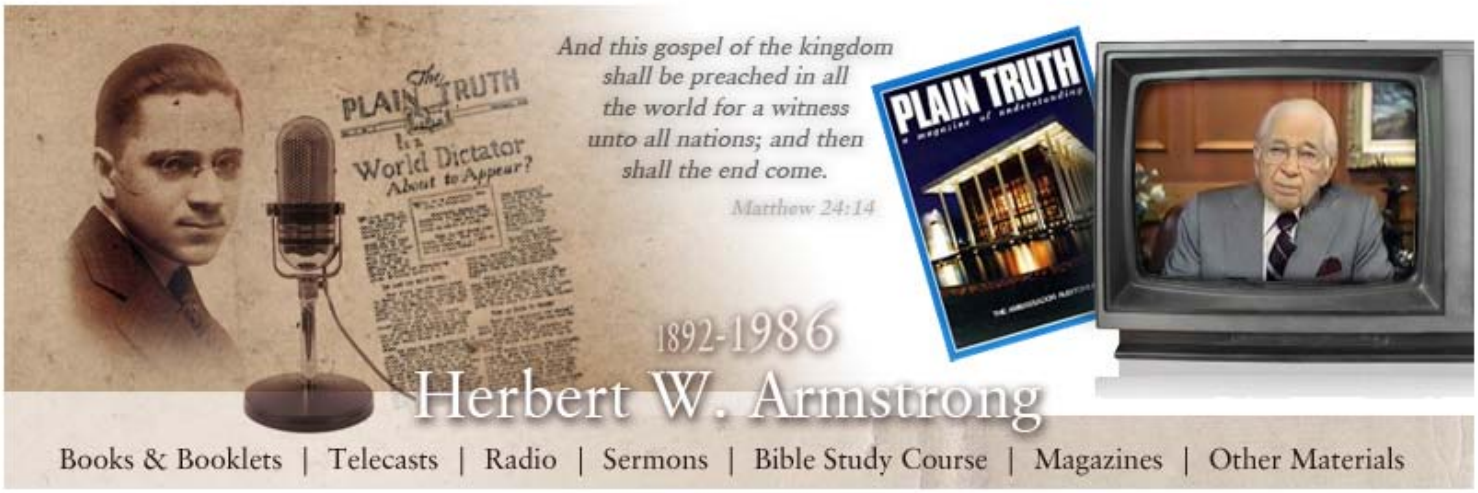


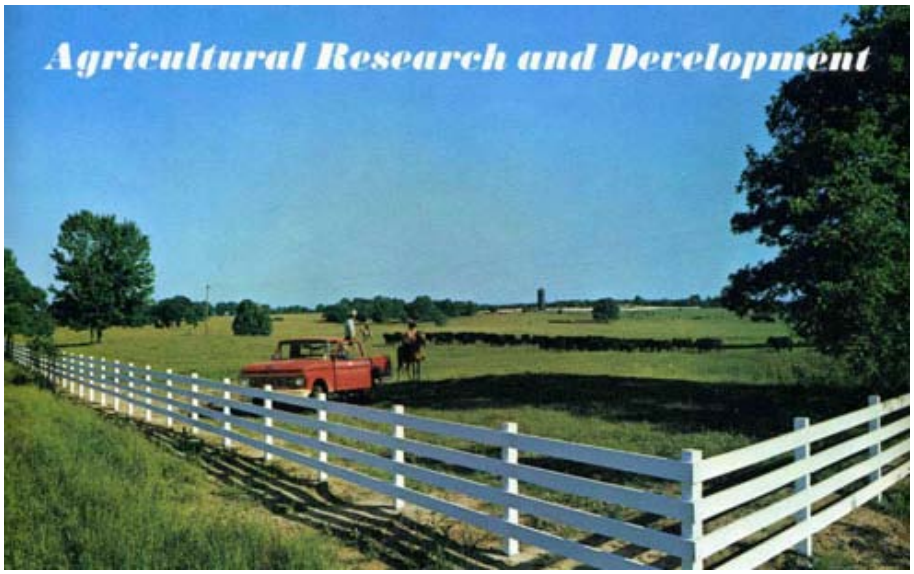
Ambassador College Agriculture

Howdy

a brief look at

A.C. AGRICULTURE

Big Sandy, Texas



AMBASSADOR COLLEGE

BIG SANDY, TEXAS 75755

HERBERT W. ARMSTRONG, *Chairman*

AGRICULTURE DEPARTMENT

INTRODUCTION TO SOIL PRINCIPLES

Productive farming is based on the law that life comes only from pre-existing life. Soil fertility is a LIVING PROCESS. Living organisms provide for living plants which in turn provide living food to support the life of animals and men.

Mr. Herbert Armstrong approved and appointed a committee to look into and reevaluate our agriculture problems and questions. Much valuable study and research had already been done, and other study and experiments were being carried on by staff members of the Colleges.

The purpose of the committee was to meet, discuss and consolidate the thinking and findings of all and present the material at a coming conference.

By "putting our heads together" and comparing information we found some beginning and basic steps to proper, tangible agriculture methods.

Results of Experiments and Studies at Big Sandy

We feel a real breakthrough in changing from artificial to natural methods of farming is that of being able to shorten the length of time required to economically make the switch.

The soil beneath our feet is a marvelous and miraculous creation. There are three basic constituents of soil which much be in balance if health-sustaining crops are to be produced. These are: minerals -- dirt and rock particles which form the foundation of "skeleton"; organic matter, which is decomposed excretions and the dead remains of plants and animals; and a community of living organisms. The organisms convert both the minerals and the organic matter -- or humus -- into plant food.

When soil is out of balance through use of poisons, soil life is killed and most of the minerals of the soil are "locked up" and unavailable for use of plants. The object of soil redevelopment is to restore this natural soil life and balance and thus release the potential productivity. Chemicals and poisons have been forced into our soils, resulting in mass slaughter of its living organisms.

There are three basic constituents of soil which must be in balance if health-sustaining crops are to be produced. These three are: 1) the dirt or rock particles which form the foundation or "skeleton"; 2) the organic matter -- wastes or dead remains of plants and animals; 3) and a vast community of living organisms.

A way has now been made possible to begin restoring this living culture of soil organisms at a much speeded-up rate which will in turn help speed soil rebalancing. This is not a panacea to soil restoration. It is, however, an important aid in accelerating the process. Proper tillage methods, organic matter, land rest, proper use of natural rock fertilizers, good management are still a must.

Here are some of the results after six months of "restoration." At the time of the conference we had taken crops from two fields and the garden area with other crops still in process. The first crop harvested was a 27-acre field of silage sorghum. We had planted leftover seed of this same crop planted on the same field the preceding year (1965). The 1965 crop grew to approximately three feet in height, turned a yellowish-red color and grew no more. This was baled for hay and produced only 12 tons. In February 1966, we ran soil tests and found an unbalanced condition, the soil being highly acid and almost void of life. We applied 2,000 pounds of crushed limestone per acre, a heavy application of the bacteria culture, and disced it in. About a month later we applied 500 pounds of "organic," and 500 pounds of diatomaceous earth per acre and disced it in.

The crop raised this year was quite different. It grew 14 to 15 feet high, had a beautiful green color, and produced 260 tons.

However, most soils would not be as expensive to condition as ours. We had only loose sand as a base. Many soils already have sufficient minerals and need only organic matter to produce living organisms and a natural balance.

Another interesting result was with our milo crop. Our neighbor across the road planted his crop "at just the right time," a good three weeks before we did. He used heavy amounts of chemical fertilizer. For a while his crop looked, and was, way ahead of ours. We were pressed for time and were able to apply only the soil bacteria culture. When harvest time drew near, both crops looked similar from the road, maybe his looked better. The difference was quite revealing when we began to harvest. We had gotten two or three "unseasonal" showers which helped us greatly. Mold formed between the berries on his milo and as it ripened the mold turned to a black, dusty blight. When harvested it was lightweight and made 12 bushels per acre. The berries on ours were large, bright, firm and made 41 bushels per acre.

