're very large. And you can stuff these bell peppers with your favorite stuffing and bake it and it looks just like you picked it off the vine. It doesn't shrink, it doesn't wilt, it doesn't fold up. It's absolutely beautiful. I mean it still looks just like you plucked it off the vine even though it is baked. The most beautiful peppers you've ever seen. And it doesn't take very many of them to fill a bushel.

AG LECTURES: Student: Why is it that you can't plant **bell peppers** and tomatoes close together? Reams: Because they hate each other. The frequency is too far apart. Or hot peppers either. Don't plant them close to tomatoes. The frequency is too far apart.

AG LECTURES: What happens to young plants or onions or **peppers**, beans, tomatoes – row corps; whenever there's a copper deficiency? What happens to your young plants? They rot off at the ground.

AG LECTURES: Cucumbers, squashes, green beans, **bell peppers**, hot peppers, rutabagas, turnips, onions should have between 6 & 8 Brix.

ENERGY RESEARCH: Student: You said you were going to say something about Vitamin C yesterday. Skow: OK, vitamin C. This is one we have come up with and have found to be very successful in legume crops. That means peas, string beans, alfalfa and **bell peppers**.

FOLIAR FEED 1981: Bell peppers have a "placenta." This requires manganese**.**

GARDENING: There are some plants that really appear to hate each other. One case is a tomato plant and a **pepper plant**. Don't plant those together.

PLANT FEED 1976: [Reams telling story of long ago personal farming] My **bell peppers** were 15 cents each and my competitor's were 3 for 5 cents. His were a little smaller than mine, but the weight of his 3 would equal more than one of mine. His were 3 for a nickle and mine 15 cents each, but in 5 days his would be wilted and in 2 weeks mine were still laying up beautiful. They'd stay that long.

REAMS/SKOW COOK: Also eat **bell peppers** – rich, rich, rich source of vitamin A, very rich. Also keep the seed and add to soup for manganese. Excellent, excellent foods raw.

REAMS/SKOW COOK: If you grow **bell peppers** in your garden, I"ve got a secret for you. Let them get red. The red bell peppers are better-flavored than the green ones. If you would grow a highly organic – no, not organic, highly mineralized pepper, and then you stuff it, it"ll look just like you picked it off of the bush after it's stuffed. It will not wrinkle or shrink up and look like an accident waiting for a place to happen.

RETURN TO TOC

PEPPERS, HOT

AG LECTURES: Student: Why is it that you can't plant bell peppers and tomatoes close together? Reams: Because they hate each other. The frequency is too far apart. **Or hot peppers either**. Don't plant them close to tomatoes. The frequency is too far apart.

AG LECTURES: Every year I grow about 25 hills of **hot peppers**, about 25 hills of bell peppers and 25 hills of the yellow banana peppers. And we pick all these peppers about every 3 weeks. We get about a bushel of peppers.

AG LECTURES: Cucumbers, squashes, green beans, bell peppers, **hot peppers**, rutabagas, turnips, onions should have between 6 & 8 Brix.

AG LECTURES: What happens to young plants or onions or **peppers**, beans, tomatoes – row corps; whenever there's a copper deficiency? What happens to your young plants? They rot off at the ground.

GARDENING: There are some plants that really appear to hate each other. One case is a tomato plant and a **pepper plant**. Don't plant those together.

RETURN TO TOC

PESTS

AG LECTURES: All [**pest] worms** are laid by some kind of a moth or a beetle.

AG LECTURES: Nematodes bear their own young and lay eggs. **Worms have to have a moth** or beetle or something on that order to propagate them.

AG LECTURES: Reams: The higher the sugar content, the higher the mineral content and the higher the sugar and mineral content, the less **bugs [pests]** you have. Why? Student: The alcohol kills them? Reams: Yes, the alcohol kills them, but there's another reason too. There's one more reason I haven't told you about. It increases the oil content and it gives him a physic. That is exactly what happens. In other words he gets diarrhea. You who have studied **bugs and worms**, you know what I am talking about. You've handled them and you go to do something with them, the whole business would get diarrhea and you'd have to start over again. In other words they'd just go to nothing. I don't know of anything sicker than sick worm with diarrhea. He looks like just a dead mass of stuff, really a sick worm.

ANDERSEN: The Reams soil test was developed to reflect, in the test values, the characteristics actually observed in the field. These characteristics include soil compaction and tilth, weed **and pest problems**, crop quality and yield, and overall stability of soil and plant nutrients.

ANDERSEN: Irradiation of "food" only covers up the mistakes of growing nutritionally inferior crops and perpetuates the myth that crop diseases, **insect pests**, and cosmetic flaws are due to pesticide and radiation deficiencies.

ANDERSEN: The reality in the field is that **pests are directly correlated to a nutritional-balance threshold**, below which these pests eradicate the crop and above which they leave the crop alone.

BEDDOE: Pests are natures disposal crews working to get rid of the poor quality plant life resulting from poor

soils.

BEDDOE: Lack of boron also contributes to providing **areas for plant pests** to proliferate.

ENERGY RESEARCH: If there is a carbon deficiency there is a C02 deficiency which will result in a carbohydrate deficiency and an oxygen deficiency which will result in decreased aerobic microbial life which will result in increased toxicity, reduction of carbon cycle and finally sterile soil, loss of the magnetic field, and a **favorable environment for all types of pests** both above and below the ground.

FOLIAR FEED 1981: Reams urges his farmer audience to foliar feed the soil PRE-PLANT so as to head off blue mold, cutworms, nematodes, wireworms, loopers, aphids, **and other pests** before they get a chance to cause harm.

FOLIAR FEED 1981: 4 pounds of 5% **chlordane** per 100 gallons of water will destroy all **sand flies, mites, fleas and ticks**.

FOLIAR FEED 1981: Chlordane, Dieldrin, Black Leaf 40, or pyrethrin for **grasshoppers**. The last two are nutritional sprays.

FOLIAR FEED 1981: Use 2 pounds of 10% chlordane in 100 gallons for **wireworms and grasshoppers**.

FWTK: A plant with a high mineral, oil and sugar content will not be as susceptible to insect damage either. The leaves of a healthy plant will have a glossy sheen, and egg-laying insects will not lay their eggs on a healthy leaf as readily as they will on a sick, dull leaf. **Insect pests are not as attracted to a plant with a high sugar content**, attacking it last. Damage produced from chewing insects is also reduced because of the oxidation of the sugar in the sap of the plant into alcohol. The alcohol intoxicates the insects, killing them or making them sick in the progress. This can only happen if the plant contains a high sugar content.

PLANT FEED 1976: Our foods have never been so safe from poison sprays as they are today. The sprays we use today are all gases **that kill the pests**. They evaporate off the vegetables and plants and don't remain on there like you read in the health books. It gets more into the air and messes up the air, doing more harm to the air you breathe, than it does to the food you eat. Fifty years ago, when they used arsenic of lead on fresh green foods, they were a lot more dangerous because that did not evaporate. They were not water-soluble and were dangerous to eat. Today all highly toxic high stream sprays are under strict surveillance of the government. Orchards have never been so safe.

PLANT FEED 1976: Sugar is the greatest enemy that bugs and pests ever had. Bugs will not attack plants with a high sugar content - they hate it with a passion but they don't know it.

SKOW: In order to **keep all insects out**, the *[corn]* stalk sap must be above 12 Brix before it confers complete insect resistance.

RETURN TO TOC

pH

ADVANCED AG: Reams: the **pH is not important** except to help understand the resistance in the soil.

AG LECTURES: Reams: Suppose you were down in a place like Haiti **where the pH is 14, solid lime rock**. What is the first thing you'd do to make that soil possibly produce? Student: You have to put in what you don't have, put acid on it. Reams: That's right, You'd use sulfuric acid. Then what? If you apply the sulfuric acid to the lime rock, what would it do, what would you have? Student: Change it to a cation. Reams: Yes, but what is the name of the substance you'd have? Student: Calcium sulfate, gypsum.

AG LECTURES: Reams: How could aluminum lead you astray in the soil? How could it fool you? Student: Make you think you have a nutrient when you really don't. Reams: How would that show on a soil analysis report? Student: Say there's more energy than there really is? Reams: That's right, you'd say there's more energy there. Now what makes energy? Student: Anions and cations. Reams: And how does that show on your chart? Student: As ERGS? Reams: No, not as ERGS. Student: pH? Reams: pH, that's right. It's a measure of the resistance. It can make you think you've got more resistance than you have got there. It can lead you astray. **pH is always a measure of resistance. It can fool you, it can lead you astray**.

ANDERSEN: An interesting additional note about alkaline extracted humic acid products is that once they are applied to the soil and they are **exposed to a pH less than 7**, the humic acid precipitates and has little or no activity or benefit.

ANDERSEN: The **pH of cow urine should be around 7.4**. If the pH is much higher than this, there is a possibility that the rumen is malfunctioning, allowing too much free ammonia to pass into the blood. If the pH is too low, the rumen possibly is not functioning properly because of too much acid, which may inhibit nutrient assimilation.

ANDERSEN: pH does not indicate the level of calcium availability. At high pH, only Ca(OH)2 is soluble [*in water*]. Sour grass weed pressures indicate insufficient calcium availability.

ANDERSEN: Adding high-calcium lime, one in which the calcium carbonate component in extremely dominant to a high-magnesium soil **might actually lower the pH**.

ANDERSEN: Finally, this [typical not-so-great organic] program adds an excess of calcium sulfate in an **attempt to**

lower the soil pH which contributes, along with the excess nitrogen and salt, to the depression of the biosystem.

BEDDOE: Metallic substances, such as iron, sulfur, and aluminum are often the **culprits that give low pH readings** in soil where there is already an over-supply of water soluble calcium.

BEDDOE: Many soil chemists say that when the pH of the soil is wrong that the iron is less available. In other words, when the pH is on the acid side of the pH scale, the iron is much more available than when it is on the alkaline side of the scale. This statement is actually only true if there is not enough available phosphate in ratio to the potassium in the soil chemistry. When there is adequate available phosphate, the **pH of the soil makes little difference**.

ENERGY RESEARCH: Skow: Manures in general have a tendency to acidify the soil and ideally for most crops **we like the pH in the 6.4 6.8 range**.

ENERGY RESEARCH: If the **pH of the water is extremely high or extremely alkaline**, it probably is not going to be nearly as effective as far as being taken in by the leaf.

ENERGY RESEARCH: One thing that can make the **soil pH go up** is just the lack of air. As that pH goes up nutrients become unavailable and the quickest way to solve that problem is to go out and cultivate.

FWTK: Testing soil without using a test for water soluble plant foods will lead a farmer to believe his soil has plenty of the elements in which it may be most deficient. The basic tests included are for nitrate nitrogen, ammoniacal nitrogen, phosphate, potash, calcium, **pH** and ERGS.

FWTK-pH: Metallic substances, such as iron, sulfur and aluminum, are often the culprits **that give low pH readings** in soil where there is already an over-supply of water-soluble calcium.

FWTK-pH: Potash may also be **used to raise a pH**. Potash also comes in many different forms. Sulphate of potash, which is highly acidic when first applied, is slow acting. Even though it is acid to begin with, the soil pH reading will rise somewhat above what it was at the tune of application.

FWTK-pH: A pH reading does not show **when lime or potash is needed** even though it may denote such to be advisable and is wrongly used as such.

FWTK-pH: The colloidal content of the soil also **affects the pH reading of sandy soils**. The colloids in the soil are very important and must not be overlooked

PLANT FEED 1976: Student: **Why don't you care about pH values**? Reams: Why should I? I'll handle it in any soil. For example ,we are going to be testing the ERGS and whenever I know what my ERGS are I feel that is what the pH is.Student: So you can do it either way---in some things? Reams: No, ERGS is the only accurate way to do it.

SKOW: Even farmers who use generous amounts of compost on their crop acres still need high-calcium lime because it just isn't there, **pH notwithstanding**.

SKOW: Magnesium, pound for pound, can **raise the pH up to 1.4 times higher than calcium**. A soil high in magnesium and low in calcium can test above 6.5, but will be entirely inadequate for the growth of alfalfa, for the growth of legume bacteria, and above all, for maintenance of an environment necessary to decay organic crop residues into humus.

SUCROSE: A **pH reading is not a quantitative reading**, and therefore is very unreliable when used as such.

WHEELER: High-calcium lime can be applied at most any pH, but is **usually reserved for a pH of 7** or below. When the pH is above 7, gypsum (calcium sulfate) is preferred. This assumes that the high pH is due to sodium, magnesium or potassium. **NOTE:** *Be cautious with Wheeler's statement as Reams-Ag gives little credence to the "add calcium based on pH" philosophy.*

WHEELER: It [*copper*] may be somewhat immobile in **higher pH soils**.

WHEELER: The standard source of calcium for soil for centuries has been calcium carbonate. In the authors' experiences, application of high-calcium lime to a soil above 7.0 pH has **sometimes actually lowered the pH** due to the complex biological and chemical processes found in living soil. A non-toxic program calls for viewing soils as to their available calcium content, rather than using the pH concept. **NOTE:** *This quote seems far more in tune with Reams-Ag.*

WHEELER: So the first rule is: calcium is king and the second rule is: **don't use pH to determine if you need to apply calcium**.

WHEELER: **When the pH is too low** (acid) relative to the type of crop, the energy flows too rapidly. Nutrients literally pass by plant roots too fast to be properly attracted to and absorbed by the root.

RETURN TO TOC

PHOSPHATE

ADVANCED AG: The **higher the phosphate** in the soil, the higher the sugar, the mineral, the specific gravity and healthier the animal.

ADVANCED AG: When **Phosphate Rule** doesn't work, look at other elements.
ADVANCED AG: All elements enter plant in **phosphate form** except nitrogen.
AG LECTURES: Reams: What is the minimum amount of APA (available phosphate per acre) that soil should contain? Student: 400 lbs. per acre. Reams: Of what? Student: Phosphorus. Reams: **Phosphate, not phosphorus**, but phosphate. There is a difference in phosphorus and phosphate.
AG LECTURES: Reams: Let me ask you a question, what is the ratio for grasses and alfalfa between the P2O5 and K2O? Student: You want 200 lbs. of potassium and 100 lbs of P2O5? Reams: No, that's not what we said in the last lecture, first course. What is the ratio for grasses? Sugar cane? 4 to 1, **4 parts phosphate to 1 potash** is for grasses.
AG LECTURES: Student: So you're taking land that's 0-0-0 trace 0 and you're putting this on, **first phosphate**, calcium, potash, chicken manure in that order, then you should plow it in right? Reams: Yes. That is for farm crops, but not on orchards or groves. Do not disc in any of the fertilizer in orchards or groves.
ANDERSEN: **Sources of phosphate** are.: Mycorrhizae fungi—varies with bioactivity, good.
ENERGY RESEARCH: You can force a lot of growth in the stalk with nitrogen (and even with calcium) and get a high uptake in the plant but you won't increase the mineral or raise the Brix. It **still takes the phosphate**.
PLANT FEED 1976: The goal to work toward in annual crops is 400-500 pounds of water soluble **phosphate** per acre and only use superphosphate as a cata1yst in order to change your soil from an anionic condition of growth to a cationic condition of production.
SKOW: One of the biggest problems in maintaining nut trees is the failure to keep enough **phosphate of manganese** available to the tree. The best and cheapest way to supply these nutrients is via foliar spray.

NOTE: *Reams always speaks of phosphate and not phosphorous (as university people do}. You must keep these straight. According to Dr. Beddoe, you should multiply your ordinary soil test phosphorous result by 2.3 to approximate phosphate.*

RETURN TO TOC

PHOSPHATE, HARD ROCK

ADVANCED AG: Even under ideal conditions, soil bacteria can only convert 3% of the unavailable **hard rock phosphate** each year.
ADVANCED AG: If you add **hard rock phosphate** and cellulose (sawdust) to composting you get excellent release.
ADVANCED AG: Student: Can you add **hard rock phosphate** to compost? Reams: Yes, about 200 pounds to the ton.
ADVANCED AG: Non-colloidal **hard rock phosphate** is in another realm.
ANDERSEN: Sources of phosphate are: ■ Soft rock phosphate, good. ■ **Hard rock phosphate, good**. ■ Superphosphate——0-20-0, specialty. ■ Triple super phosphate——0-46-0, no-no. ■ Di-ammonium phosphate—18-46-0, no-no.
ANDERSEN: Reams used soft rock phosphate rather than **acidized or hard rock phosphate**. Although he was not opposed to hard rock phosphate, he preferred to use soft rock phosphate because it was colloidal. Colloidal particles are the key to biological systems. They do not tie up as readily as do non-colloidal materials.
PLANT FEED 1976: How do you break that sodium *[compaction]*? You use phosphate---the baking powder---the soft rock phosphate. Don't ever confuse the soft rock phosphate with your superphosphate or your triple superphosphate. It must be soft rock phosphate, because **hard rock phosphate will break down over many years** while soft rock phosphate is baking powder, right now available.

RETURN TO TOC

PHOSPHATE, SOFT ROCK

ADVANCED AG: Add **soft rock phosphate** before lime to prevent moisture loss which is slowed via magnetism of carbon.
ADVANCED AG: Don't use chicken manure on strawberries because of the boron. Instead use **soft rock phosphate**.
ANDERSEN: Sources of phosphate are: ■ **Soft rock phosphate, good**. ■ Hard rock phosphate, good. ■ Superphosphate——0-20-0, specialty. ■ Triple super phosphate——0-46-0, no-no. ■ Di-ammonium phosphate—18-46-0, no-no.
ANDERSEN: Reams used **soft rock phosphate** rather than acidized or hard rock phosphate. Although he was not opposed to hard rock phosphate, he preferred to use soft rock phosphate because it was colloidal. Colloidal particles are the key to biological systems. They do not tie up as readily as do non-colloidal materials.
BEDDOE: Iron sources include **soft rock phosphate**, basic slag, iron sulfate, molasses, and various chelated irons as can be used in foliar applications.

BEDDOE: The fastest and best way to get chemical compound colloids onto your soil is the use of **soft rock phosphate**.

BEDDOE: The use of **soft rock phosphate** will counteract this high sodium level, and help pulverize the soil.

BEDDOE: As Reams continued to work for Porter, he began to realize greater and greater benefits from the use of **soft rock *[phosphate]***. He found that the sugar levels in fruit would reach its highest level when 2000 lbs. of soft rock was applied to one acre. Later he discovered that this level applied to most farm crops, except grapefruit trees which required 4000 lbs per acre.

BEDDOE: **Soft rock phosphate**, as was mentioned, is an excellent agent to holding plant food substances and not allowing them to leach away.

BEDDOE: In a good fertilizing program, this is the reason that **soft rock phosphate** and lime should be applied first, before any other elements. Then those fertilizers applied later will not be wasted.

BEDDOE: **Soft rock phosphate** also does for the soil what yeast and baking powder does for bread dough. When the sun strikes the soil it makes it rise and aerates it. When the soil is thus aerated, it takes the bacteria down deeper and allows the oxygen to filter down in. This action helps it develop and increase topsoil depth.

FWTK: The use of **soft rock phosphate** will counteract this high sodium [*and its compacting effect]*, and will pulverize the soil. Dr. Reams has seen hardpan, like the Mississippi Valley has (so hard that the soil is like a rock), on which soft rock phosphate has been used. The soft rock phosphate pulverized the soil and made it just as loose as a farmer could wish it to be.

PLANT FEED 1976: How do you break that sodium *[compaction]*? You use phosphate---the baking powder---**the soft rock phosphate**. Don't ever confuse the soft rock phosphate with your superphosphate or your triple superphosphate. It must be soft rock phosphate, because hard rock phosphate will break down over many years while soft rock phosphate is baking powder, right now available.

SKOW: It is safe to say that 75% of the monocalcium phosphate [from factory acid treated rock phosphate] reverts back to stable tri-calcium phosphate within 90 days. In some soils the reversion takes place within hours. As soil conditions worsen, release of nutrients from **[*soft*] rock phosphate** worsens, and the chemical amateur becomes married to buying [*N-P-K*] salt fertilizers, each go-round worsening still further the structure of that soil.

SKOW: The first thing he [*Reams did to make sand productive*] was apply approximately one ton of **soft rock phosphate**.

RETURN TO TOC

PHOSPHATE, SUPER

ADVANCED AG: 0-20-0 is **superphosphate** and needed for energy. Be careful as your fertilizer dealer may give you 0-46-0 mixed with something else.

ADVANCED AG: 0-20-0 On Reams program means **superphosphate** and no other product.

AG LECTURES: Too much calcium on Irish potatoes will cause them to have scales, look like scales on it. On potatoes you need to do 2 things. You need to have a certain amount of sulfates from **superphosphate** but you also need certain amount of calcium.

AG LECTURES: Anionic plant food makes growth, cationic plant food makes fruit. So now you're going to change it from anionic to cationic. You know when the blossoms start to shed off, regardless, there's a fine delicate point there in your soil chemistry that you're not going to be able to measure. It's too delicate, but when the blossoms starts to shed off, what are you going to do to stop it? Student: Add acid. Reams: Well, what is the name of that acid you're going to add? Student: Superphosphate. Reams: **Superphosphate, yes**, or you can use just plain vinegar, if you've got a backyard garden. It's a lot quicker and a lot cheaper and a lot handier. And it's in any store. Add one teacup full to two gallons. Just sprinkle it around the ground.

ANDERSEN: When Reams discussed applying a fertilizer or material such as vinegar, **superphosphate**, or thio-sul to set fruit, he stated that a cationic material should be added. In reality, more fruiting or condensing-energy (Yin) material was needed. If he discussed applying a fertilizer or material such as calcium or nitrate nitrogen (like in forage or leaf crops) to get mostly growth without fruit, he stated that an anionic material should be added. In reality, more growth or expanding-energy (Yang) material was needed.

ANDERSEN: Sources of phosphate are: ■ Soft rock phosphate, good. ■ Hard rock phosphate, good. ■ **Superphosphate**——0-20-0, specialty. ■ Triple super phosphate——0-46-0, no-no. ■ Di-ammonium phosphate—18-46-0, no-no.

BEDDOE: **Superphosphate** is used to stimulate resistance in the soil to increase ERGS and to supply small amount of phosphate. BE AWARE that some companies have been guilty of taking double super and triple superphosphate and cutting it with a filler of some type to get the analysis on the bag to be 0-20-0 like single super phosphate. Even though the analysis is an 0-20-0 this does not make it the same as single super phosphate. It is still triple super in a

diluted form and it acts like it in the soil. Single Super Phosphate will have about 12% sulfur content, so use this as a cross check. Remember to avoid the use of the double super and triple superphosphate.

BEDDOE: **Superphosphate like (0-20-0) are highly acid**, and if you were to use and try to apply enough to get 400 lbs. of available phosphate per acre, it would create so much acidity in the soil that the soil would be totally useless for upwards of 3 years.

BEDDOE: Increasing ERGS is done by the use of catalysts. The main catalyst is the fertilizer called single **superphosphate** also known as 0-20-0.

BEDDOE: Single s**uperphosphate** is also used in conjunction with ammonia nitrogen fertilizers to keep the ammonia from following the line of least resistance and changing to nitrate. As you will remember, nitrogen is called an isotope. This means that as an element, nitrogen will follow the line of least resistance dictated by the other available minerals in the soil, especially calcium. Therefore, if you apply ammonia nitrogen on soil that is high in available calcium, then the ammonia will switch to a nitrate unless single superphosphate is applied right along with it. So anytime there is a need for a cationic switch in a crop grown on high calcium soil and more ammonia nitrogen is needed in that crop, make sure single superphosphate is also applied at the needed rate.

PLANT FEED 1976: Don't ever confuse the soft rock phosphate with your **superphosphate** or your triple superphosphate.

RETURN TO TOC

PHOSPHATE, TRICALCIUM

ANDERSEN: The calcium-humus-phosphate complex is the key to maintaining stable soil ERGS and crop quality. Without the humus component, the calcium and phosphate complex [together] to form [unavailable] **tricalcium phosphate** rendering both the calcium and the phosphate unavailable.

ANDERSEN: Quoting Weinstein *The more intense the growth of microbes, the faster the decomposition process of substances. Certain compounds, for instance, **tricalcium phosphate**, do not dissolve in the sterile rhizosphere of plants, but when soil microbes are added to the vessel the substance becomes available to the plants.* The above cited work is of particular interest because it points out that the availability of plant nutrients is a biological phenomenon as much as or more than it is a chemical phenomenon. Carey Reams repeatedly stressed this, and Dan Skow still does.

SKOW: When we study how Dr. Reams rated the different elements according to his biological theory of ionization, we have two complete opposites: one turning clockwise and one turning counterclockwise. This gives a tremendous energy release to the plant when these two elements are sprayed together. The problem has always been that when they were mixed, they formed **tricalcium phosphate**, which was not readily taken in by the plant.

SKOW: For instance, use of 18-46-0 in a high calcium soil will result in a rapid tie-up into **tricalcium phosphate** if the soil has low organic matter and low biological activity.

SKOW: **Tricalcium phosphate** is a highly insoluble calcium. I would not even consider it unless the price was extremely right and I had a biologically active soil.

*[See Entry **UNAVAILABLE**]*

RETURN TO TOC

PHOSPHATE/POTASSIUM RATIO

ADVANCED AG: **Ratio of phosphate to potassium** is 2-1 except in grasses. **Ratio of phosphate to potassium** in grasses is 4-1.

ADVANCED AG: **Ratio** of phosphate to potash is 2:1.

AG LECTURES: Reams: What is the **ratio for grasses**? Sugar cane? 4 to 1, **4 parts phosphate to 1 potash** is for grasses.

ANDERSEN: Reams soil-testing method, this **ratio should be** 2 pounds of phosphate to 1 pound of potash for row crops and 4 pounds of phosphate to 1 pound of potash for alfalfa and grass crops. Succulent types of plants like purslane are indicative of soils that are deficient in biologically active carbons.

BEDDOE: When the **phosphate and potassium ratio** is where it should be, you can remove a maximum of 50% of the available TDN (Total Daily Nutrient).

BEDDOE: The **ratio of phosphate to Potassium in the soil should be 2-1**, or two parts Phosphate to 1 part of Potassium or Potash. This means that for maximum yields you want a minimum of 400 lbs. of phosphate and 200 lbs. of potash. This ratio and level is for all crops except grasses. On grasses you want a **ratio of 4 parts phosphate and 1 part potassium**. These grass crops have the ability to get practically all their potassium from the air.

SKOW: The **ratio** of all crops (except grasses) for **phosphate and potassium** in the soil is two parts phosphate to one part potassium [2 P2O5 to 1 K.] The **ratio** for all grasses is four parts **phosphate to one part potassium**. [4 P2O5

to l K.]

PLANT FEED 1976: The **ratio between potassium and phosphate** in the soil is this - don't forget it - two parts of phosphate to one part potassium.

PLANT FEED 1976: The **ratio between phosphoric acid and potassium** is 2:1, two phosphate and one potash except alfalfa and grass with the ratio of 2.5 to .5 . What about sugar cane, what is your ratio for sugar cane? Did you know sugar cane is a special grass? So the ratio does not apply to sugar cane.

PLANT FEED 1976: In this case where you've got too much potash, if you added more phosphate, that would tend to correct the imbalance if you added calcium proportionately to your phosphate. There's no ratio between calcium and phosphate in other words, it is a variable. Nature will make those corrections providing you have sufficient amount by volume.

SUCROSE: Keep the **ratio of phosphate and potash 2:1** from November to April, and it will join in sufficient amounts in the protein molecule to give tremendous yields (2 P:K).

NOTE: *The careful reader is sure to spot numerous variations of the "phosphate to potassium ratio" so staunchly pushed by Reams. Phosphate is P2O5, not elemental phosphorous. Potash is K2O, not elemental potassium.*

RETURN TO TOC

PHOTOSYNTHESIS

ADVANCED AG: The rate of osmosis is not a constant. It can be increased if you work to be sure everything the plant needs is there if the photosynthesis is correct.

AG LECTURES: Reams: How does the process of osmosis work? Student: Photosynthesis? Reams: No, not on photosynthesis. **Photosynthesis is the process of osmosis in reverse**. Student: Absorption of water? Reams: Yes, absorption of water, but by what? By squeeze method. Just pushed it on up, squeeze, squeeze, squeeze method. That's the way it gets up there. Isn't it interesting to know how plants feed?

ANDERSEN: Manganese activates a number of enzymes, including some **related to photosynthesis**, and is an important component in chloroplasts.

BEDDOE: **Photosynthesis usually starts when the first rays of the morning sun** penetrate the leaf. As glucose is produced by photosynthesis, the leaf cells use some of it for respiration. The excess glucose is stored as starch grains in the mesophyll cells. Starch storage is at a maximum, usually, at about mid-afternoon. The mesophyll cells then convert the starch back into glucose.

FOLIAR SEMINAR 1983: Pith separates the liquid flow of osmosis & **photosynthesis**.

SKOW: The other key to the success of this spray program is the use of magnesium sulfate which speeds up metabolic processes and helps make sure there is enough magnesium for the chlorophyll molecule to keep the **process of photosynthesis rolling** to produce simple sugars.

WHEELER: The brix reading is a good indication of the efficiency of the plants' output of carbohydrates which is the **result of photosynthesis**.

WHEELER: Magnesium, like calcium, is now being considered as a primary nutrient. It is an integral part of chlorophyll making it **essential for photosynthesis**. **NOTE:** *Reams strongly warned against magnesium supplementation, possibly because of its ability to drive nitrogen out of soil, plant, and animal.*

RETURN TO TOC

PITH

ADVANCED AG: Skow: If you have no test equipment at all when evaluating a crop, **examine the pith**.

