



# The Vital Earth News

## Agricultural Edition

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### Aqua-Min, a Boost for Dairymen

by Paul W. Syltie, Ph.D.

**D**airying is a family business for Bill Newsom of Godley, Texas, south of Ft. Worth. He and his son Ben milk about 250 Holstein cows, with a rolling herd average of around 70 pounds per cow per day... a fine production level by any standard. Most of their feed must be shipped from as far away as eastern Colorado, so efficiency of feed utilization is a major issue with the Newsom's.

Several years ago John Willis of Dairyland Automation, Sulfur Springs, Texas, convinced Bill to try Aqua-Min with his herd and note the effects. Willing to try anything that might improve herd health and feed efficiency, Bill began applying Aqua-Min to his feed during mixing at 8 ml per cow per day, in an average ration of 58 lb per cow. Since production is carefully monitored, he was able to determine that production increased from 3 to 5 lb per day per cow, a sizeable improvement in output. He also noted that the increase was greatest — around 5 lb per day — when the ration was less rich in protein and concentrates.



**A team effort of Bill and Ben Newsom provides a 70 lb per day herd average. Aqua-Min has boosted milk production above their previous high standards by 3 to 5 pounds per day through improved feed utilization.**

Bill indicated that he knows Aqua-Min works because once he runs out — as he has on occasion — the herd average drops 3 to 5 lb per day within about two days. Once the product is restored to the ration, production bounces back to previous levels within two days. Not only that: he can smell it! When the cows lack Aqua-Min in their ration the proteins in the feed are not digested as thoroughly. It is the undigested proteins which are passed out through the manure that give rise to the offensive odor noted on so many dairy and cattle farms. Once the proteins are digested more thoroughly, the offensive odor is greatly reduced.

Bill has even gone so far as to check the milk tank level when he smells the bad odor. Bad odor equals less milk, and he can read it on the tank gauge. Needless to say, Aqua-Min is quickly reinstated in the ration.

The increase in income from adding Aqua-Min to his milking ration is sizeable: \$7.00 return for each \$1.00 invested. The source of this increased return is improved utilization of feed. The cows are utilizing this costly protein fraction in

*See Aqua-Min, page 2*

## Thoughts on Tillage from Plowman's Folly

### Introduction

*This article is Part II of Chapter 1 from Plowman's Folly, the epic book on tillage from the 1940's. Written by a now-deceased, seasoned author highly familiar with problems concerning soil and tillage, his thoughts continue to provoke controversy and debate even to the present day.*

by Edward H. Faulkner

**T**he prevalent and generally accepted doctrine concerning green manures has accordingly been modified to two comparatively ineffective recommen-

dations: (1) plow down the green manure crop early, before it has become woody and difficult to rot, and (2) if the crop gets out of hand and becomes woody before it can be plowed in, apply nitrogenous fertilizers to the crop itself before plowing it down.

Even these recommendations have always been recognized as makeshift procedures. It is only too obvious that render rye or other green crops must contain less minerals than the same plants would if allowed to reach



**Plowing and other machine tillage tends to generate compact soil layers which roots have difficulty penetrating. Reduced or zero tillage allows soil microbes to gradually loosen the compaction.**