Our wheat and oats were harvested after the conference. According to our local county agent, wheat is not grown in this area. Our wheat made 31 bushels per acre, and the oats made 45 bushels per acre. These would not be outstanding quantities in some areas of the country, but for an area that doesn't grow wheat it is pretty good.

Society has promoted highly specialized occupations not only in the fields of the arts, business, technical science and industry, but just as much as in the field of agriculture. Educators in this field gloss over and depress the need for diversification and true fundamental knowledge.

Since the conference much has been learned concerning the ecology -- or environmental balance -- of plants in relation to each other, to the soil, to animals -- and their relative values. This is basic in that proper soil, plant and animal ecology maintain the soil and begin to build new soil once it has been restored to a balanced state. It takes the interrelationship and interdependency of all facets of the field of agriculture to finally produce healthy human lives.

What Is Soil?

The soil is not, as many suppose, a dead, inert substance merely supplying mineral elements and providing a place for plants to anchor their roots. A healthy soil is full of living organisms.

There are three basic constituents of soil which must be in balance if health-sustaining crops are to be produced. These three are: 1) the dirt or rock particles which form the foundation or "skeleton"; 2) the organic matter -- wastes or dead remains of plants and animals; 3) and a vast community of living organisms.

The difference between sick soil and healthy soil is BALANCE -- in essence, LIFE. A lack of organic matter, with a subsequent lack of micro-organisms will throw soil out of balance. Soil is out of balance when most of its minerals are "locked up." This occurs when there are not enough soil bacteria to change the minerals into food for plants.

The object of soil redevelopment is to restore soil to its natural former balance and thus release the potential productivity of the stored-up minerals. A balanced soil is one that has the correct amount of minerals, organic matter and living organisms to produce the kind, variety and amount of vegetation for which it was created.

Many think a balanced soil is one with a "pH" level (degree of acidity or alkalinity of soil) of 7. A soil with a pH of 7 is simply a neutral soil, but not necessarily a balanced one.

The soil has varying degrees of acidity and alkalinity. Many types of plants need varying pH levels (some 7, some other than 7) to produce healthy, quality plants. However, an abundance of humus will enable plants to tolerate different pH levels.

The Soil Particle

The soil under our feet is not solid! It is actually a layer of billions of grains, or soil particles, ranging in size from finest clay

particles smaller than 1/2000 of an inch in diameter to coarse sand particles up to 1/12 of an inch across, some of which are decomposed rock.

A continuous supply of minerals is being made available as long as the soil is in balance. According to some authorities, the supply of minerals in the soils covering the earth is inexhaustible. But, only the living faction of the soil, the microbes and earthworms, can make these minerals available in the right balance for healthy and health-sustaining crop growth.

Each of the tiny mineral particles in the soil is covered with a tight-fitting film of oxides, water, and bits of organic matter. This film provides a habitation for the teeming life in the soil underfoot.

To show the tremendous capacity the soil has for containing organic matter, and the fantastic surface area of the soil particles on which multitudes of organisms live, notice this example! One ounce of soil, sampled at Britain's Rothamsted Experiment Station, was found to have surfaces adding up to 250,000 square feet, about six acres!

When we notice the awesome capacity of the soil for life, it becomes apparent that we need to farm in such a way as to allow these organisms to carry on their natural functions of providing soil fertility! Soil life isn't something insignificant or trivial! This life is the difference between vibrant health and wretched degenerative disease in the plant, animal, and human realms.

Organic Matter

In healthy soil, each particle of dirt or mineral matter is coated with organic matter.

Organic constituents of the soil are obtained from living and dead plants and animals, plant roots, green manure crops, animal manure, crop residues, fungi, bacteria, worms, and insects. The importance of organic matter in the soil cannot be stressed too strongly.

Organic matter supports the soil's living organisms; aids in the bringing of insoluble soil minerals into solution and holding them; improves the physical condition of the soil; increases water-holding capacity; improves aeration; regulates soil temperature; and serves as an important source of nitrogen and other plant food elements. It also reduces erosion and increases productivity. Normally the more organic matter a soil contains, the healthier it is.

When rains come, soils with ample organic matter soak up the water. Where organic matter is lacking, water runs off the land wasted, and carries topsoil with it, producing erosion. No mineral mass, regardless of how fine its particles, can absorb as much water as does an equal weight of organic matter, for the mineral can hold water only on the surfaces of the particles. Most of the crop land in the United States has suffered moderate to severe erosion.

Organic matter is about 50 percent carbon. Carbon acts as a buffer to excessive acidity or alkalinity and helps keep the soil sweet and maintains conditions most favorable to good plant growth.

As organic matter decays in the soil, the most bulky product of this decay is carbon dioxide gas. This gas disolves readily in soil water to produce carbonic acid -- a natural reagent for dissolving plant nutrient elements from the mineral particles and making them available to plants.

Organic decay, through the working of soil bacteria and soil acids, unlocks minerals and makes them available for plant usage. There is usually little shortage of plant minerals in most farm soils.

Much of our land has been seriously depleted of organic matter chiefly because of improper cultivation, erosion, and the use of chemical fertilizers, herbicides and insecticides. Large, unnecessary losses in organic matter are caused by "burning over" land and by burning crop residues. We cannot improve and maintain the productivity of our soils without regularly replenishing the organic matter!

Practices of maintaining and replenishing organic matter include: 1) growing sod, cover, and green manure crops; 2) the proper use of weeds; 3) conserving and applying manure and composts; 4) conserving and applying crop residues; 5) controlling erosion; 6) right tillage practices; 7) and the replacement of soil bacteria. Applying the first four principles automatically replaces soil bacteria, or the process can be speeded up by applying bacteria as a liquid culture. A major key to maintaining soil balance is ample organic matter.

The Living Soil

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 hive of living things in the soil, the eaters and the eaten, adds up to incredible numbers. The bacteria alone may range from comparatively few up to three or four billion in a single gram of dry soil. In good soil the bacterial matter, living and dead, may weigh as much as 5,600 pounds per acre.

The fungi may add up to a million in a gram of dry soil, weighing over 1,000 pounds to the acre.

Among the most important of the soil-making crew is the humble earthworm. He is nature's own plow, chemist, cultivator, maker and distributor of plant food. Humus-rich soil easily supports a worm population of 26,000 per acre. Worms eat inert minerals and organic matter and mix these digested minerals with their bodily secretions. Each year they deposit as much as 10 to 20 tons of castings on the surface of an acre!

Worm castings are shown to contain 40 percent more humus than the surface soil. They are a humus factory manufacturing vast amounts of balanced plant food. The Connecticut Experiment Station shows that the casts of earthworms are five times richer in combined nitrogen, seven times richer in available phosphate, and eleven times richer in potash than the upper six inches of soil. Depositing castings is only a part of the good that earthworms do. They pull organic matter down under the soil, and by their digestive juices break it down into a form usable to the plants. They burrow down to eight feet or more below the surface and bring up rich minerals that plants need. The burrows improve aeration of the soil, permit the penetration of surface water, and help facilitate the downward growth of roots.

"Myriads of small creatures spend parts of their lives in the soil; ants, beetles, wasps, spiders, and many others. About 95 percent of the roughly one million insect species spend part of their lives in the soil." (Living Earth by Farb, p. 5).

