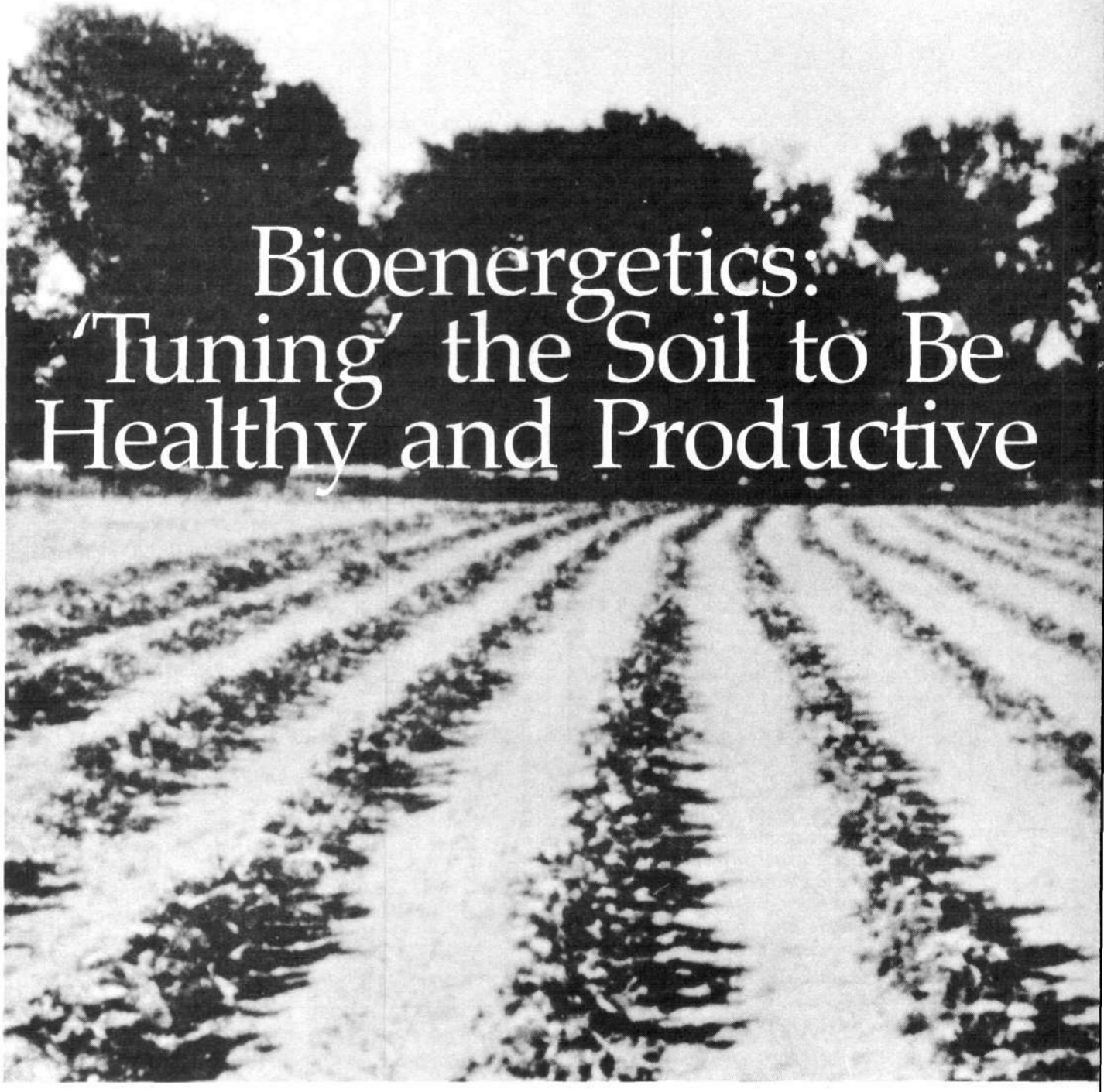


Bioenergetics: 'Tuning' the Soil to Be Healthy and Productive

A "crop doctor" prescribes a bioenergetic approach for sick soils and crops, showing that insects "tune out" healthy plants and home in on the sick ones.

by Arden B. Andersen

Producing more nutritious food at less cost is the goal of a pioneering group of agricultural consultants whose tools of the trade are electromagnetic—they apply advanced biophysics to solve problems of soil and crops. "Sick" soil is not a small problem: Over the past 50 years, the United States has lost 50 percent of its productive top soil, and soil loss in the 1980s dwarfed that lost during the great dust bowl of the 1930s.