ADVANCED AG: Skow: If the **pith of corn** is pearly white, you have adequate calcium.

ADVANCED AG: If you have **no pith at all** in pasture grasses or alfalfa, you have boron deficiency.

AG LECTURES: Reams: How would you check the mineral content of 4 foot high growing alfalfa? Student: The refractometer? Reams: Suppose you didn't have your refractometer? Suppose you were in lespedeza or corn or any other field? Student: Could you do it by **checking the pith**? Reams: Exactly right. Cut it off and look to see if it is hollow in the middle. If the pith is solid and full. You have higher sugar content. Low sugar content gives you a hollow stem, a reed.

AG LECTURES: Top quality wheat will not shed off the stalk even when it's ripe. The whole head will bend over, the head will break and bend. When you see ripe wheat with the heads breaking and bending, you have fairly good wheat. The best wheat will stand up all winter long until beat down by snow or after the stalk is dead providing it has **plenty of pith** within the stalk.

ANDERSEN: As the soil improves, the weeds will decline and the crop will increase in Brix readings. Pull some weeds and slice open their stems lengthwise with a knife. **Look at the pith of the weed**. What color is it? Is the

stem hollow? The healthier the weed, the higher the Brix reading, the more solid the stem and the more pearly white its pith, and the less insect damage it will have. The same, of course, holds true for the crop. The healthier the weed, the more conducive your fertilization practices are to growing weeds rather than crops unless weeds (herbs) are your crop.

BEDDOE: Boron should be of concern for one important reason, sap flow. Boron is related to the plant stem pith development When there is a deficiency in available boron, **the pith does not completely fill**. This lack of filling will then interfere with the development of the part of the stem called the xylem in which the movement of the sap, with the mineral energy from the soil, flows into the plant. When farmers are asked whether their crops have hollow stems or not, most either have never paid attention or think that it is normal for most crops. What is not realized, is that hollow stems on grasses and forage crops, such as alfalfa, are not normal. It is an expression of phosphate of boron deficiency.

FOLIAR FEED 1981: Boron makes pith and is a germicide except in chicken manure because the calcium makes it non-toxic.

FOLIAR SEMINAR 1983: Pith separates the liquid flow of osmosis & photosynthesis.

FRANK: The stems of alfalfa and small grains such as wheat or oats are often hollow, lacking adequate phloem tubes which carry nutrients from leaves to roots and other parts of the crop. With proper basic nutrition, you can create much larger phloem tube pathways, **visible as pith in stalk cores**. Look for solid stem alfalfa.

PLANT FEED 1976: Reams: If you had grass that had a hollow stem [**no pith**] what kind of fertilizer would you use? Student: Chicken manure? Reams: That is right---chicken manure---why? Student: It has boron in it? Reams: Right. Chicken manure is the best---the rest of it can come from the air.

SKOW: If com is healthy, tubules will be packed together all the way to the center. The **center or pith** of the stalk should be pearly white, not the dirty gray called gummosis.

WHEELER: [After cutting a corn stalk to evaluate] never taste a discolored node as you may be ingesting a toxic dose of whatever your plant is trying to filter out of the plant juices. Tasting the clean, **clear white pith** from higher up can give you a relative payability [palatability] check for your livestock. The sweet taste in a healthy corn plant is comparable to chewing gum and the sweetness can be measured by a refractometer.

WHEELER: Its use *[muriate of potash]* will cause growth to occur, but the alfalfa will produce hollow ***[no pith]*** (empty) stems, will bloom before potential growth has occurred, and will be high in both nitrates and potash.

RETURN TO TOC

PLOW, MOLDBOARD/DISK

ADVANCED AG: Plow in the fall to stop erosion. Plow roughly as possible so as to retain moisture.

ADVANCED AG: Skow: **Don't plow in the Spring**. Double disk instead.

AG LECTURES: Student: You're taking land that's 0-0-0 trace 0 and you're putting phosphate, calcium, potash, chicken manure in that order, then you should **plow it in** right? Reams: Yes. That is for farm crops, but not on orchards or groves. **Do not disk** in any of the fertilizer. Leave it right on top of the ground.

AG LECTURES: Reams: What is the primary benefit of adding compost over manures whenever you **disc them in or plow them under**. Student: It is immediately available. Reams: That's one thing, but what is the something else I am trying to get across to you? It doesn't burn the plants. The raw manure creates a heat in the soil. If you have a dry year

BEDDOE: Colloidal phosphate will prevent calcium from leaching down in the soil. Every ton of soft rock phosphate will pick up and hold in the topsoil 6 tons of lime. Because of the upward movement of phosphate and carbon, it is **recommended to use a moldboard plow** to flip the soil so that the phosphates and carbons are taken down in the soil. When this is done, it will allow the phosphates along with the carbons to move toward the surface again picking up more mineral energy and moving to the topsoil.

BEDDOE: ...*[some]* farmers do not realize how poor mineral energy reserves *[TDN]* can be made worse by working ***[plowing]*** too deep. In other words the small amount of energy that is in the top soil can get spread out even thinner by turning it or mixing it too deep.

FOLIAR SEMINAR 1983: Plow roughly with **moldboard plow** in fall, adding lime & phosphates. This will double the root zone.

FWTK: An orchard or grove should **never be disced or plowed**. because the roots of the trees will bleed sap if they are cut.

PLANT FEED 1976: Use the **moldboard plow every year**, because the carbon keeps rising to the top, making the topsoil more narrow and more narrow. The moldboard plow catches that soil, puts it down to the bottom and then it'll start. rising again up to the top. So use your moldboard plow. A good rotary disk plow is good on very hard soil. But. never try to get. by without your moldboard or your disk alone. I prefer that every place you can use the

moldboard p1ow, use it. But there are some soils so rocky you can not use the moldboard and you have to use the disk plow. So, you'll have to work out. those details according to how many rocks are in the soil.

PLANT FEED 1976: Student: What about sandy soils? Won't the wind blow them away after **moldboard plowing**? Reams: Moldboard---put your plant food on like I told you and the wind will blow the dust off everybody's field but yours. Not a grain of sand will be blown off your field. It will be like your soil is magnetized and the wind will bring in soil from other places. I have seen 100-500 acres where this was done and not a grain was blown off. Yet all around it looked like a fire. It. may take a 1ittle while to reach its climax, but this sand blowing can be stopped. You have the power in your hands to stop it.

SKOW: Midwest prairie soils were running 10 to 12% in organic matter before the arrival of the **moldboard plow**. Today most of them have organic matter in the 2 to 3% range. Only a few well managed soils have a 5 to 6% index. Only rarely will 8% become an entry on a soil audit. Once intensified farming is started, most excellent soils have a tendency to back down to 5 or 6%.

WHEELER: To **moldboard plow** residue 8 to 10 inches deep in this soil condition [pre-existing 3-4 inches aerobic] is to almost guarantee that there will be little decay system and no new humus formed.

WHEELER: In spite of the negative aspects involving erosion and power requirements, the **moldboard plow can be beneficial**. In the soil, some nutrients tend to rise while calcium and others tend to move downward. A soil left undisturbed will stabilize from the top down in the following layers: carbon, magnesium, phosphate, potash, sulfur, aluminum, manganese and calcium. At times, it is very beneficial to invert this system with the moldboard plow. This inversion will bring the heavy nutrients to the top and move the lighter nutrients down into the soil.

WHEELER: Most tillage approaches can produce a plowpan or hardpan. The **moldboard plow carries much weight on a very narrow edge of the plowshare**. In wet conditions, the soil below the plowshare will smear. As it dries, it will seal, stopping water and air movement. Disks, chisel plows, field cultivators, and subsoilers can **all contribute to hardpan even in sandy soils**. As the-soil is tilled, the small particles settle. When tillage is continued at the same depth, the particles settle just below the tilled level. These small particles keep filling the pore spaces until a hardpan is formed. This can be just as bad a hard pan as that caused by plowing when the soil is too wet.

NOTE: *Plowing, the mechanical moving of soil, whether to plow or to not plow, has occupied the time and energy of countless farmers for perhaps countless years. Reams clearly instructed that permanent crops such as groves or orchards should never see a plow. On the other hand, he strongly suggested plowing to counteract or offset the tendency of certain minerals to move in the soil strata. He felt they should be brought back to the top. It is interesting to note that a general consensus among conventional farmers that plowing mostly harms soils has kept some of Reams' most loyal students from freely embracing him on this subject.*

RETURN TO TOC

PONS

ANDERSEN: Cut the corn stalk lengthwise and look at the plant's plumbing system. Is the bottom of the stalk base, **the pons**, brown and hard? In general, we find that it is. This is congested or plugged tissue caused by toxins in the soil.

ENERGY RESEARCH: The pons is a place in the plant where the sap changes direction similar to capillaries in animals. It is located in the leaves [?] in plants.

PLANT FEED 1976: The sugar has to go all the way to the ground, then go back up to **the pons** or the trunk or little dispatcher which tells sugar where to go according to the micronage.

SKOW: Osmosis is the process of sap going up. Photosynthesis is the process of converting sap to sugar, and this includes bringing the sap **down to the pons** and redistributing the sugar to the rest of the plant. The pons is a sort of brain center for the plant, and it is usually right at the ground level.

SKOW: If you buy pecan trees you will discern the fact that they have a forked root system. If this is missing, **the pons will be missing**, and the tree will grow a year or two and die.

WHEELER: Quoting Reams: "Upon passing from the root zone to enter the plant stalk, a crucial line exists **called the pons**." Here the plant electrochemically fixes the nutrient in question with phosphate so it will go to a particular part of the plant, for instance, leaf, stalk, or fruit, based on the new frequency established at that point. Through the growth process, the phosphate would then travel back down through the stalk, re-enter the roots, and the cycle would repeat. This cycle gives a clue as to why phosphate is not necessarily required in large quantities (it cycles), yet it is important to be available in sufficient amounts.

COMMENTARY: *The reader should review the "**STUMP**" entry. It is possible that stump and pons are the same concept with different names.*

RETURN TO TOC

POTASSIUM (as compound)

ADVANCED AG: On potatoes you would be better off to use Chilean **nitrate of potash** with ammonium sulfate as a side dressing instead of 0-20-0 (if you have plenty of ammonia nitrogen).

ADVANCED AG: **Muriate of potash** deteriorates soil due to chlorine.

AG LECTURES: Reams: What would happen if you added 300 lbs. of potash at one time to that acre? Student: Too much of a jolt? Reams: It would kill that ground as dead as a doornail because you had too much at one time. You're going to have to divide it up. I might add 100 lbs. of **sulfate of potash per acre**. I might add 5 tons of sawdust and I might add a ton or two of tobacco stems. And that way I would get my potash up and in about 6 months later I would add whatever it takes to move it up again. But what I am trying to say is be careful, when you calculate your amount of potash and when to put it down.

ANDERSEN: Now, when someone tells you that the chlorine from **muriate of potash** just evaporates into the air, you will know better...

ANDERSEN: The first thing you must understand is that crops grow from energy; therefore, you must provide sufficient energy for the upcoming crop. If you have been using large quantities of nitrogen and **muriate of potash**, you cannot just stop using them without replacing their energy equivalent, or you will have a failure. If you reduce the potash, you must replace it with calcium.

BEDDOE: Other fertilizer materials that can be used as catalysts in certain situations include: ammonium sulfate, ammonium thiosulfate, ammonium phosphate, calcium sulfate, calcium nitrate, **potassium sulfate, and potassium nitrate**.

BEDDOE: Muriate of Potash is one fertilizer that ought to be completely out-lawed. It contains 40-50% chloride. It is **potassium chloride**.

ENERGY RESEARCH: The interesting thing about that aspect *[dying cows]* was when we examined the alfalfa crop the leaves on the alfalfa and the stems were covered solid almost with little black dots. This is an indication of an **excess of potassium nitrate**..

FRANK: Coops typically use the very worst fertilizers that compromise soil health; **potassium chloride**, DAP, and anhydrous ammonia are the worst offenders.

FRANK: If you go in there with a **high nitrate, high potassium product**, you will probably push the ERGS up some, but the health of the plant will simply go down very fast if you put on what is there in excess already.

FWTK-pH: The three most commonly used ingredients for sweetening soil are ashes, lime and **chlorine from muriate of potash**. A pH reading is wrongly used when used for the sole purpose either of denoting whether an alkali is needed or what form of alkali is needed. Either or both of these factors can cause a farmer to operate far below his capacity and are many times the absolute reason for great financial losses.

FWTK-pH: Potash may also be used to raise a pH. Potash also comes in many different forms. **Sulphate of potash**, which is highly acidic when first applied, is slow acting. Even though it is acid to begin with, the soil pH reading will rise somewhat above what it was at the tune of application.

FWTK: They [salts] become a problem when they are out of ratio with the other elements in the soil. There are many types of salts that can cause this problem. It could be chloride salts, nitrogenic salts, calcium salts, **potassium salts**, ammonia salt, iron salt or many other different kind of salts. Despite the type of salt, increasing the calcium, phosphate and potassium in proportion to these salts will eliminate the problem.

FWTK: This [simplistic] type of test may show a forty-year supply of calcium, phosphate **or potash**, and yet these may not be available to the plant at all.

SAIT: While we are talking potash, what are your feelings about the use of **muriate of potash vs. sulfate of potash**? Andersen: The only time we would consider muriate is if the soil needed chlorine. Chlorine is actually required at about 10 ppm,

SKOW: One of the biggest problems in maintaining nut trees is the failure to keep enough **phosphate of manganese** available to the tree. The best and cheapest way to supply these nutrients is via foliar spray.

SKOW: Chlorides also account for cosmetic growth, which may or may not explain the enchantment many growers have with **potassium chloride**. It works, but works has to be interpreted loosely. The response is both obvious and temporary — and costly in the long run.

WHEELER: Compaction has induced the anaerobic bacteria supposedly found only in the lower levels of the soil to populate the majority of the soil bed. **Potassium chloride isn't the only culprit**. Herbicides, pesticides, and other farm chemicals also contribute to the decrease of proper soil life.

NOTE: *See note about "potassium vis-a-vis potash" in the entry **POTASSIUM** (as element)*

RETURN TO TOC

POTASSIUM (as element)

ADVANCED AG: Calcium carbonate will **not tie up potassium** if applied with chicken manure because of the added bacterial content.

AG LECTURES: Just one cigarette did that because that plant [Defenbachia] **cannot stand potassium. It takes it from the air**. So whenever you see the tip point of the leaf dead and crisp and dry on the side or little black dots on the leaf, that's too much potassium for the amount of P2O5.

AG LECTURES: Have you noticed it [little black dots] on peach leaves, orange leaves, any crop? That's **too much potassium** in the soil.

AG LECTURES: Student: Going back to the tomatoes, you get these brown spots on the tomato with the black spot in the middle. They call it anthracnose. Reams: Yes, it is a copper deficiency. Student: Is it the same thing in alfalfa? Reams: No, alfalfa can be too much potassium. Student: [Potassium] causes anthracnose? Reams: No, I've never seen anthracnose as such on grass. It may be mislabeled, but it's generally a mold. **It can be too much potassium**, it can be a lack of iron. You have to examine some of these things under glass to really evaluate them.

AG LECTURES: Student: Side dressing, **what is that, potassium**? Reams: A side dressing is any inorganic N-P-K. All three are used in side dressings.

ANDERSEN: Nutrients and compounds in the soil that are considered alkaline include calcium, magnesium, chlorine, sodium, **potassium**, salts, ashes, and aldehydes.

BEDDOE: Potassium is what determines the caliber of a corn stalk or the caliber of an alfalfa stem.

BEDDOE: Alfalfa can have this [black spots on leaves] happen and the condition is said to be a virus. The problem is actually a **potassium excess** which opens the way for the virus to set up housekeeping.

BEDDOE: The parts of the reserve soil TDN are calcium, phosphate, **potassium** (potash), nitrate nitrogen, ammonia nitrogen, iron, and copper.

BEDDOE: On grasses you want a ratio of 4 parts phosphate and 1 part potassium [potash?]. These grass crops have the ability to get practically **all their potassium from the air**.

BEDDOE: ...it is even **assumed that potassium is more important** than phosphate. This conclusion is drawn from a fact that is almost always overlooked. That is that phosphate is a catalyst, and therefore is recycled in the plant, leaving little in the plant residue to be picked up by analysis.

BEDDOE: In the northern temperate zone, during the period from July 15 to September 20 (and sometimes up unto the first frost, or anytime the temperature drops below 60 degrees for two hours or more) the **trees take in potassium** that will be used to make next year's fruit. If the right ratios of potassium are not available for the trees at this time, then next year's crop has already begun to suffer. **BEDDOE:** A top-dressing by definition always refers to a synthetic fertilizer that contains nitrogen and/or **potassium** but never contains phosphate.

ENERGY RESEARCH: Liquid fish is a real nice thing to use from the stand point that it furnishes oil, amino acids, some nitrogen, phosphorus, **potassium**, a full array of trace minerals and calciums.

ENERGY RESEARCH: If citrus leaves tend to fall off if you touch them, that is a **potassium availability problem**.

ENERGY RESEARCH: Student: **How do you get the potassium down**? Skow: Add lime. It is very strange how it will come into line. When the potassium goes down and the lime comes up a very interesting phenomenon happens. For some strange reason the weed problems you've been having are no longer a problem.

FRANK: On the clay colloid *[see note below]* is adhered a certain amount of calcium, **some potassium**, some magnesium, and some sodium.

FRANK: Compost and manure are actually potent suppliers of potassium to the soil. When compost is over-applied, potassium rises to become excessive. **When potassium is excessive**, calcium is hindered and results in poor quality produce. When potassium is excessive [as shown by soil test], do not apply compost or manure...period.

FRANK: When roots and leaves sense a lack of moisture, the **potassium flow slows** down, guard cells relax and stomates close.

FWTK: They [salts] become a problem when they are out of ratio with the other elements in the soil. There are many types of salts that can cause this problem. It could be chloride salts, nitrogenic salts, calcium salts, potassium salts, ammonia salt, iron salt or many other different kind of salts. Despite the type of salt, increasing the calcium, phosphate and **potassium** in proportion to these salts will eliminate the problem.

PLANT FEED 1976: The ratio between phosphoric acid and **potassium** is 2:1, two phosphate and one potash except alfalfa and grass with the ratio of 2.5 to .5 [while this indicates 5:1, every other mention is 4:1].

PLANT FEED 1976: Student: Is there any mineral the plants cannot get from the air? Reams: Yes, calcium, **potassium** [?], phosphate, **potash** [?] - those are the main ones they can't get from the air. **NOTE:** *This is a*

puzzling claim as Reams also says ALFALFA [see] can get all its potassium from the air.

PLANT FEED 1976: The white in the [chicken] manure is a **high amount of potassium**.

SAIT: Andersen: Reams also showed that weeds are evidence of nutritional imbalance---often involving calcium and phosphate deficits or **potassium excesses**.

SKOW: The goal is TDN, total digestive nutrients — nitrogen, calcium, phosphorus, **potassium**. It is the function of carbon to keep these nutrients separated by enough space to confer on them the status of complexes. and keep them from becoming salts.

SKOW: There are a couple of products on the market that might be helpful. One is Sul-Po-Mag. It contains sulfur, **potassium** and magnesium, and it makes copper available to the plant.

SKOW: Seaweed foliars also work quite well. But from my chair, they do not deliver quite as well as liquid fish. It may be that the **potassium shortfall** underwrites my conclusion.

SKOW: Some farm crops go directly to the dinner table. In crops where the calcium has been **replaced by potassium**---lettuce, broccoli, Brussels sprouts, spinach---this potassium-calcium imbalance causes heart trouble and kidney disease. Using the conventional N-P-K fertilization program, agronomy puts too much potassium in the system, and not enough organically soluble calcium.

WHEELER: High-calcium lime can be applied at most any pH, but is usually reserved for a pH of 7 or below. When the pH is above 7, gypsum (calcium sulfate) is preferred. This assumes that the high pH is due to sodium, magnesium **or potassium**.

WHEELER: The major positive ions that attach themselves to the negative clay colloids [see note below] of your soil are calcium, magnesium, **potassium** and sodium.

NOTE: *"Clay colloids" are not the "chemical compound colloids" of Reams-Ag.*

NOTE: *How can any researcher, farmer, or author keep potassium and potash separate and in the right column? There are thousands of references in the Reams-Ag literature and every speaker or writer constantly rotates between potaissum "potash" or one of the 20-some potash compounds. Potassium is an element. Potash, K2O, is a compound. Potassium with any other element is a compound.*

RETURN TO TOC

POTASSIUM (as potash)

ADVANCED AG: Adding too much lime can **tie up potash** (both are anionic and like attracts like).

ADVANCED AG: On potatoes you would be better off to use Chilean nitrate of **potash** with ammonium sulfate as a side dressing instead of 0-20-0 (if you have plenty of ammonia nitrogen).

ADVANCED AG: In the long run, fields will need more **potash** than phosphate because the phosphate cycles and the potash does not.

AG LECTURES: Remember, alfalfa has the ability to take practically all its **potash from the air**.

AG LECTURES: Reams: After you have the phosphate and calcium, what is the next thing you should try to get on? Student: **Potash**, then chicken manure? Reams: That's right.

AG LECTURES: Student: What does sawdust give to the soil again---potassium? Reams: That's the main thing you put it down for is to supply the **potash**, but it's also a nutrient for the bacteria. It also has carbon which causes the soil to hold moisture. It also has many minor trace elements also, so sawdust is an excellent thing, providing you have enough calcium in your soil, otherwise it will make it too acid.

AG LECTURES: Student: You're taking land that's 0-0-0 trace 0 [i.e., worn out] and you're putting this on, first phosphate, calcium, **potash**, chicken manure in that order, then you should plow it in right? Reams: Yes. That is for farm crops, but not on orchards or groves. Do not disc in any of the fertilizer. Leave it right on top of the ground.

AG LECTURES: Reams: What would happen if you added **300 lbs. of potash at one time** to that acre? Student: Too much of a jolt? Reams: It would kill that ground as dead as a doornail because you had too much at one time. You're going to have to divide it up. I might add 100 lbs. of sulfate of potash per acre. I might add 5 tons of sawdust and I might add a ton or two of tobacco stems. And that way I would get my potash up and about 6 months later I would add whatever it takes to move it up again. But what I am trying to say is be careful, when you calculate your amount of potash and when to put it down.

ANDERSEN: Add **excess potash** to alfalfa, displacing calcium, and you will have "gunpowder hay" by the formation of potassium nitrate and nitrocellulose, which form when phosphate is insufficient to catalyze the proper formation of protein and other metabolites.

ANDERSEN: ...high nitrogen fertilization, particularly using anhydrous ammonia, creates a nutrient availability condition in the soil that is almost exclusively nitrogen and **potash occupied**.

ANDERSEN: Out-of-roundness of the [corn] stalk indicates phosphate, **potash**, and molybdenum deficiencies.

ANDERSEN: The first thing you must understand is that crops grow from energy; therefore, you must provide sufficient energy for the upcoming crop. If you have been using large quantities of nitrogen and muriate of potash, you cannot just stop using them without replacing their energy equivalent, or you will have a failure. **If you reduce the potash**, you must replace it with calcium.

BEDDOE: The parts of the reserve soil TDN are calcium, phosphate, potassium (**potash**), nitrate nitrogen, ammonia nitrogen, iron, and copper.

BEDDOE: Alfalfa has the ability to take practically **all its required potash from the air**, and so needs little from the soil.

BEDDOE: If a fertilizer is 50% organic, that means that 50% of the nitrogen comes from a fertilizer source containing carbon such as dried blood, cotton seed meal, or synthetic organics like urea. The **law does not apply to the phosphate and potash** in a fertilizer, both of which may be synthetic. Yet this fertilizer could be called 100% organic despite the fact that it contains many synthetics, simply because all of its nitrogen content comes from organic sources. It becomes obvious, then, that one must do his homework in order to make sure he is receiving just what he's after.

BEDDOE: There are three main sources for base (anionic), or sweet plant food elements in soil chemistry. They are potassium (**potash**), calcium, and chlorine. All other plant foods will be considered an acid reacting (cationic), or sour plant food element.

BEDDOE: There are also many instances wherein **potash added as the alkali** (anion) or soil sweetener, would have given a much better return than the addition of lime.

ENERGY RESEARCH: **Do not apply potash to the soil for grasses** (alfalfa included). There are times when a little potash in a foliar spray will benefit, but as a general rule this is not the case.

ENERGY RESEARCH: To be successful in foliar feeding one must either [already] have or [pre]apply the basic minerals to the soil, those being calcium, phosphate, **and potash**.

FWTK-pH: A pH reading does not show **when lime or potash is needed** even though it may denote such to be advisable and is wrongly used as such. Adding too much lime or potash at one time can do great harm by releasing too much energy in too short a time span. This can cause starvation in the following crop because the soil acids have been so neutralized that there is no longer any resistance.

FWTK-pH: **Potash** may also be used to raise a pH.

PLANT FEED 1976: Chicken manure is also rich in **potash**. The white in the manure is a high amount of potassium.

PLANT FEED 1976: There are 192 forms of nitrogen, 50 different kinds of phosphates, and **20 kinds of potash** that are available to you.

PLANT FEED 1978: **Potash** should be thought of as an enemy by cattlemen because it causes a terrific decrease in hay volume.

SAIT: Andersen**:** Broad-leaf weeds are a functional phosphate and **potash** issue, and succulent weeds (the viney things on the ground) are a carbohydrate issue. Another interesting thing is that, when balance improves and Brix readings go up, then the Brix in the weeds goes down. The insects go from eating the crop to eating the weeds. Again, if you're not out in the field looking at these things, you won't see them.

SAIT: While we are talking **potash**, what are your feelings about the use of muriate of potash vs. sulfate of potash? Andersen: The only time we would consider muriate is if the soil needed chlorine. Chlorine is actually required at about 10 ppm,

SKOW: This means that for maximum yields a minimum of 400 pounds of phosphate and **200 pounds of potash is indicated**. This ratio and level applies to all crops except grasses. On grasses a ratio of four parts phosphate and one part potash is correct. Alfalfa has the ability to **take practically all its potash from the air**. Therefore, it needs very little from the soil.

SUCROSE: Some things that will decrease yield: not enough **potash.** Also an oversupply of nitrogen salts, potash salts , magnesium salts, calcium, sulphur, boron, and others

SUCROSE: Apply the fertilizers as soon as possible after harvest. Phosphates join with **potash** on the protein cation side only when the temperature is less than 70° F. for two hours or more. This union produces sugarcane with a larger barrel , being one factor that determines the caliber of the sugarcane and gives a greater yield.

NOTE: *See note about "potassium vis-a-vis potash" in the entry **POTASSIUM** (as element)*

RETURN TO TOC

PROTEIN

ADVANCED AG: Skow agrees with student that many feeds are protein-deficient and that added sulfur can increase amino acids leading to **improved protein**.

ADVANCED AG: White and yellow corn has **same amount of protein**.

AG LECTURES: If you've ever taken a plant and caught this water that drips off the plant and analyzed it, you'd be surprised at how much protein is in it. However, you only get a fraction of the protein that's there. Most of the nitrogen component evaporates into the air. But that droplet contains **quite a bit of protein that's sweated out**. **NOTE:** *In some places Reams refers to this as plant urine.*

AG LECTURES: Did you ever stick your hand into a bale of hay and it felt hot, warm? Did you ever stick your hand in another bale of hay and it felt cold? Even at the same [*ambient*] temperature? I have and the one that was hot inside was rotting, decaying because it had a low sugar content. And one more thing too, it had a **low protein content**.

AG LECTURES: What I am trying to tell you is how to produce **higher protein hay**. You cannot let it lay out there and have high protein hay. You must cut it at the blossom stage and if you cut it at that stage, you must dehydrate it.

ANDERSEN: If cellulose is nitrated it forms nitrocellulose, which is used in the manufacture of explosives, collodion, and lacquers. Add excess potash to alfalfa, displacing calcium, and you will have "gunpowder hay" by the formation of potassium nitrate and nitrocellulose, which form when phosphate is insufficient to catalyze the proper **formation of protein** and other metabolites.

ANDERSEN: An excellent plant to include in the pasture mix is comfrey in 6 x 6 grids, which adds nutrition and healing substances to the pasture. **Protein levels of 25% to 30%** are reasonable with good soil nutrition as well as a more balanced calcium-to-phosphorus ratio (2:1) than alfalfa has. **NOTE:** *Here, Andersen is speaking of the ratio in the comfrey itself.*

ANDERSEN: Nitrogen must be combined with carbon, hydrogen, and oxygen in order to form an amino acid. Amino acids are then combined, as discussed in the chapter on biology, **to form proteins**. This is rarely discussed in connection with fertilization.

ANDERSEN: Sulfur can inhibit molybdenum assimilation and reduce nitrogen fixation. It is a **component of many proteins** and plant oils.

BEDDOE: The aerobes *[aerobic bacteria]* in the soil convert everything possible into **protein molecules**.

BEDDOE: Some potential benefits of potassium may include better stalk strength and lodging resistance. improved winter hardiness, more resistant to disease. **increased protein** and carbohydrate production. better sugar translocation, enhanced enzyme functions and cell division.

BEDDOE: The more bacteria that grow and die in the soil, the more **protein protoplasm** there will be to hold reserve mineral for better growth potential.

FRANK: The primary role of plants is to use their leaves and sunlight to produce sugars i.e., carbohydrates. These carbohydrates are combined with minerals, **proteins**, and other phytonutrients to produce food.

FWTK: The higher the sugar content, the **higher the percentage of protein** and oil in a crop. A high level of nitrates in crops is a result of a low mineral content. The appearance of nitrates in feeds is caused by a lack of phosphate and calcium in the soil.

