

# AMBASSADOR COLLEGE

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## KEYS TO PROPER SOIL MANAGEMENT

Agriculture is in a growing DILEMMA! Each year in spite of advances in technology the farmer's profit margin is LESS AND LESS. And, in many cases there is no profit at all. With new "improved" varieties of seeds, more potent herbicides and pesticides, new types of machinery and "more efficient" management practices the business of agriculture is coming to a standstill!

Each year, multitudes of farm families are forced to abandon their land and life's profession in despair and join the trek to town in search of economic success. This sad fact is revealing! Something grossly wrong is happening with the way agriculture is being carried out in our land!

To this personal tragedy must be added the trends in food production that portend a mammoth crisis for all of us -- unless these trends are reversed, and soon.

Warning us of the effects of soil mismanagement, at a recent meeting of the American Association for the Advancement of Science, Barry Commoner, a noted ecologist, pointed out that when the United States was settled, the soil system was in a natural and fertile condition. But the organic store of nutrients began to be depleted as the quality and the yields of crops declined year by year. Farmers moved westward, skimming the most available nutrients from the soil, resettling each time, land productivity fell. Finally reaching the west coast they could go no farther. As the nation's population increased, agriculture responded to the demands by robbing the soil as more and more of the nutrients were removed by wrong farming practices.

The farmer applied chemical fertilizers, hoping he would somehow restore soil fertility. Today this has led to such a wide practice that now farmers find themselves almost completely dependent on these fertilizers for their livelihood.

. . . fertilizer is being substituted more and more for land and other capital. The acreage of crops harvested has decreased but the percentage fertilized has increased. (Farm and Ranch Bulletin, Federal Reserve Bank of Dallas, April 1968)

Yet, in spite of all the additional fertilizer that is being used, soil fertility has actually decreased -- and continues decreasing.

Evidences of declining soil fertility are seen in the greater number of deficiency diseases among our farm animals. Veterinarians are constantly faced with increasing cases of strange animal ailments for which no specific body weakness or visible physiological cause can be found. Eye ailments, a tendency to blindness, bad gaits, rounded back lines, inferior condition, poor feeding progress, and even debility and death can be traced to deficiencies in animals' nutrition. ("Sick Soils Have Effect on Animals," by Dr. William A. Albrecht)

### The Cause of Chaos -- and the Cure

There is a cause for these alarming trends, a reason agriculture is in trouble. That cause is a monumental failure to seek out, examine and apply the principles that govern soil fertility and economic crop production.

You need to know the fundamental laws -- the basic physical principles -- that govern success or failure in farming -- which in turn will govern the continued existence of human life with plenty.

But what are these principles? What are they concerned with? Where can you read about them?

Natural laws, revealed from creation, instruct man in dressing and keeping the earth so it will produce abundant, healthfully nutritious, life sustaining crops. These laws will naturally attempt to destroy sick, diseased and inferior plants and animals. But, unfortunately, most of the effort in commercial agriculture has been directed toward trying to find a way around nature's laws. It seeks to suspend the natural penalty of breaking these laws, instead of seeking out ways to farm in harmony with them. Certain industries dealing with farming have sought more profit for themselves by ignoring natural farming principles.

The laws of agriculture were set in motion by God at creation, but mankind has lost much of the true understanding of these laws. These laws have to do with such things as the soil life cycle and maintaining a balanced, living soil. Crop rotation and diversified farming are also a part of the cycle.

The key to understanding these laws is to first understand what the soil really is and how it works. The common view is that the soil is nothing

but a dead substance in which plants are held up while receiving various applications of chemical plant foods which cause them to grow. But this is not true. Soil is a living, active thing.

A healthy soil is very much "alive" and dynamic, teeming with bacteria, actinomycetes, fungi, molds, yeasts, protozoa, algae, worms, insects, and other minute organisms which live mostly in the top few inches of the soil. This soil life must be maintained in balance in order to grow health-giving, nutritious crops. It is essential to understand this soil life cycle in order to understand the physical principles that control it. (For a more complete explanation of this soil life cycle write for our article on "Soil Principles.")

But how are these laws or principles broken? Simply by doing anything that kills soil life. Most all highly soluble chemical applications will kill soil life. Improper tillage can destroy this life. Lack of proper crop rotation is also detrimental. These are areas in which man has gone far astray. He has lost the understanding that soil is a dynamic living substance and hence does not understand how chemicals, tillage and crop rotation affect the soil. But these laws are living laws that work, whether they are understood or not. To kill the life in the soil is to destroy the capacity of the soil to produce quality food.