The application of biophysics to agriculture starts with the electromagnetic anatomy and physiology of soil, plants, and fertilizers and then extrapolates that to the physical aspects of each. It is well established that energy precedes matter. In other words, the energy fields of organisms and chemicals interact first. This interaction results in the chemical/physical phenomena we observe. Consequently we can evaluate these energy fields to arrive at a truer picture of what is actually happening. When we combine these data with the chemical test data, we can solve almost every problem we face in soil and plant nutrition.

Remote sensing instruments like those aboard the Landsat spacecraft map the growth and health of plants by mea-

Weeding with fertilizer: A bioenergetically designed fertilizer program for this strawberry field on a farm in Pennsylvania kept the front section clear of weeds without *tillage, herbicide, or mulch. The control field in the background is overgrown with 5-foot high weeds.*

suring the frequency and intensity of the radiation they *reflect*. Recently, scientists have found that the biophoton *emission* frequencies of plants differ not only from one crop to another and according to the general health of the plants, but also according to the nutritional content and other conditions of the soil the plants depend upon. Consequently the plant's electromagnetic signature can be changed by altering fertilizer and nutritional additives to the soil. This is quite important because it has been shown by entomologist Philip S. Callahan, a bioenergetic pioneer, that insect pests recognize their crop prey by its electromagnetic signal (Callahan 1985). If the signal emitted by a plant can be changed, the insect will not "recognize" it and, therefore, will not be able to prey on it.

The application of bioenergetics to agriculture is a scientific procedure that enables us to see beneath the surface of chemical phenomena to the fundamental biological processes of plant growth. It allows agricultural specialists and farmers to scientifically intervene in the life and health of plants.

The Energy of Living Processes

As long ago as the late 1800s and early 1900s, Albert Abrams, Georges Lakhovsky, and Nikola Tesla showed that all material things and particularly living systems have electromagnetic signatures. All three showed that altering these electromagnetic signatures would alter the living systems themselves (Andersen 1989).

In the 1960s, Soviet scientists V.P. Kaznocheev proved that cellular disease could be induced, as well as reversed, electromagnetically (Bearden 1988). In 1976, Kaznocheev reported that cell cultures could be altered and killed—without physical contact—by simple transmission of the altered electromagnetic pattern from one culture to another, and he reported more than 5,000 successful experiments demonstrating this (Bearden 1980). Then in 1979, Kaznocheev showed, using monkey cell cultures, that viral transmission was possible via ultraviolet photons (Grauerholz 1988).

Further evidence has been provided by West German biophysicist Fritz-Albert Popp, who has shown that the interaction of chemicals in living systems is initially energetic and secondarily physical/chemical; that is, the energetic interaction causes the physical reaction (Lillge 1988). Robert Becker and Gary Selden argued in *The Body Electric* that all biological systems function energetically, manifesting physically according to the energetic patterning. This understanding produced advances in agriculture prior to the development of the field of biophysics, which we discuss a bit later. First we review a few basics concerning agricultural pests.

Tuning Out Insects

Observing and understanding the energetics of agricultural matter—soil and plants—enable scientists and farmers to optimally fertilize and manage crops making use of the knowledge that healthy plants and soils have different physical characteristics and correspondingly different energetic characteristics from sick plants and soils.

More than 25 years ago, Philip Callahan proved that insects home in on crops, like airplanes equipped with omnidirectional radar devices, by picking up the infrared radiations emanating from the crops. Callahan further proved that insect behavior could be altered by simply jamming, altering, or overriding these infrared emissions, thereby effectively protecting entire crops from insect infestation electromagnetically, without the use of insecticides (Callahan 1975).

We also know from Callahan's work, as well as that of other researchers around the world, that insects and dis-

eases infest only *nutritionally imbalanced* plants, although for many years experts believed that "healthy plants make healthy insects." In other words, insects are tuned in to aberrant electromagnetic spectrums. Healthy plants can also better resist pests and disease through their primitive immune systems. Thus if a pest-infested area is investigated for nutritional imbalances and those can be corrected, it should be possible to *eliminate* rather than temporarily ameliorate the problem by making the healthy plants "unattractive" (unrecognizable) to the insects. For example:

- We know that aphid infestation is linked to nitrogen fertilization; the more excess nitrogen, the greater the aphid population.
- Nematodes are correlated to salt concentration and biological activity in the soil, and especially to carbohydrate levels; the lower the biological activity, the greater the salt build-up, the lower the carbohydrate level, and the greater the parasitic nematode populations.
- Fungus problems correlate with copper and calcium deficiencies.
- Infestations of Colorado potato beetles are indicative of calcium, phosphate, vitamin C, copper, and manganese deficiencies.
- Adult corn root worms will *not* eat the ear silks that receive the pollen, if the carbohydrate content of the sap in the corn stalk is sufficiently high. In other words, the plant's level of sugar is a "marker" for the overall health of the plant. If the sugar level falls below a critical point, silk damage will occur and get progressively worse as the reading declines. That critical point is measured with a refractometer that measures the refractive index of the sap, calibrated in brix units.

The accompanying table lists the threshold brix levels of various food crops below which disease will take over. Existing chemical standards don't reveal these correlations, yet when these nutrients are supplied the problem disappears. Only biophysics can explain these phenomena.

MINIMUM BRIX READINGS FOR PLANT HEALTH

A plant's sugar level (measured in brix) corresponds to the mineral level of the plant and is an important indicator of the plant's overall health. Listed here are the minimum brix levels for these selected plants to be healthy. Brix, the unit of measurement that indicates the carbohydrate content of the sap, is based on a calibration of the refractive index.

Strawberries 16	Melons 16	Sweet corn (white) 24
Raspberries 15	Squash 15	Sweet cherries 16
Blueberries 14	Pumpkin 15	Sour cherries 14
Alfalfa 14	Lettuce 12	Beans 14
Tomatoes 18	Onion 13	Peas 14
Potatoes 13	Celery 15	Eggplant 12
Cucumbers 13	Apples 16	Pepper 12

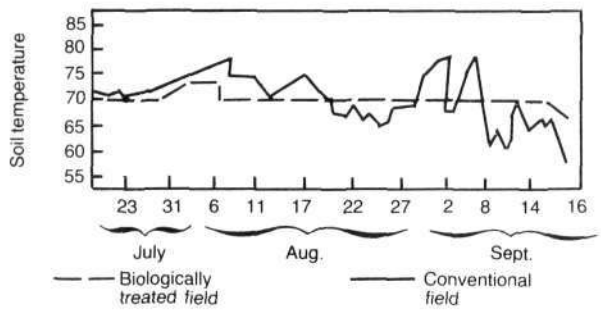
Getting to the Root of the Problem

Case in point: A university chemical analysis showed that a western soil exhibited magnesium, potassium, iron, and manganese deficiencies. When the biophoton activity of the soil was evaluated with a photometer—described more fully below—it was found that calcium, copper, sugar, and vitamin B12 were actually deficient, causing the magnesium, potassium, iron, and manganese symptoms. Subsequent application of the calcium, copper, sugar, and vitamin B12 not only relieved the magnesium, potassium, iron, and manganese deficiencies, but also reduced the weed and disease pressures on the growing crop. These results make sense when one understands that soil is a dynamic biological system, not a test tube of mineral and dirt. Living organisms must therefore be considered in any soil evaluation. In fact, there is an integral symbiotic relationship between the plant and soil microorganisms (Krasil'nikov 1958). If purely chemical methods are used to determine whether nutrient levels are deficient, this symbiotic relationship is not considered.

Further, calcium is of the utmost importance for microorganism growth as well as for plant growth. This has been well researched and proven by many scientists, including William Albrecht at the University of Missouri (Albrecht 1975). Rigorously, the addition of calcium will release potassium from the colloidal exchange sites, making it available for microorganism and plant use.

Copper is important for cellular and tissue elasticity, fungal disease inhibition, and the plant's use of other trace elements. In this particular soil, as sometimes is the case, copper was the major limiting factor connected to the iron and manganese problems.