FWTK: High quality crops have a resistance to disease, will not be bothered by insects as much, and will not rot as easily. Therefore, they will store longer and have **much higher protein**, mineral, oil and carbohydrate levels.

FWTK-pH: The aerobes in the soil **convert everything possible into protein molecules** in spore form. This aerobic bacterial spore is nature's way of preventing plant food from leaching. This makes the soil quite gummy and also helps prevent erosion.

FWTK-pH: The conductivity of the **plant food proteins** does have a great deal to do with the rate of plant growth. The pH reading does, in fact, greatly affect the forming of plant food proteins which are direct plant food. In the molecular structure, the proteins become more or less good or poor conductors of the electrical current passing over the crust of the Earth. The pH reading is an electrical measurement of the resistance between the acids and alkalies plus the magnetism of the electrical current flowing over the crust of the Earth.

PLANT FEED 1976: If you switch to the high quality, **high protein** natural grass, you will find that a cow won't eat over 2-3 lbs. and if you put 5 lbs. in there, they'll leave it in the trough. But if that cow eats like mad and eats it up in a hurry, that means the grass, hay or silage she's eating is too low in TDN.

PLANT FEED 1976: Alfalfa is **extremely high in protein**, a legume, it is also high in calcium. In order to produce 20 tons of alfalfa, a minimum of 8-10 tons of water soluble calcium per acre is required.

SKOW: Plants also have enzymes. These are **small protein units** that act as on-scene engineers in the cell building business.

SKOW: Although the Brix reading is loosely called a sugar index, it is really much more. For the higher the carbohydrate content in a plant, the higher the mineral content, the oil content and the **protein quality**.

SUCROSE: An oversupply of water-soluble magnesium displaces carbon in the protein molecule and converts

nitrogen into a gas, thus decreasing the **probable protein molecule** count which decreases sucrose yield.

SUCROSE: Too much fertilizer applied at one time can result in a quick release of energy without preserving this energy in protein molecules. Most of the **energy is lost unless harnessed by the protein molecules**, which results in a decreased sucrose yield.

WHEELER: There is a certain amount of that NPN (non-protein nitrogen) molecule that is urea. If you're feeding a cow **beyond 17-18 percent protein**, particularly if it's conventionally raised, you're feeding urea to cows. And you can't feed urea to dairy cows and keep them around; it's impossible.

WHEELER: Sulfur is **needed in protein and amino acid formation**, in the formation of nodules on legumes, and in many other plant processes.

WHEELER: Our conclusion is that our methods described above allow or force the plant to produce more cellulose and hemicellulose because of the large amounts of sugars available. This is why **we downplay crude protein** and emphasize Brix (sugars or carbohydrates).

RETURN TO TOC

PROTOPLASM

AG LECTURES: Reams: The carbons hold the moisture and take it out of the air. But what is the the factor that really determines the holding power? Student: Phosphates? Reams: Well, that is a part of it. One of the links in the chain, but what over all chemical structure in the soil determines the holding power? Student: Protoplasm? Reams: **Protoplasm---that's exactly right**.

AG LECTURES: Reams: Phosphate forms protoplasm in the soil. **What is protoplasm**? Student: The material in a cell, I always understood. Reams: Well, some of it is in a cell, but what is the meaning? A very fine sticky substance is the meaning of protoplasm, gummy, gluten so to speak. What is the advantage of having the protoplasm in the soil? Student: To hold the nutrients? Reams: Yes.

AG LECTURES: [Reams describing how the field he had treated with lime, phosphate, and carbon did not allow dust blow while surrounding fields did] Now why wasn't the dust blowing off that field? The answer is that **protoplasm in the soil** kept the soil and nutrients from blowing away.

AG LECTURES: So what happens when you use a chelate [on alfalfa] in a high calcium soil? It loses its leaves, all the leaves fall off. Why? Because it **thins the protoplasm** that holds the leaf onto the stalk. Nothing to hold it on. The leaf is held onto the stalk by protoplasm. Did you ever break a leaf off and look at it about 3 minutes later under a glass and you saw a little jelly-like substance form in there? It's that little jelly-like substance that holds that leaf on the plant.

BEDDOE: As the bacteria feed and function they leave both their excrement as well as their body remains when there life cycle is complete. These remains are referred to as **spore protoplasm**. This **aerobic bacterial spore protoplasm** is natures way of preventing plant food from leaching as well as holding it in a very easily usable form.

BEDDOE: [Soil] crumbling will allow for more aeration which in turn will promote more bacteria growth (providing the bacteria are fed). The more bacteria that grow and die in the soil, the more **protein protoplasm** there will be to hold reserve mineral for better growth potential.

FRANK: All biology requires calcium to build their **protoplasm**. Many soils are critically short on calcium and consequently biology is hindered. Adding compost tea to inoculate the soil will achieve little. Adding calcium is what the situation requires.

FWTK-pH: The aerobes in the soil convert everything possible into **protein molecules in spore form**. This aerobic bacterial spore is nature's way of preventing plant food from leaching. This makes the soil quite gummy and also helps prevent erosion. **NOTE:** *"Protoplasm" not used but fitting.*

WHEELER: Manures and other animal or plant remains serve to replace mineral and **protoplasmic matter** directly to the soil. In both instances, they are potential plant food which must first be composted (consumed by microorganisms) before they are available to the plant. **NOTE:** *Be wary the manure or remains have sufficient minerals to start.*

WHEELER: Ideally, bacteria will consume these fertilizers and hold them in the soil in the form of their own **protoplasmic remains**. Once this happens, the fertilizer is now considered stabilized and is not subject to leaching. It is available in a biologically active soil for the needs of the plant. It is extremely important, therefore, to use fertilizers and other chemicals which will feed the soil and not just feed the crop.

NOTE: *Two distinct thoughts appear here. First, Reams speaks of an almost automatic protoplasm generation if lime, phosphate, and carbon are correctly applied. Second, other authors speak of protoplasm as a byproduct of*

bacterial growth. In either case the goal is to achieve a stickiness in the soil that retards leaching or erosion.
RETURN TO TOC

QUALITY

ADVANCED AG: The quicker a plant or animal is grown, the **higher the quality**.

ADVANCED AG: You should have two 20 lb watermelons per vine. You should get 20 tons per acre of **high quality watermelons** (50 tons minus culls). The national average is 4-5 tons per acre of low quality.

AG LECTURES: The **lower the quality**, the less the quantity. And there's no exception to it.

AG LECTURES: Student: How do you go about marketing that quantity? Reams: Through your supply houses, your grocery chain will take all you've got if they are **high quality strawberries** that will hold up, won't rot, red all over, no hollow heart, and high sugar content.

AG LECTURES: Beet juice is a wonderful physic. it's a laxative. It also builds red blood cells, vim, vigor, vitality. It gets you ready to go in the morning. That's the way you do beets, **top quality**. The health food stores, once they're shown how to do this, they can't supply enough beets, beet juice, fresh beet juice, frozen beet juice and it's really, really good providing the **beets are top quality beets** when you start. If they're low quality beets, etc., then the juice is low quality.

AG LECTURES: **Top quality wheat** will not shed off the stalk even when it's ripe. The whole head will bend over, the head will break and bend. When you see ripe wheat with the heads breaking and bending, you have fairly good wheat. The best wheat will stand up all winter long until beat down by snow or after the stalk is dead providing it has plenty of pith within the stalk.

AG LECTURES: It's your poor quality corn that will mildew. Good corns will not mildew. I don't care how much rain falls on it or how much dew. The **top quality corns will not mildew.**

AG LECTURES: It isn't fair to you to **sell top quality produce at the same price they're buying junk for**. It's not fair to you. And if you don't know what you've got, no one is going to tell you.

ANDERSEN: Proponents of conventional chemical programs cannot imagine farming without chemicals, nor do they comprehend that balancing soil and plant nutrition corrects the problems of soil compaction, erosion, hardpan, insect, disease, and weed infestations, and **inferior commodity quality**.

ANDERSEN: In many cases, the soil in which these plants are growing is spewing free ammonia into the atmosphere, either from ammonia fertilization or anaerobic soil digestion. This further pumps up the plant signal---turns the volume up, as one can do with modern hearing aids---notifying the **quality-control inspectors** *[insects & pests}* to reject this production run due to inferior construction.

ANDERSEN: Manganese seems to be closely correlated to iron and copper; it is very important for **seed quality** and germination.

ANDERSEN: The calcium-humus-phosphate complex is the key to maintaining stable soil ERGS and **crop quality**.

ANDERSEN: The Reams soil test was developed to reflect, in the test values, the characteristics actually observed in the field. These characteristics include soil compaction and tilth, weed and pest problems, **crop quality and yield**, and overall stability of soil and plant nutrients.

ANDERSEN: *[Speaking of genetics]* Natural **quality indicators** such as insects, weeds, and disease have been concealed with toxic pesticides, thus creating a facade of healthy crops. As such, most open-pollinated native varieties have been discarded because their genetic expression requires a fertilization program that contains all nutritive elements.

BEDDOE: Pests are natures disposal crews working to get rid of the **poor quality plant life** resulting from poor soils.

BEDDOE: Average com seed will weigh approximately 56 pounds per bushel. Optimum corn can run as high as 66 pounds per bushel. With this information it can be seen that **high quality seed** corn is 17% heavier than the average quality seed.

BEDDOE: **High quality crops** have a resistance to disease, will not be bothered by insects as much, and will not rot as easily.

BEDDOE: Yet increasing the nitrogen out of ratio to the amount of mineral energy available will put too much water into the crop and thus **reduce quality** to quite an extent.

BEDDOE: And of course the faster **mineral energy** moves into a plant means that the magnetic attraction for greater and greater amounts of mineral energy increases faster. The **end result is quality**.

FRANK: When potassium is excessive, calcium is hindered and results in **poor quality produce**.

FRANK: So what is the difference between a tomato plant that collects and reformulates energy into 2 lbs. of tomatoes versus another plant that produces 30 lbs. of tomatoes? What is the difference between a plant that **produces the highest quality** and another that produces poor quality? Lack of energy! The difference is the amount of collected and reformulated energy.

FWTK: **High quality crops** have a resistance to disease, will not be bothered by insects as much, and will not rot as easily.

FWTK: If the mineral balance in the soil can be matched to suit the frequency of the crop, the plants will be fed as fast as they can assimilate the food. This will cut the number of days till harvest, **improving the quality** and yield in the process.

FWTK: According to government standards, it takes 32 lbs. of green beans to make a bushel. A bushel of **high quality beans** will only fill the bushel basket 3/4 full and still weigh 32 lbs. Poor quality beans with a low sugar content will require an extra six inches of beans on top to weigh 32 lbs. The heavier beans are the most nutritious since they contain the most minerals.

GARDENING: Reams: I inspected 80 acres where a third of the onions were dying. When I inspected one and found teeming nematodes, the university people present said they did not know that nematodes would eat onions. I pointed out that the **quality was so low that the nematodes would indeed eat onion**. What I am trying to tell you is that worms, bugs, nematodes, etc. only strike at the poorest of poor produce.

PLANT FEED 1976: If you switch to the **high quality, high protein natural grass**, you will find that a cow won't eat over 2-3 lbs. and if you put 5 lbs. in there, they'll leave it in the trough. But if that cow eats like mad and eats it up in a hurry, that means the grass, hay or silage she's eating is too low in TDN.

PLANT FEED 1976: It you grow **top quality** corn or wheat and you don't know what you have, the buyer is going to pay you the same price for your top quality produce as he pays for the **poorest quality**.

PLANT FEED 1978: Be sure and tell the brokers what you have and when it is coming, as it takes them a couple of years to know you are a grower. If your **cabbage is high quality** and high Brix, they will be bidding against each other soon.

REAMS/SKOW COOK: *[Reams was in a market in Hot Springs and for 50 cents each bought two bushels of grapefruit that he noticed had hard rinds]* **Top-quality fruit won't rot**; they'll form a shell like wood around it. The friends I was staying with thought I was crazy, buying junk, trash---but when they tasted them, they said, that's the best grapefruit I've ever eaten in my life." Sure they were the best, or I wouldn't have bought them.

SKOW: Repeated sprays with fish and seaweed combinations in low amounts as a ten day program — especially in orchards — will gradually build up fruit-wood and root production for the following year. The consequences will be **high quality produce**.

SKOW: Although the Brix reading is loosely called a sugar index, it is really much more. For the higher the carbohydrate content in a plant, the higher the mineral content, the oil content and the **protein quality**.

RETURN TO TOC

RATIO

NOTE: ***The PHOSPHATE/POTASH RATIO is a key part of Reams-Ag and has it's own entry.***

ADVANCED AG: 10% carbon is the best **carbon/nitrogen ratio** for soil bacteria to be able to work.

AG LECTURES: Student: Too much is what caused the root to split? Reams: That's right, too much nitrogen salt, yes. Student: What do you do to prevent this? Reams: Raise your phosphoric acid content. Your copper, you make the roots stretch. Raise your **calcium content and copper ratio**. In other words, your nitrogen is too great for the other elements

ANDERSEN: In essence, pH is the result of the nutrient interaction, not the cause. **When the nutrient ratios are balanced**, the pH will stabilize automatically in the correct range.

ANDERSEN: An excellent plant to include in the pasture mix is comfrey in 6 x 6 grids, which adds nutrition and healing substances to the pasture. Protein levels of 25% to 30% are reasonable with good soil nutrition as well as a **more balanced calcium-to-phosphorus ratio** (2:1) than alfalfa has. **NOTE:** *Here Andersen is speaking of the ratio in the comfrey itself.*

ANDERSEN: Whenever there is less than a 7:1 **calcium-to-magnesium ratio** (Reams test), there will be an increased nitrogen demand because of less efficient nitrogen use, requiring increased applications of nitrogen fertilizer.

ANDERSEN: The criteria for good compost production are a good mix of organic materials, i.e., manure, straw, leaves, sawdust, food scraps, and so on, to get a 20:1 to 30:1 **carbon-to-nitrogen ratio**...

BEDDOE: As the elements and compounds in the soil encounter each other with their **differing frequency ratios**, a resistance reaction begins between them. The amount of that resistance depends on combination and strength of the anions and cations involved. When the resistance runs to a complete synchronization of the two substances, they will combine.

BEDDOE: Plants cannot be grown without salts or carbon; this is where the organic salts come from in vegetables. The problems begin only when **salts are out of ratio** with the other elements in the soil.

BEDDOE: Any time the major carrier of mineral into a plant is allowed to be nitrogen, problems will develop. One, not much mineral gets into the plants. Two, the plant has an **extremely high water ratio**, which when dehydrated leaves a small amount of poor food substance.

ENERGY RESEARCH: The application of Sul-Po-Mag is a better way to make copper available to the plant on a long term basis. If there is an **excess of Sul-Po-Mag in ratio to the copper** then thin skinned fruit like tomatoes will have creasing where the skin is too thin.

ENERGY RESEARCH: The only way to get rid of the sodium build-up on the surface of the ground is to apply carbons and some calcium to **bring the sodium in ratio with the other elements**.

ENERGY RESEARCH: The darker the color of the leaf the more energy it picks up from the sun. If the leaves are too thin then the **nitrogen ratio is out of balance**.

FWTK: They [salts] become a problem when they are **out of ratio** with the other elements in the soil.

PLANT FEED 1976: In this case where you've got too much potash, if you added more phosphate, that would tend to correct the imbalance if you added calcium proportionately to your phosphate. **There's no ratio between calcium and phosphate** in other words, it is a variable. Nature will make those corrections providing you have sufficient amount by volume.

PLANT FEED 1976: Reams: **S**uppose you have too much nitrogen on the ground. There are 2 or 3 ways to prevent it and handle the situation. What. is the most economical way? Student: Add magnesium? Well, yes, that will get it down immediately, but is that the wisest thing to do? Add more water. The **nitrogen content of the soil is in direct ratio to the amount of moisture that the soil contains** at all tines.

SKOW: Calcium and magnesium should be about 7:1. Most farmers have a 3:1 or even a 1:1 ratio. **Any ratio narrower than 5:1 means problems** beyond instant comprehension. It means compacted soils, bacteria that can't proliferate, and weed takeover---in short, a marginal production sequence.

SKOW: The efficiency of this [decomposition] process is **governed by the ratio of carbon to nitrogen** in the soil, which at its optimum level should be twelve parts of carbon to one part of nitrogen.

SUCROSE: Soils that are depleted of carbon will result in air that contains less carbon; however, it is not necessary for all the carbon to come from the air. Much of the carbon can be taken in through the roots, as this supply is mined out of the soil by the sugarcane; and its yield will **decrease in direct ratio** to the supply of the available carbon in the air and the soil. **SUCROSE:** Keep the **carbon/nitrogen ratio** equalized for greatest yield of sucrose.

SUCROSE: Keep the applied plant food, before it forms into protein, **in ratio with the amount of water** present in the soil. When there is too much water, the plant food protein forms much more slowly and the result is less available plant food in storage. When there is not enough water, raw manure salts may burn the roots.

WHEELER: The larger the CEC, the more nutrients are being held and the more difficult it is to make **changes in the nutrient ratios** because of the need for applying larger amounts of nutrients. **NOTE:** *It appears that Reams never refereed to the "CEC," which is strictly reserved for cation balancing theory. Reams thought in terms of **TDN** [see entry].*

WHEELER: Besides the actual amount of calcium, the ratio of available calcium to available magnesium is also critical. If the range is too narrow---less than 7:1---there is a tendency for the soil not to hold nitrogen. **As ratios of 2:1 or 3:1 are approached, it is very difficult** to keep enough nitrogen available to grow a crop without more frequent applications or larger amounts of actual N.

NOTE: *A ratio simply addresses the relationship of two (sometimes more) items. Three cats and two dogs is a cat to dog ratio of 3:2. Be cautious when reading this page as it is obvious several writers confused the term.*

RETURN TO TOC

REFRACTOMETER

AG LECTURES: Reams: How would you check the mineral content of 4 foot high growing alfalfa? Student: The **refractometer**? Reams: Suppose you didn't have your refractometer? Suppose you were in lespedeza or corn or any other field? Student: Could you do it by checking the pith? Reams: Exactly right. Cut it off and look to see if it is hollow in the middle. If the pith is solid and full. You have higher sugar content. Low sugar content gives you a hollow stem, a reed.

ANDERSEN: An apple with apple scab fungus will itself have a **low refractometer reading** (below 12); however, the leaves on the branch supporting the sick apple will have very high refractometer values (above 12 or even in the upper 20s). In any event, there is a mineral imbalance/deficiency in the crop.

ANDERSEN: Regardless of whether you follow an organic or a biological procedure, your success will be reflected

in the **refractometer reading** of the commodity and its freedom from insects, diseases, and weeds.

ANDERSEN: Squeeze the juice from the stalk next to an ear and take a **refractometer reading**. If the Brix level is 8 or above and maintains this reading for 24 hours a day, there will seldom be any noticeable damage to the ear silks by adult rootworm beetles. However, if this reading drops below 8, there will be progressively greater silk damage as the reading gets lower and lower. It is important to make sure that the reading is a "true" reading and not one in a dehydrated condition, which would give a false impression.

ANDERSEN: An ear of corn at 24 Brix with corn ear worms inevitably will have leaf or stalk refractometer readings below 12. Grapes at 18 Brix with insect infestation inevitably will have **cane or leaf refractometer readings** below 12 Brix.

ANDERSEN: A **refractometer reading** of 20 for the milk will never be achieved by feeding milk cows today's typical feed or feed rations. A value of this magnitude would require feedstuffs with at least an equivalent refractometer value.

BEDDOE: This [working with soft rock phosphate] was also how it was learned that the higher the sucrose readings of plant juices **on a refractometer**, the lower the freezing point of that fruit or plant.

PLANT FEED 1976: On the **side of some refractometers** you'll notice a small thermometer. In testing fruit juices for home use, you do not need to pay any attention to the thermometer. But, if you're buying juices commercially for canning in thousands and thousands of gallons, It is very important to pay attention to your thermometer.

SKOW: The **refractometer**---in its subtle way---warns against the use of dolomite limestone.

WHEELER: Six portable instruments deserve mention for farmer use: **refractometer**, pH, ERGS, sodium, and ORP meters, and the new magnetic susceptibility meter developed by Dr. Philip Callahan.

WHEELER: It is generally held that a clear, distinct line separating the blue and white fields [in the **refractometer** viewscreen] indicates a more acid condition while a fuzzy line indicates better calcium levels and a more alkaline condition.

WHEELER: A foliar spray is indicated whenever the **refractometer reading** drops two or more points from nutritional shortages.

RETURN TO TOC

RESIDUE

ANDERSEN: To regenerate the microorganism populations rapidly, they must be fed. Then and only then can they **digest crop residues** and produce organic acids, humus, and nutrients. Very few crops have adequate sugar contents, as attested by their low refractometer values; hence, crop residues do not contain sufficient sugar for the microbes to use for optimum efficiency.

ANDERSEN: An area may have much organic matter but very little actual humus because humus formation requires plenty of oxygen and energy [sugar] for the correct microorganisms to work properly. If these conditions are not met, the **crop residue**, manure, and other organic materials are simply converted to ashes, alcohols, aldehydes, or other non humus compounds.

ANDERSEN: Reasons to **till the soil are to incorporate residue into the aerobic zone**, to prepare a seed bed, and to aerate the soil. Tilling too much, tilling too deeply, and tilling wet soil are three major contributors to soil degeneration.

BEDDOE: That is why this type of information would begin to reveal why growing crops of different frequency groups in rotation will set the stage for a poorer yield. **Crop residue will be of the frequency of the crop it came from**.

BEDDOE: Usually "soil sciences" only reason for measuring a conductance of a soil is to **calibrate the salt residue**.

BEDDOE: Some, I am sure, will wonder what the difference is between steer manure and cow-dairy manure. The cow-dairy manure is usually a better manure for two reasons. One is the way the cows are fed, and two, **this manure usually has much higher levels of urine residues** which cart carry higher levels of phosphate.

BEDDOE: ...it is even assumed that potassium is more important than phosphate. This conclusion is drawn from a fact that is almost always overlooked. That is that phosphate is a catalyst, and therefore is recycled in the plant, **leaving little in the plant residue** to be picked up by analysis.

FWTK: The best fertilizer for a crop is the **residues from that crop**.

SAIT: Andersen: In many of our conventional soil systems the **crop residues comprise an extremely high lignin fiber** and very low carbohydrate or free sugar. Lignin takes a lot of energy to break down, and the humus production is limited by this problem.

SKOW: An unbalanced equilibrium of calcium and magnesium **permits organic residues to decay into alcohol**, a sterilant to bacteria; and into formaldehyde, a preservative of cell tissue.

SKOW: All plant root systems have a base exchange, and as the old rootlets drops off and new ones establish they

supply nutrient for the bacteria introduced at planting time. This **rootlet residue** is rapidly converted to humus and humic acids which are powerful chelating agents and help the plant acquire plant foods more readily.

SKOW: **Salt residues** and underutilized plant nutrients results in baseline ERGS of 25 to 600 microsiemens.

SKOW: A soil high in magnesium and low in calcium can test above 6.5, but will be entirely inadequate for the growth of alfalfa, for the growth of legume bacteria, and above all, for maintenance of an environment necessary to **decay organic crop residues into humus**.

WHEELER: To moldboard plow residue 8 to 10 inches deep in this soil condition is to almost guarantee that there will be little decay system and no new humus formed. The aerobic bacteria will be buried below the oxygen level while the anaerobic bacteria will be left on top exposed to the air. **The residue will ferment,** producing an alcohol or aldehyde. These substances kill off the aerobic bacteria and preserve the trash.

WHEELER: Trash is often left lying on the soil surface with little effort given to incorporation into the soil. **Residue left in this manner will actually rust**, similarly to resting equipment with the beneficial carbon being lost to the atmosphere. Residue must be incorporated so that beneficial soil microorganisms can reduce it to humus.

RETURN TO TOC

ROOTS

ADVANCED AG: On corn, the dying off of main **tap roots** with maturity is normal.

ADVANCED AG: Reams felt 2 pounds per acre of zinc could keep **roots** from rotting.

ADVANCED AG: Some sources of carbon: sawdust, manure, calcium carbonate, sludge, compost, **roots**, green manure, etc.

ADVANCED AG: Phosphorous grows **roots.**

AG LECTURES: Reams: Name 3 sources of getting carbon into the soil? Student: Sawdust? Reams: Sawdust is one, what's another one? Student: Grass roots? Reams: **Grass roots** is another, **or crop roots**. What's the third one? Student: What about your carbonates? Your lime? Reams: Yes, but I was thinking of all of your carbonates, lime. It just goes in with the lime as carbonates. These are factors that you need to know and use and measure.

AG LECTURES: Student: What about the top of the leaf? Reams: You know plants have bowel movement or urinate just like everything else. And this spray *[we applied]* goes through this leaf and [it] takes out the nutrients that it wants and **sends the rest down to the roots**, down through the stump and [the plant] mixes it with other substances and sends it back up. And then it becomes a part of the plant, [on] the frequency of the plant. But the water, the extra water that it gets in to keep that plant growing, sweats out through the top of the plant.

AG LECTURES: Reams: A lot of people get out there and cultivate, just to be cultivating when it doesn't even need it. Do you realize that? Does it make sense? Are they saving money? Student: They're tearing up the roots? Reams: They're **tearing up the roots**. How deep should you cultivate when you cultivate? I'm talking about row crops now or truck crops. Just as shallow as you can cultivate it, actually. Very, very thin, very thin, unless you have a very high sodium content and have to cultivate deeper.

AG LECTURES: There's one reason, that nematodes attack plants and only one. What is that? There's too much salt in the soil. No other reason, but too much salt in the soil. The nematode cannot attack the root until the salt weakens the root, until the bark will slide off and then he gets in. He **cannot attack the root** until this happens. Now, you apply too much nitrogen what happens to the roots? Student: The bark slides off. Reams: Yes, but something else happens to a lot of the roots, even before the bark slides off. What happens? If you get too much nitrogen on radishes, turnips, or sweet potatoes, what happens? Student: Break open? Reams: They split open, that's right, they split open and the root does the same thing. And then you've said to the nematode, I've built you a house, furnished your room and board. Won't you please, please move in? And he does.

AG LECTURES: Reams: **How does the root grow**? Student: By ionization, building, putting together? Reams: That's right, by ionization. In other words, the ionization of the soil builds the roots. As the root is built the process of osmosis takes the particles thru the plant.

ANDERSEN: The browning of the stalk interior is the result of congestion in the vascular system. The plant's plumbing is plugged, shutting off the movement of nutrients. The plant then sends out brace **adventitious roots** above the plugged area to make up for the reduction in flow from the primary roots. This is similar to a heart bypass operation. Each successive growth of brace roots indicates increased vascular plugging below. It is a rescue operation by nature. The plugging is caused by many things—chemical toxicity such as herbicides, putrefaction products of an anaerobic soil, excess nitrogen, and premature death of vascular tissue—all related to lack of nutritional integrity. Proper farming practices can eventually correct these problems, making brace roots unnecessary.

ANDERSEN: In addition, **plant roots** deposit certain materials into the soil and extract different materials from the soil.

ANDERSEN: During their life, plants excrete **through their roots** various organic and mineral substances which attract microorganisms.

ANDERSEN: The aerobic zone of the soil ranges from nothing to only a couple of inches. The depth of the aerobic zone determines the primary volume of the plant's rhizospheres. It takes oxygen to grow extensive third- and fourth-order roots and root hairs. **Primary and secondary roots may be growing outside** of the soil's aerobic zone, but their collective mass and volume are minor in comparison to the finer roots and root hairs that proliferate primarily in the aerobic zone.

BEDDOE: Therefore, iron is heavier than aluminum and iron will also float on boiling lead. For this reason, heavier elements in the soil naturally go down and very often too far down **out of the range of the plant root**s.

BEDDOE: Since nitrogen is an electrolyte, remember to not band it close to the plant. The electric fields need to be kept away from the plant, so that the magnetism is away from the plant. This will assure that the roots are drawn out into the middle of the rows. The **more topsoil the roots are directed through, the better** the exposure to soil mineral energy.

BEDDOE: In a soil with 500 pounds per acre of chloride, chicken manure should not be used on the ground. The chicken manure is high in boron and with lack of plenty of water the stage would be set to convert ammonia nitrogen to nitrite nitrogen. If this were to happen it would **severely burn the roots** of any plants in the soil.

BEDDOE: Cover crops not only have good top growth for green manure for turning back in the soil, but also have large and prolific root systems that are rich in carbons. One of the cheapest forms of biologic carbon is from the **recycled roots** of the plants.

BEDDOE: You can experience this heat loss by placing a small amount of strong acid like sulfuric in water. The water will immediately get warm. It is this type of reaction heat from anion-cation encounters that causes **burning and dehydration of the roots**. The result can be seen as a sudden die back in the leaves because of reversing the normal osmotic flow. So the water in the plant is drawn right out through the roots. Only abundant water will compensate for this problem until the reaction weakens.

BEDDOE: Osmosis is used to refer to the movement of the sap of a plant up **from the roots** toward the leaves.

ENERGY RESEARCH: You can have all these things but the final and key thing here is the calcium that must come up **through the roots**.

ENERGY RESEARCH: Student: You have the statement in here that the **synchronization of the nutrients takes place in the roots** and not in the soil. Is that right? Skow: Yes, that is correct.

FRANK: When **roots and leaves sense a lack of moisture**, the potassium flow slows down, guard cells relax and stomates close.