their full growth. And, while the second recommendation is of more recent origin

*See Nature, page 3*

# Aqua-Min Expedites Protein Digestion

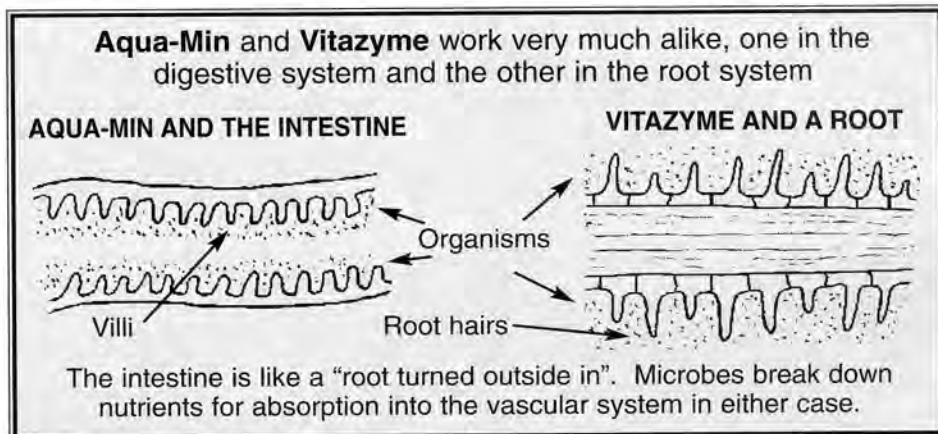
Continued from page 1

their feed more fully, and not wasting its value in the lot.

Another benefit from Aqua-Min is improved health for the Newsom herd. This includes better success in breeding, and a virtual elimination of a stomach ailment called *displaced abomasum*. Fewer veterinarian and breeding bills are very attractive when added to increased milk output.



Other dairy farmers have found similar responses to Aqua-Min with their herds. With Vitazyme, a related product used for crops, field production and profits can be benefited as well. Bill and Ben Newsom have discovered that building a more pro-



lific microflora in the stomachs of their cows will boost feed utilization, health, and fertility. Their success is just one more evidence that aiding the operation of natural systems is the key to both short and long-term success in today's sometimes confusing world of products and approaches in farming.

## Aqua-Min in a Nutshell

Aqua-Min is a fermented product of specific plants and other natural substances which contains a unique array of

biostimulants for improving the metabolism of microorganisms. Ingested with roughages and concentrates in the animal's diet, these metabolic activators trigger greater activity of the bacteria that break down the cellulose, proteins, and fats to utilizable forms, thus improving the efficiency of feed use in the ration. Overall effects on the animal include better health, improved fertility, increased rates of gain and milk production, improved profits, and less odorous manure. It is an unbeatable boost for dairymen! ■

## Another Mode of Action for Aqua-Min?

By Paul W. Siltie, Ph.D.

**B**ecause living organisms and their interrelationships are so complex, it is likely that Aqua-Min functions through multiple modes of action ... much like Vitazyme biosimulant does in the soil. An article by Karen Mantel in the August, 1990, issue of *Ontario [Canada] Milk Producer*, entitled "Better Digestion Could Boost Milk Output", outlines the way in which an antibiotic synthesized by *Streptomyces bambergiensis* can boost milk production and livestock growth.

According to Dr. John Burton of the Animal and Poultry Science Department at the University of Guelph, dairy cows given this naturally-produced antibiotic "...develop a more favorable microflora in the rumen, increasing their digestive efficiency. They can also extract more energy from the forage diet for milk production."

The way in which *S. bambergiensis*,

through its natural antibiotic, stimulates better milk production and weight gains is through its inhibitory effect on some microbes of the digestive tract. According to Dr. Burton, "Some microbes produce toxins which can destroy cells that line the intestine. The more rapidly those cells are lost, the more the body must work to replenish them." The antibiotics interfere with the growth of some toxin-producing microbes so the intestinal cells may not be lost as rapidly, resulting in more feed energy going into milk production and weight gain.

It is very possible that ingredients in Aqua-Min — or stimulators of organisms akin to *S. bambergiensis* — are potent inhibitors to intestinal microbes which damage intestinal cells, thus reducing the energy the animals requires to repair the damage. On the other hand, these growth-stimulating substances may trigger accelerated regeneration of damaged nutrient-absorbing cells and tissues — like

Vitazyme accelerates root growth of plants — increasing the total absorption of carbohydrates, protein, vitamins, and minerals which might pass on through the digestive system and be lost. The overall effect of Aqua-Min, as with *S. bambergiensis*, would thus be to favor the beneficial symbiotic organisms and their by-products at the expense of toxin-generating antagonists. After all, roots act very much like an inside-out intestine, and vice versa. The same principles of nutrient uptake apply to both.