The activity of these creatures combines to carry on the work of plowing, mixing, and fertilizing as they add their remains to the land. If these living organisms use up all their food supply, billions of them die or become inactive. The life processes in the soil slow down until further stores of food are added. As in most of nature's activities this whole life cycle in the soil becomes a self-regulating system, an organized community, adjusting its numbers to the food supply so long as it is undisturbed by outside forces.

While the soil lives, stored-up energy is constantly being used for food by the teeming hive. A good soil's health is actually a matter of life and death to the plants and animals that live on its surface. Our health is also dependent on its health.

Why Soil "Wears Out"

Soils become "worn out" when they no longer contain sufficient organic matter to maintain an adequate population of soil organisms to make mineral nutrients available to plants.

As virgin land is plowed up, the increased oxygen made available greatly stimulates the bacterial crews into breaking down the organic matter at a more rapid rate. Unless organic matter is returned to the soil in the form of crop refuse, animal wastes, compost, cover crops, etc., the supply of organic matter is eventually used up.

In nature we find a variety of plants growing together and animals wandering about eating a selection of herbage and pausing here and there to "pay their dues." Plant and animal litter accumulate together on the surface to compost and decay, feeding the micro-organisms a balanced diet and making a health-sustaining humus-rich soil.

Without food, the population of soil microbes (millions per gram in healthy soil) diminishes and no longer makes available sufficient nutrients to grow crops.

Symptoms of Sick Soil

Healthy soil, as we have seen, requires a balance of minerals, organic matter and living organisms. When this balance is disrupted, low-quality, disease-ridden, insect-infested crops, which do not sustain health in man or beast are the result. This is caused by allowing the organic matter to become depleted and by poisoning the soil with wrong types of fertilizers which destroy the living organisms.

Sick soil becomes hard, difficult to work. It fails to absorb rainfall. Erosion is the result. It becomes either too acid or too alkaline and vital trace elements are "locked up," and thus become unavailable to plants.

Sick soil produces sick plants which produce sick animals and humans. Thus sick soil becomes largely responsible for the increasing worldwide plagues of disease that are threatening mankind in this age.

How to Revitalize Sick Soil

To heal sick soil and bring it back into profitable production of high-quality, health-sustaining crops, it is necessary to stop using the farming practices which have caused the trouble.

We have successfully rejuvenated some soil in three to four months on the college farm in Texas and harvested good crops the following season without using any artificial fertilizers. The cost was less than half the expense of using artificial fertilizers.

There is always the question, "where to begin?"

The first step is to determine as much as possible where your soil presently stands, so a plan of action can be formulated. A soil test is helpful here. It will give a guideline to the available N-P-K (nitrogen, phosphate, potash) and the pH level. As mentioned before, organic matter is the key to soil balance. This should always be increased. A soil test will help tell you what is "locked up."

For example, if the soil is too acid, organic matter and ground limestone will bring it back into the growing range so soil organisms can multiply rapidly and begin to work efficiently.

Soils low in phosphorus or potash may need an application of ground rock phosphate or potash rock. Since one application of these minerals lasts for a number of years, in most cases the soil organisms will begin to liberate sufficient supplies from the earth itself so further applications will not be needed.

Nitrogen-fixing bacteria (rhizobia) live in nodules on the roots of legume plants such as clover, peas, peanuts, soybeans, cowpeas, vetch, and alfalfa. These bacteria are capable of adding as much as 200 pounds of nitrogen to an acre of soil each year.

Nitrogen can also be added by applying manure and compost. Most nitrogen of plant and animal remains is locked up and must be liberated by the living bacteria.

Still other forms of nitrogen-fixing bacteria make nitrogen available to a plant directly from the air.

Tillage Methods

The methods and practices used in preparing the soil for planting have a considerable effect on the natural processes going on in the soil to produce fertility.

Many different types of plows and other tillage implements are on the market but not all are equally efficient in putting the crop's refuse and organic matter where it will do the most good. Disc plows, rotor tillers, chisel plows, and that type are very useful and effective. They chop and mix crop residues into the topsoil which aids greatly in the process of decomposition.

The moldboard plow, however, is quite different. This type plow turns under and buries all protective mulch material in a layer several inches below the surface of the earth. It packs the surface trash into a narrow layer subject to great pressure both from the weight of the soil above and the wieght of the tractor and machinery passing over it. This pressure produces heat which "burns up" this material rather than allowing it to decay or ferment (which is the natural and beneficial process). This "burning" creates harmful acids and reduces the production and availability of beneficial nitrogen.

Still further, the compacted layer of trash serves to create a barrier which prevents moisture from "wicking" from the subsoil below to the roots of the plants growing above. It hinders the roots of the plants from finding the moisture that lies below. At the same time, the earth above the compacted layer is left bare to all the processes of wind and water. This creates a condition of drought between the surface of the soil and the compacted layer of organic material below.

In some few cases the use of a moldboard plow may be effective to break up a very hard soil to permit the mixing of organic material to improve the hardened condition.

Proper tillage practices leave a mulch on or chopped into the soil's surface. This prevents the evaporation of rainfall, vastly increasing the soil's ability to absorb and hold water. It aids greatly in controlling the blowing or washing away of the soil, and produces best conditions for a steady rate of decay -- a moist seed bed and plant food supply.

Restoration

The system of rehabilitation we have described recognizes the fact that the average farmer is economically forced to grow a revenue crop from his land while he is restoring it.

Through proper tillage methods, cover cropping, and the application of soil bacteria, diatomaceous earth (mineral source), "organic" (organic and mineral source), we were able to produce two quality crops in a year on our experimental plot from once poor, sandy soil.

In our greenhouse we presently have tomatoes that weigh one-half pound to one and one-half pounds of excellent quality. Our soil was on its way to normality in less time than it could have been under conventional organic methods.

Costwise - production expenses of natural farming are less, and should be.

This system of soil development employs the methods which are designed in nature to rejuvenate topsoil, simply speeding up the process. One inch of topsoil residue per year can be established if these natural principles are followed properly.

This process achieves a kind of resurrection in which dead soil once again becomes alive!

AGRICULTURE DEPARTMENT
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AGRICULTURE DEPARTMENT

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 <u>completely</u> <u>dependent</u> 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. (<u>Farm and Ranch Bulletin</u>, 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.

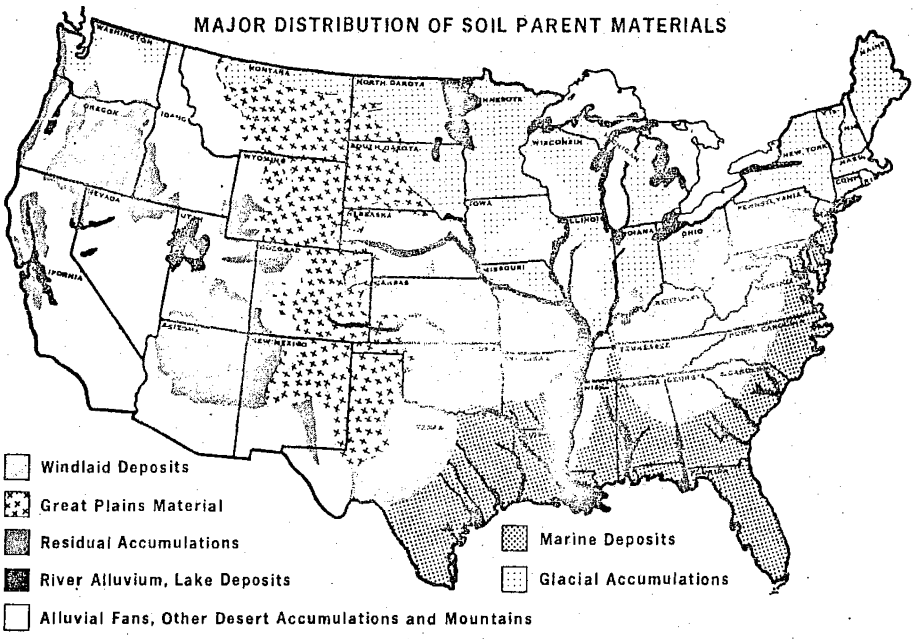
Another aspect of diversification concerns crop rotation and relying on a number of crops instead of relying completely on one crop for an income. Different crops take different minerals from the soil. Monoculture can rapidly deplete a soil of the particular element one crop uses. By rotating crops, 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

UNIV. OF ILL. & USDA

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 <u>man</u> 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 <u>learning</u> 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

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AGRICULTURE DEPARTMENT

SOIL FERTILITY

One of the great deceptions of this generation is the concept that the application of man-made chemicals and manufactured fertilizers alone can supply what the soil needs to produce abundant healthy crops. Another deception is that methods of natural or "organic" farming are not practical on a large scale and that it would not be possible to stop using chemical fertilizers and pesticides without total crop failure and resulting starvation.