FRANK: **Roots also absorb CO2**, and root uptake is just as important to yields as leaf absorption of CO2. When you apply calcium carbonate to the soil, organic acids excreted by microbes in the root zone react with it to release more CO2 for root uptake. **FRANK:** With a drip tape underneath plastic, you can't do as much as you can with the broadcast, but you can change that little **micro climate right around the roots** and you can do a lot of good with that.

FRANK: Foliar feeding that you put on the plant goes down through the plant **and into the roots** and helps to build up the soil. But, it's not a good way to build up the soil because it's very slow, very difficult, very expensive.

FWTK-pH: Therefore, iron is heavier than aluminum, manganese is heavier than magnesium, and iron will float on boiling lead. The heavier elements in the soil naturally go down, and they very often go too far down and **out of the range of plant roots**.

FWTK-pH: Heat created by acids coming into contact with bases is nature's way of growing crops. Whatever organic or inorganic substances there happen to be in the soil also take part in this chemical action. Too much heat at such a time **burns the roots**, releases too much nitrogen, promotes oxidation of calcium and phosphate, and will leave a very low plant food bank account.

FWTK: It is this charge that moves the needle of a compass, and it is the same force passing through the earth that attracts ionized plant food inside the seed. This plant food **enters the seed and roots** in two forms, anionic and cationic.

FWTK: Suppose you place a morning glory vine cutting in a glass of water and **watch the roots as they grow.** They will extend in a direct northerly line. They will grow in other directions, too, but the first roots will be on the north side.

FWTK: In a good soil, **most of the roots will grow to the north** on perennial crops such as orchards, vineyards and groves. If the roots are reversed when trees or nursery stocks are transplanted, plant growth will be hindered because the root structure of these plants are polarized by the electrical fields of the earth.

FWTK: An orchard or grove should never be disced or plowed. because the **roots of the trees will bleed sap** if they are cut.

GARDENING: [Reams working with a failing hydroponics farmer] I said, "Now take this little pair of scissors I have in the edge of this scope/microscope case, you go over and **cut me some roots** off of these plants, these little plants, or just bring me a plant for that matter." He brought me a plant, we cut some roots off, and we put it under the microscope and you couldn't see the root for the bugs sucking on it. And I said, "Friend your trouble is not in the solution, it's in the bugs in the solution." He said, "There's nothing in the hydroponic book about that!" I said, "Well, if there was, you wouldn't have needed to call me over here." Now I said, "These bugs are sucking the sap out of these plants." He said, "What should I do about it." Well I said, "You need a little boron. You haven't got quite enough boron in the nutrient solution to kill them. And the second thing is, you need a little chlorine in the water. Chlorine is an essential plant food and essential food for people. Clorox, but it has to be a lot more dilute."

PLANT FEED 1976: You should also carry alfalfa over from year to year. Don't dig it up and replant each time. **Let it come up from its roots** each time. It's lifetime this way is at least 100 years.

PLANT FEED 1976: Remember there is as much of a plant under the ground as there is above the ground. After you harvest the top, if your soil is not sterile, your **aerobic bacteria will convert those roots** into heavy, heavy amounts of organic nutrients. Nature is trying to help you if you will let it.

PLANT FEED 1976: All plants can take all the magnesium they need out of the air. You do not have to add magnesium to any crop that I have seen, anywhere in the world. Unless the farmer had added so much nitrogen he had to add Epsom Salts in order to release the nitrogen to keep it from **burning the roots.**

PLANT FEED 1976: I want to give you a very simple rule to know whether your soil has too much nitrogen or not enough, without a soil test. Get **one of the little rootlets** the size of a small string and see if the bark will slip off it and if it does, there's too much nitrogen. That is, if the rootlet is still looking alive.

SAIT: Andersen: Let's take sweet com as an example. You may take a reading of the ear and you may have 24 Brix, yet the com borers are running rampant. What you will find with that sweet com is that, if you take a **reading of the stem or the main roots**, you will have a Brix reading of 4 or 5. What's happening is that nature is moving all of the carbohydrates into the ear in an attempt to reproduce the species, so it's a fictitious level in the cob.

SKOW: Unlike nitrogen, oxygen, hydrogen and carbon, calcium does not come from the air. It has to come from the soil. Calcium in the soil is very insoluble. It has to be acted upon by organic acids which are **produced by plant roots,** bacteria, yeasts and fungi in the soil. Without this activity, calcium cannot be incorporated into the plant structure.

SKOW: If there is no manganese in the seed, it will swell up and rot. Manganese has a high atomic weight, 54.9380, meaning it has more power than nutrients in the surrounding soil. This puts into play the magnetism necessary to draw nutrients into the seed to **feed it and its emerging root system**. When there is a shortfall for manganese, the entire fertility program has to be adjusted to create enough energy to pull more manganese.

SKOW: In developing a foliar program, maximum attention must be given to the thickness of leaves, how well leaves stand up, the degree of wilt, and so on. A thin or weak leaf suggests a nutrient deficiency, or low TDN — total digestive nutrients. The caliber of the stalk and stem is extremely important, as is the development of the root system. Field observation will **reveal an under-developed root system when herbicides are used**. These shortfalls can be repaired with foliar sprays and fertilization through irrigation systems.

SUCROSE: Soils that are depleted of carbon will result in air that contains less carbon; however, it is not necessary for all the carbon to come from the air. Much of the **carbon can be taken in through the roots**, as this supply is mined out of the soil by the sugarcane; and its yield will decrease in direct ratio to the supply of the available carbon in the air and the soil.

WHEELER: When the pH is too low (acid) relative to the type of crop, the energy flows too rapidly. **Nutrients literally pass by plant roots too fast** to be properly attracted to and absorbed by the root.

WHEELER: The LaMotte procedure *[used by Reams]* uses solutions for nutrient extraction which, supposedly, are more similar to those **produced by the plant roots**.

WHEELER: Plant stress due to moisture, temperature or low pressure could trigger the plant to **move the sugars to the roots**.

RETURN TO TOC

ROT

ADVANCED AG: Top quality produce **will not rot**, it will dehydrate, except with tomatoes.

ADVANCED AG: Boron prevents grain from molding and **fruit from rotting**.

ADVANCED AG: Celery and cabbage with **rotten core** has boron deficiency.

ADVANCED AG: If **everything starts to rot** its too much sulfur not enough lime.

AG LECTURES: There is no mineral in the sweet potato here, it's as light as a cork. Also, there's too much sulfur in this ground and when there's **too much sulfur it rots**. This is Black Rot and lack of calcium in the soil is what

causes it and there's too much sulfur there.

AG LECTURES: But let us suppose that you had this same soil, same problem and that you found out that the crop was already nearing maturity, ready to mature, but it was **rotting in the field**. Then what would you do? With all these numbers that I have told you and yet the crop was rotting just as it matured. Student: Put some sulfur on? Reams: Sulfur or copper? Student: Too much sulfur? Reams: Too much sulfur, that's right. So what would you do? Student: Put calcium on it? Reams: Calcium hydroxide, the hot lime. Just about 100 lbs. to the acre will knock that sulfur right out of existence as far as availability to the plant is concerned. And in 3 days you've stopped the rot. Calcium hydroxide is the hot lime. This is the hot stuff they like to make plaster out of for inside of buildings.

AG LECTURES: Reams: At what percent moisture do you bale hay? Student: 20-25%. Reams: 25-30 is good. About 28% makes the best hay with the highest sugar content. **And it won't rot**, won't go through a heat, not nearly so badly as the one with the low sugar content. The higher the sugar, the less trouble it is to go through a heat? Why? What is protein? Student: Nitrogen? Reams: Nitrogen.

AG LECTURES: Did you ever stick your hand in another bale of hay and it felt cold? Even on the same kind of temperature? I have and the one that was hot inside was rotting, decaying because it had a low sugar content. And one more thing too, it had a low protein content. The one that you put your hand in that felt cool to you, it had a high sugar content and a high ammoniacal nitrogen content and the heat cooled it. See what I mean? This is very important to know.

AG LECTURES: What happens to young plants or onions or peppers, beans, tomatoes – row corps; whenever there's a copper deficiency? What happens to your young plants? They **rot off at the ground**.

ANDERSEN: The Brix reading of these [high nitrogen, high potash] plants would be lower and, therefore, these plants would be less desirable to animals and **more susceptible to storage rot**.

ANDERSEN: Sulfate, the next item on the test, is not to be confused with elemental sulfur. Elemental **sulfur can cause rot at maturity of fruit** and can tie up or interfere with calcium.

ANDERSEN: Top-quality produce will dehydrate **rather than rot**.

BEDDOE: High nitrogen soils without enough calcium and phosphate make the produce very watery and low in sugar. Hence the produce will **deteriorate and rot**.

BEDDOE: When excessive sulfur is present in the soil where tree crops are grown, it will cause the fruit to ripen very unevenly and **rot before it ripens** completely.

ENERGY RESEARCH: Zinc is used to control many types of blight. It is also a minor catalyst for Sul-Po-Mag and copper. It helps to make the acedic acid in the root to **keep it from rotting**.

FOLIAR FEED 1981: If crop **rots as it heads up**, add calcium hydroxide.

FWTK: High quality crops have a resistance to disease, will not be bothered by insects as much, and **will not rot** as easily.

GARDENING: Also, the higher the sugar content in produce, the longer it lasts and it won't rot. **Good produce won't rot.** I grew a crop of watermelons for a client and he gave me some of those watermelons and they sat on my desk for 3 years and didn't rot. I entered them into the fair 8 months after they were picked [and then] for 2 consecutive years. They did get lighter and dehydrate, but they did not rot.

PLANT FEED 1976: Do you know you can grow watermelons which can **sit on your desk for 3 years without rotting**? I've done that. I presented one in the county fair for 3 years consecutively. Yes, the same identical watermelon. It was marked - this was a demonstration of research. It was authenticated and sealed and under supervision and under no refrigeration. The higher the sugar content - foods will not rot.

SKOW: Top quality produce will not rot. It will simply dehydrate. There is a saying that all generalizations are false, including this one! The tomato resists identification with the above general rule. Even an excellent tomato will resist dehydration. Still, a top quality tomato will have longer shelf life before it starts to deteriorate.

WHEELER: The ideal ORP range is between 25 and 29. Soils with a reading lower than 20 can be said to be greatly lacking oxygen due to its use in the composting process. Such soils are characterized as poor growth mediums. **Seeds planted in these soils may tend to rot** as there will be an excess of moisture.

WHEELER: Seed lacking in manganese will often **rot in the soil** rather than sprout.

RETURN TO TOC

ROTATION

AG LECTURES: In small garden crops you don't have to fool with frequency, but when you get into specialized planting then you want to deal with frequency, because it matters much and then **you do not want to rotate crops**. You want to plant the same crop on the same soils every year. Never rotate, because you're just simply rotating yourself out of business.

ANDERSEN: Plants are a very strong ecological factor, selecting certain species of bacteria, fungi, actinomycetes

and other inhabitants of soil. As a result of wrong agricultural practices and crop rotation, the soil becomes infested with harmful microbial forms [emphasis added]. **By use of suitable plants in the crop rotation, one may change the microflora** of soil in the desired direction, and eliminate harmful organisms, in other words— restore the health of soil.

ANDERSEN: The practice of intensive rotational grazing is regaining popularity and sophistication. With proper management of both the pasture nutrition and the **grazing rotation**, maximum production from both land and cattle can be obtained, as well as optimized animal health.

BEDDOE: That is why this type of information would begin to reveal why **growing crops of different frequency groups in rotation will set the stage for a poorer yield**. Crop residue will be of the frequency of the crop it came from. Planting another frequency crop in that ground means that the new crop will have less potential energy for growth until the bacteria and resistance process digest the previous plant material in time for the current crop. When it is the same crop being replanted or one of similar frequency group, the bacteria will also be of an arrangement unique to that crop. This means the energy that can be recycled from the previous crop material will be readily available faster.

BEDDOE: Plant residue of a crop that is not in the same frequency group as the new crop being grown can interfere with production. This is why **crop rotation can work against good intentions**. Remember the rule: "like attracts like?" Well, a plant can only attract in plant food energy that is on its own basic frequency. Energy being released fiom decomposing plant material that is not of the frequency group of the plant being grown, means that the frequency mismatch does not as easily deliver food energy to the feeding plants.

ENERGY RESEARCH: About the only known way to have some affect on this [high mag problem] is to basically have a compost and manure program and a very **effective rotation program** and just try to continue to row crop it.

FWTK: Another farming procedure that can ultimately **achieve maximum yields is continuous cropping, rather than rotating** crops. Dr. Reams recommends continuous cropping, once the fertility levels reach where they should be. The best fertilizer for a crop is the residues from that crop. By farming the same crop year after year, the soil is built on the frequency of that crop. This is a part of achieving maximum yields. Continuous cropping is a controversial subject, but is something that a farmer using this program will want to be doing.

PLANT FEED 1976: How many have heard of **rotation of crops**? It's the worst thing that ever was done to American farmers. It was designed to put the farmer out of business on the installment plan. To rob the earth of the last little bit of nutrients in there. To keep the big farmer in business and let the little farmer go broke. Student: But we get bigger yields when we rotate. Reams: Yes---over a [short] period, but in a 10 year period, there's a decrease. But- you say - Doc - I don't believe that. However, I think you do, but you're so indoctrinated in what you've been taught in the last 30 years that you don't know what is true. Tell me, how do you rotate a peach orchard? An orange grove? Apple orchard? A grape vineyard? Well, i f you don't rotate those, why rotate anything else? You do not rotate crops---but *[you must]* put the nutrient back in the soil.

PLANT FEED 1976: Crop rotation is the worst thing pulled over farmers eyes.

SKOW: Dr. Albrecht, as a director of all of the Sanborn Field research, had seen these same acres produce face-reddening facts. For instance, he knew that back when everyone was **talking and preaching crop rotations**, evidence from Sanborn Field had proved that such practices under certain conditions could be not beneficial but actually very harmful.

WHEELER: These cover crops, also known as "green manure" crops, are important in many ways other than just their nitrogen-fixing abilities. They play a crucial role in soil aeration, erosion control, and **crop rotation**, to name a few.

WHEELER: These *[Wheeler listed Auburn University suggestions*] can be considered as part of an IPM: Take advantage of **crop rotation benefits**.

NOTE: *Reams was adamant in his opposition to crop rotation. One does not have to seek deeply to see that some of his students failed to follow his lead. It is easy to imagine that Reams felt that once the farmer had put much energy and nutrients into making land special for a certain crop, there was little reason to waste it on a crop with different needs.*

RETURN TO TOC

SALT

ADVANCED AG: Skow: Asparagus likes **table salt** [but not too much].

ADVANCED AG: Reams: I use 10% ocean water for **salt on asparagus**.

ADVANCED AG: The reasons for nematodes include high nitrogen, **high salts**, low aerobic bacteria, excess chlorine, etc.

AG LECTURES: Student: You said the reason for [nematodes] is **too much salt** in the soil? Reams: Yes. Student: Which particular kind is it, the chlorides? Reams: It can be a chloride, it can be ammonia salts, nitrogenous salts, calcium salts, iron chloride salts, yes, it can be many different kinds of salts.

AG LECTURES: In 1939 I wrote an article about the **salts that were accumulating** in the fields and in the citrus groves. And I predicted that in 15 years the citrus industry would be in great difficulty. This was before WW II. I missed it by 2 years. In 13 years they were in great difficulty, because this salt was built up in the soil from their fertilizers, synthetic fertilizers.

AG LECTURES: There's one reason that nematodes attack plants and only one. What is that? There's **too much salt in the soil**. No other reason, but too much salt in the soil. The nematode cannot attack the root until the salt weakens the root, until the bark will slide off and then he gets in. He cannot attack the root until this happens.

AG LECTURES: Student: So how do you get the **salt out of the soil**? Reams: Add your phosphates, potassium and other things to get them high enough. Potash is always a salt. Calcium nitrate is a salt, sulfate of ammonia is a salt. Nitrate of soda is a salt. All those are salts. You can't get along without salts and carbon. That's where your organic salts come from in your vegetables. It's necessary to have them in there. Student: Too much is what caused the root to split? Reams: That's right, too much nitrogen salt, yes. Student: What do you do to prevent this? Reams: Raise your phosphoric acid content. Your copper, you make the roots stretch. Raise your calcium content and copper ratio. In other words, your nitrogen is too great for the other elements

ANDERSEN: Nutrients and compounds in the soil that are considered alkaline include calcium, magnesium, chlorine, sodium, potassium, **salts**, ashes, and aldehydes.

ANDERSEN: Finally, this [typical not-so-great organic] program program adds an excess of calcium sulfate in an attempt to lower the soil pH which contributes, along with the **excess nitrogen and salt**, to the depression of the biosystem.

ANDERSEN: The [ERGS] reading must be interpreted in relationship to the inherent conductivity of the base soil due to salts and non-nutrient minerals. If the overall reading gets above 1,000, there is **generally a salt problem**, energy loss and waste, and increased potential for root burn and nematode proliferation.

ANDERSEN: However, it is possible to apply too much sulfate, which seems to be happening in some areas where reductionists are attempting to "hammer down" soil pH with large amounts of gypsum and sulfuric acid. This practice causes **additional salt problems**, calcium demand, and microbial stress.

ANDERSEN: **Salts create a hypertonic, dehydrating environment**, which draws water out of the cells, thereby stopping the microbial growth or even killing the microbe.

BEDDOE: Usually "soil sciences" only reason for measuring a conductance of a soil is to **calibrate the salt residue**.

NOTE: *Beddoe is making a point that conventional soil science pays scant attention to the value of ERGS.*

BEDDOE: Soil depth is related to the carbon content also. The more carbons to hold bacteria and **soluble mineral salts** the greater the depth of the topsoil.

BEDDOE: Drainage problems may have to be addressed in some dry land areas where **alkali mineral salts have been accumulating**. The best solution is to try and establish drainage and then use heavy green manure crops. As the bacteria and carbons increase in number and activity, the salts will be taken out of solution and no longer be a problem.

ENERGY RESEARCH: Student: How come most of the [trace element] minerals have sulfate added to them? Skow: OK, the sulfate is **mainly a mineral salt**, and that is the only way they are water soluble.

ENERGY RESEARCH: When you get into that crusted situation, you will have a **salt build up** and anaerobic bacteria produce toxic substances.

ENERGY RESEARCH: But if the carbons are low and you have an excess of boron in relation to calcium **or a high salt** or sulfur content, you can get ammoniation of the plant. What it does is simply kill them.

FOLIAR FEED 1981: Adding 10% **saltwater** (ocean water) to the tank before adding any other ingredients will increase the magnetism (stickiness).

FOLIAR SEMINAR 1983: The **more salt in soi**l the less bacteria you will have and the less organic matter.

FWTK: In a dry year **urea forms a salt**, and dries out the plant roots.

FWTK: Nematodes attack plants for one reason, and that is that there is **too much salt** in the soil. Once the soil dehydrates the root, the bark will slide off it, allowing the nematode to enter the plant. It cannot attack the root until this happens.

FWTK: They [salts] become a problem when they are out of a ratio with the other elements in the soil. There are **many types of salts that can cause this problem**. It could be chloride salts, nitrogenic salts, calcium salts, potassium salts, ammonia salt, iron salt or many other different kind of salts. Despite the type of salt, increasing the calcium, phosphate and potassium in proportion to these salts will eliminate the problem.

GARDENING: When you add a synthetic fertilizer or certain synthetic fertilizers to your soil that is high in organic,

the bacteria in the organic then **turns the inorganic salts into organic salts**.

PLANT FEED 1976: All plants can take all the magnesium they need out of the air. You do not have to add magnesium to any crop that I have seen, anywhere in the world. Unless the farmer had added so much nitrogen he had to add **Epsom Salts** in order to release the nitrogen to keep it from burning the roots.

PLANT FEED 1976: Sterile soil is soil in which the **salts turn the organic substance into more salt** Just like the ocean does. Consequently, you are farming hydroponically, whether you believe it or not.

SKOW: **Salt residues** and underutilized plant nutrients results in baseline ERGS of 25 to 600 microsiemens.

SKOW: The goal is TDN, total digestive nutrients---nitrogen, calcium, phosphorus, potassium. It is the function of carbon to keep these nutrients separated by enough space to confer on them the status of complexes. and **keep them from becoming salts**.

WHEELER: Reams suggested you avoid dolomite for three reasons. The most impressive one has to do with nitrogen release. Magnesium is antagonistic to nitrogen as seen in the use of **Epsom salts as a treatment for nitrate poisoning** in cattle or an Epsom salt spray on fruit trees to stop apple drop due to nitrate-weakened stems.

WHEELER: Try gently pulling on a medium-size corn root to see if the root bark will separate and slip off easily like a stocking. This would indicate weakness caused by **excessive salts** in relation to carbohydrates and humus and could provide a situation where nematodes could easily penetrate.

RETURN TO TOC

SAP

AG LECTURES: But the copper makes the bark elastic. Just like a little boy that out grows his britches, they're too tight. It makes the bark elastic and **lets the sap flow**. Therefore gives you a greater yield. I've seen a 300% increase in yield just because copper was added.

ANDERSEN: The sap of corn enhances the virulence of the root-nodule bacteria of peas. Perhaps this is due, in part, to the **sugars found in corn sap**.

BEDDOE: Osmosis is used to refer to the **movement of the sap** of a plant up from the roots toward the leaves.

BEDDOE: This lack of filling *[pith]* will then interfere with the development of the part of the stem called the xylem in which the **movement of the sap**, with the mineral energy from the soil, flows into the plant.

FOLIAR SEMINAR 1983: Potash on cabbage helps develop a larger caliber stem & more **sap movement**.

FWTK: Damage-produced from chewing insects *[in high Brix plants]* is also reduced because of the oxidation *[fermentation?]* of the sugar in the **sap of the plant** into alcohol.

FWTK: An orchard or grove should never be disced or plowed. because the roots of the trees will **bleed sap** if they are cut.

GARDENING: The moth knows by instinct that where she stings the plant leaf and lays her eggs a **small drop of sap** will come out of the plant. And these little worms will eat on that sap until they get big enough to eat the leaf. But suppose that little drop of sap that comes out is very high in sugar content. When that sugar content then strikes the oxygen content of the air, it's going to ferment and turn to alcohol. And those little worms are going to get drunk and roll off of that leaf into the ground and the bacteria are going to eat them and you'll have a garden without any worms in it. **NOTE:** *An implication is made here that if plant sap is kept away from air, it will not ferment. The claim deserves investigation.*

GARDENING: *[Hydroponic situation***]** Now I said, "These **bugs are sucking the sap out of these plants**." He said, "What should I do about it." Well I said, "You need a little boron. You haven't got quite enough boron in the nutrient solution to kill them."

PLANT FEED 1976: Student: What about all the minor elements that are there? Reams: God will supply **most of those in the air**. Student: Why don't plants take more of them from the air now? Reams: They're not healthy enough. In other words, you know the sap of plants is similar to the gastric juice of people? Well, there are saps and gastric juices that are very weak. The weaker the gastric juice - the sicker the person becomes. The **weaker the sap in the plant** - the less minerals it can take in from the air. I believe farmers are the finest doctors in the world. If you grow good produce, people are less likely to become sick. You only have one cause of illness: mineral deficiency.

PLANT FEED 1976: When you see peach, orange, apple or other trees with the bark **leaking out sap** and crystallizing, that means there is a phosphate deficiency first. Second, a copper deficiency. Or phosphate of copper.

PLANT FEED 1978: **Sap** moves upward because of anionic pull and cationic push.

SKOW: Copper---or the lack thereof---is most frequently noted when fruit trees do not produce. They do not produce because the bark cannot stretch. When the bark cannot stretch, **sap can't flow**.

SKOW: In order to keep all insects out, the *[corn]* **stalk sap must be above 12 Brix** before it confers complete insect resistance.

RETURN TO TOC

SAWDUST

ADVANCED AG: If you add hard rock phosphate and cellulose (**sawdust**) to composting you get excellent release.

ADVANCED AG: 20 gallons of oil per acre mixed in about a **ton of sawdust** will put carbon in the soil.

ADVANCED AG: Some sources of carbon: **sawdust**, manure, calcium carbonate, sludge, compost, roots, green manure, etc.

AG LECTURES: You apply 2 or 3 hundred pounds of this old motor oil and **sawdust** to the acre, you need to do that after you harvest the crop, or it won't hurt to put 500 lbs. to the acre, if you want to, but I am going to tell you, it will really do miracles.

AG LECTURES: Reams: Name 3 sources of getting carbon into the soil? Student: Sawdust? Reams: **Sawdust is one**, what is another one? Student: Grass roots? Reams: Grass roots is another, or crop roots.

AG LECTURES: Sawdust also has carbon which causes the soil to hold moisture.

AG LECTURES: I might add **5 tons of sawdust** and I might add a ton or two of tobacco stems. And that way I would get my potash up and in about 6 months later I would add whatever it takes to move it up again. But what I am trying to say is be careful, when you calculate your amount of potash and when to put it down.

AG LECTURES: Student: **What does sawdust give to the soil** again---potassium? Reams: That's the main thing you put it down for is to supply the potash, but it's also a nutrient for the bacteria. It also has carbon which causes the soil to hold moisture. It also has many minor trace elements also, so sawdust is an excellent thing, providing you have enough calcium in your soil, otherwise it will make it too acid.

ANDERSEN: The criteria for good compost production are a good mix of organic materials, i.e., manure, straw, leaves, **sawdust**, food scraps, and so on, to get a 20:1 to 30:1 carbon-to-nitrogen ratio...

BEDDOE: Once in a while, a farmer will have land that does not have an excess of potassium. When this is encountered, one of the best and **cheapest materials to add is sawdust.** Apply according to the ratio needs demonstrated by the soil test. It may require upwards of 2 tons in some cases. Sawdust will have about 4 units of potassium per ton. Again, the best time of the year to apply sawdust is in the fall of the year because of the time it takes for release of its potassium.

BEDDOE: Chicken litter is the pure manure that has been mixed with type of **sawdust** or wood shavings or grain hulls used as bedding in the pens. It is about 50% manure and the rest can be sawdust, rice hulls, or the like.

BEDDOE: Potash can be supplied from many sources. Some of the better ones are sulfate of potash, Chilean nitrate of potash, hardwood ashes, tobacco stems, pecan hulls, rice hulls, **sawdust**, wheat or oat straw, and chicken manure. **Sawdust** is about the most convenient and least expensive source of potash in most areas. It also provides a nutrient to feed the soil bacteria, and contains many trace elements plus carbon.

FOLIAR SEMINAR 1983: You can use **sawdust** to build carbon, but don't apply all in one year unless your soil needs potassium.

FWTK: Potash can be supplied from many sources. Some of the good ones are sulfate of potash, Chilean nitrate of potash, hardwood ashes, tobacco stems, pecan hulls, rice hulls, **sawdust**, wheat or oat straw and chicken manure.

PLANT FEED 1976: Student: What is cage manure? Reams: It is from chickens that are in cages and have no shavings or **sawdust** mixed in with their droppings.

PLANT FEED 1976: [*Reams explaining how chicken (cage) manure is OK, but chicken litter with **sawdust** is not]* Has too much potash in it. Keep your potash off your legumes and grasses.

SKOW: Sawdust is about the best source of potash. It also serves as a nutrient for bacteria. It contains carbon, which causes the soil to hold more moisture, and also has many trace elements.

SKOW: Sawdust is a form of carbon, but it can backfire. Too much is treated with unspeakable chemicals nowadays. Delivered to the farm acre, these killers can create a bad scene. I know of one Michigan farm literally put out of business for three crop years by **poisoned sawdust**.

SKOW: The next potash source is **sawdust**, and it has a variable level of potassium. Hardwood ashes are a source of potash, as are tobacco stems, pecan hulls, cottonseed hulls—but if you put cottonseed on the field, look for insect problems.

RETURN TO TOC

SEAWATER

ADVANCED AG: Reams: I use 10% **seawater** for salt on asparagus.

BEDDOE: The ERGS test shows what value is obtainable from the nutrient that is in the soil; but it doesn't reveal its source. It is very important to know what is producing the ERGS reading. For instance, the **ERGS could be coming from seawater**, but the seeds wouldn't sprout in such a climate. If the ERGS in the soil are being created

from elements that are not plant foods, then they are not counted in the calculations.

BEDDOE: **Seawater** is also a good source [of colloids] when used in conjunction with foliar spray at about 10% of the overall liquid.

BEDDOE: **Seawater** can also work as an enhancement to insecticidal sprays. Why **it works is not exactly clear. It appears to have an effect of reverse osmosis in combination with its raising the conductivity of the spray solution. The increased**

conductivity is believed to make a better electrical contact for the insecticide to the insect.

ENERGY RESEARCH: If at all possible, at. least once or twice a year, you could get some **seawater and put 10% in your mix**.

FOLIAR SEMINAR 1983: Add 10% **seawater**, once or twice a year for insect control and sometimes other benefits (90 gallons regular water + 10 gallons of seawater for the foliar tank).

FWTK: For instance, the ERGS could be coming from **seawater**, but the seeds would not even sprout in it. If the ERGS in the soil are being created from elements that are not plant foods, then they are not counted in the ERGS calculations.

SKOW: The ERGS test tells what value is being gotten from the nutrient that is in the soil, but it doesn't reveal the source of the energy. It is very necessary to know why the ERGS are there. For instance, ERGS could come from **seawater**, but seeds would not even sprout in it.

NOTE: *Seawater addition might be easy for the coastal farmer, but often impossible for those inland. As of this writing, the author is unaware whether seasalt producers are offering dry products that can be reconstituted.*

RETURN TO TOC

SEAWEED

ANDERSEN: It is quite simple to get carbon into a fertilizer mix. Carbon is in carbohydrates. Common carbohydrates are sugar, molasses, humic acid, humates, fish meal, **seaweeds**, algae, yeasts, enzymes, biological brews, whey, and so on.