A great deal of research needs to be done on Aqua-Min's modes of action, but without a doubt it will eventually be discovered that the product's active agents tip the balance of digestive tract organisms more in favor of the beneficials. With the friendly bacteria on the ascendancy, it is possible to envision how livestock producers can improve feed efficiency with small additions of Aqua-Min to their rations. ■

# Nature Raises the Living from the Dead!

*Continued from page 1*

and is supposed to be more advantageous, it has a fundamental weakness for which there is no completely effective remedy in nature. The purpose of adding the nitrogen fertilizer is to hasten the decomposition of the mass, thus removing the organic matter as a bar to further rise in the soil of water from deep in the earth. (It should be mentioned here that the plowing in of great quantities of absorbent material results in exhausting the water from the overlying soil layers.) The decay is hastened by this trick, but the decay products released are necessarily subject to being leached out of the soil by the first rains that fall after their release. A relatively small percentage of such nutrients can be retained by colloids — in soils which have enough colloids that are not already holding all the plant nutrients possible. The rest must inevitably be lost, unless by lucky chance insufficient rain falls to carry them away before roots arrive to salvage them. It must be remembered, too, that in most soils few roots ever reach the plowsole to do salvage work. The net effect, then, of this treatment is likely to be almost nil.

Later it will be shown that such use of nitrogen — any purchased nitrogen, in fact — is sheer waste of money, since nature is perfectly organized to supply the right amount of nitrogen to every plant. Later, too, the universal use in nature of the principle of direct transfer of organic compounds from the decaying dead to the growing living will be exemplified by illustrations from small-scale test work, supplemented by later field work, done during the past decade in a city back yard and on leased land in the country.

Most scientists probably are mentally unprepared to accept, without official tests, an idea apparently so new. An exception is Paul B. Sears, who in *Deserts*

*on the March* has pictured plant nutrition as follows:

"The face of the earth is a graveyard, and so it has always been. To earth each living thing restores when it dies that which has been borrowed to give form and substance to its brief day in the sun. From earth, in due course, each new living being receives back again a loan of that which sustains life. What is lent by



***Processes of decay in the natural world are essential to the reestablishment of life throughout out planet.***

earth has been used by countless generations of plants and animals now dead and will be required by countless others in the future .... No plant or animal, nor any sort of either, can establish permanent right of possession to the materials which compose its physical body."

Thus, pointedly, Sears brings to our attention a principle of plant growth which has not hitherto been sufficiently utilized, though most scientists have been aware of its academic existence at least. He says by implication that life necessarily depends upon the snuffing out of other lives — of enormous populations, in fact.

We dislike thinking of ourselves as murderous, but the fact that we must be, if we are to live, is difficult to refute. As civilized beings, so-called, we keep the slaughterhouse busy. Even the strictest vegetarian must snuff out many lives — those of plants — if he is to retain his own.

Such suggestions may sound like bits of philosophical quibbling; however, the ideas involved are so pertinent to the subject in hand that they need to be brought sharply into focus in our thinking. We have always accepted theoretically the interdependence of every form of life upon other forms; we have not so easily progressed to the thought that dead tissues contribute their substance to new living forms. This is the solemn, necessary truth; and the earlier it becomes a part of our thinking, the more quickly can we plan intelligently the necessary work of recreating the soils on our farm lands. We have been too squeamish to visualize dead tissue being transformed into living, though with every mouthful we eat we demonstrate precisely that fact. Let us be practical, even if being so proves painful to our stomachs.

Plants establish intakes, in the form of roots, for nutritive materials in the decaying fragments of last year's plants; and, left to themselves, they will use without loss every atom of the material that previously had been used in the dead plants. As farmers, we have not left the bodies of last year's plant where the roots of this season's crops could invade them. Instead, we have buried those decaying remains so deep that few roots could reach them. We have, by plowing, made it impossible for our farm crops to do their best. Obviously, it seems that the time has arrived for us to look into our methods of soil management, with a view to copying

*See Follow, page 6*

Thank God — every morning when you get up — that you have something to do that must be done, whether you like it or not. Being forced to work, and forced to be your best, will breed in you a hundred virtues which the idle never know.