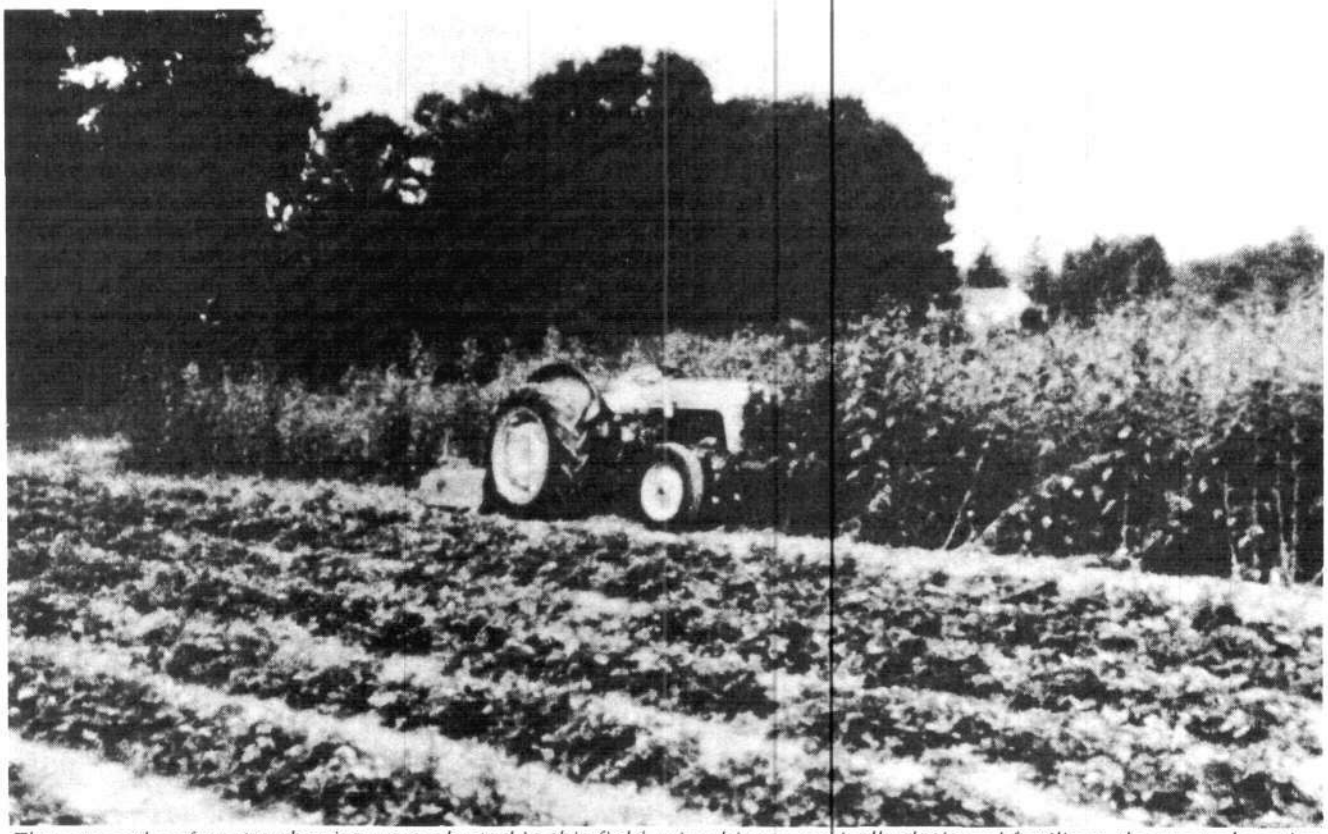
Sugar is a basic sustenance for every living organism.



BIOENERGETICS PROTECTS PLANTS AGAINST THE WEATHER

Keeping plants healthy with a nutritionally balanced program can maintain the soil at a near-steady 70° F, regardless of variations in air temperature. Compared here are the soil temperatures of a biologically treated field and a conventionally treated field in Bureau County, Illinois, in July, August, and September 1984. Typically, temperatures can vary by more than 30 degrees during the summer growing season in the Midwest.

Source: Larson Farm Management



Three months after strawberries were planted in this field using bioenergetically designed fertilizer, the treated section has successfully suppressed the growth of weeds (foreground) without tillage, herbicide, or mulch, while weeds grow wildly in the control section (background).

Experience has shown that almost every soil in the United States is deficient in sugar as a result of more than a half century of salt and acid/caustic fertilization. Deficient soils and plants indicate insufficient microorganism activity. The addition of sugar provides the microorganisms with energy—food—to do their job.

Vitamin B12 is an essential nutrient for both plants and soil microorganisms. Under proper conditions, vitamin B12 will be produced by soil microorganisms, particularly actinomycetes (Krasil'nikov 1958). However, if these microbes have been suppressed because of imbalanced nutrition or adverse conditions, vitamin B12 will be deficient. The addition of vitamin B12 primarily stimulates bacterial growth, which in turn leads to overall nutrient availability and stabilization in the plant-soil system.

Traditional chemical analysis simply cannot provide this type of problem-solving capability because it gives only a static picture of the symptoms, while energetic evaluation gives a dynamic picture of causal interaction between soil, plants, and microorganisms. Traditional soil and plant analyses simply provide too narrow a picture to solve the problem completely.