The truth is there are vast supplies of virtually untapped natural ORGANIC and MINERAL fertilizers and soil conditioners readily available throughout this country and the world. These fertilizer materials when used in conjunction with the natural principles and methods of building and maintaining soil fertility are more economical, easier to use, and more beneficial to soils and health than the manufactured chemical counterfeits. We strongly recommend that farmers use the natural mineral and organic materials when fertilizers are needed to improve their soils.

The natural rock fertilizers will supply a variety of mineral elements in a form that will be released slowly in the soil by microbial activity. Organic fertilizers enhance soil microbial activity and increase soil humus. Humus improves the physical character of the soil by increasing its capacity to take in and hold water and minerals. It improves aeration and temperature relations, tilth and prevents erosion. Decomposing organic matter also provides nitrogen and carbon dioxide and many minerals to stimulate plant growth.

The extensive use of chemical fertilizers and failure to maintain the organic component of soils is resulting in rapid depletion of soil fertility and destruction of physical properties. Many soils are literally becoming hard as iron (Deuteronomy 28:23). The limited application of naturally occurring chemical nitrogen fertilizers such as "Chilean Nitrate" can be used on depleted soils for the purpose of providing the needed initial boost. This will provide a valuable green manure crop to help start the soil life cycles. Naturally occurring fertilizer materials contain a greater variety of elements necessary in plant nutrition than manufactured products. However, it is still important that they be used in proper balance with other soil requirements especially organic matter. Once soil fertility is restored, need for fertilizers (other

than the regular return of plenty of organic matter) will depend upon the original soil resources.

Studies have shown that highly soluble chemical fertilizers rapidly become locked up or leached from the soil. According to radioactive tracer experiments made at the U.S. Experimental Station, Beltsville, Maryland, only 2 to 10% of phosphate remains available. The following table is a comparison of the percentage of total mineral content remaining available to plants:

INORGANIC	ORGANIC
Nitrogen - 25%	Nitrogen - 100%
Phosphate - 10%	Phosphate - 80-90%
Potash - 10-15%	Potash - 80-90%

Using Soil Test Results to Restore Soils

To heal sick soil and produce profitable high quality, health-sustaining crops, it is necessary to stop using the farming practices that have caused the trouble, and begin farming in harmony with the natural laws God has set in motion. The big questions are, "Where and how to begin?"

Steps should be taken to determine the present condition of your soil so corrective measures can be formulated. Condition of plants and soil must first be examined in the field because of the many factors affecting crop production including: climate, soil structure and drainage, cultivation, insects, diseases, etc. Consideration of the types and varieties of crops suited to the soil types and climate should not be disregarded.

Hunger Signs in Plants

The health and productivity of plants are good indicators of the condition and needs of the soil; however, variations in temperature, moisture, light and disease can also cause similar symptoms.

Not Enough Nitrogen:

1. A sickly yellowish-green color.
2. A distinctly slow and dwarfed growth.
3. Drying up or "firing" of leaves which starts at the bottom of the plant, proceeding upward. In plants like grains and grasses, the firing starts at the tip of the bottom leaves and goes down the center or along the midrib.

Not Enough Phosphorus:

1. Purplish leaves, stems and branches.
2. Slow growth and maturity.
3. Small, slender stalk in grass; in small grains, lack of stooling.

4. Low yields of grain, fruit and seed.

Not Enough Potash:

1. Mottling, spotting, streaking or curling of leaves, starting on the lower levels.
2. Lower leaves scorched or burned on margins and tips. These dead areas may fall out, leaving ragged edges. In grains and grasses, firing starts at the tip of the leaf and proceeds down from the edge, usually leaving the midrib green.
3. Premature loss of leaves.
4. Plants like grain falling down before mature due to poor root development.

Not Enough Calcium:

1. Young leaves just beginning to bud become "hooked" in appearance and die back at tips and along the margins.
2. Leaves have wrinkled appearance.
3. In some cases, young leaves remain folded.
4. Light green band along margin of leaves.
5. Short roots.

Soil Testing

Simple chemical tests on soil samples can give you some guidelines by indicating the pH level (degree of acidity or alkalinity) and the relative availability of N-P-K (nitrogen, phosphorus, and potassium). Interpretation of test results must be made with regard to the testing method, soil type, crop and climate. As mentioned before, organic matter is the basic fertilizer necessary to establish and maintain soil balance. Organic matter should be supplied continually. A soil test will help tell you what is "locked up" or lacking in your soil.

Using Test Results

Proper use of test results will depend somewhat on the soil texture and type, intended crops and climate. A good husbandman will recognize and begin to understand these various factors by practicing the right principles of soil management. Man's responsibility is to dress (work) and to keep (preserve or protect) the earth (Gen. 2:15). Much of the work is performed by soil microorganisms, worms, etc. when we protect the soil by providing an abundant cover of organic matter.

Every seventh year the land is to have a rest and not be worked (Lev. 25:1-7). This will help restore the natural ecology and provide

new stores of organic matter necessary for soil balance and fertility. The sabbath year will also allow man to make repairs and improvements on the rest of his farm. "It is a sabbath of rest unto the land, a sabbath for the Lord:" The weekly and annual sabbaths also are essential to proper planning and management. Growing seasons and weather can be better discerned by planning around these seasons following the Hebrew solar-lunar calendar.

The system of cropping will be of particular importance when intertilled crops are grown. "The stirring of the soil in preparation of the seedbed and cultivation tends to break down the structure of the soil. . . . Intertilled crops such as peanuts, potatoes, tobacco, cotton, sugar beets, and vegetables are detrimental to soil structure because they require many tillage operations, return but little organic residue to the soil and generally have small shallow root systems" (Soil, 1957 Yearbook of Agriculture, page 389). Under conditions of intensive cultivation rotation systems and applications of manure have proven beneficial in maintaining productivity of the land. Proper use of soil is important. Certain types of plants are best adapted to acid soils (low pH). Some plants have higher requirements than others for nitrogen, phosphorus, potassium, and other elements. All of these factors should be considered to maintain production and fertility.

Greed to get all one can from the soil is the major cause of soil depletion. Chemical fertilizers are used to force that last ounce of production from the soil without leaving any residue to maintain the life of the soil.

A good husbandman will look first to his responsibility of keeping (preserving) the land for future generations. With the right goals in mind, he will not be blinded by greed and will recognize the importance of maintaining soil fertility through proper management. By understanding and applying these principles he will be able to properly evaluate test results to restore soil balance and maintain the mineral, organic and living portions of the soil. A good husbandman is always conscientious about his work and employs the valuable trait of "common sense."

Organic matter and more specifically humus (product of microbial breakdown of organic matter) is primary in correcting imbalances and deficiencies of the soil. Humus will serve to buffer an acid or alkaline soil to bring it back into the optimum growing range for most crops. It aids in unlocking unsoluble elements and also greatly increases the absorption capacity for high concentration of soluble salts such as occur in "alkaline" soils thus helping to balance all extremes of soil conditions.