A big key in maintaining this soil life cycle which is often overlooked today is to have a diversified operation. By that we mean having cattle, chickens, etc., as well as grain and hay. If you feed your own balanced, nutritious grain to your animals, they will supply you balanced, nutritious food to eat and also fertilize your land. This will maintain your health and outlook, and thus your capacity to work and live.

Diversification plays a big part in keeping the cycle of minerals and micro-organisms alive. Healthy soil means good produce which means productive animals which means adequate manure which can be put back on the soil to maintain its health.

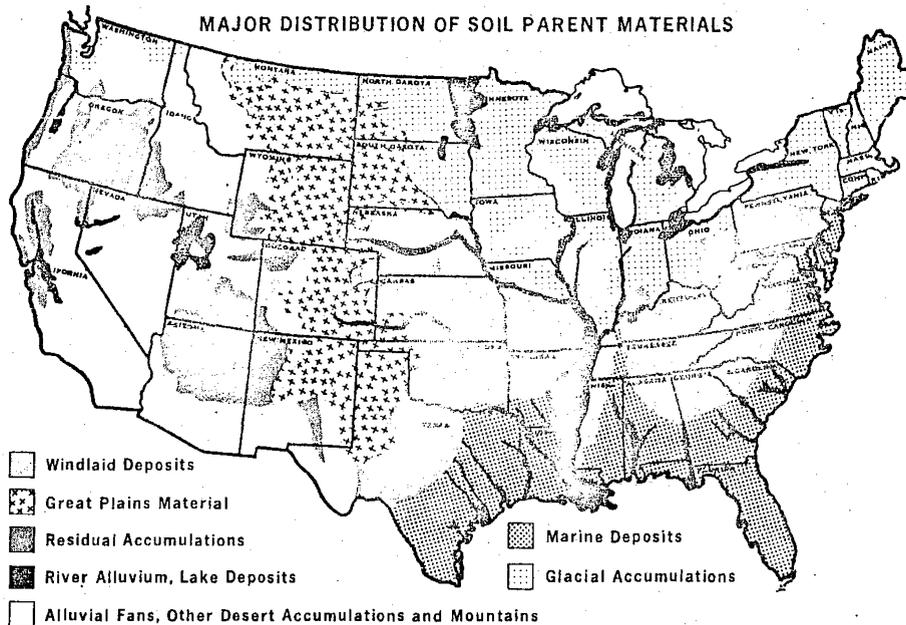
Another aspect of diversification concerns crop rotation and relying on a number of crops instead of relying completely on one crop for an income. Different crops take different minerals from the soil. Monoculture can rapidly deplete a soil of the particular element one crop uses. By rotating crops, minerals will be balanced and maintained since certain crops will replace minerals used by others.

Here are some common problems which can be answered by farming in harmony with these fundamental and basic laws.

### Soil Fertility

Fertile soil is simply soil capable of growing and sustaining abundant, healthy plant growth. It supports a variety of soil microorganisms which help make elements available to the growing plant.

The materials from which soils were originally formed and the manner in which they were formed will determine inherent fertility. Certain soils are better suited to certain crops, depending of course upon the topography, drainage, and the soil forming factors. Your county agent will have information for your area. The 1957 yearbook on "Soils" is also an excellent reference manual. You should determine physical soil type for a proper fertilization program.



Soil follows a biotic life cycle and fertilizers applied need to be balanced, containing major, minor and trace minerals. Why? So soil microorganisms and plants can get a balanced diet. Only those natural fertilizers which aid the soil life cycle should be used. "All the phases of the life cycle are closely connected. All are integral to nature's activity. All are equally important. None can be omitted. Soil fertility must be the basis of any permanent system of agriculture." (An Agriculture Testament, p. 22)

How can we attain true soil fertility? Soil cannot be made healthy and fertile merely by the addition of chemical fertilizers. There are,

however, natural rock fertilizers that can play a part in bringing back true fertility by adding missing trace minerals and other needs.

Immediately when people hear about natural fertilization they think that it is either completely impractical or only practical on a small scale. In the long run, however, it is the only practical method of farming. Increasing problems of insects and disease in animals and humans present evidence that natural fertility must be restored.

The United States produces a larger amount of food than other nations. It is largely the result of greater acreage and more machinery -- not better quality produce or better care of soil fertility. Our yield per acre for most crops, including wheat, is low in comparison to many other nations. This fact is very seldom mentioned because it is a disgrace to our agricultural methods.