The Limits of Chemical Analysis

Traditionally, fertilization and plant-feeding recommendations have been based on chemical analysis of soil and plant samples, performed by taking the samples out of the field and into the laboratory. There, chemicals that extract the nutrients are applied to the samples and the nutrient content of the soil is measured.

For various reasons, this method can produce a fictitious reading. First, by removing the sample to the laboratory, the material is examined in vitro rather than in vivo, and the effects of the things living in the soil, like the plants themselves and microbes, are eliminated.

Second, just because a mineral is present in the soil does not mean it is available to the plant. Energetic analysis as well as insect, disease, and weed symptoms have shown this to be the case. It is also likely that the magnetic field of the Earth influences the growth of plants, which is not considered by this or any other chemical evaluation.

In general, although chemical soil sample tests produce valuable data, they measure only effects, not causes. In addition, the standards established for these tests, classifying soils and plants as normal or deficient were formulated under the *incorrect* assumption that healthy, nutritionally balanced plants and soils are attacked by insects and diseases just as imbalanced ones are. This created standards that were suboptimal and perpetuated the production of more of the same because plants that required insecticides to rescue them were considered healthy and nutritionally balanced and, therefore, were subsequently used as standards.

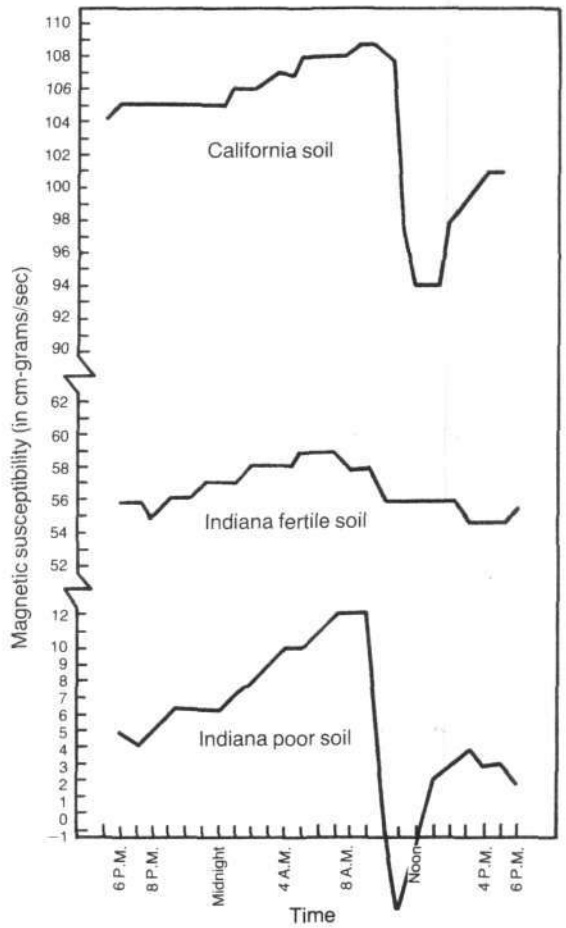
This point is easily impressed upon us when we consider the following: A chemical test may indicate that our soil

Continued on page 43

Magnetic Susceptibility and Soil Fertility

Soil fertility is generally thought of in terms of cation exchange capacity and macronutrient content. Research is revealing that electromagnetic properties may be of greater significance to soil fertility.

Highly fertile soils have positive magnetic susceptibility values and are called *paramagnetic*. Sterile soils have a negative value and are called *diamagnetic*. The fact that a soil is highly paramagnetic does not guarantee high fertility, but it does indicate high *potential* fertility. The key to translating high potential fertility into actual productivity is the development of a fully functional and balanced soil biology.