When tests reveal an actual lack of certain elements they can be supplied by the moderate application of natural rock fertilizers. One application of these minerals lasts for a number of years. Once the soil balance and natural cycles for carbon, nitrogen and the various minerals are restored, further applications are not likely to be needed.

Fertilizer Materials

As already mentioned, the organic fertilizers are primary for providing nitrogen, making other minerals available and conditioning the soil. Some organic materials such as sawdust, straw and peat will require an extra source of nitrogen until the soil balance and life are restored. Nitrogen-fixing bacteria, some living in the soil and others in root nodules of legume plants, are capable of adding as much as 200 pounds of atmospheric nitrogen to an acre of soil each year. Most nitrogen of plant and animal remains is not available until liberated by the living bacteria. To help speed up the rejuvenation of dead soil, it may be advisable to spray a culture of soil bacteria on the fields. This is especially helpful if a farmer does not have enough compost to spread on the land to supply the bacteria. (Information on soil bacteria culture is available on request).

Mineral fertilizers are secondary to soil organic requirements and need to be applied only when there is an actual deficiency in the soil or to help restore the natural mineral cycles. Soils testing low in available minerals often contain ample. Once soil balance is restored these will become available for plant use and show high on the soil test.

Listed below are some of the natural products commonly used to supply the major elements. Composition may vary considerably from various sources. Natural products usually contain many other elements than those listed.

NITROGEN (Material)	Per Cent	PHOSPHORUS (Material)	Per Cent	POTASH (Material)	Per Cent
Chilean Nitrate	16.0	Phosphate Rock	30.0	Fly Ash	12.0
Bloodmeal	15.0	Bone Meal, Steamed	28.0	Wood Ashes	8.0
Guano	12.0	Bone Meal, Raw	24.0	Greensand	7.0
Animal Tankage	8.0	Animal Tankage	20.0	Granite Dust	5.0
Cottonseed Meal	8.0	Fish Scrap, Dried	13.0	Seaweed	5.0
Fish Scrap	8.0	Basic Slag	8.0	Fish Scrap, Dried	4.0
Bone Meal	4.0	Sugar Wastes, Raw	8.0		
Cowpea, Vetch, or Alfalfa Hay	3.0	Incinerator Ash	5.0		
		Cottonseed Meal	2.5		

"SOIL BACTERIA" is a culture of many varieties of natural soil microorganisms necessary for decomposing organic matter into humus, fixing nitrogen in the soil and combating many disease organisms. This in itself is not a "fertilizer," but serves to make elements available for plant use.

FERTILE MIX is a combination of 2 parts lignite and 1 part KMP innoculated with the soil bacteria.

Note: Chemical and spectranal analysis of these materials is available upon request.

How Much and When Should Fertilizers Be Applied?

Organic matterneeds to decompose to produce its effect as a fertilizer. The decomposed or composted products are effective immediately. Temperature, moisture and soil life will determine how rapidly other materials will become available to plants. For best results organic matter should be applied several months before planting in soils being restored. The amount need not be limited except by availability and rate it can be incorporated into the soil. Caution should be used with acid forming material, such as sawdust, pine needles and peat, to balance them with limestone materials unless an acid soil is desired.

Natural rock type fertilizers usually have a low level of available minerals. They are released by the activity of soil microorganisms and water. This will occur most rapidly during the warm growing season when an abundance of organic matter is present. Natural rock fertilizers can be applied any time, remembering it may take some time for them to become available, depending upon the condition of the soil They should be used moderately, especially the more soluble types as they can create an unbalanced condition if there is not adequate organic matter to buffer and balance them. Soil texture and types of plants will also affect the amounts needed. Most vegetable food crops require more minerals than the non-food type plants. The results will depend largely on the understanding experience and diligence of the husbandman.

Sources of Natural Fertilizers

There are numerous sources of organic fertilizers. Crop residues, green manure crops, livestock and poultry manures, composts, various mulching materials such as straw, spoiled hay and sawdust, peats, lignite, and other materials are available in most areas. Some organic products are available at local feed and seed stores, feed mills, cooperatives or perhaps even some grocery stores. Commercial products if used in excess, can result in a condition of imbalance by sudden release and subsequent lock ing up of certain elements. Use only as recommended or as a soil test would indicate. Organic matter and humus are helpful at all times to maintain soil life and balance.

When purchasing commercial "organic" fertilizer and soil conditioner products, check the quality. They should be decomposable to support and enhance soil microbial life. It should mulch to help balance and build your soil as a compost and not harm or poison it. The cost should be reasonable for your operation comparable to other materials.

The following is a list of several sources handling organic and natural rock fertilizers. You may write to them for information concerning their products if not available locally.

Natural Rock Fertilizers

Rhum Phosphate and
Chemical Co.
P.O. Box 361
Columbia, Tenn. 38401

Robin Jones Phosphate Co.
204 23rd Ave.
Nashville, Tenn. 37200

Fanning Soil Service
4951 S. Custer Road
Monroe, Michigan 48161

Organic Fertilizers

Farm Guard Products
701 Madison N.E.
Albuquerque, N. M. 87100

Bactelife International
Soil Conditioner Corp.
P.O. Box 212
Caldwell, Texas 77836

Southwest Wholesale Co.
P.O. Box 35052
Dallas 35, Texas 75200

Alginure Seaweed Products
P.O. Box 693
Sidney, B.C., CANADA

Blenders, Inc.
Lithonia, Georgia 30058

Diatomaceous Earth Sources

Perma-Guard
Box 6607
North 60th Ave.
Glendale, Ariz. 85301
(Insecticide and
mineral supplement.)

The information and guidelines given present only an outline for fertilizer application. If you desire further specific details please feel free to write.

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AGRICULTURE DEPARTMENT

SPRINGTIME IS GARDEN TIME

Delicious, nutritious - home grown vegetables - yours for the "growing." Let fresh, golden yellow, hot buttered roasting ears from your own garden tantalize and fulfill the desires of your delicate taste buds and those of your family. Crisp, fresh cut greens, firm juicy vine-ripened tomatoes - salad delight. Here are basic guidelines to help you "cultivate" a family food factory.

Successful gardening can be a very satisfying and rewarding experience for the whole family -- not only from the produce that is harvested, but also from the principles learned in applying basic laws of plants and soil. When applied properly, persistently, and effectively these principles will bring forth abundant, delicious benefits.

Gardening provides an exciting and "fruitful" family hobby. It presents an opportunity to strengthen family ties and for each member to enjoy the fruits of his labor. The germination and growth of a single seed portrays the wonder of Creation. Gardening is an engrossing pursuit, and you need not guess and depend on the proverbial "green thumb". Success comes from proper planning, timing, management, and following laws of Nature (Prov. 12:11).

Most people spend a large portion of their budget for food. Where available, many pay premiums for "home grown" vegetables. Why? Because of flavor and quality.

"Today, by train, truck, and plane we draw on the riches of half the world for food. This gain in variety has not been all gain, however, for in reaching afar we have lost freshness. We no longer have a ring of truck farmers around our major cities: today's lettuce, tomatoes, cabbage and celery must travel thousands of miles to market. Most important has been the loss in flavor" (Vegetables for Today's Gardens, Carleton, p. 2). A loss in flavor confirms a loss in nutrients.

Proper Planning

Fresh, tender, flavorful produce can be within close proximity of your back door if you take the time to plan a family garden. One of the first

things to consider is the size garden needed for your family. Allow plenty of vegetables for daily use for canning, freezing and storing to fit your needs. Do not overplant items which the family will not eat or too much of any one at a time.