Charles Kinsley  
*Bits and Pieces*, Vol D(4A), 1981

*The man who does  
only what is required  
of him is a slave.  
The moment he  
does more  
he is a free man.*

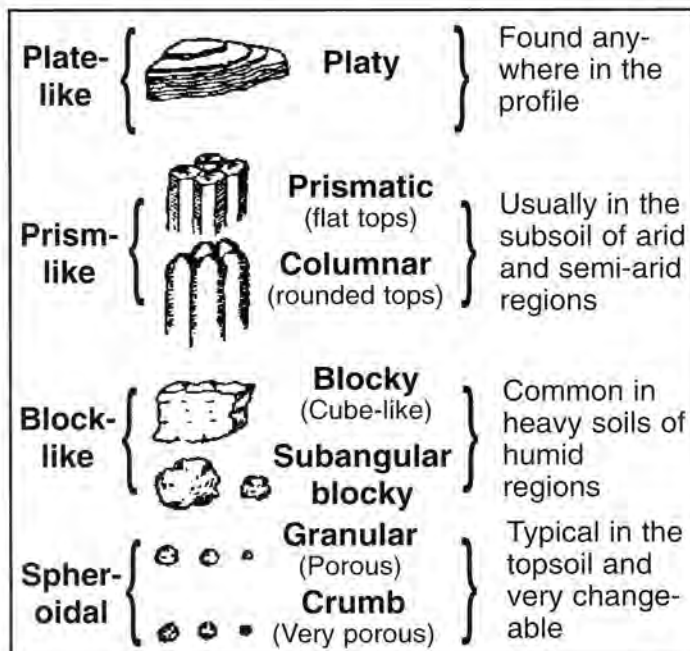
# 15-Minute Soils Course

## Lesson 7: Soil Structure

The soil contains many important physical, chemical, and biological properties. Among all of them, one of the most important is **structure**, a physical property that directly relates to organic matter, mineral particles, bulk density, porosity, water-holding capacity, percolation, infiltration, and thus to plant growth and crop yields. It is a supremely important aspect of soils.

### What Is It?

**Structure** is the gross aggregation or arrangement of soil particles. These structural units can vary from *single grains* (as sand) to *large blocks* or *columns* in the soil, to *massive* (solid, no cleavage planes). A soil may have different types at different layers of the profile. Several of the types of aggregates commonly found in soils are shown in the diagram below.



### How Do "Peds" Form?

Structural units — sometimes called "peds" — are formed by complex, poorly-understood processes. Among the more important factors involved are the following:

1. Wetting and drying
2. Freezing and thawing
3. The physical action of roots
4. Organic decay and soil organisms, their activity and by-products
5. Modifying effects of adsorbed cations
6. Soil tillage

The interplay of these factors creates lines of weakness, forcing soil particles to and fro, causing contact of one to another and gluing them into aggregates of various configurations



Structureless

Structured

One may visualize the swelling and contracting of wetting and drying, and freezing and thawing, to help create cleavage planes. Roots form channels and force soil particles apart. Earthworms create multitudes of channels throughout the soil mass, and their castings are fairly stable against breakdown; they vary according to the organic residues available which serve as food (if they have not been poisoned out of existence), and may vary from 13,000/acre (no manure added) to 1,000,000/acre (manure added). They may leave up to 16,000 lb/acre of castings each year!

Soil organisms such as bacteria, fungi, algae, cyanobacteria, and others break down organic residues and produce various by-products, one of which is *polysaccharide*. This general group of materials is strings of sugar molecules which act as a glue to bind soil particles together. As little as 0.02% of added polysaccharide in the soil will markedly improve soil structure.

Not to be minimized is the effect of symbiotic mycorrhizae on structural formation. These fungi extend thread-like hyphae from plant roots out into the soil in all directions, stabilizing cleavage surfaces and creating sac-like structures around particles.

A predominance of sodium in the soil will tend to disperse soil particles, while calcium in abun-

*Continued on the next page*

# 15-Minute Soils Course

Continued from previous page

dance tends to flocculate them (cause to clump). Tillage, such as plowing — and especially when the soil is wet — on the other hand will weaken and destroy structural units.