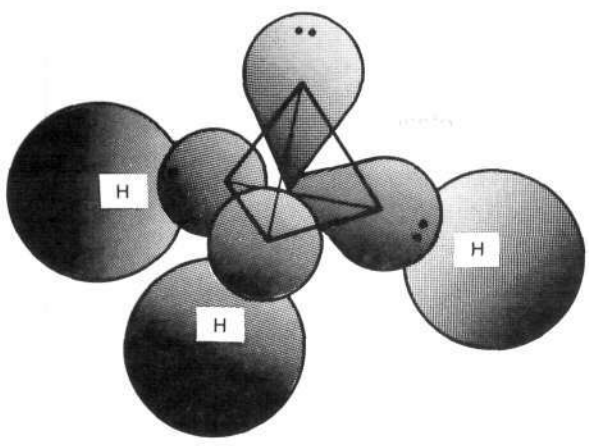
COMPARISONS OF SOIL FERTILITY AND MAGNETIC SUSCEPTIBILITY

Very fertile, biologically managed soil of California is compared here to naturally fertile soil in Indiana and poor soil in Indiana in terms of magnetic susceptibility and the variance in susceptibility over a 24-hour day. The California soil measures a high magnetic susceptibility and varies by less than 15 percent in a day, while the poor Indiana soil varies by more than 100 percent. The soil in Indiana that is naturally fertile but also is in a bioenergetically designed nutrition program, shows highly stable magnetic susceptibility over the entire day and night. This factor may prove important in maximizing agricultural productivity.

There are two factors that affect soil magnetic susceptibility: the presence of certain minerals (such as the rare earths, some limestones, iron, and copper) and the shape of the soil particles and nutrient complexes. This latter factor is clearly demonstrated in the case of nitrogen sources.

Urea, for example, has a flat triangular shape with a "handle" on it, nitrite nitrogen has a simple plane triangular shape, and ammonia has a tetrahedral shape (see illustration). Although the different compounds may supply the soil with the same or similar chemical species, apparently the shape of the compound itself as an antenna makes a significant difference in the nitrogen's availability to the plant.

The structuring of soil is largely done by microorganisms. Once proper structure is achieved, the soil is made more fertile and less susceptible to erosion because the magnetic forces holding the soil particles together are stronger.



ANTENNA GEOMETRY: THE AMMONIA MOLECULE

Nitrogen can be added as a fertilizer to soil in many different chemical compounds, each of which has a unique geometry that affects the magnetic susceptibility of the soil. The ammonia molecule shown here (NH_3) is a tetrahedral structure because of the arrangement of the nitrogen electron pairs. The bond angles in the ammonia molecule are 107°, which is very close to the tetrahedral angle (109.5°)

Continued from page 41
and plants have deficiencies in magnesium, potassium, iron, and manganese. The traditional recommendation would be to add magnesium, potassium, iron, and manganese. Follow-up tests would usually show an increase of these nutrients in the soil and success would be assumed. However, the problem arises that this soil continues to have increasing weed infestation and compaction. The crop continues to have insect infestation, but it "looks okay." The weeds are sprayed with more herbicide, the soil is tilled with bigger equipment, and the crop is sprayed with more insecticide. The following year is a repetition of the previous one.

Common sense tells us that recurring problems are only symptoms shrouding a deeper cause. Refractometer readings and some chemical analyses, together with insects, diseases, and weeds provide us the status of a crop, but none of them tells us how we can proceed to formulate a fertilizer and management program that will accomplish the nutritional integrity necessary to avoid insect and disease infestation. Energetic evaluation does. Because insects and diseases operate in the energetic realm, we must perform energetic analyses to observe not only the empirical problems but also the causal circumstances.

One chemical soil test method has been found to be of great value, however, especially when augmented with energetic testing. This test evolved out of the work of the late Dr. Carey Reams, using a basic La Motte soil testing kit. It was streamlined and standardized by Robert Pike and Dan Skow, D.V.M., for its present commercial use. Its uniqueness lies in its remarkably close correlations to actual soil, plant, and microorganism status. This is primarily due to Reams's understanding of soil fertility and his correlations of the latter to soil test values using this procedure.

Reams's minimum "perfect" soil numbers look quite different from any other agronomic system, except William Albrecht's. The proportions in pounds per acre are: calcium 2000#, phosphate 400#, potash 200#, sulfate 200#, magnesium 300#, ammoniacal nitrogen 40#, nitrate nitrogen 40#, pH 6.4-6.8. Unique to this system is the 2:1 phosphate to potash ratio. Once this ratio is achieved using this test, broad leaf weeds like lambs quarter and pigweed cease being a major problem, eliminating the need for broad leaf herbicides. With this ratio and the 2000# or higher calcium level, "sour" grass weeds like foxtail, quackgrass, and dandelion cease being a major problem, eliminating the need for grass herbicides. A narrower than 7:1 calcium to magnesium ratio indicates soil compaction.

"No number is perfect until all numbers are perfect," said Reams. All will not be perfect until the microorganisms are in their necessary balance. Like all other chemical soil analyses, this system is static and only indicates what the present nutrient status is relative to the extraction reagents. It indicates where a field is, but does not tell the farmer or consultant *how* to get where he wants to go. This is a key point. It shatters an old paradigm that says, if a chemical analysis or symptom shows potash to be deficient, the problem is addressed by the addition of potash.