Select a well drained soil on a gentle slope if possible. A southern slope is warmer and will enable you to plant 2 to 3 weeks earlier and encourage faster growth. The site should not be close to trees. Tree roots reach out many feet in all directions and will rob moisture and soil nutrients from your garden.

Timing is very important for a successful garden. There is a time to plant, and a time to pluck. There is an early harvest and a later harvest exemplified by the feasts of Pentecost and Tabernacles (Ingathering). The early garden is generally more profitable.

Planting and harvest times vary considerably in different parts of the country. In many areas, especially southern states, a year-around garden is possible. Northerly areas, high or mountainous regions, etc. usually have later and shorter seasons. Easily acquired gardening pamphlets (USDA Bulletin #9 "Suburban and Farm Vegetable Gardens" is one) give guidelines as to which vegetables can withstand light freezing. If needed you can check with your local county agricultural extension agent for information concerning the last and first freezing trends for your area. A general guide for last frosts in the spring is to notice the little wild flowers when in full bloom in your area. If it froze after they are in full bloom they would not make seed and the species would die. Although the dates vary from year to year, these wild flowers do not blossom too early or too late. Many guidelines can be learned from these little "miracles" around us.

The basic factors that determine the proper times for planting and harvesting include: soil condition, temperature, fertility, available moisture, seed quality and variety, and amount of light. These factors control seed germination, plant growth, and maturation. Ground cover and good soil fertility will modify and lessen extremes of temperature and moisture.

Soil Preparation and Fertilization

Having selected the best possible location, it should not change from year to year. This practice allows the soil to be developed to a high state of fertility and productivity by the addition of organic matter, mineral fertilizers, mulching and cover-cropping. If enough land is available, garden crops may be alternated between two plots. Soil-improving crops (legumes, rye, beans, peas, etc.) may be grown in one of the plots for cultivating into the soil while the other is producing.

Fertile soil is living soil. An important factor to look for in soil is the amount of microbial life it will support. The pH range and amount of organic matter generally determine the amount of life your soil will support. The pH is merely the degree of acidity (0-7) or alaklinity (7-14). 7 is neutral. Plants and soil life produce best in a pH range

of 6.0 to 7.5. Good organic material will help bring your pH to 7. The key to fertility is soil balance. Proper soil balance simply means all soil nutrients are available in a usable form for the desired crop. Balance is achieved by restoration of organic matter, soil life, and needed minerals. A soil test can assist in determining basic needs.

Plenty of compost, manure and a good cover crop worked into the soil will help keep the nitrogen and humus content high. Humus is the substance which gives the soil its dark color. It is an indication of the soil's fertility. Manure used to be carefully preserved and composted when people understood its value. All too often, for many today, it is little more than a pollutant. Manure and compost feed bacteria and earthworms which reproduce to keep soil in a more healthy and productive state. In applying manure or compost, work it into the soil with a disc or roto-tiller. (If you desire, you may write for further information on "Soil Fertility".)

The lack of major elements may be determined generally by plant growth.

Hunger Signs in Plants

Not Enough Nitrogen:
1. A sickly yellowish-green color.
2. A distinctly slow and dwarfed growth.
3. Drying up or "firing" of leaves which starts at the bottom of the plant, proceeding upward. In plants like grains and grasses, the firing starts at the tip of the bottom leaves and goes down the center or along the midrib.

Not Enough Phosphorus:
1. Purplish leaves, stems and branches.
2. Slow growth and maturity.
3. Small, slender stalk in grass; in small grains, lack of stooling.
4. Low yields.

Not Enough Potash:
1. Mottling, spotting, streaking or curling of leaves, starting on the lower levels.
2. Lower leaves scorched or burned on margins and tips. These dead areas may fall out, leaving ragged edges. In grains and grasses, firing starts at the tip of the leaf and proceeds down from the edge, usually leaving the midrib green.
3. Premature loss of leaves.
4. Plants falling down before mature due to poor root development.

Choose Good Seed

Another important item to consider initially is your choice of seed. Often good seed can be acquired from local gardeners or seed stores you know. Three major U.S. seed companies which carry good seed are Burgess, Burpee and Henry Field. Most companies advertize both hybrid and non-hybrid varieties and you will need to specify you want open pollinated

varieties when placing an order. Non-hybrid seeds produce a much higher quality product, both in flavor and nutritional value. Proper seed selection is of utmost importance to successful gardening.

When selecting your vegetables, carefully read the seed catalogue. The old name varieties for home gardens have more flavor than the commercial varieties which are bred for good looks, storage and shipping qualities. Flavor is a measure of quality and will bring rich dividends if considered in planning and selecting vegetables. A good booklet, "Care of the Home Garden" by the Joseph Harris Company, Rochester, N.Y., lists many proper varieties.

Cultivation, Planting and Care

A garden can and should be beautiful as well as useful. A variety of flowers can be planted for borders and interspersed in rows throughout the garden to add color and beauty. Some flowers such as marigolds, chrysanthemums, pyrethrums, and mums have helpful insect repellant characteristics.

When cultivating, strive to loosen and aerate the soil. A rake or garden harrow is fine to assist in preparing the seedbed for planting and sowing. Remember, your object is to loosen, not invert the topsoil, which in some cases may be quite shallow.

You may plant in any artistic form that meets your taste. However, if you desire nice straight rows, stretch a heavy cord or rope taut along the ground and walk on it. It leaves a good indentation in soft earth. The corner of a how or a pointed stake will make a suitable furrow for most seeds.

Start on one side of the garden, planting 30- to 45-day crops. When you harvest these crops, you could replant. Next to 30-day crops plant 45- to 75-day crops. Then plant your 75- to 100-day crops. This method of planting produces a continual vegetable harvest. If possible, plan your rows to run north and south for better utilization of sunlight by each plant. The previously mentioned USDA booklet #9 gives planting dates, depths, distances as well as many other specific helpful gardening details. (The "rule of thumb" is to cover three times the diameter of the seeds).

When planting certain seeds pollinated by wind, you may need to leave about 6-8 rows between types. This applies to garden seeds such as squash, cucumbers, pumpkins and watermelon. These should not be planted next to each other. These vegetables will cross-pollinate and produce inferior quality, flavor, and mingled seed. You can plant squash on one side or end and cucumbers on the other, but not together. Cantaloupe will not mix so it may be planted next to most any vegetable.

Take care in cultivating your garden properly. Do not hoe or cultivate too deep, too often or too close to the plants. Excessive cultivation does not conserve moisture.

After the plants are well established and you have cultivated a few times, it would be wise to mulch your garden. This will save labor and

conserve moisture. Earthworms have an ideal place to work under a mulch. This type cover helps maintain constant temperature and side moisture retention. Good mulch material is hay, straw, leaves, or any composted organic matter.

Keep weeds out of the garden. They rob your soil of moisture. A few inches of good mulch works well between rows to control weeds.

Keep a close check for insects in your garden. If you have properly selected seeds and have a rich fertile soil, the plants should be for the most part insect and disease resistant. In a garden that is properly fertilized, beneficial insects such as ladybugs, praying mantises, lacewing flies, and orange and black spotted beetles will take care of destructive insects that present themselves. However, to assist in insect control until proper soil and plant health is established, an inexpensive grade of wheat flour or diatomaceous earth dusted on plants when dew is on is helpful. If the insects have gotten out of control, add one part of Rotenone or Pyrethrum powder to ten parts of dust.