Note how a low organic matter soil on the left has produced a puddled, massive structure with few cleavage planes, while the well-granulated soil on the right has excellent porosity. This superb structure is typical of grassland soils that are highly productive.

Just as important as the type of structure is its strength and stability. Microbial glues are needed to bind particles together; iron oxides also help cement them. In general, the larger the aggregates present in any particular soil the lower their stability.

## That Critical Organic Matter

The overriding factor common to excellent, strong soil structure is **organic matter**. Aggregates are more stable when certain binding agents — such as polysaccharides and humic acids — are present in sufficient amounts. These are produced in larger quantities when a vigorous microbial population is working within a highly organic soil. Aggregates in low organic matter soil fall apart easily, while those from high organic matter soil are more stable.

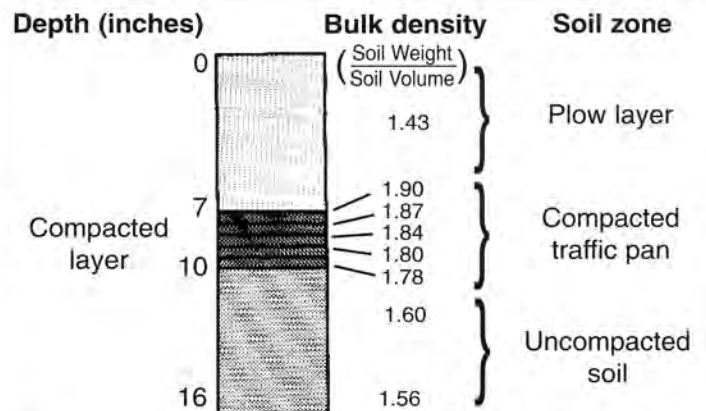
**Compaction** of the soil at a particular layer, such as at the plow layer, essentially destroys the structural development at that plane and greatly restricts water and air movement, root penetration, and crop yields. Note bulk densities in the following soil profile.

## Sandy Soils

Organic matter and microbial by-products bind sand particles together to improve water-holding capacity, infiltration, aeration, porosity, cation exchange capacity, and other properties.

## Clayey Soils

Organic matter and microbial activity build cleavage planes for a strong and stable structure, while increasing the number of macropores to improve air and water movement, root growth, and percolation and infiltration. Puddling of the soil is reduced.



## See How Much You Learned

1. What fraction of the soil is the overriding factor in building good structure? \_\_\_\_\_
2. Name four factors involved in building good soil structure.
3. What are the extremes of soil structure? \_\_\_\_\_ and \_\_\_\_\_.
4. What type of structure is usually found in the topsoil (plow-layer)?  
a. Platy   b. Blocky   c. Prismatic   d. Granular
5. Are earthworms important for building good soil structure? \_\_\_ Yes \_\_\_ No
6. Which of these elements tends to aid in soil flocculation and good soil structure?  
\_\_\_ Sodium \_\_\_ Calcium
7. Is tilling soil when wet a good practice? \_\_\_ Yes \_\_\_ No   Why or why not?

1. Organic matter; 2. See the text; 3. Single grain, Massive; 4. Granules or Crumb; 5. Yes; 6. Calcium; 7. No; aggregates are broken and destroyed, creating compaction.

# Consider Raising Open Pollinated Corn

## ... if you feed livestock

By Paul W. Syltie, Ph.D.

**P**ushing to beat the cost-price squeeze, corn farmers have coupled fertilizers, genetics, and pesticides to up average corn yields to well over 100 bushels/acre nationwide. The nutritional value of the starchy kernels that have resulted, however, is less than desirable.

One Iowa farmer recently grew an open pollinated variety of corn and tested it for

some standard nutrients. These values were then compared with 4,000 corn samples tested in ten Midwestern states. Note the changes below (*ACRES U.S.A.*, March, 1998).