The new paradigm reveals that this potash deficiency probably is not caused by a quantitative lack of potash, but rather by a missing link in the biological cycle of nutrient availability and assimilation. This secret is readily revealed—and in some cases only revealed—by *energetic* evaluation. The chemical test establishes one's status and starting point, but an energetic evaluation plots the course of action.

Energetic Analysis

There are currently two methods to evaluate the energetics of soil. First, there is the magnetic susceptibility meter. This instrument is traditionally used by paleontologists and archaeologists in the study of ancient remains and artifacts as well as fossils. For agriculture, the instrument has provided some interesting data. Magnetic susceptibility is the ability of something—in this case soil—to function as an antenna for magnetic energy or fields. It is measured as the ratio of the magnetic field strength induced in a substance to the strength of the inducing field.

Callahan was the first to show that soil magnetic susceptibility was related to soil fertility. Fertile soils are *paramagnetic*—they have positive magnetic susceptibility values. Infertile soils are not necessarily *diamagnetic*—having negative magnetic susceptibility values—but diamagnetic soils are always infertile. The soil's ability to receive magnetic energy is very important to microbial and plant growth; in fact, it is essential. It is however only half of the system. The ability to receive magnetic energy is only valuable when there is something to translate this energy into useful form. It is like having a radio antenna without the radio.

That something is the biological system of the soil—the humus and microorganisms. This system is analogous to the radio, and the antenna is analogous to the mineral system. Without both the system as a whole is mute. Continuous 24-hour runs on three different soils using a model MS-2 Bartington magnetic susceptibility meter are shown on page 42. The bottom soil is an Indiana soil of low fertility. The middle is an Indiana soil of good fertility and the top is a California soil of good fertility. Both the poor Indiana and the good California soils showed marked magnetic susceptibility decline during the hottest part of the day while the good Indiana soil remained fairly stable. The decline in magnetic susceptibility correlates with a reduced ability to deal with solar energy necessary for plant growth.

The poor Indiana soil actually exemplified a total inability to deal with solar energy. The factor common to these latter two soils is very low humus levels, while the good Indiana soil was relatively high in humus. Further study has shown that both the magnetic susceptibility and the humus level vary directly with the fertilization practices employed. As both decline, the susceptibility of the soil to erosion increases. Additionally, it has been observed that anhydrous ammonia and potassium chloride (the two most widely used fertilizers in the United States, and both widely imported) *decrease* the magnetic susceptibility of the soil.

Energetic analysis, which includes measurements of magnetic susceptibility, has led to the discovery of the value and importance of many nontraditional fertilizer materials, including vitamins like B-12 and C; sugars like molasses, sucrose, and dextrose; trace elements like silicon and iodine; and even color dyes.

Since magnetic susceptibility, like plant growth, is an electromagnetic phenomenon, chemical soil analysis falls short in evaluating potential fertilizer programs that raise or regenerate the electromagnetic and, consequently, the productive properties of the soil. This obstacle appears to be overcome by an electronic scanner (a highly sensitive light meter) patented as a mineral assay instrument by T. Galen Hieronymus in 1949. Although the meaning of its readings for nonliving materials is not actually understood, some modifications have made it very useful for evaluation and prescription of bioregenerative fertilizer programs. The instrument evaluates mitogenic radiation in the 200-1,000 nanometer range (the range from near-ultraviolet to and including infrared). Its uniqueness lies in its ability to evaluate the biophoton interaction between soils or plants and selected fertilizers when the former and the latter are brought in close proximity to each other without actually mixing them physically, bearing out Kaznocheev's findings in 1979. The procedure is as follows:

The existing energy level is measured. Then, based on chemical analysis reports, history, and experience, fertilizer materials are selected and put with the sample. Energy readings are again taken. If they increase, the material is beneficial and another material is checked. Eventually, a combination of several fertilizer constituents is obtained and checked collectively to determine its effect on the sample. The prescription is then formulated.

This system allows the consultant or farmer to perform his trial-and-error routine with an instrument and a soil sample, rather than by using expensive fertilizers on crops in the field. In this way, he goes to the field with a predetermined success. Every season is different from the last. Every lot of seed is different. Repeating the same fertilizer program year after year is feasible only with an unlimited soil reserve.