Do not water too much. Excessive watering retards root growth because the roots do not have to search for moisture. Also, the larger the root system, the more plant food becomes available to the plant and the better the production. Irrigation is a substitute when the blessing of rain is lacking. Many plants cannot take too much water, especially tomatoes. Too much moisture may contribute to unwanted fungus growth. One can easily tell when a plant needs water, not because the surface soil looks dry, but rather when plants begin to show a dark bluish green color or begin signs of wilting, or both. Much more good is derived from a real good gentle soaking (perhaps once a week in dry weather) rather than from daily wetting the ground. Also, it is best to not apply the water directly on plant foliage during the hottest part of the day. This can encourage "burning" rather than "cooling".

Harvest Time

When the time for ingathering has fully come -- here is what to do. Harvest your vegetables when they are ripe and contain the most nutritional value. At this stage they are tender and easy to cook and prepare. If they become overripe and too mature, they lose some of their nutritional value. Certain dried crops such as kidney, great northern, and navy beans must be mature when harvested. This also applies to pumpkin and some types of squash.

It is best to harvest only as much as can properly be taken care of (refrigerate, can or freeze) within three hours from harvesting. This will preserve the full tenderness, flavor and crispness. A home garden can often supply most of the vegetable needs of a family not only during the seasons it produces, but throughout the winter months if the produce is properly prepared and stored.

After harvest, if you desire to plant winter crops on part of the area, it is beneficial to mulch or use a cover crop on the rest. This gives the

earthworms and soil bacteria something to feed on and a chance to continue working before it gets too cold. This is part of a good program.

Remember to properly clean and store tools when your gardening season(s) are over. A light surface lubrication will prevent rust. Selecting an accessible dry location will help you locate them when needed and give them longer life.

Once you have made a garden plan -- stick to it. God's blessings require perseverance, hard work and diligence.

Successful gardening is rewarding and satisfying. How about it? Why not find out what a thrilling, educational experience and opportunity gardening can be for the whole family.

GDN

AMBASSADOR COLLEGE
BIG SANDY, TEXAS 75755

HERBERT W. ARMSTRONG, *Chairman*

AGRICULTURE DEPARTMENT

MICROORGANISMS OF THE SOIL

Soil Bacteria -- How They Help Plants Grow

Bacteria are minute forms of life that live abundantly in healthy soils. They, along with millions of other living organisms such as fungi, algae and protozoa, make up the life in the soil.

Each particle of soil under our feet is a little world of its own. Over each particle's surface is a thin film of water, teeming with many types of microbes. Bacteria are some of the smallest forms of these microorganisms. They are so small and complex that science still has a great deal to learn about them.

Although little is known about their anatomy, much is known about their effect on all living things. Only recently have we realized 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 any attempt to fertilize soil. There is no dispute over the prominent role soil bacteria play in soil fertility. The types discussed can thrive either in the presence of air (aerobic) or if air is excluded (anerobic). They fall into several major classes with hundreds of varieties in each class.

The first major type of bacteria we're concerned with are decomposition and decay organisms which live on dead plant and animal remains in the soil. They are called saprophytic bacteria. Their function is very important in the process of soil building. As they decompose organic debris nitrogen, carbondioxide and many minerals are liberated. Stems, leaves, roots, and virtually all vegetable and animal matter is turned into humus vital in maintaining soil condition and fertility.

> Simple carbohydrates and many proteins are decomposed by many soil microorganisms, but cellulose and nucleoproteins are difficult to decompose and relatively few soil organisms can do it. Cellulose may be digested by members of the genera Cellulomonas, Cellvibrie, Clostridium, Pseudomonas, Actinomyces, some molds, etc. This decomposition of cellulose which is found as plant residues in large quantities in soil, results in the production of acids which react

> with insoluble material rendering them available as plant foods. . . Cellulose ferments are used in waste disposal, water purification, and soil humus formation.
> --Bryan and Bryan, Bacteriology, pp. 114-115.

Another major type, nitrogen-fixing bacteria, convert atmospheric nitrogen to compounds utilizable by plants. Nitrifying bacteria also convert ammonia to utilizable nitrates. Without soil microorganisms continually at work replenishing the supply, plants would soon totally deplete nitrogenous substances from the soil. The mutually beneficial (symbiotic) nitrogen-fixing bacteria (of the genus Rhizobium) live in nodules on the roots of various leguminous plants. Legumes help replenish soil with this type of bacteria. The aerobic Azotobacter and the anaerobic Clostridium are non-symbiotic nitrogen-fixing bacteria. Nitrification or conversion of ammonia to nitrates occurs in two steps accomplished by autotrophic bacteria of the genera Nitrosomonas, Nitrosococcus and Nitrobacter. (Ibid. pp. 104-109).

Disease fighting microorganisms of the soil exert a natural biological control (antibiosis) on many of the parasitic organisms responsible for soil-borne diseases of plants. Antibiosis is accomplished in several ways. Sometimes they produce destructive toxic materials or antibiotics such as chloromycetin from the soil-borne Streptomyces venezuelae useful against brucellosis, typhoid and other microbial diseases (Bryan & Bryan, Bacteriology, p. 13). Some produce antibiotics to combat fungus diseases, nematodes, root rot and insects. In still other instances nonparasitic disease fighters compete more successfully for oxygen and nutrients and thus cause suffocation or starvation of parasites. "When fresh organic material, such as green manure, is added to the soil the nonparasitic microorganisms multiply rapidly, and whatever ill effects they exert on parasites are intensified" (Soils, 1957 Yearbook of Agriculture, p. 338).

A culture containing many varieties of these types of microorganisms is available on request from the Ambassador College Agriculture Department, Big Sandy, Texas. If a farmer does not have enough manure and compost filled with bacteria to spread on his land to restore bacterial life in the soil, a special culture of soil organisms will be very beneficial. The culture may be added for speeding the restoration of soil balance and fertility for growing abundant disease-free crops.

In summary, soil bacteria benefits you by (a) overcoming and breaking down harmful chemical residues from previous wrong practices, and (b) encouraging higher soil life such as earthworms which will create new balanced soil. Once you have the needed soil bacteria--continue adding plant and animal residue to feed and keep the soil life cycle going. Simple methods of farming, incorporating the life designed to help nature work for you, reap rich dividends.

* * * * *

GUIDELINES FOR GROWING MICROORGANISMS OF THE SOIL

Soil Bacteria -- How They Help Plants Grow

Instructions upon receiving one pound of bacteria material:

1. Add material to one gallon of water.
2. Add one pint (or about 3/4 lb.) of yeast or bloodmeal. (Do not use the yeast commonly sold under the name brewer's yeast. It has been heated to remove the bitter flavor and in so doing the yeast cells are killed.)
3. Add one-half pint (one lb.) of sugar or molasses. This feeds the bacteria allowing them to multiply.

Care

1. Let the mixture set about four days at around 70° F. It will multiply best at this temperature but will not die at another temperature.
2. After four days, add this to 50 gallons of water. Use a wooden or cement container. A plastic garbage container will also be fine.
3. Add about five pounds bloodmeal or natural yeast and five pounds of sugar or molasses. Be careful you do not over-feed the bacteria. Extreme over-feeding causes the culture solution to sour or form a thick scum on its surface. The scum reduces the availability of air and may cause the culture to die. Under-feeding may cause starvation.
4. Let the mixture set until bubbles begin rising. After 30 hours or longer (can be up to 7 days) depending upon the temperature, it is ready for application. The bacteria should be re-fed in about three weeks if not used. You can save a gallon if you wish to begin a new batch. The above is simply a feeding guide. Larger quantities may be made by increasing items proportionately. With proper care, the liquid culture teems with bacteria. Solid matter at the bottom of a container need not be saved for starting a new quantity. When spraying the culture, just pour the liquid off the settled material and apply.

Water varies in different areas in regard to acid and alkaline content. The bacteria may die in highly acid conditions. We have found ground limestone acts as a buffer to help control the pH or acid balance. If you have trouble keeping your culture alive, we recommend you add one-half pound of limestone to 10 gallons of water. In case you need to replace your bacteria, we can mail you another starter culture with a small amount of yeast for your first gallon for $1.50 (prepaid).