### Farm Manure

Part of a natural fertilization program should, if possible include farm manure. The value of manure will depend on the source. Because of modern antibiotics, insecticides, herbicides and artificial fertilizers, much of the manure produced today will not even decompose properly. However, one should never underestimate the values of "good" farm manures.

The value of manure will vary depending on the kind of feed used. The following table gives average values of manures from various animals.

YEARLY EXCRETION PER 1000 LBS. LIVESTOCK (FECES)			
Animal	Nitrogen	Phosphate	Potash
Horse (1)	69	35	47
Cow (1)	66	35	23
Steer (1)	68	51	16
Hog	112	97	61
Sheep (2)	56	32	23
Chicken	90	83	37

(1) 50 per cent is usually dropped on pastures and uncultivated fields.  
(2) 80 to 90 per cent is usually dropped on pasture.

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The figures in the table above could be doubled for the amount of nitrogen and tripled in the amount of potash when all liquid manure is saved from cattle and sheep. The nitrogen would be increased by one-half again and the potash by two-thirds again. Urine contains practically no phosphate. About 50 percent of the nitrogen and phosphorus and 90 percent of the potassium in manure are soluble in water and subject to leaching. In figuring the amount of plant food returned to the soil through manure, loss by leaching should be figured. The table following shows the losses when manure is handled in different ways.

LOSSES FROM MANURE			
	Nitrogen Per Cent.	Phosphate Per Cent	Potash Per Cent
Leaching from piles	15-30	10-40	20-60
Heating in piles	15-35	None	None
Drying after spreading	15-35	None	None
Freezing after spreading	5-20	None	None

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When one considers the fact that the majority of nutrients a plant contains is manufactured from the air, light and water in connection with the life in the soil, these losses are placed in a more balanced perspective. In nitrogen especially the atmosphere is a major source of supply.

### Minerals and Soil Life

Deficiencies of major minerals can be corrected over a period of time by the careful application of mineral powders. These are much less costly than manufactured fertilizers, and do not produce the undesirable side effects.

In the past few years trace minerals have come into the limelight. A side effect of today's agricultural practices is trace mineral deficiency. These deficiencies are especially prevalent in humid regions (where nutrients have been leached or cropped out) in thin or sandy soils, or in older well-weathered types of soils. Symptoms of these shortages are especially noted in intensive cropping areas where production has dropped off. Legumes readily show a lack of trace elements. For example, alfalfa is particularly susceptible to a boron deficiency.

Often trace elements do not have known values because "science" is just beginning to learn about them. Increasing micronutrient deficiencies and problems emphasize the need for a balanced natural fertilizer which contains trace elements. They play a big part in making other elements available. They increase humus and soil tilth and encourage bacteria and higher soil life. This is a complex subject and anyone who desires will be able to find good books on natural farming. If interested, write for our booklist giving sources of information.

Only recently has man begun to realize how dependent quality crops are on the bacterial population of the soil. Without soil bacterial activity it would be useless to dung crops, to try to improve land by tilling a legume cover crop into the soil, or to attempt to fertilize soil. There is no dispute over the prominent role soil bacteria play in soil fertility. If you desire to know the major types of bacteria in the soil and their relationship to compost and healthy soil you may write for additional information on microorganisms and compost.

### Correct Cultivation

Part of a good fertilization program includes returning of crop residues. Stubble mulching, "trash" farming, cover cropping are all a part of the "law of return." To make effective use of crop residues, you should not till too deeply, burn straw, or continually bale everything off without replacement. Burning or deep plowing of a crop residue is burning or burying money. Yet this is commonly done. Then costly nutrients are purchased to replace those burned off. Too often these are in man-made or artificial, highly soluble chemical form which will leach out with the first rain and then leave a harmful chemical residue in the soil.

When you disobey the law of return and rob from soil humus -- you are destroying soil life, texture, and moisture reservoir. Correct cultivation will leave crop residue on the land, thus improving tilth and texture. It will also allow for easier tillage, conserve moisture and improve fertility. Nature's most prolific and industrious workers -- soil microbes -- live off the trash and crop residue in the top three to four inches of the soil. Preserve, keep and cultivate this valuable life.

### How to Plow

A common practice is improper cultivation through deep plowing. Some arguments have been stirred up by E. Faulkner's book, Plowman's Folly. To many his concept of minimum tillage is quite new. Proper tillage aids the top four or five inches of topsoil. Deep plowing (6-12 inches) destroys the top layer of soil life and brings up soil with less life. Where one has 1-4 feet of rich topsoil the harmful effect of deep plowing is lessened.