Hybrid corn will usually yield more grain than open pollinated varieties, but when a farmer is planning to feed the grain to cattle, hogs, sheep, or poultry the added nutritional value of the open polli-

nated varieties normally outweighs the "penalty" of fewer bushels. One may expect fewer diseases, improved conception, and better feed utilization for livestock fed open pollinated crops of any sort.



*Though yielding less than hybrid corn, Reid's yellow dent produces a superior kernel that is high in protein, minerals, and vitamins.*

"Nature knows best." When we simulate the systems God has placed within the environment we can be certain the best long-term results will be achieved. These results will not always harmonize with short-term economic laws of society, but for the farmer in business for the long haul there should be no question which genetic complement — hybrid or open pollinated — is superior. ■

### Open pollinated vs. Midwest hybrid average

Open pollinated advantage

Crude protein.....	+75%
Copper.....	+875%
Iron.....	+345%
Manganese.....	+205%
Cobalt.....	(little to none detected in Midwest hybrid corn)

## Follow Nature's Lead

*Continued from page 3*

the surface situation we find in forest and field where the plow has not disturbed the soil. No crime is involved in plagiarizing nature's ways. Discovering the underlying principles involved and carrying them over for use on cultivated land violates no

***In fact, all that is necessary to do — if we want a better agriculture — is to recharge the soil surface with materials that will rot. Natural processes will do the rest.***

patents or copyrights. In fact, all that is necessary to do — if we want a better agriculture — is to recharge the soil surface with materials that will rot. Natural processes will do the rest. The plant king-

dom is organized to clothe the earth with greenery, and, wherever man does not disturb it, the entire surface usually is well covered. The task of this book is to show that our soil problems have been to a considerable extent psychological; that, except for our sabotage of nature's design for growth, there is no soil problem.

Science now knows that several times more plant food is carried away from farm land in the streams that drain the various watersheds than is absorbed by growing crops or grazed off by animals. Most of this loss is in invisible form, that is, dissolved — an especially important consideration because it is in the only form in which plants are able to take their food. The undissolved (visible), eroded portion of the loss makes the news, simply because it is visible; but it is relatively

unimportant as a loss, since beneath where it lay there is an inexhaustible stock of the same material. The chief damage done by erosion is the filling in of stream channels, reservoirs, and natural lakes, along with the burial of downstream lands under a quite inert layer of miscellaneous mud. Fortunately, the necessary technique for preventing erosion is precisely what is required to make the land most productive. By restoring the conditions which prevailed upon the land when it was new, we will cure erosion and restore productiveness in a single stroke.

For years scientific men have been aware that losses by leaching were in progress, but until the report of the National Resources Board was made in 1934, few had any conception of the staggering scale on which our mineral resources were going out to sea. To arouse general interest in this matter, the

*See Retain, page 7*

Smart people feel that the most effective way to be ambitious is to uplift their fellow man — at home, in their place of work, or wherever they may be. Being ambitious for others is by far the best way for leaders to show their talents ... not resorting to politics and internal feuding. Emotionally well-balanced leaders don't stay awake nights worrying whether someone is getting ahead faster, has a bigger office, has more authority, or is being paid more. They know that envying the success of others will get them nothing except ulcers. They simply concentrate on doing the best job they can, letting the chips and rewards fall where they may.

*Bits and Pieces, Vol. D/No.4A, 1981.*

# Retain Soil Nutrients By Surface Incorporation

*Continued from page 3*

U. S. Department of Agriculture included on page 99 of its 1938 *Yearbook* a condensed table of the various kinds of losses. To clarify further the seriousness of our land waste, the department hired Russell Lord, an able agricultural writer, to advertise the government's efforts to stop erosion by co-operative watershed demonstrations in various sections of the country. In his report Mr. Lord gives this concrete resume of the figures in the report of the National Resources Board:

"Leached plant food is that part that percolates down through the soil and is lost by way of underground waters .... Of mineral losses (nitrogen, phosphorus, potash, calcium, magnesium, and sulfur) crops and grazing take off a total of 19,500,000 tons a year, while erosion and leaching whisk away nearly 117,000,000 tons."