Impressive results have been obtained in increasing the quality of crops and reducing or eliminating pests and disease, where farmers have used the fruits of energetic analysis. The old adage, "healthy soils make healthy weeds," has been proven a myth. By electronic scanner evaluation, fertility programs have been formulated that increase the calcium availability sufficiently to eliminate sour grass weed problems, balance the phosphate-to-potash ratio sufficiently to eliminate broad leaf weed problems, and raise plant refractometer levels sufficiently to eliminate insect pest problems.

It is also possible to improve the quality of crops by scientifically balancing nutrition. An Illinois farm management firm has demonstrated in numerous tests over many farms (comprising 14,000 to 20,000 acres) that the amount of protein in grains can be increased by applying bioenergetics. Using conventional fertilizer programs the average protein content of the grain was 7.55 percent, compared to 8.9 percent with a bioenergetic program. This translates to an increase of .76 pounds of protein per bushel, which means that less feed grain is required per animal fed.

Similarly, lambs fed with corn grown with a bioenergetically determined fertilizer regimen required a 27 percent lower feed intake because of the higher mineral content of the feed. Extensive, large-scale tests show that after three years on such a fertilizing program, average drying requirements on corn decline from 7 percentage points to between 3 and 4 points, while test weights increase 1 to 1½ pounds per bushel. Additionally, as the figure on page 40 shows, a biologically balanced soil is much more temperature-stable than a conventionally fertilized soil. This translates to more stable microbial populations, more stable nutrient reserves, and a less stressed crop.

MAGNETIC SUSCEPTIBILITY OF FERTILIZERS

Fertilizer	Magnetic susceptibility*	Use on U.S. soils
Urea	+1	Common
Potassium chloride	+1	Common
Diammonium phosphate	+4	Common
Soft rock phosphate	+33	Uncommon
North Dakota humates	+36	Uncommon
Leather tankage	+14	Uncommon
3-2-2 (organic)	+135	Uncommon
Ground rock mineral	+250	Uncommon

*Measured with MS-2 Bartington magnetic susceptibility meter.

Imperative to this technology is the integration of all fields of science, from biomedicine to biochemistry, physics to petroleum engineering, nutrition to microbiology. Consultants and farmers who understand the close symbiotic relationship between plants and soil microorganisms, as well as nutrient interactions and interrelationships, can be reasonably successful in their fertilization practices through experience, good observation, and recognition of insect, disease, and weed meanings. Energetic analysis allows them to go a step further than being reasonably successful—to being *very* successful. Using this technology, farmers are able to produce equal or better yielding harvests, at equal or less cost per unit of production, with little or no pesticides, and, most important, with higher nutritional values.

Arden B. Andersen, a private consultant for several agribusinesses, has a B.S. degree in agricultural education and a Ph.D. in biophysics from Clayton University in St. Louis, with specialties in soil and plant nutrition, product development, and regenerative management. He has written two books, Applied Body Electronics, *and* The Anatomy of Life and Energy in Agriculture, *and is active in several electrobiological research projects.*

References

William Albrecht, *The Albrecht Papers*, Vols. I and II, Ed. Charles Walters, Jr. (Kansas City: Acres, USA, 1975).

Arden B. Andersen, *Biophysics: An Ancient Art, A Modern Science.* Doctoral dissertation (St. Louis: Clayton University, Jan. 1989).

_____, *The Anatomy of Life and Energy in Agriculture* (Kansas City: Acres, USA, 1989).

Thomas E. Bearden, "Soviet Phase Conjugate Weapons," *CRC Bulletin* (Jan. 1988).

_____, *Excalibur Briefing* (San Francisco: Strawberry Hill Press, 1980).

Robert O. Becker and Gary Selden, *The Body Electric: Electromagnetism and the Foundation of Life* (William Morrow, 1987).

Philip S. Callahan, *Tuning Into Nature* (Old Greenwich: Devin-Adair, 1975).

_____, "Insects and the Battle of the Beams," *Fusion* (Sept.-Oct. 1985) p. 27.

John Grauerholz, M.D., "Optical Biophysics and Viruses," *21st Century* (July-Aug. 1988) p. 44.

N.A. Krasil'nikov, *Soil Microorganisms and Higher Plants* (Moscow: Academy of Sciences of the USSR, 1958), Transl. Y. Halperin, The Israeli Program for Scientific Translations, 1961.

Wolfgang Lillge, M.D., "New Technologies Hold Clue to Curing Cancer," *21st Century* (July-Aug. 1988), p. 34.