A farmer can maintain the organic humus -- maintain the top few inches of soil in a proper texture -- by cultivating with the harrow, disc, or similar tools. Of course it may be necessary to plow heavy grass, sods, thick weed growth, or to break a hard surface crust. Some of this might work with a sub-soiler. Where a disc or similar type implement will not work, shallow plowing may be done. Deep plowing damages the soil life structure and it should be wisely limited. Only recently have men felt that they needed to plow deep. For millennia, soil tilth was such that surface cultivating was adequate. The proper handling of a plow is an art and in order to apply it one must understand the importance of life in the soil and how to conserve it.

Moisture conservation is another reason deep moldboarding should not be done. Soil without organic matter cannot absorb water. In contrast organic material will hold up to ten times its dry weight. Why? It is very simple. Internally "organic matter" is chiefly open space. Minerals on the other hand are dense, largely solid crystal. The matter rather than the minerals should be on the surface to hold moisture.

Most farmers know that plowing will check weed growth for quite some period. Now why is this? There are two reasons: One is that you have cut off another water source. Before plowing there was an unbroken capillary track from the water table to the surface. After plowing, these finer capillary tracks are destroyed. This along with the organic matter deposited at the plowsole cuts off sub-soil moisture. The second reason is that the soil has lost its firmness. After spending hours of laborious, rubber-tire wearing, gas-consuming time to loosen the ground, you have to turn right around and establish that former state of firmness before anything will grow vigorously on it again. Seem rather ridiculous? It is. Oftentimes plowing is simply unnecessary.

Cultivated soil should have a loose texture, be properly aerated and allow plenty of oxygen, water and light to enter in. It does not form a hardpan and in most instances its crumbly surface will look as if harrowed rather than plowed even if shallow plowed.

### What About Weeds?

Weeds are called an enemy of the farmer. They are something which he fights with sweat and valor. They steal moisture, nourishment and growth from the crops planted. They are a plant growing in the wrong place! Often they are a result of monoculture. Cultivation rather than weedicide is the solution. Herbicides merely kill the soil life and result in hardened lifeless soil.

If weeds are destroyed and properly tilled in, they aid the crop as food for microorganisms and are returned as manure. By being worked into the soil, they add to the organic matter of the soil, its tilth, fertility and moisture retention. A good source to study which shows the practical value of weeds, in bringing back fertility by drawing on the deep minerals in the soil, is Weeds -- Guardians of the Soil by J. Cocannouer. Once fertility is restored to soil, the weed problem will often disappear. Harmful weeds have a tendency to avoid a properly balanced fertile soil.

### Balanced Diversification

Where soil is specialized for a certain industry or crop, soil life tends to die. It will literally die because it lacks a balanced diet for its microorganisms. The only function of such soil is to hold up the plant. Specialized farming can be judged by its fruits. Are today's increasing pests and diseases and more chemical sprays the solution? No. A better way is to be balanced and diversified by growing several types of grasses for grazing pastures, by rotating corn, wheat and other grains year by year with legumes, by raising livestock and spreading the manure, etc. Only through balanced diversification in farming can one wisely use the land and produce healthy crops from soil.

"If we study the prairie and the ocean we find that similar principles are followed. On lakes, rivers and the sea mixed farming is again the rule. Great variety of plants and animals are found living together. Nowhere does one find monoculture." (An Agriculture Testament, p. 271) The example of nature shows we should be diversified in crop production.

There are many benefits of diversified farming. Not only does fertilization occur in the return of various nutrients from different root levels, but also there is encouragement of beneficial insects and discouragement of harmful insects and disease. Cover and crop rotation allows a buildup of natural soil and insect life. This is the only sensible control measure for harmful insects and disease. Soil fertility produces healthy crops that naturally resist insects. So-called "harmful" insects merely do the job for which they were created -- to destroy weak and sickly plants.

A good source to study about beneficial insects such as ladybugs, lacewing flies, praying mantises, etc., is the book by Beatrice Trum Hunter, Gardening Without Poisons, published by the Houghton Mifflin Company, Boston. It covers many practical solutions for the insect problem and shows how one can grow crops and gardens without the use of toxic chemical sprays.

#### HOW TO CHANGE FROM CHEMICAL TO NATURAL METHODS

Basic knowledge must be learned and the importance of proper education cannot be over-emphasized. The structure of natural agricultural laws shows farmers are expected to be diligent in studying their occupation. They must be well educated -- not just hard workers. Once a person understands the basic laws involved, and that they will work, the question is where to begin in applying the knowledge. How should one change from chemical to natural farming? Is there an economical way to change in today's society with the high taxes, high interest rates and the high cost of machinery? Natural laws are not followed in most present methods of agricultural practices. This society has no desire to obey the laws of God. Yet these laws are the controlling force. They bring the results. Obedience is the key. What do you need to know and how can you start in a practical way to correct the situation on your land?