BEDDOE: Substances that are rich in cobalt are: fish emulsion, **seaweed**, and soft rock phosphate.

FOLIAR SEMINAR 1983: **Seaweed** has gibberellins.

FRANK: Dry or liquid **seaweed** is great for trace minerals, amino acids, and naturally occurring plant growth regulators.

FRANK: You must include nitrogen to make the solution magnetic. We typically build our foliar sprays using a carbon source such as sugar, liquid fish and RL-37 **from seaweed**.

FWTK: Along with the N-P-K and trace elements, other products such as **sea kelp [seaweed]**, fish fertilizer, vinegar, and sometimes some gibberellic acid can be added to foliar sprays.

SAIT: Andersen: It is possible to build a good biological system without a microbial inoculation, simply by the use of fish, **seaweed**, humic acid, composts and sugar.

SKOW: Repeated sprays with fish and **seaweed** combinations in low amounts as a ten day program, especially in orchards, will gradually build up fruit-wood and root production for the following year. The consequences will be high quality produce.

SKOW: My formula follows: Put in water, a humate, calcium hydroxide, magnesium sulfate, Bo-Peep [ammonia], a special amine compound, castor oil, sodium carbonate and water — it has to be distilled water or good reverse-osmosis water — and **seaweed extract**.

SKOW: **Seaweed foliars also work quite well**. But from my chair, they do not deliver quite as well as liquid fish. It may be that the potassium shortfall underwrites my conclusion.

WHEELER: **Seaweed** contains all the naturally occurring trace nutrients known to man and has been used for centuries as a soil amendment by farmers living near the ocean.

RETURN TO TOC

SEED

ADVANCED AG: The process of osmosis is not limited by time UNTIL **seed sets**. Prior to that the plant can grow very rapidly if the TDN is available.

AG LECTURES: Reams: Would you ever use manganese on cabbage or lettuce? Student: No. You're not working toward seed. Reams: That's right. You only use it where you're **growing a mature seed**.

AG LECTURES: Ants really love **cottonseed** meal. So if you must add cottonseed meal, you better add a little [harmless] fumigant with it. I would suggest snuff.

AG LECTURES: You only use it [*manganese*] **where you're growing a mature seed.** Would you use it on green

beans? You would, yes, if you don't you'll have skinny looking beans. Yes, you need it in the beans, because nature is trying to leave offspring there.

AG LECTURES: Reams: Is there anything else you want to know about side dressings? Student: Which should we use? Reams: Depends on what you are growing. Anionic plant food produces stalk and cationic **produces seed**.

AG LECTURES: Reams: Tear gas is safe to use if you wait at least 42 days from the time you use it, **before you seed** anything.

ANDERSEN: Many sporiferous bacteria (anaerobic) have toxic or herbicidal properties on many plants, suppressing growth and lowering the percentage of **germinating seeds**.

ANDERSEN: Manganese brings the **electrical charge into the seed**, creating the magnetic force to draw the other elements into the seed. Manganese seems to be closely correlated to iron and copper; it is very important for seed quality and germination.

BEDDOE: Average com seed will weigh approximately 56 pounds per bushel. Optimum com can run as high as 66 pounds per bushel. With this information it can be seen that **high quality seed** com is 17% heavier than the average quality seed. Not only is it heavier per bushel, but also as we said earlier there will be fewer seed per unit weight. This principle will be seen in most all seed buying and sowing *[selling?]* situations the farmer is involved in.

BEDDOE: For instance, the ERGS could be coming from seawater, but the **seeds wouldn't sprout** in such a climate.

BEDDOE: From the **time the seed sprouts** until the 40-50 day period has passed, keep plants anionic.

BEDDOE: In seedless watermelons or grapes, the stump of the plant will not allow manganese to go out into the fruit because of its micronage. Because there is no manganese, the **fruit will not have seeds**, as manganese is required to make them.

ENERGY RESEARCH: When you build a spray for leaf crops you don't want to be adding manganese to it unless you are **raising it for seed**.

ENERGY RESEARCH: Is there any question on the amounts of the use of manganese? Student: How long or how many times can you use it? Skow: This product you can use practically every time you spray. **This is for seed crops only**, Any crop that you want to harvest the seed.

ENERGY RESEARCH: For instance, if you have a real high calcium soil and you put on ammonia nitrogen and you want to make the soil to the point of producing seed, you are going to have to use more than normal amounts of ammoniacal nitrogen. Otherwise it will switch it all to nitrate nitrogen and you will just get more growth. Now that is great if you are producing alfalfa but if you want to produce wheat or barley or oats you don't want more growth after a certain point. Somewhere along the line **you want some seed production**.

FOLIAR SEMINAR 1983: On cabbage**,** cauliflower, broccoli, strawberries lettuce & others, keep manganese low or they will **go to seed**.

FOLIAR SEMINAR 1983: Watermelon with **white seeds** points to a manganese deficiency. They will take longer to mature.

FOLIAR FEED 1983: An ordinary nitrogen need is 80 lbs of nitrate on leaf crops, but **seed crops should switch** to ammonia mid-season.

FWTK: It is this charge that moves the needle of a compass, and it is the same force passing through the earth that attracts ionized plant food **inside the seed**. This plant food **enters the seed** and roots in two forms, anionic and cationic.

FWTK: On those [crops] grown for fruit, **seed**, root or blossoms (com, wheat, tomatoes, apples, etc.), both nitrate and ammonia is used.

FWTK: An added factor for farmers trying to farm without using as many herbicides is that the farmer's ground in the spring **will sprout the first crop of weed seeds**, thus allowing time to work them out, and still plant on time.

PLANT FEED 1976: If manganese was too high in the cabbage or lettuce field, it will **go to seed** long before it heads up.

PLANT FEED 1976: In pecans, the base exchange is about every 3 years. Citrus is about 18 months but a radish has no base exchange---none. Until it **starts to go to seed**.

SKOW: Crops that need a lot of calcium are alfalfa---unless you're going to **harvest the crop for seeds**---lettuce, cabbage, broccoli, Brussels sprouts and spinach.

SKOW: Manganese is a prime requirement for getting a **good seed fill**. This is especially true for stone fruit, peaches and apricots, for instance. Housewives who purchase grocery store fruit often encounter rotted centers, always a sign of manganese deficiency.

SKOW: A high aluminum uptake sets up all types of strange things. It stunts plants, then shrivels them. Under aluminum assault, **seeds may not even sprout**.

SKOW: For instance, ERGS could come from seawater, but **seeds would not even sprout** in it.

SKOW: Plant foods that **cause seed production** are ammoniacal nitrogen, phosphorus, metal trace nutrients,

manures and composts.

SKOW: The idea of a good strawberry is to **have less seed** on it. There is a case where you don't want to use very much fish on strawberries.

WHEELER: **Seed lacking in manganese** will often rot in the soi**l** rather than sprout.

WHEELER: Crops **harvested for their seed**, such as corn, wheat, tomatoes, and peppers, would require both growth and fruit-producing fertilizers with the timing important---varying with the length of the growing season.

RETURN TO TOC

SHEEN/GLOSSY

ADVANCED AG: Dairy cows **without sheen** on their hair have worms.

ADVANCED AG: Skow: Close mowing peas (legumes) in an orchard with dolomitic soil will put a **glossy sheen** on the leaves by releasing magnesium to the air.

ADVANCED AG: You will have a **shiny leaf field [sheen]** when iron and phosphates are ideal.

AG LECTURES: Did you ever see corn that you had trouble getting the chlorophyll green enough? And you put on more nitrogen and it still looked pale? The more you put on, well it would make it grow, but it just **didn't look waxy, a sheen**. Let me tell you this, when you see a crop that has no sheen on it or a grove or an orchard, that the leaves do not have a waxy sheen to, you're going to see a grove or orchard or crop that is low in carbon.

AG LECTURES: What is it that makes a citrus tree not have to be sprayed if it has a **waxy sheen** on it? Kind of like a bald headed man. If a bug lights on it, it slides off. He has a job getting his feet to hold on there.

ANDERSEN: To notice that one field of beans **has a sheen** and the adjacent field does not indicates a difference in nutritional balance.

ANDERSEN: Iron draws energy to the leaf by absorbing heat from the sun; it makes the leaf darker, thus absorbing more energy. It will increase the **waxy sheen** of the crop.

ANDERSEN: Molybdenum is a catalyst for iron in the bark or epidermis, is important in the integrity of bark or plant skin, and gives a transparent look to the **sheen on the bark**.

ENERGY RESEARCH: The oats that we had in here earlier had what I call a **waxy sheen to the leaf**. Those leaves get a waxy sheen like some house plants and when you get a corn field that looks like that or a bean field or an oats field, you have come a long way.

FRANK: Don't worry about morning dew on leaves if you're applying foliar nutrients. A correctly designed spray will break the surface tension of those droplets. The mist you apply, plus dew, will **coat leaves with a glossy wet sheen**. The leaves will sponge up both dew and nutrients within a half-hour of sunrise, even with 70% humidity.

FWTK: The leaves of a healthy plant will have a **glossy sheen**, and egg-laying insects will not lay their eggs on a healthy leaf as readily as they will on a sick, dull leaf.

SKOW: When a field has a **metallic sheen**, the crop will be healthy. On small grain, a golden color is something devoutly to be wished. It isn't seen very often, but when it shows up it brings real excitement.

RETURN TO TOC

SIDE-DRESSING (N-P-K)

ADVANCED AG: A major reason to **side-dress** is to compensate for excessive rain.

AG LECTURES: Student: **Side dressing, what is that**, potassium? Reams: A side dressing is any inorganic N-P-K. All three are used in side dressings. Do you remember what I told you about applying side dressing? How many hours should it be mixed before application? Student: Quickly---why is that? Reams: So it doesn't get hard. Do you know why it would get hard? Student: You are mixing anionic and cationic so as to create energy in the soil and it would get hard if you didn't put it on the soil quickly? Reams: That's right. So if it gets hard in the bag or mixer, what is it going to do in the soil? Student: Make a gum. Get gummy? Reams: That's right, it's going to make something like chewing gum that won't wash out in the rain. It will be right there until the plants use it.

AG LECTURES: You must have all of your nutrients down in the soil before you plant your crop. Do not try to get by with **side-dressing**, use it only as an emergency in case of an extremely heavy rain. But even then at 6 or 8 inch corn, you still can evaluate what type **top-dressing** you'll need, and apply it accordingly.

AG LECTURES: Reams: What is a "soil" **top-dressing**? Student: Something you broadcast on the soil to make a late change adjustment to. What is the difference between that and a **side-dressing**? Reams: There is a lot of difference. Top-dressing is any plant food containing more than 16 units of nitrogen products. It does not contain any appreciable phosphate. If it contains phosphate it's a **side-dressing**. If your soil is low in potash you could apply some as a part of the **top-dressing**.

AG LECTURES: Reams: I've talked to you now about **side-dressing** and replacement of side-dressing. Is there anything else you want to know about side dressings? Student: Which should we use? Reams: Depends on what

you are growing. Anionic plant food produces stalk and cationic produces seed.

BEDDOE: A **side -dressing by definition** always refers to a synthetic fertilizer that contains the full complement of nitrogen, phosphate, and potash in high analysis.

BEDDOE: **Side-dressings** can be of either a liquid or granular type. In determining whether to use liquid or granular, be sure to take into account whether you have the ability to control the moisture. When using liquid types, the moisture must be very carefully watched because of the rapid reactions in the soil.

BEDDOE: For increasing the effectiveness of top-dressings and **side-dressings** it is recommended that a highly available form of carbon be mixed with the dressings being used. Sugar, in either granular or liquid molasses, can be mixed with all the top and side dressings. Being over 40% carbon, the sugar will hold the fertilizers in the top layer of active topsoil for a longer period of time.

ENERGY RESEARCH: Student: When do you start to bring ammonia levels up? Skow: The 45th day from emergence on seed crops primarily. That is why I am suggesting to go out and do a little **side-dressing** to give that system a little kicker.

SKOW: If the ERGS are low, this shortfall must be repaired if yields are to be maintained. The foliar route won't increase the ERGS of energy very much because it takes a volume of plant foods to handle that chore. Usually **side-dressing** and nutrient injection via irrigation systems are indicated.

WHEELER: Foliar sprays and **side-dressing**, applied about 40-45 days after emergence on corn, give the added reproductive energies needed to develop full ears and increase the potential for filling out second or third ears. **NOTE:** *Wheeler speaks of "side-dressing" multiple times but does not appear to address "top-dressing." A though is that he does not consider the two different as Reams did..*

NOTE: *There are places in the literature where Reams is clear that top & side dressings are two different things. However, in one section of the Ag Lectures he speaks as if they are the same. Is this another famous Reams mis-speak?*

*[See Entry **TOP-DRESSING**]*

RETURN TO TOC

SODIUM

AG LECTURES: Reams: What is it in the soil that causes soil compaction? I am not asking what breaks it, I am asking what causes it? Student: Is it nitrogen? Reams: **Sodium, it's sodium in the soil that causes soil compaction**. Now, how do you break this soil compaction? Have you ever seen a field plowed in great big clods? Turned over and it rains and rains and it's still in clods? That's high sodium content. Now how do you break this soil compaction? What breaks it up? Student: Soft rock phosphate? Reams: Soft rock phosphate, that is correct. Not baking soda, but baking powder, crude baking powder.

AG LECTURES: How deep should you cultivate when you cultivate? I am talking about row crops now or truck crops. The answer is just as shallow as you can cultivate it actually. Very, very thin, very thin, unless you have a **very high sodium content [causing compaction]** and have to cultivate deeper.

AG LECTURES: Student: Where is the **sodium on the strata**? Reams: It's all through – it's equal, it's hard, it's what makes soil hard like a brick. It really makes it hard.

ANDERSEN: Nutrients and compounds in the soil that are considered alkaline include calcium, magnesium, chlorine, **sodium**, potassium, salts, ashes, and aldehydes. *[See Entry **ALKALINE**]*

ANDERSEN: Adding high-calcium lime, one in which the calcium carbonate component is extremely dominant to a high-magnesium soil might actually lower the pH. This can also happen in **high-sodium soils**.

ANDERSEN: Sodium is a fairly ubiquitous element, yet it can often become problematic when in excess concentrations. As **sodium concentration surpasses 70 ppm**, the soil will become increasingly clumpy and compact, exemplify poor water-exchange characteristics, require greater calcium levels for balance, and show excessive ERGS levels.

BEDDOE: **Excess sodium levels** can contribute to soil compaction [keep below 70ppm].

ENERGY RESEARCH: The only way to **get rid of the sodium build-up** on the surface of the ground is to apply carbons and some calcium to bring the sodium in ratio with the other elements.

FRANK: How much growth energy does a few lbs. of **sodium chloride** provide? Very little.

FWTK: **Sodium is the element** in the soil that causes soil compaction. The use of soft rock phosphate will counteract this high sodium, and will pulverize the soil.

PLANT FEED 1976: For instance, if you added 1 ton of superphosphate per year you would have 1,000 lbs. of sulfuric acid added to that acre. Do you realize that? You take hard rock phosphate, 1,000 lbs. of it and 1,000 lbs. of the top quality highest hard rock phosphate and you will come up with the 20% phosphate- water soluble, and the

rest will be sulfuric acid and **sodium filler**.

PLANT FEED 1976: So the thing that makes soil compact tight **is sodium**. Don't forget that. How do you break that sodium? You use the phosphate---the baking powder---the soft rock phosphate.

PLANT FEED 1976: Where do the get the **sodium used as filler** in commercial fertilizers? It is a byproduct when chlorine is made from salt for laundry purposes or swimming pools. It's one of the cheapest fillers 1n the world.

SKOW: My formula follows: Put in water, a humate, calcium hydroxide, magnesium sulfate, Bo-Peep [ammonia], a special amine compound, castor oil, **sodium carbonate** and water — it has to be distilled water or good reverse-osmosis water — and seaweed extract.

SKOW: Sodium nitrate isn't used too often anymore. It is used more in the food industry and the price has taken it out of the marketplace. It is a negatively charged element. It would prove useful on lettuce, celery, spinach and cabbage crops. The amount would have to be based on analysis, but in some situations 300 or 400 pounds per acre might be indicated. The problem you run into is sodium, and the **only way to counteract sodium** is to add back plenty of compost, or Z-Hume, a liquid humate product with enzymes added.

WHEELER: Soil pH will rise from adding a liming material like calcium carbonate, calcium oxide, or calcium hydroxide. But pH will also rise if any positive ion is added. The major positive ions that attach themselves to the negative clay colloids [*see note below*] of your soil are calcium, magnesium, potassium **and sodium**. If you don't differentiate between ions and simply consider pH, you are falling into the pH trap and you may have imbalanced nutrients, particularly a shortage of calcium. Since the available calcium determines the total yield of your crop, you could be losing yield and test weight from being caught in the trap. So the first rule is: calcium is king and the second rule is: don't use pH to determine if you need to apply calcium.

WHEELER: High-calcium lime can be applied at most any pH, but is usually reserved for a pH of 7 or below. When the pH is above 7, gypsum (calcium sulfate) is preferred. This assumes that the high pH is **due to sodium**, magnesium or potassium. If the soil really is calcitic (very high in calcium), then the additions of sulfur forms other than gypsum would be best.

WHEELER: When ERGS are high, e.g. 800 or higher, check to **see if sodium is a factor**. High-sodium soils can be more difficult to grow on. Very low sodium soils can benefit from applications of sodium for flavor enhancement of produce and soil texture.

NOTE: *"Clay colloids" are not the "chemical compound colloids" of Reams-Ag. [See Entry **COLLOID**]*

NOTE: *Reams was adamant that soil compaction always traced back to **excessive sodium**. You can see that some of his students did not closely follow his thinking. Also see entry **COMPACTION***

RETURN TO TOC

SOIL TEMPERATURE

AG LECTURES: Reams: At what **temperature do plants grow best in soil**, most crops? Student: 68°. Reams: Sixty eight to what? The answwer is 85°, 68-85° is the ideal soil temperature. Suppose everybody's in such an awful hurry to get out there and plant their crop before that temperature gets up to where it should be. And the soil temperature is running too cold, so what happens? Student: The plant becomes stunted. Reams: That's right, it becomes too woody and doesn't grow up as fast as it would otherwise.

AG LECTURES: The lower the quality, the less the quantity. And there's no exception to it. So **watch your soil temperatures**. That has much to do with your cultivation program.

AG LECTURES: Reams: The process of osmosis is not limited by time. The shorter length of time that you can bring things into production, the higher the yield. The quicker you can produce it the higher the yield. Why? Student: More goes into fruit and less into the plant? Reams: Yes, but the real reason is because it's not retarded. It's not hindered, it must have everything that it needs, **including soil temperature**, weather temperature and everything else.

BEDDOE: Another interesting sidelight about calcium is that in some forms it can be very valuable to **regulating soil temperatures**. When the farmer encounters problems with cold weather, a substance called calcium hydroxide can be used to increase soil temperatures. It works this way because it creates a lot of resistance in the soil, therefore a lot of heat is produced.

FWTK-pH: Crops grow best when the **soil temperatures are between 78 and 90 degrees** Fahrenheit in the upper 6 inches of the topsoil.

PLANT FEED 1976: I've seen two soils with the same amount of carbon and one was very low in ammonia. Three days after a 6 inch rain, the one soil was like an ash bed, but where the ammonia was the soil was moist. You need something in there to **control soil temperature**.

RETURN TO TOC

SOIL TESTING

AG LECTURES: Student: This crop is taking so much material out of the soil. Suppose the crop takes out, say 50 lbs. of phosphorus out and your test showed 100 lbs. of phosphorus when you started. Does that automatically mean your next test would show you needed 50 lbs. of phosphorus? Reams: Generally speaking when **testing soil**, at your very best you'll only pick up 70-72%. That's all you'll be able to pick up.

ANDERSEN: Using the Reams **soil-testing method**, this ratio should be 2 pounds of phosphate to 1 pound of potash for row crops and 4 pounds of phosphate to 1 pound of potash for alfalfa and grass crops.

ANDERSEN: The Reams soil test was developed to reflect, in the test values, the characteristics actually observed in the field. These characteristics include soil compaction and tilth, weed and pest problems, crop quality and yield, and overall stability of soil and plant nutrients. **No other testing system can make such a claim**.

BEDDOE: It [fall soil testing] also means that you would be wise to have a mineral assay done of the top and sub-soils so that you know what minerals, major and minor, may be there but unavailable. Knowing what is in your ground and unavailable may mean less soil amendments needed later if you make them available by your farming practices.

BEDDOE: Fertilizing with manures is the preferred method in the *[Reams-Ag]* ionization program, then **testing soils** to discover their deficiencies, and using synthetics to make up the difference.

BEDDOE: One of the basic principles of the Biologic Theory of Ionization *[Reams-Ag]* is that a plant can only use a nutrient that is in a water-soluble form. **Testing soil** with other than a water soluble test may lead the farmer to believe he has something he really doesn't have.

ENERGY RESEARCH: Don't use ammonium sulfate if the calciums are below 1800 lbs per acre using the **LaMotte method of testing**.

FRANK: Headings: I said *[to Skow]*, I've got potato beetles on my potatoes." He said, "Oh? Well, you don't have high Brix potatoes." I said, "High Brix, what do you mean?" He said, "Well, the sugars aren't high enough." And so, it kind of went from there and we **started soil testing**, and we started seeing phenomenal results right away.

FRANK: International Ag Labs has always promoted the **Original Morgan soil test** [Reams-Ag]. All of our fertility recommendations and writings are based off this specific test.

FWTK pH: All **soil solvent testing** reagents that are foreign to what is available in the soil should not be used. They are unreliable for the same reason that the flame photometer is unreliable. Where could plants go to get alcohol or carbon disulfide to dissolve the oxidized plant food?

FWTK: Testing soil without using a test for water soluble plant foods will lead a farmer to believe his soil has plenty of the elements in which it may be most deficient.

FWTK: Reams recommends fertilizing with manures, then **testing them [the soil]** to see their deficiencies, and using synthetics to make up the difference.

PLANT FEED 1976: Student: Why don't you care about pH values? Reams: Why should I? I'll handle it in any soil. For example ,we are going to be **testing the ERGS** and whenever I know what my ERGS are I feel that is what the pH is. Student: So you can do it either way---in some things? Reams: No, ERGS is the only accurate way to do it.

PLANT FEED 1976: As a commercial farmer, if you are to get the maximum benefit for the first 2 years from your soil testing, you must **test your soil every six weeks** or there abouts, throughout the year, except when the ground is frozen. Follow your results on a graph and watch your soil move toward the goals you are shooting for.

PLANT FEED 1976: Student: What about **testing every six weeks**. Do you take the soil sample more at the top or . . . .? Reams: Sample your topsoil the same way each time. And run your analysis the same way.

SKOW: There are so many ways of **testing soils** and so many interpretations that the only thing we do know is that when you have a tendency to have higher phosphate and lower potassium, there seems to be quite an explosion in yield, especially in grasses. This also seems to be true in corn.

SKOW: During most of his *[Reams]* life he was guided by the Morgan Universal **Testing Systems** and the LaMotte procedures.

WHEELER: Soil testing is done not only to provide data from which to make fertility programming, but also to be able to monitor progress over the years.

RETURN TO TOC

SPRAY SAFETY

PLANT FEED 1976: Our foods have never been so safe from poison sprays as they are today. The sprays we use today are all gases that kill the pests. They evaporate off the vegetables and plants and don't remain on there like you read in the health books. It gets more into the air and messes up the air, doing more harm to the air you breathe, than it does to the food you eat. Fifty years ago, when they used arsenic of lead on fresh green foods, they were a lot

more dangerous because that did not evaporate. They were not water-soluble and were dangerous to eat. Today all highly toxic high stream sprays are under strict surveillance of the government. Orchards have never been so safe.

RETURN TO TOC

STARCH

ANDERSEN: If a phosphate ion were added to this sugar, we would have alpha-glucose-l-phosphate. This sugared phosphate or phosphated sugar is the **immediate precursor of starch** in plants and of glycogen in animals; it is also the first product of the breakdown and use of these products. This compound is a major reason the refractometer reading of a crop is correlated to the phosphate/mineral level of the plant and also why it is recommended that sugar be added with all acid phosphate fertilizers.

ANDERSEN: The endosperm is stored food for the young seedling; **it is largely starch**, which is made of glucose chains.

ANDERSEN: The cow develops a fatty liver, reproductive organs, and spleen because this excess nitrogen—protein—does not allow the liver to metabolize fats, **starches**, and sugars properly.

BEDDOE: Photosynthesis usually starts when the first rays of the morning sun penetrate the leaf. As glucose is produced by photosynthesis, the leaf cells use some of it for respiration. The **excess glucose is stored as starch** grains in the mesophyll cells. Starch storage is at a maximum, usually, at about mid-aftemoon. The mesophyll cells then convert the starch back into glucose.

FOLIAR SEMINAR 1983: There are more **starches** in root crops and more carbohydrates in leaf crops.

WHEELER: Potash is needed to build strong stalks of sizable diameter, it controls the caliber (size) of the fruit, increases the yield of tubers and seed, and is necessary for the plant to produce **starch**, sugar and oils.

NOTE: *There is scanty reference to starch in the Reams literature. Possibly he felt that when he was speaking about carbohydrates that everyone knew he included starch.*

RETURN TO TOC

STERILE SOIL

ADVANCED AG: *[Student asking about "black blight" in commercial tomatoes]* Yes, but damp weather will finish the plants in no time. Reams: Then your nitrogen is off and your phosphates are not right or your soil is **too sterile** and you don't have enough bacteria in it. Student: Well, I never get it in the garden. Reams: I see.

ANDERSEN: Carey Reams repeatedly asserted that plants absorb much nutrition from the air. But they can do this only if the plant is a good conductor and if the soil acts as a good electrical ground. To be a good ground, the soil must be highly paramagnetic; this means that the soil is a good antenna for solar and cosmic radiation. Paramagnetism does not guarantee fertile soil, but it is a prerequisite for fertile soil. **Sterile soils are diamagnetic**; they are poor antennas. Paramagnetism is achieved by both the mineral composition and the physical structure or form of the materials in the soil. The microorganisms are responsible for creating structured materials in the soil that are paramagnetic.

ANDERSEN: Most of the literature on soil and plant nutrition is based on research in vitro (in the laboratory or out of the natural system) or in **sterile or relatively sterile conditions**. These conditions differ from those in the real world of agriculture, yet the observations made therein are propounded as universal fact.

ANDERSEN: **Sterile N-P-K farm management** simply does not effectuate a sustainable planet or agriculture.

BEDDOE: Anhydrous ammonia is extremely detrimental to the soil chemistry. It is too hot for the soil, besides it causes the bacteria to go dormant. This will in turn reduce the carbons and the live bacterial protoplasm so that the soil can become very **hard and sterile**.

ENERGY RESEARCH: If there is a carbon deficiency there is a CO2 deficiency which will result in a carbohydrate deficiency and an oxygen deficiency which will result in decreased aerobic microbial life which will result in increased toxicity, reduction of carbon cycle **and finally sterile soil**, loss of the magnetic field, and a favorable environment for all types of pests both above and below the ground.

FWTK: Chicken manure that has not been sterilized with antibiotics, applied to **soils that are not sterile** from chlorine, is one of the finest ways to create a healthy living soil. Without a source of good chicken manure, a second-best is the use of cover crops and soil innoculants.

PLANT FEED 1976: **Sterile soil** is soil in which the [existing] salts turn the organic substance into more salt just like the ocean does. Consequently, you are farming hydroponically, whether you believe it or not.

PLANT FEED 1976: After you harvest the top, if your soil is **not sterile**, your aerobic bacteria will convert those roots into heavy, heavy amounts of organic nutrients. Nature is trying to help you if you will let it.

SKOW: Highly fertile soils have positive magnetic susceptibility values and are said to be paramagnetic. **Sterile soils** have negative magnetic susceptibility values and are said to be diamagnetic.

RETURN TO TOC

STRAWBERRY

ADVANCED AG: Don't use chicken manure on **strawberries** because of the boron. Instead use soft rock phosphate.

ADVANCED AG: A high Brix **strawberry** is uniformly red. If the tip is redder, it is a third rate strawberry, probably sour.

AG LECTURES: With my methods anyone can grow 10,000 strawberry plants per acre and each plant should produce at least one quart of strawberries. That's the minimum that should be produced. I am talking about **top quality, high sugar strawberries**. Strawberries that are so sweet that you do not need any sweetening on them whatsoever.

AG LECTURES: Student: How do you go about marketing that quantity? Reams: Through your supply houses, your grocery chain will take all you've got if they are **high quality strawberries** that will hold up, won't rot, red all over, no hollow heart, and high sugar content. You may have to add a pound per acre of 20 Mule Team borax to prevent hollow heart.

BEDDOE: In the **strawberry,** excessive boron can make the berry develop a very woody center.

SKOW: The idea of a good **strawberry** is to have less seed on it. There is a case where you don't want to use very much fish on strawberries. You want to use mainly your phosphoric acid, ammonia, and calcium nitrate.

RETURN TO TOC

STUMP

AG LECTURES: Student: What about the top of the leaf? Reams: You know plants have bowel movement or urinate just like everything else. And this foliar spray *[we applied]* goes through this leaf and [it] takes out the nutrients that it wants and sends the rest down to the roots, **down through the stump,** and [the plant] mixes it with other substances and sends it back up. And then it becomes a part of the plant, [on] the frequency of the plant. But the water, the extra water that it gets in to keep that plant growing, sweats out through the top of the plant.

BEDDOE: In seedless watermelons or grapes, the **stump of the plant** will not allow manganese to go out into the fruit because of its micronage.