Incidentally, Mr. Lord became so impressed by the urgency of the situation reflected above that he wrote *Behold Our Land*, in which he presented further interesting material, and published it the same year.

Most of the dissolved plant food that escapes down the streams originates from the decaying material plowed in. This seems an inescapable conclusion from the known facts. This being true, by salvaging this waste, even though no other measures were taken for soil improvement, we should be able to realize greatly increased production from the land. So long as plant food continues to get away, both land and

people become poorer and poorer; and people become more and more subject to ailments which we now know are caused by insufficiency of some essentials in their diets. The drain tile and the moldboard plow, therefore, become suspect of complicity in robbing our people of their birthright of vigorous health — by stealing

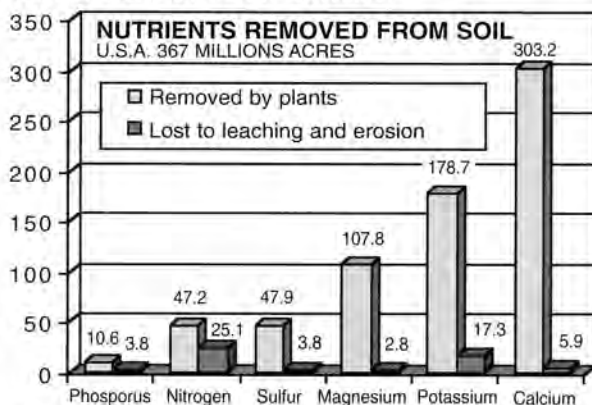
rather than by bottle as conventionally is done. In neither case is experiment necessary. We already know — by incontrovertible example — that wherever man does not interfere crops grow spontaneously. It follows of necessity that if man duplicates in his farming the soil conditions which in nature produce such perfect results, he will be able to grow similarly perfect crops on cultivated land.

So, I introduce to you something so old in agriculture that it may justly be considered as new. The whole thesis is perhaps so clearly obvious that we have universally failed to see it. Seven years were required for me to break away from conventional ways of thinking about soil. Like all others trained in agriculture, I had vainly tried to piece the puzzle together, in order to make of agriculture a consistent science. Then I discovered, through certain tests, that the trouble lay in the operation which preceded all of the tests, namely plowing. It was as if one tried to assemble a picture puzzle with the pieces upside down.

By simply correcting the basic error — by incorporating all of the organic matter into the surface of the soil — the difficulties all disappeared as if by magic. The tests by which these conclusions were reached are briefly described in the pages that follow. ■

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LB. PER ACRE OF PLANT NUTRIENT



**Soil lost to erosion takes with it an amazingly high toll of nutrients, as shown in this table based on a Rutgers University (New Jersey) study.**

away vital elements from the plowsole before plant roots are able to salvage them. So logical does this inference seem that it is difficult to understand why it has never been investigated officially.

It seems a bit humorous, too, to suggest a need for investigating whether men could grow healthy crops if they copied the soil conditions which prevail in nature where crops are universally healthy. It is a good deal like suggesting to the mother of a new-born baby to investigate the possibility of feeding her child naturally

## Statement of Purpose

Vital Earth Resources is a for-profit private corporation dedicated to the development, production, and sale of top-quality, ecologically sound horticultural and agricultural products. *The Vital Earth News* is a periodic publication of Vital Earth Resources to inform customers and other interested parties about our products and programs, and to educate our readership on critical issues facing growers today and in the future. If you would like to receive future issues of this newsletter or product information, simply fill out the form on the right and mail it to us.

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# *Now Vitazyme comes in two styles!*

- *Traditional Vitazyme*
- *New forest green Vitazyme*



Each performs excellently in the field, but the new Vitazyme has micronutrient chelates that impart a pleasing green color and pleasant, pungent odor. Traditional Vitazyme will always be available for organic farmers, and is registered with several organic agencies.

Help your crops grow better with Vitazyme's rhizosphere stimulating action. Fertilizer nutrients will be more efficiently utilized, crop quality will be enhanced, soil conditions will be improved, and profits will be increased!

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