#### Economic Considerations

The way other people look at farming today is -- "Does it pay?" Someone with the courage to change from chemical to natural farming will be continually observed by people who have not tried natural farming.

When you have not tried, applied and seen the profitability of simply following right principles it is difficult to invest and believe in them. It is easy to follow instructions carefully printed on a costly sack of toxic

pesticide; 2,4-D or DDT for example. It is more difficult in natural farming where you must follow unwritten instructions, where more knowledge is needed and where greater obedience to law is demanded. Yet in spite of this difficulty, natural methods are expected to be profitable automatically and immediately.

### A Note of Caution

If you lack information or experience in the natural and true ways of farming you should not just jump into the venture. Success is based on knowledge, a proper foundation and understanding of the laws involved as well as faith and courage. Because of today's tight economic pressures, especially on the farmer, perhaps you should not make too bold a start without first having developed a sure market and planning overall economic success.

### Methods of Restoration

The four simple, basic, practical methods which we have used on the Ambassador College Farm reap abundant, rich benefits. (1) Correct the soil pH. A near balanced pH will unlock and make available a storehouse of minerals and elements already in the soil. This can be done by applying the recommended natural rock fertilizers. (2) Add a buffering marine-type marl, rock mineral, or material from natural organic lignite deposits or any material high in humates to rapidly create soil humus. (3) Grow a crop to add plant residue to keep the soil cycle going. Add as much organic matter as possible and keep a cover crop on the soil. Actively grow a cover crop and with proper tillage practices, use the field as a compost pile. (4) Add soil bacteria to (a) help break down trash into useable humus (b) overcome harmful chemical residues from previous wrong practices and (c) encourage higher soil life such as earthworms which will help create additional newly balanced soil.

The above four points are just part of an overall plan followed by the Ambassador College Agriculture Department as a practical program in changing from chemical to natural farming. To help get started you need to run a soil test to evaluate the amount of material needed to correct the soil pH, as well as to show which type of fertilizers are needed.

In making a change in agriculture, take it easy and do not jump into the program overnight or try to make the entire change on a whole farm in one day. Wise counsel and careful planning all the way is necessary for converting or changing even part of the acreage and it does take time. An initial step of course is to stop using harmful and poisonous chemicals.

Remember the natural steps listed are simple practical methods of enhancing and increasing soil microorganism and soil life. They need to be adapted to local, individual circumstances to help establish and keep the soil cycle going. A soil test will help indicate what corrective measures should be taken. You must, however, make your own decision. Repeated tests (once per season or crop) will help give continual guidelines on establishing truly productive methods of farming.

You should remember too, it is better to use no soil building supplements than to make a wrong application. This would only throw the soil into a greater unbalanced condition. Soil tests are only general guidelines and should not be viewed as the answer to every problem. However, they can help you avoid applying the wrong material which might throw the soil into a more unbalanced condition.

Finally, no matter how profitable or practical any steps or methods of production or management are, they won't solve the agricultural problems overnight for just any individual. God looks at the heart and the attitude of willingness and the initial step by the individual in the right direction.

God will give rain in due season, the land will yield its abundant increase and the trees of the field will yield their fruit to those who obey Him. God promises to rebuke the devourer and help overcome all the problems in farming if man will just learn to obey and understand the basic lessons he needs to learn.

The world can't solve the entire agricultural problem by its methods. Farmers today, however, can and need to learn the right principles and become educated in the right methods for success. Preparation for a future solution to the world's agricultural problems and for yours individually can begin now.

For the ultimate solution of the overall agricultural problems and for our society as a whole review the available fully-illustrated booklet, "The Wonderful World Tomorrow -- What It Will Be Like."

In only a few short years, society will once again -- as it should -- be geared to an agricultural society. People will be receiving fantastic blessings because they'll be obeying God's laws. Why not get a head start and begin receiving these fantastic blessings NOW! In Malachi 3:10-12 God promises to bless those who willingly obey His laws -- not just normal prosperity but blessings so there is not room enough to receive them, and He does not limit it to the future. You can, at least, begin learning proper soil management and agricultural principles now! In the World Tomorrow you'll be able to help teach others to return to the wonderful agrarian life -- the most satisfying and rewarding occupation of the future.

MGR