BEDDOE: Photosynthesis---Making sugar in the leaf by using water, carbon dioxide and phosphated mineral in sap, and sending it to the root, where sugar is concentrated, and then **sent back via the "stump"** to be distributed for building plant tissue or fruit.

BEDDOE: The **stump is where the secret of the plant's frequency lies**.

BEDDOE: Trees that retain the stumps of pruned or broken off limbs in their bark are also showing lack of copper. When copper is being supplied, those **stumps will be thrown out of the bark** and leave no scaring.

ENERGY RESEARCH: The **stump** of the plant is essentially right here at the ground level.

ENERGY RESEARCH: The **stump is where the nutrients are put on the frequency** of the plant.

ENERGY RESEARCH: One thing **about the stump of the plant** if you are growing trees you don't want it covered up with dirt. It will kill the plant.

ENERGY RESEARCH: The **stump** may not be important for grain but for those of you in the tree business it is vital.

ENERGY RESEARCH: The **stump** is where the nutrients are put on the frequency of the plant. It is located at the base of the plant. It is sometimes called the "Brain or Liver" of the plant.

FOLIAR SEMINAR 1983: The **stump works like a liver** by putting particles together to form plant parts according to frequency.

FWTK: The secret of a plant's frequency **lies in its stump**. The nutrients coming up into a plant in the sap pass through the stump, where they are formed according to the micronage of the part of the plant they are to become - a stem, a leaf, a seed, a blossom or fruit. This also takes place when the nutrients taken in and manufactured in the leaf go down through the stump. In seedless watermelons or grapes, the stump of the plant will not allow manganese to go out into the fruit, because of its micronage.

PLANT FEED 1976: In the **stump of the plant** lies the secret of the frequency of the plant.

PLANT FEED 1976: Student: Do plants have glands? Reams: No, their growth is not determined by glands, nor a nervous system either. There is a plant intelligence, but it has "**stumped**" us all.

COMMENTARY: *The reader should review the "**PONS**" entry. It is possible that stump and pons are the same concept with different names.*

RETURN TO TOC

SUCROSE

ANDERSEN: **Sucrose** is the combination of glucose and fructose. In living systems, sugars are used for two purposes: as energy stores and as structural components. Providing energy/food is a major reason sugar is used in fertilization.

BEDDOE: Brix is a unit of measure used in the refractometer. When the Brix reading is divided by 2 it will be equal to the percent of **crude sucrose** in plant tissue.

BEDDOE: This [working with soft rock phosphate] was also how it was learned that the higher the **sucrose** readings of plant juices on a refractometer, the lower the freezing point of that fruit or plant.

FOLIAR SEMINAR 1983: Skow: If you have a higher sugar content, especially **sucrose**, then your protein-nitrogen should be higher.

FWTK-pH: **Sucrose** is the staff of life for plants as bread is for man.

FWTK-pH: The higher the **sucrose** content of the fruit or vegetable crop, the lower the freezing point.

SAIT: Andersen: **Sucrose** is the primary carbohydrate in both sugar and molasses, but the difference is that there are other minerals present in molasses.

SKOW: During photosynthesis, **sucrose** takes its place in the leaves. Osmosis becomes operative, and cells with a high sugar content achieve turgor pressure.

SKOW: As a result, many nontraditional fertilizer materials have been discovered to be vital to soil regeneration and plant feeding. They include vitamins like B-12 and C; sugars like molasses, **sucrose**, and dextrose; trace elements like silicon and iodine; and even colors.

SUCROSE: Soil balance means that the elements are joining to form protein molecules that will give the greatest yield of **sucrose**.

SUCROSE: Too much fertilizer applied at one time can result in a quick release of energy without preserving this energy in protein molecules. Most of the energy is lost unless harnessed by the protein molecules, which results in a **decreased sucrose yield**.

SUCROSE: Since nature knows no laws except that of supply and demand, there must be something lacking in the soil that is used by the sugarcane to make **sucrose** that causes a decrease in yield. As pure sucrose is composed of carbon, hydrogen, and oxygen, would it not be reasonable to examine all phases of the possibility that the decrease in yield could possibly be a deficiency of one of these three elements or of an elementary catalyst that joins them together to make sucrose? It could not be hydrogen or oxygen because these two elements come from water, so then the deficient element is carbon or its catalyst. The theorem that all carbon used in the manufacture of sucrose comes from the air and there is nothing we can do about it is only a half truth.

SUCROSE: An oversupply of water-soluble magnesium displaces carbon in the protein molecule and converts nitrogen into a gas, thus decreasing the probable protein molecule count which decreases **sucrose** yield.

SUCROSE: Keep plenty of **water-soluble, ionized carbon** so the crop will not have to depend upon its entire supply of **carbon from the air**. Keep the carbon/nitrogen ratio equalized for greatest yield of sucrose.

WHEELER: This can be shown by taking refractometer readings and observing that the brix reading measured as percent **sucrose** on attacked plants is lower than plants not being attacked. The brix reading is a good indication of the efficiency of the plants' output of carbohydrates which is the result of photosynthesis.

RETURN TO TOC

SUGAR CANE

AG LECTURES: Did you ever take a leaf of alfalfa, **sugar cane** or corn and examine it closely and see little black dots in it? Have you noticed that or on the stem? Have you seen little black dots appear on the stem of alfalfa? Did you really look that close? That's too much potassium in the soil. How many have seen those little black dots? Have you noticed it on peach leaves, orange leaves, any crop?

AG LECTURES: Student: You said a 4 to 1 P and K for grasses, do you consider alfalfa a grass? Reams: Yes, **sugar cane too is a grass**. Corn is not a grass.

AG LECTURES: What is the ratio for grasses? Sugar cane? 4 to 1, 4 parts phosphate to 1 potash is for grasses.

FWTK: All grasses, such as the Bermudas and fescues, **and even sugar cane**, can take most of their potassium from the air.

PLANT FEED 1976: The ratio between phosphoric acid and potassium is 2:1, two phosphate and one potash except alfalfa and grass with the ratio of 2.5 to .5 . What about **sugar cane, what is your ratio for sugar cane**? **Did you know sugar cane is a special grass**? So the ratio does not apply to sugar cane. ☑ **NOTE:** *This is Reams speaking and even he gets a little mixed up. There are plenty of other Reams quotes that say sugar cane is a grass and the phosphate:potash ratio should be 4:1 for grasses.*

RETURN TO TOC

SUGAR CONTENT

ADVANCED AG: Increasing growth without TDN will lower **sugar content**.

AG LECTURES: Reams: The higher the **sugar content**, the higher the mineral content and the higher the sugar and mineral content, the less bugs you have. Why? Student: The alcohol kills them? Reams: Yes, the alcohol kills them, but there's another reason too. There's one more reason I haven't told you about. It increases the oil content and it gives him a physic. That is exactly what happens. In other words he gets diarrhea. You who've studied bugs and worms, you know what I'm talking about. You've handled them and you go to do something with them, the whole business would get diarrhea and you'd have to start over again. In other words they'd just go to nothing. I don't know of anything sicker than a worm with diarrhea. He looks like just a dead mass of stuff, really a sick worm.

AG LECTURES: Did you ever stick your hand into a bale of hay and it felt hot, warm? Did you ever stick your hand in another bale of hay and it felt cold? Even in the same [*ambient*] temperature? I have and the one that was hot inside was rotting, decaying because it had a **low sugar content**. And one more thing too, it had a low protein content. The one that you put your hand in that felt cool to you, it had a **high sugar content** and a high ammoniacal nitrogen content and the heat cooled it. See what I mean? This is very important to know.

AG LECTURES: Reams: At what percent moisture do you bale hay? Student: 20-25%. Reams: 25-30 is good. About 28% makes the best hay with the **highest sugar content**. And it won't rot, won't go through a heat, not nearly so badly as the one with the low sugar content.

AG LECTURES: [*About strawberry selling***]** your supply houses, your grocery chain will take all you've got if they are high quality strawberries that will hold up, won't rot, red all over, no hollow heart, and **high sugar content**.

AG LECTURES: Reams: If you're cutting alfalfa [or other grasses], the best thing to do is is to start about 4 o'clock in the morning and cut them and then about 10 o'clock start putting them in your harvester. Student: One thing. Your nitrates would be too high. The sun hasn't shown on it at 4 o'clock in the morning and you may poison your cattle, right? Reams: No, not if there's a high sugar content [*Brix*] you won't. You'll poison the cattle because there's low sugar content in it. **You will never poison the cattle with a high sugar content**.

ANDERSEN: To regenerate the microorganism populations rapidly, they must be fed. Then and only then can they digest crop residues and produce organic acids, humus, and nutrients. Very **few crops have adequate sugar contents**, as attested by their low refractometer values; hence, crop residues do not contain sufficient sugar for the microbes to use for optimum efficiency.

BEDDOE: All elements in molecular structure are the same size under the same temperature and pressure. Take a look at (Avogadro's Law in Chapter 1). If this were not true we would not have a standard of weights and measures. And if it were not true then a **crop could not increase its sugar content** while not increasing in size; and there could be no way of determining the amount of carbohydrate a plant can contain.

FOLIAR SEMINAR 1983: Skow: If you have a **higher sugar content**, especially sucrose, then your protein-nitrogen should be higher.

FWTK: Alfalfa hay, which should measure twelve to 14% **sugar content**, is often only six to 8 Brix. **NOTE:** *Be wary of wrong comparison because in various places Reams says that a Brix reading is 1/2 sugar.*

FWTK: If they offered a horse or cow some carrots with a sugar content of 12% Brix and some with 7% Brix, the animal would eat those with the **highest sugar content**.

FWTK: According to government standards, it takes 32 lbs. of green beans to make a bushel. A bushel of high quality beans will only fill the bushel basket 3/4 full and still weigh 32 lbs. **Poor quality beans with a low sugar content** will require an extra six inches of beans on top to weigh 32 lbs. The heavier beans are the most nutritious since they contain the most minerals.

GARDENING: The moth knows by instinct that where she stings the plant leaf and lays her eggs a small drop of sap will come out of the plant. And these little worms will eat on that sap until they get big enough to eat the leaf. But suppose that little drop of sap that comes out is **very high in sugar content**. When that sugar content then strikes the oxygen content of the air, it's going to ferment and turn to alcohol. And those little worms are going to get drunk and roll off of that leaf into the ground and the bacteria are going to eat them and you'll have a garden without any worms in it.

GARDENING: Also, the **higher the sugar content in produce, the longer it lasts** and it won't rot. Good produce won't rot. I grew a crop of watermelons for a client and he gave me some of those watermelons and they sat on my desk for 3 years and didn't rot.

PLANT FEED 1976: If you do decide to market, let me know and I'll help you, but you've got to have a **sugar content** in comfrey of about 5 1/2 or 6 [*remember that Reams considered Brix to be half sugar*] or it will spoil on

you. Even 7 is not too high for comfrey.

PLANT FEED 1976: Do you know you can grow watermelons which can sit on your desk for 3 years without rotting? I've done tnat. I presented one in the county fair for 3 years consecutively. Yes, the same identical watermelon. It was marked - this was a demonstration of research. It was authenticated and sealed and under supervision and under no refrigeration. **The higher the sugar content** - foods will not rot.

SKOW: [*Explaining insect kill***]** The reason is that when you have insects in a field that has high energy and a **high sugar content** in the crop, alcohol is produced. A human being can consume alcohol with moderation. An excess can cause diarrhea, but diarrhea in a human being is nothing compared to the same malaise in an insect.

*[See Entry **BRIX**]*
RETURN TO TOC

SUL-PO-MAG

ADVANCED AG: **Sul-Po-Mag** makes copper available.

ADVANCED AG: Reams tells a story of once using **Sul-Po-Mag** on a second crop of corn and then later hearing the corn making snapping noises as the stalks expanded.

ADVANCED AG: Maple syrup trees benefit from phosphate, lime, and **Sul-Po-Mag**.

ANDERSEN: Reams used calcium carbonate, never dolomite. He observed that sufficient magnesium would be available if he balanced the calcium, phosphate, and microorganisms and then applied fertilizer quantities of **Sul-Po-Mag**.

BEDDOE: Citrus do not really require the help of **Sul-Po-Mag**.

BEDDOE: There is a prenatal period in trees and plants just as there is in animals. In the northern temperate zone, during the period from July 15 to September 20 (and sometimes up unto the first frost, or anytime the temperature drops below 60 degrees for two hours or more) the trees take in potassium that will be used to make next year's fruit. If the right ratios of potassium are not available for the trees at this time, then next year's crop has already begun to suffer. A **product called Sul-Po-Mag** (sulfate of potash magnesia, a naturally-occurring product mined out of the ground), is used to promote this process. During this prenatal period, Sul-Po-Mag will also react as a catalyst for phosphate of copper uptake.

BEDDOE: Reams had no explanation as to why the potassium is taken into the tree in the **Sul-Po-Mag** form between July 20th and September 15th and no other time except that his experiments showed that it consistently was.

ENERGY RESEARCH: Zinc is used to control many types of blight. It is also a minor catalyst for **Sul-Po-Mag** and copper. It helps to make the acedic acid in the root to keep it from rotting.

ENERGY RESEARCH: The application of **Sul-Po-Mag** is a better way to make copper available to the plant on a long term basis. If there is an excess of Sul-Po-Mag in ratio to the copper then **thin skinned fruit like tomatoes** will have creasing where the skin is too thin.

FWTK: Trees and plants have a prenatal period just like animals do. In the North Temperate Zone, from July 20 until September 15th, trees take in potassium that will be used to make the next year's fruit. The trees store this potassium in the form of **Sul-Po-Mag** (sulfate of potash magnesia).

PLANT FEED 1976: Here's a rule with no exception. In the North temperate zone, from the 20th of July each year until about Sept. 15th, trees take in potassium in the form of Sul-Po-mag. (sulfate or potash magnesia) . Do not under any circumstances use the sulfate of potash and sulfate of magnesium mixture. I am talking about .a natural product now, as this magnesia never being separated from potash. This union will not separate, it is forever bound. But you can take sulfate of potash and sulfate of magnesium and them and we call that Sul-Po-Mag too. But it is called Sulfate of Potash Magnesia. Do not misconstrue the trade name of Sulfate of Potash Magnesia with Sul-Po-Mag. They are the same thing, but two different forms. One can be divided and the other is a naturally mined product that the potassium and magnesium does not separate.

PLANT FEED 1976: I've seen 80% of a crop of oranges lost when they were three-fourths grown because of a lack of **Sol-Po-Mag**.

SKOW: In other words, there may be enough phosphate to accommodate the basic functions of the plant, but not enough to handle copper and iron needed from a standpoint of energy. There are a couple of products on the market that might be helpful. One is **Sul-Po-Mag**. It contains sulfur, potassium and magnesium, and it makes copper available to the plant.

SKOW: The normal rate of application for **Sul-Po-Mag** is 200 pounds per acre every ten years. In the North Temperate Zone, the most effective time to apply Sul-Po-Mag is from July 15 through September 15, if the application is via the soil.

WHEELER: Reams claimed **Sul-Po-Mag** works best in the northern hemisphere when applied between July 15 and September 15. During this time, it supposedly works to release copper which allows plant bark to expand and

stretch. This is a great product for use on orchards, and it will also work well on farm crops.
RETURN TO TOC

SULFATE

ADVANCED AG: If adding **calcium sulfate** in an alkaline soil to improve the energy, limit it to 500 pounds per acre for any one application.

AG LECTURES: Reams: Suppose you were down in a place like Haiti where the pH is 14, solid lime rock. What is the first thing you'd do to make that soil possibly produce? Student: You have to put in what you don't have, put acid on it. Reams: That's right, You'd use sulfuric acid. Then what? If you apply the sulfuric acid to the lime rock, what would it do, what would you have? Student: Change it to a cation. Reams: Yes, but what is the name of the substance you'd have? Student: **Calcium sulfate, gypsum**.

ANDERSEN: Sulfate, the next item on the test, is **not to be confused with elemental sulfur.** Elemental sulfur can cause rot at maturity of fruit and can tie up or interfere with calcium. Sulfate, on the other hand, can help enhance calcium availability, is needed in certain protein and enzyme complexes, and sometimes can aid in mellowing the soil. However, it is possible to apply too much sulfate, which seems to be happening in some areas where reductionists are attempting to "hammer down" soil pH with large amounts of gypsum and sulfuric acid. This practice causes additional salt problems, calcium demand, and microbial stress.

ANDERSEN: Calcium carbonate (CaCO3), though not technically considered an organic chemical, is preferable to dehydrated lime (calcium oxide, CaO), hydrated lime (calcium hydroxide, Ca(OH)2), or even **gypsum (calcium sulfate, CaSO4)**, if one is seeking the nutrient calcium.

ANDERSEN: Finally, this [typical organic program] program adds an **excess of calcium sulfate** in an attempt to lower the soil pH which contributes, along with the excess nitrogen and salt, to the depression of the biosystem.

ANDERSEN: Calcium sulfate (gypsum); use a maximum of 500 pounds/acre.

BEDDOE: Ammonium sulfate is made by reacting anhydrous ammonia with sulfuric acid.

BEDDOE: Tomatoes do best when there is a minimum of available nitrogen. When nitrogen gets too high, excessive anionic growth (vegetative growth) will develop. **Magnesium sulfate** can be used around the tomato plants so the excessive nitrogen can be reduced by its reaction with the magnesium in the Epsom salt.

BEDDOE: Calcium sulfate is not a preferred source mainly because the sulfate (a double cation) can either release too much energy and/or contribute to sulfur excess. Usually no more than 500 lbs. at one application per season.

BEDDOE: Other fertilizer materials that can be used as catalysts in certain situations include: ammonium sulfate, ammonium thiosulfate, ammonium phosphate, **calcium sulfate**, calcium nitrate, potassium sulfate, and potassium nitrate.

ENERGY RESEARCH: Student: How come most of the [trace element] minerals have sulfate added to them? Skow: OK, the **sulfate is mainly a mineral salt**, and that is the only way they are water soluble. In other words, they have been treated with sulfuric acid. See, if it was in oxide form, it wouldn't go into solution so what they do is they take it with sulfuric acid and then they dry it to make it soluble in water.

ENERGY RESEARCH: Don't use **ammonium sulfate** if the calciums are below 1800 lbs per acre using the LaMotte method of testing.

FOLIAR FEED 1981: Add calcium hydroxide not **calcium sulphate** (gypsum).

FRANK: The Morgan soil test has concluded time and time again that **gypsum [***calcium sulfate***]** is not the tool of choice to raise a low calcium soil. It flat out doesn't work. Limestone works very consistently. This information doesn't show up when using a Mehlich 3 soil test.

FWTK: There are five basic sources of calcium for agricultural purposes. The most common source is ground limestone. Then there is dolomite - which we do not use, **gypsum (calcium sulfate)**, calcium oxide, Aragonite and basic slag.

FWTK: Ammonium sulfate both warms and cools the soil and controls the temperature.

SKOW: Carey Reams talked about calciums, plural. By calciums, plural, he meant that every kind of plant had calcium in it, but always in a different organic complex. Each affects a human being differently. **Calcium sulfate has a different effect** on Homo sapiens than calcium carbonate. Calcium from alfalfa and calcium from peppermint tea are each in a different complex. As a consequence, they affect the cells of the body differently. They have a different pH and a different energy potential. These observations prompt a question over whether we should use different calcium forms on the soil. The answer is, Yes!

SKOW: Gypsum is calcium sulfate. It has a tendency to act like baking soda, to fluff and drive the particles of the soil apart. Calcium carbonate does not do that.

WHEELER: High-calcium lime can be applied at most any pH, but is usually reserved for a pH of 7 or below. When the pH is above 7, **gypsum (calcium sulfate)** is preferred. This assumes that the high pH is due to sodium,

magnesium or potassium. If the soil really is calcitic (very high in calcium), then the additions of sulfur forms other than gypsum would be best.

WHEELER: **Sulfur** could be applied as dilute sulfuric acid, thiosulfate or **ammonium sulfate**.

NOTE: *Magnesium sulfate is highly soluble in water whereas **calcium sulfate (gypsum)** is only moderately soluble in water. It is important to remember this when listening to Reams talk about the necessity of liming dolomitic soils (i.e., high magnesium). He is trying to help the student understand how to let nature (via rain) remove some of the excess magnesium.*

RETURN TO TOC

SYNCHRONIZATION

BEDDOE: **Synchronization** means to co-ordinate molecular frequency by rearrangement of electrons between molecules, so that electrons of all molecules are traveling at the same speed. It is during the process of synchronization between anions and cations that resistance takes place. When the synchronization point is reached the resistance actually drops.

BEDDOE: When the plant food elements become [water] soluble, they are then in a state of being vulnerable to reacting with any other soluble element they may encounter. The reaction involves a **synchronization process**. As the elements and compounds in the soil encounter each other with their differing frequency ratios, a resistance reaction begins between them. The amount of that resistance depends on combination and strength of the anions and cations involved. When the resistance runs to a complete synchronization of the two substances, they will combine. The energy released, while the synchronization point is being reached, is released into other soil reactions or may be picked up by a plant rootlet if one were present.

BEDDOE: There will always be a **synchronization** anytime two different elements, compounds, or molecules interact toward combining. The process involves the giving off of energy until the interacting substances become one harmonious structure.

BEDDOE: When ERGS drop in the soil during the growing season plant growth slows and can even stop. This is because resistance is slowing due to either poor bacterial activity, excess moisture diluting out the given amount of ERGS being released, and/or the interaction between given fertilizer elements ceases by totally **synchronizing**.

ENERGY RESEARCH: Student: You have the statement in here that the **synchronization of the nutrients takes place in the roots** and not in the soil. Is that right? Skow: Yes, that is correct. **NOTE:** *This statement seems contrary to many others.*

ENERGY RESEARCH: One of the most important things I want to get across to you is that plants live off the loss of energy from the elements during the **synchronization** of these elements. One of the things you want never to happen is for these elements to completely synchronize because if they do, there is no more energy given off. This may be another reason why the ERGS reading can go down to zero.

ENERGY RESEARCH: Skow quoting "Rules of Biological Life": Plants live off of the loss of energy from the elements during the **synchronization** of these elements.

FOLIAR SEMINAR 1983: Elements while **synchronizing** can generate much heat and can burn plants if in excess. A slow energy release is how plants grow.

PLANT FEED 1976: There is a loss of energy between the synchronization of products and that's what you and plants live on.

PLANT FEED 1976: When the elements synchronize, they each end up with with something less than they started. The plant or the human lives off the difference of the loss of energy during the synchronization. So the ions go away with less, but the plants go away with more.

SKOW: If a soil becomes perfectly **synchronized**, no energy exchange is possible. At this point the crop stops growing. Fortunately there is a higher power that does not permit this to happen. At ground level, and from our point of view, the chief impediment to such an energy synchronization is temperature. During any 24 hour period anywhere in the world, there is a variation in temperature of at least a few degrees. If you have a solution, the addition or subtraction of heat will force molecules to speed up or slow down. In August, when it is extremely dry, molecules can move too fast and fly right on by the rootlets. If there isn't enough magnetism to pick up these nutrient molecules, then there will be a shortfall of the anions and cations required for plant growth.

SKOW: In addition to temperature, moisture will keep a soil from total **synchronization**. Moisture will fluctuate considerably in any topsoil. It cycles up and down in the soil over a 24 hour period.

SKOW: Any molecule or atom will seek **synchronization** halfway between the lowest and the highest value for anions and cations on the Milhaus Unit scale. Halfway between 500 and 999 on the cationic scale is 750. Halfway between one and 499 on the anionic is 250. Thus, an overall average value would be 1,000, this for one single atom

of hydrogen. Using this concept and these numbers it is well within the reach and capability of the farmer to calculate a number of different fertilizer materials on an average basis.

RETURN TO TOC

TDN (Total Daily Nutrient)

AG LECTURES: Student: And that's your **total of TDN of calcium**? How much have you got to apply? You recommended 8,000 didn't you? Reams: That's right, but you can't do it all the first year. You have to apply it in degrees. *****ADVANCED AG index:** 095 Need Chart For Fertilizer Recommendations And **TDN In Root Zone**

ADVANCED AG: The Brix reading should be the same throughout the plant, **unless the soil is low in TDN.**

ADVANCED AG: 80% of TDN from ground should be calcium

AG LECTURES: But one of the great mistakes in growing corps is that the **farmer does not regulate his TDN** or ERGS in the soil with the moisture content.

AG LECTURES: That pasture will be perpetual except for your calcium and phosphates. That juice [from sickle-bar mowed grass] will drop onto this ground and go back in and supply you with **enough TDN for 2 more crops**.

AG LECTURES: Reams: How much calcium do you have per acre? Student: 2,000 lbs. per acre. Reams: And that's your total of **TDN of calcium**? How much have you got to apply? Student: You recommended 8,000 didn't you? Reams: That's right, but you can't do it all the first year. You have to apply it in degrees. In other words I would get it to 4,000 the first year, 6-7,000 the next and 8-8,500 and even 9,000. If you will evaluate your soil by what you've got left over after the crop, it will mean a lot more to you than trying to figure out what you've got before you plant your crop. However, you've got to do both.

BEDDOE: It is interesting to note, that in a **high TDN and active soil** the bacteria have so thoroughly taken over that earth worms will seldom be found. Earthworms are natures way of trying to build the soil. When it is built to the maximum the bacteria take over the full load and the earthworms move on to where they are needed.

BEDDOE: When the phosphate and potassium ratio is where it should be, you can remove a maximum of **50% of the available TDN** (Total Daily Nutrient).

BEDDOE: Yes, magnesium is a necessary mineral in the function of the plant, but the plant can usually get all the magnesium it needs just from the atmosphere **when the TDN is at an adequate** level.

BEDDOE: There is a law in mathematics that says, "The whole is equal to the sum of the parts." Well **this law applies to the reserve soil TDN** also. The parts of the reserve soil TDN are Calcium, Phosphate, Potassium (potash), Nitrate Nitrogen, Ammonia Nitrogen, Iron, and Copper. When these are summed up they should equal 98% of soil reserve potential. If that potential equals 3000 lbs. per acre or more, than it is possible to start predicting yield potentials for a given crop. The higher the reserve potential, the more accurate the predictions.

ENERGY RESEARCH: Student: How high is high enough [phosphate]? Skow: I wish I could give you an absolute answer but it is not possible because the phosphate in the soil has to be worked up in the soil in relation to the what? What key thing can you do to **increase your TDN** (total daily nutrient) more? What has to be there? Carbon, there you go.

ENERGY RESEARCH: TDN Abbreviation for **TOTAL DAILY NUTRIENT**. It is the sum of all the available nutrients that are available during any given day. One can calculate this by adding together the values obtained from the soil analysis for calcium, phosphate, potash, and nitrogens, primarily. The **minimum desirable TDN value is about 3000 pounds per acre**.

FOLIAR FEED 1981: You will have to foliar feed more often in a wet year to control **TDN**

FOLIAR FEED 1981: If the bark on the tree plant roots is loose from ammoniation, you must completely foliar feed **the entire TDN.**

PLANT FEED 1976: That's what we're studying today. How to produce the most food with the **highest nutrient value, (TDN - total daily nutrient)** which is what is required to maintain a plant or animal.

SKOW: The **goal is TDN, total digestive nutrients** — nitrogen, calcium, phosphorus, potassium. It is the function of carbon to keep these nutrients separated by enough space to confer on them the status of complexes. and keep them from becoming salts.

SKOW: A thin or weak leaf suggests **a nutrient deficiency, or low TDN** — total digestive nutrients.

RETURN TO TOC

TEAR GAS

AG LECTURES: Student: There are quite a few people that are still fumigating soil. It's done where they're doing a lot of vegetables and root crops. That is harmful isn't it? Reams: Yes. There are two cheap ones that are used, 2-4-D and 2-4-5D. If you are going to use any of it, use **tear gas**. That's the safest one to use. And it rots the seed out and then it evaporates and your soil is in pretty good shape. But tear gas is the safest soil fumigant that there is.

AG LECTURES: Reams: **Tear gas** is safe to use if you wait at least 42 days from the time you use it, before you seed anything. They say 2 weeks, but if you'll wait 42 days---a full six weeks---it'll be out for sure. Student: This is after planting? Reams: No, this is long before you plant. It will kill everything on the acre.

AG LECTURES: To deal with nematodes you can use heat or fumigation or you can use things that we mentioned this morning like salt fumigants or **tear gas** or 2-4-D and 2-4-5D, etc. However, let's go the real way. So what would you do in order to keep those salts from being too high? Organic fertilizer is rich in what? Student: Carbon? Reams: Yes, but something else, rich in what? Bacteria, aerobic bacteria. Their favorite breakfast is nematode eggs. Bacteria can eat more eggs than the nematodes can lay and make fertilizer out of it.

RETURN TO TOC

TOBACCO

AG LECTURES: I might add 100 lbs. of sulfate of potash per acre. I might add 5 tons of sawdust and I might add a ton or two of **tobacco stems**. And that way I would get my potash up and in about 6 months later I would add whatever it takes to move it up again.

ANDERSEN: Source of potash: **Tobacco stems**.

BEDDOE: Potash can be supplied from many sources. Some of the better ones are sulfate of potash, Chilean nitrate of potash, hardwood ashes, **tobacco stems**, pecan hulls, rice hulls, sawdust, wheat or oat straw, and chicken manure.

FWTK: Some of the good ones [*potash sources*] are sulfate of potash, Chilean nitrate of potash, hardwood ashes, **tobacco stems**, pecan hulls, rice hulls, sawdust, wheat or oat straw and chicken manure.

PLANT FEED 1976: Every time I've ever used cottonseed meal, I've used about 100 lbs. of **tobacco dust** per thousand pounds to keep the ants and parasites out or it.

PLANT FEED 1976: You put cottonseed meal out there and a ground mole will go from one and of the row to the other and plow up everything. But you put your **tobacco dust** in it and they won't. That's a secret. Put about 100 lbs. of tobacco dust to every 1,000 lbs. of cottonseed meal, mix it thoroughly and the beetles and bugs [or ants] won't get in it.

SKOW: Potash can be obtained from many things. Some good sources are sulfate of potash, Chilean nitrate of potash, hardwood ashes, **tobacco stems**, pecan hulls, sawdust, wheat or oat straw, and chicken manure.

WHEELER: Increasingly, farmers are turning to non-synthetic pesticide options such as botanical, microbial or predator approaches. These consist of using plant extracts such as nicotine from **tobacco leaves**...

WHEELER: Manures, **tobacco stems** and wood ashes — These can be good sources of organic potash, but they can be contaminated with toxic sprays, antibiotics (used in animal care), and lead from paint.

RETURN TO TOC

TOMATO

ADVANCED AG: Top quality produce will not rot, it will dehydrate, except with **tomatoes**.

ADVANCED AG: Leaves determine your yield, 50 leaves per plant.. However, that is **not true on tomatoes.**

ADVANCED AG: Tomatoes that appear all vine can be induced to blossom with cationic substances such as vinegar.

ADVANCED AG: I suggest you not grow tomatoes except under contract to a canning company.

AG LECTURES: Student: Why is it that you can't plant bell peppers and **tomatoes** close together? Reams: Because they hate each other. The frequency is too far apart. Or hot peppers either. Don't plant them close to tomatoes. The frequency is too far apart.

AG LECTURES: What happens to young plants or onions or peppers, beans, **tomatoes** – row corps; whenever there's a copper deficiency? What happens to your young plants? They rot off at the ground.

AG LECTURES: I've seen **tomato plants 6-8 inches rot off at the ground**. It does something differently there. It doesn't make the bark stretch. What does it do? How does the copper work to keep the plants from rotting off at the ground? It's a germicide, it kills the blue mold.

AG LECTURES: I told you about those **tomato plants that I grew under a vacuum under glass** and I measured everything I started with and in the final analysis I had 80% more in this plant than I put into it to start with by actual measure.

AG LECTURES: Student: Are you going to discuss anything about the **tomato blight** that's common here in the **south that they don't have in the north?** Reams: **I don't know of any blight that you have here and not up there.** Student: **I never had any black blight in tomatoes up north, but I've got it down here.** Reams: **Black blight in tomatoes is caused because there's too much potassium in the soil.**

BEDDOE: On those [*crops*] grown for fruit, seed, root, or blossom, such as com, wheat, **tomatoes**, apples, etc., you use both nitrate and ammonia nitrogen at the proper times.

BEDDOE: Many times **tomato plants** have been seen to grow lushly only to have all the blooms fall off. This problem can be determined by soil analysis and prevented.

BEDDOE: **Tomatoes do best when there is a minimum of available nitrogen**. When nitrogen gets too high, excessive anionic growth (vegetative growth) will develop. Magnesium sulfate can be used around the tomato plants so the excessive nitrogen can be reduced by its reaction with the magnesium in the Epsom salt.

ENERGY RESEARCH: The application of Sul-Po-Mag is a better way to make copper available to the plant on a long term basis. If there is an excess of Sul-Po-Mag in ratio to the copper then **thin skinned fruit like tomatoes** will have creasing where the skin is too thin.

FOLIAR FEED 1981: If everything seems right, but **tomato blossoms fall off**, it means the manganese is low. Soft rock phosphate is usually rich enough in manganese to prevent this.

FOLIAR SEMINAR 1983: **Tomatoes that split** in wet weather need copper.

FRANK: You can **add taste to the tomato** by putting out other rock minerals.

FRANK: So what is the difference between a **tomato plant** that collects and reformulates energy into 2 lbs. of tomatoes versus another plant that produces 30 lbs. of tomatoes? What is the difference between a plant that produces the highest quality and another that produces poor quality? Lack of energy! The difference is the amount of collected and reformulated energy.

FRANK: Consider the scenario where a **tomato grows awesome vines** all summer but doesn't put on any flowers or tomatoes. This does happen, and the cause is an insufficiency of reproductive energy.

FRANK: Duane: The third time I went in the health food store with the **high Brix tomatoes**, I had them bagged up and the owner's wife was there at the counter. When she saw the tomatoes, she said, "Duane, they are not going on the shelf. Those are going home with me. I'm gonna be selfish. My children eat those like candy. I don't know what you're doing but they sure are good!" Frank: I've heard the same story from other IAL customers - they're just too good to give away. "I'm keeping all of these for myself." Duane: You have to taste 13 Brix tomato to believe it.

FWTK: On those [crops] grown for fruit, seed, root or blossoms (com, wheat, **tomatoes**, apples, etc.), both nitrate and ammonia is used.

FWTK: [Reams grew] **one tomato plant** in white sand. He carefully weighed everything that went into the growing process, every gram of plant food, water and soil. After growing the plant for twelve weeks in a glass dome, he removed it. and dehydrated it in a vacuum. An analysis of the soil and plant showed that he had supplied only 20% of the increase in the plant. Through research he found that many plants have the ability to take in nutrients from the air.

GARDENING: There are some plants that really appear to hate each other. One case is a **tomato plant** and a pepper plant. Don't plant those together.

PLANT FEED 1976: Did you ever see a little plant such as tomato or cucumber go to blossoming before it ever started growing? It is the soil. It is too acid when that happens. So then you use calcium nitrate, which is best, or you can use ammonium nitrate.

SKOW: So I told the **tomato grower** to purchase apple cider vinegar for carbon. A half gallon of vinegar with a quart of Bo-Peep *[ammonia]* in 20 gallons of water made a perfect spray for the crop *[that had no blossoms]*. Forty-eight hours later that tomato patch sported the most beautiful layer of blossoms ever. At the end of a week, the tomato patch was loaded with marble-sized tomatoes.

SKOW: The tomato resists identification with the above general rule. **Even an excellent tomato will resist dehydration**. Still, a top quality tomato will have longer shelf life before it starts to deteriorate.

WHEELER: Crops harvested for their seed, such as corn, wheat, **tomatoes**, and peppers, would require both growth and fruit-producing fertilizers with the timing important---varying with the length of the growing season.

RETURN TO TOC

TOP-DRESSING (N + K only)

ADVANCED AG: A **top dressing**, if needed, is used during the growing season to provide electrolyte.

ADVANCED AG: **Top dressing**, if needed, would only be applied after the calcium and phosphates were in order.

AG LECTURES: Cottonseed meal is a wonderful fertilizer if you can get it. It's got about everything in it. It's a good fertilizer, it's a good **top-dressing**. **NOTE:** *There are places in the literature where Reams says that top-dressings should be synthetic and surely cottonseed meal is not synthetic.*

AG LECTURES: Cottonseed meal is not a **top-dressing**.

BEDDOE: Monitor ERGS and nitrogen and adjust them with **top-dressings** as needed through the growing season.

BEDDOE: A **top-dressing by definition** always refers to a synthetic fertilizer that contains nitrogen and/or potassium but never contains phosphate.

BEDDOE: For increasing the effectiveness of **top-dressings** and side-dressings it is recommended that a highly available form of carbon be mixed with the dressings being used. Sugar, in either granular or liquid molasses, can

be mixed with all the top and side dressings. Being over 40% carbon, the sugar will hold the fertilizers in the top layer of active topsoil for a longer period of time.

PLANT FEED 1976: Anything that is 10-10-10 or above is called a **top-dressing**. **NOTE:** *This quote is from Reams' lecturing and yet he also says if all three are present (N-P-K) we are necessarily dealing with a side-dressing.*

PLANT FEED 1976: Student: My corn ls about 2 feet high now and my nitrogen is down to about 30 pounds per acre. What do I do now? Reams: Increase your ERGS. Student: Increase my ERGS? Reams: Yes, use a **top-dressing**---in this case, ammonium nitrate.

*[See Entry **SIDE-DRESSING**]*
RETURN TO TOC

TOPSOIL

ADVANCED AG: If your **topsoil is properly managed** with Reams principles, your nitrogen will not leach away.

ADVANCED AG: Additional lime can contribute to **increasing topsoil depth**.

BEDDOE: Sugar, in either granular or liquid molasses, can be mixed with all the top and side dressings. Being over 40% carbon, the sugar will hold the fertilizers in the **top layer of active topsoi**l for a longer period of time.

BEDDOE: Colloidal phosphate will prevent calcium from leaching down in the soil. Every ton of soft rock phosphate will pick up and **hold in the topsoil 6 tons of lime**. Because of the upward movement of phosphate and carbon, it is recommended to use a moldboard plow to flip the soil so that the phosphates and carbons are taken down in the soil. When this is done, it will allow the phosphates along with the carbons to move toward the surface again picking up more mineral energy and moving to the topsoil.

BEDDOE: Since nitrogen is an electrolyte, remember to not band it close to the plant. The electric fields need to be kept away from the plant, so that the magnetism is away from the plant. This will assure that the roots are drawn out into the middle of the rows. The **more topsoil the roots are directed through, the better** the exposure to soil mineral energy.

BEDDOE: Soil depth is related to the carbon content also. The more carbons to hold bacteria and soluble mineral salts the greater the **depth of the topsoi**l.

ENERGY RESEARCH: Skow: If you have pure water and add carbon, then current will flow. Why it is a key thing to maintain a level of carbon in the **topsoil**? If you increase the electrical flow in the topsoil you have increased the magnetism. Then the plant can pick up more energy from the air.

FRANK: Unlike annual vegetables, trees have deep roots that allow them to access minerals and moisture from **far below the topsoil**.

FWTK: The use of herbicides is not recommended by Dr. Reams, herbicide ties up the phosphate of carbon in the soil, causing more soil compaction, and **decreasing the depth of the topsoil.**

FWTK: Soft rock phosphate also does for the soil what baking powder does for dough. When the sun strikes the soil, it makes it rise and aerates it. When it aerates the soil, it takes the bacteria down deeper and allows the oxygen to filter down in, **thus increasing the topsoil** depth.

FWTK: Herbicide ties up the phosphate of carbon in the soil, causing more soil compaction, and **decreasing the depth of the topsoil**.

FWTK-pH: Crops grow best when the soil temperatures are between 78 and 90 degrees Fahrenheit in the **upper 6 inches of the topsoil.**

GARDENING: Phosphates have a tendency to rise in the soil and so does carbon. And when the two things together rise in the soil, **this makes topsoil**.

PLANT FEED 1976: Once the calcium, phosphate, and chicken manure of the Reams program is applied, a magnetic union will take place over the next few weeks that will not permit leaching. Leaching is what happens to most fertilizers, not erosion. When the leaching ends, you have laid the foundation for a **heavy thick topsoil**.

PLANT FEED 1976: Use the moldboard plow every year, because the carbon keeps rising to the top, **making the topsoil more narrow** and more narrow.

PLANT FEED 1976: You should be plowing at least 12" deep by his 3rd year. A 12" **topsoil** by the end of the 3rd year is the goal.

SKOW: Carbon to keep fertilizers in the top six inches of soil has become the key to making many Midwest farms successful in growing crops. Once this principle is established, then it is no longer necessary to distribute tons of materials on every acre of **topsoil**.

SKOW: In addition to temperature, moisture will keep a soil from total synchronization. Moisture will fluctuate considerably **in any topsoil**. It cycles up and down in the soil over a 24 hour period.

RETURN TO TOC

UNAVAILABLE

ADVANCED AG: Even under ideal conditions, soil bacteria can only convert 3% of the **unavailable** hard rock phosphate each year.

ANDERSEN: The calcium-humus-phosphate complex is the key to maintaining stable soil ERGS and crop quality. Without the humus component, the calcium and phosphate complex [together] to form [**unavailable] tricalcium phosphate** rendering both the calcium and the phosphate unavailable.

ANDERSEN: Some nutritionists advocate feeding cattle alcohol as a quick energy source. That it is, but it has very detrimental effects. Alcohol suppresses rumen bacteria. It also causes calcium to precipitate and thus **become unavailable**.

ANDERSEN: Also, because the microbes are ultimately responsible for nutrient availability, the real crop is the microbe; it is what really needs feeding. If the microbe is satisfied, it will take care of nutrient availability to the plant. This means that the farmer might often add materials to the soil that are different from what he perceives as deficient **or unavailable to the plant**. In this case, weeds are the "lighthouses" helping the farmer make these decisions.

ANDERSEN: pH is a result of the interaction of all nutrients, minerals, and microorganisms in the soil. It is not an indicator of the quantity or balance of these nutrients, minerals, or microbes. An example of this is the heavy application of triazine herbicides. These herbicides seem to tie up phosphates in the soil, **making them unavailable**. Phosphate tie-ups raise the soil pH.

BEDDOE: It [fall soil testing] also means that you would be wise to have a mineral assay done of the top and sub-soils so that you know what minerals, major and minor, **may be there but unavailable**. Knowing what is in your ground and unavailable may mean less soil amendments needed later if you make them available by your farming practices.

ENERGY RESEARCH: AEROBIC Any organism that breaths oxygen. These bacteria convert **unavailable** nutrients to usable form. They include sulfa ammonis, nitrous ammonis, lactobacillus, and europa.

ENERGY RESEARCH: One thing that can make the soil pH go up is just the lack of air. As that pH goes up **nutrients become unavailable** and the quickest way to solve that problem is to go out and cultivate.

ENERGY RESEARCH: They [many farmers] get an A&L test back indicating magnesium that they are worried about. **99.97% is actually unavailable**, period. Soil laboratories use acid to dissolve the magnesium, which shows up in the test. There is no such acid out in the soil so the lab report is superfluous information. It is of no value whatsoever.

FOLIAR SEMINAR 1983: Be wary of applying too many sulfates as they may combine with available calcium to create unavailable calcium sulfate.

SKOW: Phosphorus compounds in soils are slowly released to plants during the growing season and their availability is difficult to determine by chemical tests. Both acid and alkaline soils fix phosphorus **in unavailable forms** and annual fertilization may often be required.

SKOW: Under most modern agronomy systems, unused phosphates perish, so to speak, by being locked up and **made unavailable**, a not too proper role for a catalyst. The phosphate element also figures in cell construction. The world's conventional agriculture will have to face revision almost immediately. The wrench should be good for crop after crop, yet each year

conventional agriculture throws the wrench away by embedding it in the **concrete of unavailability**. The system is wasteful because it rarely uses 15% of the phosphate supplied.

SUCROSE: The use of solvents that are not common to the soil in soil analyses will lead one to believe that there are sufficient plant food elements in the soil for a great yield when, actually, the elements tested are **unavailable to the crop**, resulting in less yield.

WHEELER: **If colloidal phosphate is unavailable** in the amount you need, or if it is cost prohibitive, consider 10-34-0 or 11-52-0 as interim measures to help stimulate basic soil phosphates. **NOTE:** *Wheeler seems quick to shift to acidic phosphates.*

NOTE: *All Reams-Ag advocates seem agreed that unavailable nutrients are a huge problem that is revealed by the Reams style tests.*

RETURN TO TOC

VAN ALLEN BELT

BEDDOE: **Van Allen Belt**---A belt of magnetic radiation energy surrounding the earth about 100 miles above its

surface. It is this belt that the sun's anions hit to produce the rotation of the earth. Also known as the "magnosphere."

BEDDOE: The earth is cationic and the **Van Allen Belt** is anionic. A plant uses more anionic plant food during its growth period than cationic. Yet if the soil is not manipulated properly the plants or trees will never produce fruit or seed. The plant foods that produce anionic energy produce energy that is attracted upward toward the Van Allen Belt Remember, like attracts like.

ENERGY RESEARCH: Anionic substances go up seeking the **Van Allen belt** and cationic substances go down seeking the earth. Basically why a plant stands or stands up is because there are more anionic substances in the top and less in the bottom. So it is being drawn magnetically by the Van Allen Belt.

PLANT FEED 1978: Anions are constantly trying to leave and go to the **Van Allen Belt**.

SKOW: In 1948 Dr. James **Van Allen** of the University of Iowa discovered this radiation belt, only to suffer ridicule. A few years later he was proved correct.

RETURN TO TOC

VINE/VINEYARD

ADVANCED AG: Student: Should you plant grass in the **vineyard rows?** Reams: No, it will come on its own.

ADVANCED AG: You want to grow watermelons, **not big thick vines** and you need 50 leaves per fruit.

ADVANCED AG: You should have two 20 lb watermelons **per vine**. You should get 20 tons per acre of high quality watermelons (50 tons minus culls). The national average is 4-5 tons per acre of low quality.

AG LECTURES: I want to tell you something about growing bell peppers. You can grow bell peppers under this standard and I mean they are big ones. They're very large. And you can stuff these bell peppers with your favorite stuffing and bake it and it looks **just like you picked it off the vine**. It doesn't shrink, it doesn't wilt, it doesn't fold up. It's absolutely beautiful. I mean it still looks just like you plucked it **off the vine** even though it is baked. The most beautiful peppers you've ever seen. And it doesn't take very many of them to fill a bushel.

ADVANCED AG: Tomatoes that appear all vine can be induced to blossom with cationic substances such as vinegar.

AG LECTURES: The tree has more colloids in it. The **vine doesn't have enough colloids** in it to hold it up, so it's got to climb on something. It's the colloidal properties in phosphate form that makes the difference.

BEDDOE: The only exception to the use of the moldboard plow is in a tree crop situation as in mature orchards, groves, **and vineyards**. In these cases do not cultivate at all. Just apply the plant nutrients to the ground between the trees **and vines**. The reason for this non-cultivation is to not cause the loss of energy from the plants bleeding through roots that get cut by cultivation equipment.

ENERGY RESEARCH: Here is a little formula that Dr. Reams has used in the past of spraying a 4% sulfuric acid solution on **vine crops**, trees and shrubs to get rid of the dead wood. It is kind of a method of making *hydrogen peroxide* and spraying it on.

FRANK: Consider the scenario where a tomato grows **awesome vines** all summer but doesn't put on any flowers or tomatoes. This does happen, and the cause is an insufficiency of reproductive energy.

FWTK: In a good soil, most of the roots will grow to the north on perennial crops such as orchards, **vineyards** and groves. If the roots are reversed when trees or nursery stocks are transplanted, plant growth will be hindered because the root structure of these plants are polarized by the electrical fields of the earth.

PLANT FEED 1976: Tell me, how do you rotate a peach orchard? An orange grove? Apple orchard? A grape **vineyard**? Well, if you don't rotate those, why rotate anything else? You do not rotate crops---but *[you must]* put the nutrient back in the soil.

PLANT FEED 1976: On **grape vines**, I don't know anything that will produce more grapes every year, than just chicken manure left on top of the ground 6-8" deep and keep the weeds mowed down.

SAIT: Andersen**:** Broad-leaf weeds are a functional phosphate and potash issue, and succulent weeds (the **viney things on the ground**) are a carbohydrate issue.

RETURN TO TOC

VINEGAR

ADVANCED AG: Tomatoes that appear all vine can be induced to blossom with **cationic substances such as vinegar**.

AG LECTURES: ...when the blossoms starts to shed off, what are you going to do to stop it? Student: Add acid. Reams: Well, what is the name of that acid you're going to add? Student: Superphosphate. Reams: Superphosphate, yes, or **you can use just plain vinegar**, if you've got a backyard garden. It's a lot quicker and a lot

cheaper and a lot handier. And it's in any store. Add one teacup full to two gallons. Just sprinkle it around the ground.

BEDDOE: Conductivity of the foliar solutions should be approximately 1000 ERGS (micromhos) above what the water is that was used to make the solution. Ingredients that can be used to increase conductivity: 1. Seawater or brackish water---no more than 10% of the total solution. 2 Kelp, either liquid or powdered. This has been found to enhance the effect of herbicides so that the same effect could be obtained with using less product. **3. Vinegar**.

ENERGY RESEARCH: About grasses. Basically Reams' opinion is, no potash in the spray, no manganese in the spray, no cationic nitrogen or ammonia. Now he does use Bo-peep [ammonia] despite what he says there. He says **no vinegar except on St. Augustine and Centipede** grasses.

FWTK: Along with the N-P-K and trace elements, other products such as sea kelp [seaweed], fish fertilizer, **vinegar**, and sometimes some gibberellic acid can be added to foliar sprays.

SKOW: So I told the tomato grower to purchase **apple cider vinegar** for carbon *[cationic energy?]*. A half gallon of vinegar with a quart of Bo-Peep *[ammonia]* in 20 gallons of water made a perfect spray for the crop *[that had no blossoms]*. Forty-eight hours later that tomato patch sported the most beautiful layer of blossoms ever. At the end of a week, the tomato patch was loaded with marble-sized tomatoes.

RETURN TO TOC

VITAMINS

AG LECTURES: One thing that makes peaches and apricots so excellent whenever they're dehydrated naturally is that the **vitamins are still in there** with natural dehydration.

AG LECTURES: You can tell the difference in the taste of eggs if you just grind the corn every day. Cracked corn, wheat, rye, or oats **lose their vitamins** within four days and this affects the taste of the egg negatively.

AG LECTURES: There are two kinds of cottonseed meal. There's one that's had the cottonseed oil removed and one that isn't. Be sure you get the one with the oil in it and that's also **rich in Vitamin E**.

AG LECTURES: One thing that makes peaches and apricots so excellent whenever they're dehydrated naturally is that the **vitamins are still in there** with natural dehydration.

ANDERSEN: Many landscape and ornamental plants will respond to foliar feeding with seaweed, fish, **vitamins**, and dry solubles. Some, however, do not respond well to these feedings.

ANDERSEN: **Vitamin K suppresses the growth of fungi**, some bacteria, and the roots of higher plants. This correlates to Dan Skow's observation that animals fed moldy feed need vitamin K supplementation.

ANDERSEN: Lactobacillus microorganisms produce hydrogen peroxide, as well as lactic acid, **B-vitamins**, and other metabolites that are valuable to the nutrition of animals and soil, as well as to the inhibition of pathogenic proliferation.

ENERGY RESEARCH: Student: You said you were going to say something about **Vitamin C** yesterday. Skow: OK, vitamin C. This is one we have come up with and have found to be very successful in legume crops. That means peas, string beans, alfalfa and bell peppers.

REAMS/SKOW COOK: Also eat bell peppers – rich, rich, **rich source of vitamin A**, very rich. Also keep the seed and add to soup for manganese. Excellent, excellent foods raw.

SKOW: A high aluminum concentration will affect the central nervous system. If recognized in time, calcium can be used to counteract the effect. There is a product put out by Eli Lilly of calcium gluconate with **vitamin D** that is excellent.

SKOW: **Vitamin B-12** added to sprays on a regular basis not only improves flavor, it also presides over improved Brix readings. In working with fruit groves, it is mandatory to start a year ahead of time.

SKOW: As a result, many nontraditional fertilizer materials have been discovered to be vital to soil regeneration and plant feeding. They include **vitamins like B-12 and C**; sugars like molasses, sucrose, and dextrose; trace elements like silicon and iodine; and even colors.

RETURN TO TOC

WATER

ADVANCED AG: After corn reaches the milk stage**, its need for water lessens.**

ADVANCED AG: The higher the humidity, **the more water** [foliar feed] gets on the crops and the less the humidity the less water [foliar feed] gets on the crops.

AG LECTURES: One of the things that's very important in building your nutritional sprays is, if you can use **lake water** over other waters, it is generally superior. Lake water or river water. is better because you know it's not oversupplied with unwanted minerals.

AG LECTURES: If you're going to farm, be prepared for the worst that can happen. If you **don't have irrigation**

water , get it ready. If there is the possibility of **too much water** pre-arrange a way to get rid of it. Take the gamble out of farming.

ANDERSEN: The nutrient ration that is suitable for ocean plants would be deadly for **freshwater plants** or alfalfa.

ANDERSEN: The term "hydrated lime" means that calcium oxide (CaO) has had water added to it to get Ca(OH)2. Its proper name is calcium hydroxide. Dehydrated lime, burnt or calcined lime has **had the water removed** and is termed calcium oxide (CaO).

ANDERSEN: A refractometer reading of 20 for the milk will never be achieved by feeding milk cows today's typical feed or feed rations. A value of this magnitude would require feedstuffs with at least an equivalent refractometer value. Grain should be sprouted or at least soaked for 48 hours before feeding, long-stemmed hay having at least a 20 Brix refractometer reading would be liberally provided, and **clean water would always be available**.

BEDDOE: You can experience this heat loss by placing a small amount of strong acid like sulfuric in water. The **water will immediately get warm**. It is this type of reaction heat from anion-cation encounters that causes burning and dehydration of the roots. The result can be seen as a sudden die back in the leaves because of reversing the normal osmotic flow. So the water in the plant is drawn right out through the roots. Only abundant water will compensate for this problem until the reaction weakens.

BEDDOE: In a soil with 500 pounds per acre of chloride, chicken manure should not be used on the ground. The chicken manure is high in boron and with **lack of plenty of water** the stage would be set to convert ammonia nitrogen to nitrite nitrogen. If this were to happen it would severely burn the roots of any plants in the soil.

ENERGY RESEARCH: Student: Is calcium carbonate biologically active carbon? Skow: Not by itself. It has to be worked on by bacteria. Very little of that **will stand in suspension in water**.

ENERGY RESEARCH: When I **use purified water in making a spray**, it is far more effective than if I just used my well water which contains a lot of calciums.

ENERGY RESEARCH: Some other things to watch out for when foliar feeding; If the pH of the water is extremely high or extremely alkaline, it probably is not going to be nearly as effective as far as being taken in by the leaf. Basically what you are looking for is something that is equivalent to fog that you can condense into water. That would be your ideal. The **temperature of the water should be very close to the air** temperature.

FOLIAR FEED 1981: 4 pounds of 5% chlordane **per 100 gallons of water** will destroy all sand flies, mites, fleas and ticks.

FOLIAR FEED 1981: Use 2 pounds of 10% chlordane in **100 gallons of water** for wire worm and grasshoppers.

FOLIAR SEMINAR 1983: Grapes need a lot of carbon & **plenty of water**.

FRANK: There may also be some benefit from the slight pH reduction in a spray solution containing CO2: **Carbon dioxide reacts with water to form mild carbonic acid**, reducing the pH slightly. Generally, an acidic spray solution is absorbed more effectively than a neutral or alkaline solution.

FRANK: Most foliar sprays mixed with water will form droplets on leaves, even if the mist is almost atomized, because **water retains its surface tension without a surfactant**.

FWTK: Soil elements or compounds whose electrons rotate **faster than those in water are now classified as an acid** in soil nutrients. Those elements or compounds whose electrons rotate slower than those in pure water are said to be alkali. This is a contradiction in the purest scientific sense, but this definition relates to what is considered to be acid or alkali regardless of intricate scientific implications.

FWTK: Aerobic bacteria need four basic things: **water**, air, food and heat.

FWTK: Compound colloids are not water soluble, but they **stand in suspension in water** and create the impression that they are.

PLANT FEED 1976: If you want to know why Texas carrots **taste like dirty dish water**, its because of the natural high chlorine content in the soil.

PLANT FEED 1976: I've seen hardpan in the Mississippi Valley like a rock. Use this system (Reams-Ag) and it becomes as pulverized and nice as can be. The **water will flow over it without clouding** up with clay. However, it can get muddy if the water is flowing awfully fast.

SKOW: Let's consider a soil with anaerobic bacteria quite high. Aluminum could flip- flop in such a situation, but probably remain low. The soil would be sour and highly alkaline — with lots of calcium unable to release its energy due to a lack of air flow, carbon and **water circulation**.

SKOW: In most farm situations, well water is best for making foliar sprays. It must be checked, of course, because the potential for herbicide and insecticide contamination is worsening year after year. **Spring water is inherently dangerous**, especially when herbicides have been used in the general vicinity.

SKOW: My formula follows: Put in water, a humate, calcium hydroxide, magnesium sulfate, Bo-Peep [ammonia], a special amine compound, castor oil, sodium carbonate and water — it **has to be distilled water or good reverse-osmosis water**---and seaweed extract.

SKOW: Using a conventional sprayer, usually 20 gallons of water to the acre is correct. A mist blower---such as a Chiron sprayer---would work best with a **pint of phosphoric acid in 100 gallons of water**.

SKOW: ERGS of pure sand **and water** will be less than 10 microsiemens.

SKOW: Clay soils high in magnesium and low in calcium cement together tightly, are subject to compaction and clodding, crust over easily and prevent the **insoak of water** and the recovery of capillary water during the dry periods of the season. **NOTE:** *See SODIUM AND COMPACTION as Reams differs as to cause of compaction*

WHEELER: Overlooked, however, is the effect on countless livestock who also **drink the [contaminated] water**. Livestock suffer the same decreased performance syndrome as do people, except they can't complain. Their performance goes down with no identifiable cause. Conventional analysis measures the water for nitrates or coliform bacteria but not for Atrazine or other poisoning. Much production is lost with nothing to account for it.

RETURN TO TOC

WATER-SOLUBLE

ADVANCED AG: Only that plant food **soluble in water** or dilute organic acids and will stand in suspension is available to the plant.

AG LECTURES: A flame photometer test is worthless to know what to do, you cannot go by it because it gives you totals and it doesn't tell you how much is **water soluble**.

AG LECTURES: Reams: Suppose you've got soil now that has too much **water-soluble magnesium** in it. How would you tie it up? Why would you want to tie up the magnesium anyway? Student: Keep it from interfering with the nitrogen. Reams: That's right, because if you don't, you can't keep the nitrogen. So what would you use to "arrest" it? Student: Calcium? Reams: That's right.

ANDERSEN: Phosphate will generally remain fairly stationary in the soil unless it is in a **water-soluble** form, which can leach out. Combine this with a sugar to help stabilize it and make it more inviting for microbial assimilation. Actually, you are managing the microbial system in the soil, which in turn manages the crop. If you choose to do so under sterile conditions, so be it. Your production quality (refractometer reading) will reflect this.

ANDERSEN: The desired minimum level of calcium availability, as determined by the Reams test, is 2,000 pounds per acre. pH does not indicate the level of calcium availability. At high pH, only Ca(OH)2 is **soluble [*in water*]**. Sour grass weed pressures indicate insufficient calcium availability.

BEDDOE: A spectrographic soil analysis by a laboratory can show as much as 10,000 lbs. of calcium per acre whereas a **water-soluble test** on the same sample may show only 100 lbs. per acre.

BEDDOE: One of the basic principles of the Biologic Theory of Ionization is that a plant can only use a nutrient that is in a **water-soluble form**. Testing soil with other than a water soluble test may lead the farmer to believe he has something he really doesn't have.

BEDDOE: When the plant food elements become **[water] soluble**, they are then in a state of being vulnerable to reacting with any other soluble element they may encounter. The reaction involves a synchronization process. As the elements and compounds in the soil encounter each other with their differing frequency ratios, a resistance reaction begins between them. The amount of that resistance depends on combination and strength of the anions and cations involved. When the resistance runs to a complete synchronization of the two substances, they will combine. The energy released, while the synchronization point is being reached, is released into other soil reactions or may be picked up by a plant rootlet if one were present.

BEDDOE: Calcium is the number one anion. Calcium is the element that must be bought and distributed by man, and is most used in volume by plants. It is the one element in soil chemistry against which all others would work to produce plant food-energy. Maximum tonnage from any given area is absolutely determined on the amount of **water-soluble calcium.**

BEDDOE: To make Reams ag work, you must have at least 1800 pounds of **water-soluble calcium** and 50,000 pounds is not too much.

FOLIAR SEMINAR 1983: Plants must get calcium from soil in **[water] soluble** form to finish primary cell or they will get disease.

FRANK: To be effective, foliar sprays must present nutrients to the plant in the form it can use. This is an important rule for foliar feeding. If a nutrient is insoluble, the plant cannot use it. So the starting point of a good foliar spray is to make sure **the nutrients are water-soluble**.

FWTK-pH: Some forms of lime are slow acting and some become **water-soluble** very quickly. Unless these factors are thoroughly understood by the farmer, his cost of production before harvest will, in 96% of all cases, be greater than it should be.

FWTK: One basic principal of this program is that a plant cannot take in elements unless these elements are in a

water-soluble form. Dr. Reams uses a test that tests for only the water soluble levels in the soil. Testing soil without using a test for water-soluble plant foods will lead a farmer to believe his soil has plenty of the elements in which it may be most deficient.

FWTK: Calcium is the element that can increase the volume of a crop more than any other element. Unless there is a minimum of 2,000 lbs. of **water-soluble** calcium in a ratio with the other elements, the yields mentioned earlier cannot be obtained.

FWTK: Plant food elements in the soil exist in three forms: rock, clay and **water-soluble**. There is a continual breakdown from the rock form to the clay, and from the clay to water soluble. These are the native materials contained in the soil. The decomposition of the native materials usually does not make a significant contribution to the total available plant foods. Fertilizer generally adds soluble materials that provide nutrients for that year's crop.

PLANT FEED 1976: Remember this rule: Only that plant food which is **soluble in water** is possibly available to the plant,

SKOW: About 2,800 pounds of [**water] soluble plant nutrients** are needed for an actively growing crop in 5% organic matter soil. If the nutrient load is dropped to 1,500 pounds per acre, this shortfall becomes a limiting factor. Keep in mind the fact that carbon has an important [should we say critical?] role in holding nutrients in a given area. It also has the potential for increasing the nutrient density during the growing season by extracting nutrients from ionized air.

SKOW: There is one awesome disadvantage to the use of **water-soluble fertilizer** materials. They will leave the soil with the first rain. But when we deal with our carbon requirement, we can hold these fertility elements in the soil for a much longer period of time. **NOTE:** *Skow apparently held a mental dichotomy about water-soluble. His other writings make it clear that Reams was able to get him to understand the plant can only use water-soluble nutrients. However, Reams also taught that the soil must have abundant carbon and attendant protoplasm to hold such elements. Skow's "deal with" about carbon is skimpy to say the least.*

SUCROSE: An oversupply of **water-soluble magnesium** displaces carbon in the protein molecule and converts nitrogen into a gas, thus decreasing the probable protein molecule count which decreases sucrose yield.

SUCROSE: Keep plenty of **water-soluble, ionized carbon** so the crop will not have to depend upon its entire supply of carbon from the air. Keep the carbon/nitrogen ratio equalized for greatest yield of sucrose. When the carbon/nitrogen ratio is at its peak, the carbon is an excellent governor for water.

SUCROSE: Calcium forms the bulk of matter in sugarcane. The minimum **water-soluble calcium** should be about 2, 000 lbs. per acre when the calcium can be maintained without locking other elements and yet permit the release of energy from the plant food elements. **WHEELER:** Reams was a strong advocate of this **water-soluble testing approach**.

NOTE: *Beddoe's definition of soluble is fitting: "When a substance can be taken into a solution so that it will fit between the molecules of that solution and it is not possible for it to be either settled or filtered out." We must never forget that much of conventional agriculture testing leads the unwary farmer to think that nutrients extracted with strong acids are available to the plant. Reams never varied from his position that ONLY water soluble elements matter.*

RETURN TO TOC

WATERMELON

ADVANCED AG: You **want to grow watermelons**, not big thick vines and you need 50 leaves per fruit.

ADVANCED AG: You should have two 20 lb watermelons per vine. You should get 20 tons per acre of **high quality watermelons** (50 tons minus culls). The national average is 4-5 tons per acre of low quality.

AG LECTURES: The experts say you can produce **watermelons** or tomatoes only once every 7 years on the same soil. I've got farmers in Florida producing them on the same ground every year.

BEDDOE: In **seedless watermelons** or grapes, the stump of the plant will not allow manganese to go out into the fruit because of its micronage. Because there is no manganese, the fruit will not have seeds, as manganese is required to make them.

BEDDOE: The basic goal that any farmer ought to set is to produce 45,000 lbs. of produce at the highest Brix reading per acre of land whether it is alfalfa, **watermelon**, or apples.

FOLIAR SEMINAR 1983: Watermelon with white seeds points to a manganese deficiency. They will take longer to mature.

FWTK: Part of the commercial yields achieved with the Reams program are: ...40,000 lbs. per acre of **watermelons at l2% sugar**...

FWTK: In **seedless watermelons** or grapes, the stump of the plant will not allow manganese to go out into the fruit,

because of its micronage. Because there is no manganese the fruit will not have seeds, as manganese is required to make them.

GARDENING: Also, the higher the sugar content in produce, the longer it lasts and it won't rot. Good produce won't rot. I grew a **crop of watermelons** for a client and he gave me some of those watermelons and they sat on my desk for 3 years and didn't rot.

PLANT FEED 1976: Do you know **you can grow watermelons which can sit on your desk for 3 years without rotting**? I've done tnat. I presented one in the county fair for 3 years consecutively. Yes, the same identical watermelon. It was marked - this was a demonstration of research. It was authenticated and sealed and under supervision and under no refrigeration. The higher the sugar content - foods will not rot.

SKOW: That sugar content of an orange or a lemon or a **watermelon can be measured by its shelf life** is nothing but confirmation of Brix values. A high Brix orange will simply dehydrate, keeping a hard shell. One with a low Brix value will decay.

RETURN TO TOC

WEEDS

ADVANCED AG: Skow: A big reason for **excessive weeds** is from not managing the phosphate/potash ratio.Student: A proper cover crop can help.

AG LECTURES: Student: I had farmer tell me one day he took and sprayed his corn when it was just coming up with Atrizine, at the rate of 1/3 pound per acre. And he said it didn't kill the weeds, but it just stunted them enough that the corn grew up away from the weeds. Then he would go cultivate and cover everything up. Reams: Yes, I wouldn't have used Atrizine**.** I would just cover them up to start with. Student: Yes, I don't advocate Atrizine either, but that's what he did. Reams: I don't advocate it at all, period. **I have never seen a weed killer that didn't do harm in the long run**. One of the greatest things it ties up is phosphates, terrifically. Every one of them does.

AG LECTURES: Did you ever see an old poor piece of ground, so poor that you couldn't do anything but make a used car lot out of it? In about 3 years there were **weeds 20 feet high**, couldn't hardly find the cars for the weeds. What happened? It was the old oil, rust, and iron that got out of those old automobiles.

AG LECTURES: Reams: What are some of the factors that determine whether we should cultivate or not? Student: Weeds? Reams: **Weeds are one**. Student: To break that top crust? That's right. When that crust form, you want to break that crust on the top of the ground.

ANDERSEN: The Reams soil test was developed to reflect, in the test values, the characteristics actually observed in the field. These characteristics include soil compaction and tilth, **weed and pest problems**, crop quality and yield, and overall stability of soil and plant nutrients. No other testing system can make such a claim.

ANDERSEN: The belief that healthy soil **grows weeds equally as well as the desired crop is based on the misconception** that the soil in question is healthy. Evaluating the refractometer reading of the plants, both weeds and crops, growing in the soil tells the observer whether the soil is truly healthy. In this case, one will find that the refractometer readings of both the crop and the weeds are about the same, probably in the 4 to 8 Brix range. Neither the crops nor the weeds are well balanced nutritionally at these Brix levels, but the conventional soil test and nutrient standard may indicate that this is a "healthy" soil. In any event, It is not!

BEDDOE: Weed problems have their primary cause in the improper ratios of potassium to phosphate. Soil, no matter how virgin it is, will, as a rule, have excessive amounts of potassium while lacking on available phosphate. Hence the **primary approach to weed control** will be tied up with the over all soil chemistry changes.

ENERGY RESEARCH: Student: How do you get the potassium down? Skow: Add lime. It is very strange how it will come into line. When the potassium goes down and the lime comes up a very interesting phenomenon happens. For some strange reason **the weed problems you've been having are no longer a problem**. Now you may get a new one but the ones you have like pigeon grass will essentially not be there. I have one farmer out here that I have been working with and I have not gotten his permission to visit his farm with a group, but there has been no herbicides used and his field doesn't look any different than anybody else's.

FOLIAR FEED 1981: Don't use herbicides, **cultivate your weeds out** so that they add carbon to the soil.

FOLIAR SEMINAR 1983: Don't spray weeds because all herbicides destroy your carbon. Cut down your **first crop of weeds** to gain carbon and also ensure you have enough calcium to arrest chlorine.

FRANK: In the past farmers would cultivate grain crops in order to combat weeds. With increasing acreage, farmers found it easier to spray herbicides rather than **to cultivate**.

FWTK: A few weeds in a crop, on land that is properly fertilized, will not affect the yield, because there is enough plant food for both the weeds and the crop. Actually, a **few weeds that are easily cultivated under can produce 20 to 50 lbs. of nitrogen** per acre.

GARDENING: Is a rose bush in the middle of a potato field a weed? It is, it's out of place. A **weed is any plant that's**

out of place. So you've got to keep each thing in its own place in order to produce.

PLANT FEED 1976: Plants are very much like animals in a barnyard. Lets consider a goose and a horse. You can feed them both on green grass alone and they'll live a long time. You can feed. them both on corn and oats and they'll live a good long time, but you put them both on hay, and the goose won't live. That's what you can do for plants---just **don't give weeds the vital minerals they need and you'll get rid of the plants you don't want.** Nothing difficult about that is there? That's what you're here for---to learn how to keep from using poisonous sprays.

SAIT: Andersen: The fact is that, if we have problems with insecticides, diseases and **weeds, then we have an imbalance** in that soil, regardless of what the conventional soil test figures might be telling us. Carey Reams showed that insect and disease problems are related to the Brix level of plants. He also showed that weeds are evidence of nutritional imbalance—often involving calcium and phosphate deficits or potassium excesses.

SAIT: I was wondering about your experience with weeds. **Weeds are often called a signpost** to nutritional deficiencies. Do you have concrete evidence of this nutritional link? Andersen: Absolutely and without question.

SKOW: The only readily available tool to discern the true situation is the refractometer. Most of the time sugars go down if there is a phosphate problem, and those same sugars **go up in the weeds**.

SKOW: When an ERGS test is made, it is necessary to flesh out the information gathering synopsis with a refractometer reading on the plant. **Weeds should also be checked** with a refractometer to see whether the crop plant or the weed has the highest reading.

WHEELER: When farmers inquire [at the extension office] about methods of raising better (more nutritious) alfalfa, the conventional answer comes back with recommending 0-0-60, keep the pH up, cut by the blossom, **herbicide the weeds**, use 18 pounds of seed per acre, and all the other wrong or wrongly reasoned advice. The failure of standard forage fertility programs is appalling.

RETURN TO TOC

WHEAT

AG LECTURES: Top quality wheat will not shed off the stalk even when it's ripe. The whole head will bend over, the head will break and bend. When you see ripe wheat with the heads breaking and bending, you have fairly good wheat. The best wheat will stand up all winter long until beat down by snow or after the stalk is dead providing it has plenty of pith within the stalk.

AG LECTURES: On corn, **wheat** and soybeans, there's one other ingredient you should use on any crop that you're growing for the grain. It's manganese. Manganese is the element of life and without manganese there's not any life.

AG LECTURES: One of the finest things in the world to do to keep your soil warmer in the winter is to grow a cover crop. It can be oats, barley, **wheat,** rye, you name it.

AG LECTURES: Soft wheat has hollow stems and hard wheat has full stems. Did you know that? Well, you're missing half your life if you don't know these things. These are fact folk, that you need to know. You've got to know them in order to do something about it.

ANDERSEN: In negligibly small concentrations (0.001% and 0.0001%) they [humic acids] enhanced growth and **increased the yield of wheat**, oats, barley, sugar beet, tomatoes and other plants.

BEDDOE: On those [crops] grown for fruit, seed, root, or blossom, such as com, **wheat**, tomatoes, apples, etc., you use both nitrate and ammonia nitrogen at the proper times.

BEDDOE: When farmers are asked whether their crops have hollow stems or not, most either have never paid attention or think that it is normal for most crops. What is not realized, is that hollow stems on grasses and forage crops, such as alfalfa, are not normal. It is an expression of phosphate of boron deficiency. In fact any hollowing of stems such as in lettuce and the hollow black centers of potatoes is a boron deficiency. Lack of boron also contributes to providing areas for plant pests to proliferate. **Saw fly in wheat is an example of this**.

ENERGY RESEARCH: The potentials for foliar feeding are almost limitless. There are people in Washington getting well over **200 bushels per acre of wheat.** There are people in Wisconsin getting over 20 ton per acre of alfalfa from 4 cuttings. There are people in Montana who are getting increases in the Brix readings of their wheat from 15 Brix increasing to 30 Brix.

FRANK: The stems of alfalfa and small grains **such as wheat** or oats are often hollow, lacking adequate phloem tubes which carry nutrients from leaves to roots and other parts of the crop. With proper basic nutrition, you can create much larger phloem tube pathways,

FWTK: Potash can be supplied from many sources. Some of the good ones are sulfate of potash, Chilean nitrate of potash, hardwood ashes, tobacco stems, pecan hulls, rice hulls, sawdust, **wheat or oat straw** and chicken manure.

FWTK: On those [crops] grown for fruit, seed, root or blossoms (com, **wheat**, tomatoes, apples, etc.), both nitrate and

ammonia is used.

PLANT FEED 1976: If you want to know why Texas carrots taste like dirty dish water, its because of the natural high chlorine content in the soil. That's why the Texas vegetables are so tasteless. **It doesn't hurt wheat** or corn, but it will go into leafy vegetables.

PLANT FEED 1976: Suppose you have corn, Irish potatoes, **wheat** and just about the time it got ready to mature and there came a terrific rain and you tested the soil after the rain and you found the ERGS down between 40 and 50 but you need 200 ERGS for that last 2-4 weeks. Because in that time you can double your yield in your row crops.

PLANT FEED 1976: It you grow **top quality corn or wheat** and you don't know what you have, the buyer is going to pay you the same price for your top quality produce as he pays for tne poorest quality.

SKOW: The **best cover crop is oats or wheat**.

RETURN TO TOC

WIND

ADVANCED AG: You would need a soil test to know if **winter wind** is the cause of Christmas tree yellowing.

AG LECTURES: I have seen large fields subject to 25-35 mph **winds** and not a bit of dust was on it except what blew in from other fields. All the surrounding fields were a regular dust storm. Why wasn't the dust blowing off our field? Protoplasm in the soil was keeping the soil from blowing away.

AG LECTURES: That is true of most any other spray machine. **Watch the wind direction** and wind drafts. If the wind is shifting from every direction, don't spray that day.

AG LECTURES: Reams: A soil with high protoplasm won't dry out **due to winds**, why? Student: Phosphates? Reams: That is part of the chain. The protoplasm forms a think crust and the wind can't dry. However, we have to cultivate that crust when the wind stops blowing so air can get in and out.

ANDERSEN: Without records [of your biological progress], you will not notice that **your fields are blowing less in the wind**, that tillage equipment can be pulled more easily, or that fuel consumption per acre is lower. Most important, you will not realize that your net profit per acre has improved.

BEDDOE: This *[lime-soft rock phosphate]* bonding will also play a part in the prevention of water and **wind erosion** on any land it is applied to in the layered method.

BEDDOE: Many areas **have to deal with wind** that can be a problem in blowing dry soils after they have been flipped. Again, however, the overall program can effect a change in the soil structure so that the soil is less vulnerable to blowing.

BEDDOE: This magnetic bond will not permit any leaching or erosion to take place. It will hold the soil nutrients and moisture, preventing the rain, sun **or wind from taking them out**. The fertilizers that are applied will stay there until the crop uses them up. In a good fertilizing program, this is the reason that soft rock phosphate and lime should be applied first, before any other elements. Then those fertilizers applied later will not be wasted.

FRANK: **Winds** should be 5 mph or less [when foliar feeding] to reduce drift.

PLANT FEED 1976: Student: What about sandy soils? **Won't the wind blow them away** after moldboard plowing? Reams: Moldboard---put your plant food on like I told you and the wind will blow the dust off everybody's field but yours. Not a grain of sand will be blown off your field. It will be like your soil is magnetized and the wind will bring in soil from other places. I have seen 100-500 acres where this was done and not a grain was blown off. Yet all around it looked like a fire. It. may take a 1ittle while to reach its climax, but this sand blowing can be stopped. You have the power in your hands to stop it.

PLANT FEED 1978: **Wind is not necessarily detrimental** to growing crops and often is beneficial. Some greenhouse growers use oscillating fans to improve growth. However, be wary of spray machine blowers that blast the leaves.

SKOW: Those who serve farmers as advisors have lost track of the fact that alfalfa, for instance, is supposed to be solid stemmed. Obviously, solid stemmed alfalfa will stand up. It may **sway in the wind** and rain, but it won't lay down. Small grains such as barley, wheat, oats, spelts should have solid stems.

SKOW: Cations and anions from the sun are a fact of life. Both depend on weather, temperature, moisture **and wind**.

WHEELER: Foliar sprays are beneficial for stress caused by transplanting, hail, **wind**, heat and drought. They are effective at fruit bud formation, after petal fall, and during pod or fruit filling. A foliar spray is indicated whenever the refractometer reading drops two or more points from nutritional shortages.

RETURN TO TOC

WINTER

ADVANCED AG: You would need a soil test to know if **winter wind** is the cause of Christmas tree yellowing.

AG LECTURES: One of the finest things in the world to do to keep your **soil warmer in the winter** is to grow a cover crop. It can be oats, barley, wheat, rye, you name it.

AG LECTURES: Carbon determines the color, that's right. Did you ever see oranges after the fruit matures they start turning green again? Did you ever see that? You know oranges turn a **golden yellow in the winter time** then in the summer turn green again? Why did it turn green in the summer time again after it had been a golden yellow orange color in the winter? Student: Lack of carbon? Reams: That's right. If you have have plenty of carbon in your soil, those oranges will stay their golden color all summer long.

AG LECTURES: Reams: One of the finest things you can grow in orchards is Bermuda grass. If you can't afford Bermuda grass, you can't afford the orchard. And then **in the winter, sow rye** in there.

AG LECTURES: The best wheat **will stand up all winter long** until beat down by snow or after the stalk is dead providing it has plenty of pith within the stalk.

ANDERSEN: High nitrate nitrogen levels also increase the potential for frost damage and **winter kill**, especially if the phosphate levels are less than desirable.

BEDDOE: Hydrated lime (also called slaked lime and calcium hydroxide): dry powder, 54% pure calcium, anionic. This is a "hotter" calcium source. It can make more soil heat because of the resistance it makes and it will then cause the soil to dry out. It is best used in the fall so that it can **sit all winter long**.

BEDDOE: Some potential benefits of potassium may include better stalk strength and lodging resistance. **improved winter hardiness**, more resistant to disease. increased protein and carbohydrate production. better sugar translocation, enhanced enzyme functions and cell division.

ENERGY RESEARCH: Student: How often can you spray your orchards? Skow: I wouldn't be afraid to spray every 10 to 15 days **even through winter** in small amounts.

ENERGY RESEARCH: You can spray winter grains with manganese during **open parts of the winter.**

ENERGY RESEARCH: Molybdenum can be used with soap on fruit trees and grapes during cold times to **shield them from frost carnage**.

FOLIAR FEED 1981: There are many times **you should foliar feed in the winter**---even when the temperature is below freezing. You can reap benefits from spraying such as wheat or oats when the plants are young. It gives them a lift.

FOLIAR FEED 1981: A general rule is that the more overall minerals the grower can get into his plants, the lower the **freezing point will be**.

FOLIAR SEMINAR 1983: Animals need more calories for heat in the **winter** and more salt in the summer.

FOLIAR SEMINAR 1983: Deciduous trees must feed throughout **winter**, even though there are no leaves.

FWTK: A **warm winter will cause a lower yield** unless the cation nutrient count is mechanically controlled. Cool weather causes an increase in cation nutrient action and a decrease in anion nutrient action.

FWTK-pH: The soil pH reading should go down at night and up in the day, as there is less heat interference at night. The soil should readily give up the heat during the summer nights, but too often this does not happen. The soil should retain this heat in the **late fall and winter**. As the pH reading goes down, less plant food energy is released and the electron energy is slowed down so it can be taken in by the magnetic attraction of the rootlets.

GARDENING: Many people lose their crop because they fertilize the tree when it's in blossom. It flushes all the blossoms off. Tell them the time to fertilize deciduous trees, which **shed leaves in the winter time**, is immediately after the crop is harvested. Do not fertilize them again until the next crop is harvested and you'll have a bountiful crop.

PLANT FEED 1976: Since 1938 I have not had any citrus groves to be damaged by cold whatsoever. In 1962-63, the **coldest winters** of the century in which about 45% of all the groves in Florida were permanently destroyed, the groves I serviced, most of them never lost the leaves. They never had to be pruned and they harvested 98% of their fruit. The others were bulldozed out right up to the rows I serviced.

SKOW: It is the function of our *[RBTI]* tests and our fertilization program to expand electromagnetic fields because strong fields hold nutrients in place. Moreover, the use of computed ionization for materials applied has the dual effect of keeping soil systems cooler in summer and **warmer in winter**, the ideal being a constant 70 F. temperature.

SKOW: Most soils are switched during the **winter months** to anionic, and during the summer to cationic to set seed. Unfortunately, there are seasons during which there is not quite enough switching under the management plan in effect. It is often too cool. A strong cationic spray is indicated. But because of a lack of knowledge, repair measures are not taken and the crop yield suffers.

WHEELER: Their *[Witwer and AEC]* research concluded that trees benefited from and absorbed foliar fed nutrients even during **mid-winter months**.

WHEELER: More permanent damage can be done by playing the high Brix game on a late fall cutting. If you are new

to a biological program, your crop may not be able to sustain adequate sugars in the leaf and the roots for **winter survival**.

RETURN TO TOC

WORMS

ADVANCED AG: As the TDN is greatly increased, the yields will increase but **earthworms will tend to disappear** because there is too much energy.

ADVANCED AG: The reasons for **cut worms and root worms** are the same as for nematodes, Aerobic bacteria will eat them for lunch.

AG LECTURES: Student: Aerobic bacteria also eat live nematodes, right? Reams: Yes, grasshoppers, ants, cockroaches, anything else they come across, **[including] worms**.

AG LECTURES: All [pest] **worms** are laid by some kind of a moth or a beetle. However, there are nematodes that bear young and there are nematodes that lay eggs.

AG LECTURES: Nematodes bear their own young and lay eggs. **Worms have to have a moth or beetle** or something on that order to propagate them. Like a butterfly in a cocoon.

AG LECTURES: Student: How **long did you say the nematodes get**? Reams [tongue-in-cheek]: I've seen them 6 feet long. Student: What's the diameter? Reams : Oh, big around as an earthworm. Earthworm is a nematode too, did you know that? Snake is a type of a nematode also. It's all in the reptile family. ☑ **NOTE:** *It appears that neither the audience nor the transcriptionist caught Reams little joke.]*

AG LECTURES: Another thing that doesn't work very well is **earthworms**, which are nematodes, in orange groves, because the citric acid in the roots is very difficult for the nematodes who can't live in citrus soils or any other soil that's too dry.

AG LECTURES: Reams: The higher the sugar content, the higher the mineral content and the higher the sugar and mineral content, the less bugs you have. Why? Student: The alcohol kills them? Reams: Yes, the alcohol kills them, but there's another reason too. There's one more reason I haven't told you about. It increases the oil content and it gives him a physic. That is exactly what happens. In other words he gets diarrhea. You who have studied bugs and worms know what I am talking about. You have handled them and you go to do something with them, the whole business would get diarrhea and you'd have to start over again. In other words they'd just go to nothing. I don't know of anything sicker than **a worm with diarrhea**. He looks like just a dead mass of stuff, really a sick worm.

ANDERSEN: An ear of corn at 24 Brix with **corn ear worms** inevitably will have leaf or stalk refractometer readings below 12. Grapes at 18 Brix with insect infestation inevitably will have cane or leaf refractometer readings below 12 Brix.

ANDERSEN: Obviously, earthworms are not people, but our digestive systems and that of the soil depend on microorganisms and enzymes. Earthworms are good surrogates for determining potential hostility to these important digestive microorganisms and enzymes. **Earthworms are not parasitic like pinworms, flat-worms, roundworms, or leeches**; rather, they are an integral intermediate part of the desired soil digestive cycle. Therefore, the response of earthworms to various environments accurately represents desired biological compatibility. Even chemical agriculturalists consider earthworms to be indicators of desirable soil conditions. There will come a time when soil fertility will evolve beyond the point where earthworms are a necessary part of the cycle. This might take some time, but it will occur when the **energy concentration of the soil is balanced beyond the need for earthworm intervention**.

ANDERSEN: Good compost has no identifiable organic-matter residue, ash, or sticky, putrefied pockets. It is **nontoxic to earthworms**, plants, animals, and soils.

BEDDOE: It is interesting to note, that in a high TDN and active soil the bacteria have so thoroughly taken over that **earthworms will seldom be found**. Earthworms are natures way of trying to build the soil. When it is built to the maximum the bacteria take over the full load and the worms move on to where they are needed.

FOLIAR FEED 1981: You can use Nemagon on nematodes and wireworms if you wish, but it **will kill your earthworms**.

GARDENING: The moth knows by instinct that where she stings the plant leaf and lays her eggs a small drop of sap will come out of the plant. And these **little worms will eat on that sap until they get big enough to eat the leaf**. But suppose that little drop of sap that comes out is very high in sugar content. When that sugar content then strikes the oxygen content of the air, it's going to ferment and turn to alcohol. And those little worms are going to get drunk and roll off of that leaf into the ground and the bacteria are going to eat them and you'll have a garden without any worms in it.

SKOW: Root rot, nematodes, maggots and **root worms**, all are problems that noticeably subside once the bacteria

culture is established.

WHEELER: There is no means for mixing the crop residue into the soil for humus formation with [toxic] no-till. If the residue were cut and laid on the soil surface, the earthworms could carry some organic matter and minerals down into the soil. Herbicides on the crop residues, however, may **disperse the earthworms**.

RETURN TO TOC

YEAST

ANDERSEN: Yeasts are very effective metabolizers of phosphate. It was found that "about 43% of the radioactive phosphorus from yeast was taken up by plants in the first days of their growth."

ANDERSEN: Organic acids are important in dissolving and holding soil nutrients for subsequent use by microorganisms and plants. Some organic acids, like ascorbic acid, are used directly. Organic acids are obtained directly from microorganism metabolism of sugars or from humus as humic acid. The latter, however, also depends on microorganisms for its manufacture.

BEDDOE: Soft rock phosphate also does for the soil what yeast and baking powder does for bread dough. When the sun strikes the soil it makes it rise and aerates it. When the soil is thus aerated, it takes the bacteria down deeper and allows the oxygen to filter down in. This action helps it develop and increase topsoil depth.

ENERGY RESEARCH: For hot weather stress on crops, particularly on grass crops and also on grains, [For your foliar spray] you can put in 2 pounds per 100 gallons of **Brewer's Yeast**.

SKOW: It [calcium] has to be acted upon by organic acids which are produced by plant roots, bacteria, **yeasts** and fungi in the soil. Without this activity, calcium cannot be incorporated into the plant structure.

RETURN TO TOC