To check if the bacteria is alive it may be observed under the microscope, or if lacking a microscope, one might try the following:

1. Put a drop on a glass slide. If the droplet has some body to it and does not spread out flat, it is most probably teeming with bacteria. (You may compare it with a regular drop of water.)
2. After the mixture has set for 30 hours to a week (depending on the temperature), bubbles will rise. This is a sign of life.
3. If the mixture is cloudy and moving, it is a sign of life.
4. A noticeable odor is also a sign of an active culture.

We have completed numerous tests determining how long bacteria live in the package in which sent out. After many months in a hot, dry place, the bacteria will live and remain active. Though the carrier material may become dry, when water is added, the bacteria is fine.

Bacteria can be kept alive throughout the winter months.

Some keep an active liquid culture of it in their basement, covering the container to prevent freezing. If one does not need an active culture for application to plants or indoor gardens, a small amount may even be kept in a freezer. The culture will also remain alive, though dormant, if frozen in an organic carrier material. You need not be concerned about the condition of the bacteria outdoors as its activity simply slows down during the winter months.

When should the bacteria be applied?

The bacteria may be applied at any time, though a warm, moist soil with plenty of organic matter will produce best results. It is good to disc the soil following application; however, we have applied it with helpful results on crops, such as wheat and oats, after they were several inches high.

Application

Bacteria may be used in fields at the rate of 20 to 30 gallons per acre with a regular sprayer (garden rates - ½ gallon per square yard). It is helpful to disc it in. On pasture land, apply when the soil is wet or apply more gallons of water to the mixture per acre. It may also be applied by letting it drip into irrigation water when irrigating crops.

The bacteria may be applied on gardens, shrubbery, flowers, and lawn with a sprinkling can or small hand sprayer. Be sure your sprayer is clean and free of insecticides. If in doubt about it being clean, baking soda and warm water solution is very effective in clearing and neutralizing the sprayer. Agitate this solution in your sprayer about 15 minutes and drain it out completely. After this, the sprayer is ready for use.

If you have lifeless, sterile soil, applying soil bacteria (as well as organic matter on which bacteria can feed) will give you a resurrection and rejuvenation of topsoil. Following the process outlined will help dead soil become alive. It is one of the first steps in the restoration of poisoned lifeless soil. Soil bacteria represents only one facet in maintaining a balanced and living soil, but it is basic for right agriculture.

F O O D F O R B A C T E R I A G R O W T H

The Use of Yeast and Bloodmeal in Soil Bacteria Reproduction

We have found three types of material which may be purchased as food for culturing soil bacteria. They are bloodmeal, natural livestock yeast, or non-debittered brewer's yeast.

One of these products will generally be available at local feed stores. You should plan ahead if you desire or need many pounds of yeast or bloodmeal for culturing large quantities of soil bacteria. Make sure the food source is available and adequate before you begin.

Natural Livestock Yeast

Natural livestock or poultry yeast is becoming increasingly popular as a feed supplement. It is also an excellent food for culturing soil bacteria. If you use this feed supplement type yeast, the quantity of yeast fed the culture may be cut down by one-fourth because of the more active enzymes.

Bloodmeal

Through experiments at Big Sandy we have found that bloodmeal is a most satisfactory food for growing bacteria. It is a high protein organic material containing many enzymes. It does an excellent job and in some parts of the United States may be more readily available than yeast. It is somewhat cheaper and may be purchased at almost any feed store.

Non-debittered Brewer's Yeast

Natural yeast contains many enzymes and unidentified vitamins needed by living things. Brewer's yeast also contains many enzymes if it is not debittered. It is a natural brewer's yeast after it has fermented grain.

In drying or debittering the yeast it is commonly heated sufficiently (pasteurized) to kill the yeast cells and destroy the fermenting power. After this it may be used as a food supplement. Without this debittering or pasteurization process, fermentation might be produced in the digestive tract, causing severe indigestion if used as a food.

Debittered yeast is the commonly purchased dried brewer's yeast which has had the life taken out of it. Some types of yeast cells cause a bitter flavor and so they are killed by heat. Often the yeast is also fortified with vitamins. Because a high heating process kills the cell life, the yeast will not work in rapid reproduction of your bacteria culture for lack of the needed enzymes. Therefore, non-debittered brewer's yeast works best. Large quantities generally cost 15-30¢ per pound. One source from which you may order non-debittered brewer's yeast is: St. Louis Brewer's Yeast Corp., Box 65, St. Louis, Missouri, 63119.

Enough yeast is included with the initial package of bacteria culture for you to grow and feed five gallons of active soil organisms if you only need a small quantity (i.e. for a flower bed or garden plot). After adding the bacteria carrier material and the yeast to the first gallon of water (as per instructions) an additional four gallons of water may be added and after a few days you will have liquid bacteria culture to cover about 100 square feet. Please check in your local area if you need additional yeast or any of the above mentioned materials for culturing or reproducing large quantities of soil bacteria.

BAC

AMBASSADOR COLLEGE
BIG SANDY, TEXAS 75755

HERBERT W. ARMSTRONG, *Chairman*

AGRICULTURE DEPARTMENT

AN AEROBIC LAGOON FOR SUCCESSFUL WASTE DISPOSAL

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(NOTE: The following material on the Ambassador College lagoon system was presented at the 2nd International Poultry Liter and Waste Management Seminar at Texas A & M, College Station, Texas, in October 1968.)

Some weeks ago Dr. Howes visited the college campus where I work. In touring the grounds, we passed the college sanitation facility at which point the conversation switched to the lagoon, its function and success.

In beginning stages of planning the College, much discussion and study was directed in choosing a location. After somewhat lengthy deliberations, it was decided the location would be in a nicely wooded area of East Texas. This site had been used for a large annual Church Convention for several years. Some of the present installations could be altered and utilized by the College.

Sanitation facilities in use were septic tanks and drainage tile. The area was full of springs which caused the ground to be semi-saturated most of the time and limited the capacity and effectiveness of the present system. It was operational, but seemed likely to be inadequate.

Pressure to begin the College urged the decision to open with present facilities. It wasn't long before sanitation became a growing and "smelly" problem.

Several types of sanitation systems were considered. The College, like most others in beginning stages, had its growing pains. Economics was an important and needful consideration; however, not to sacrifice quality. An aerobic oxidation lagoon, it was thought, would best fit our needs. Lagoons were relatively new to this area. However, in Kansas, Pennsylvania and some other areas, the aerobic lagoon systems were quite popular. Reports showed them to be effective, efficient and economical to install and maintain. We decided to use this system.

The layout of our campus is of such a nature that we could take advantage of the natural terrain. Considering the slope of the landscape aided in selecting location for construction

of the lagoon. Natural drainage from all parts of the campus provided excellent fall for carrying waste materials to the lagoon. This eliminated the need for purchase of expensive and sometimes troublesome pumps.

The size of the lagoon would be determined, of course, by the amount of material to be handled. We needed capacity to handle approximately 250 people on campus over a 24-hour period and 400 students during the day for a period of 8 hours. Here is a quote used to guide in calculating the size of pond needed. "Aerobic ponds are designed to be aerobic throughout their depth, and unless they are mixed, they must be loaded at less than 20 lb. Biological Oxygen Demand (BOD) per day per acre to remain this way. When operated as unmixed ponds, they are valuable mainly as disinfection devices in which coliforms die away with the passage of time. Unmixed aerobic ponds may be constructed to have depths of 4 to 5 feet and to operate at detention periods in excess of 60 days."

Dimensions of the lagoon were determined based on the average daily volume. It was built to the following standards:

Volume: Not to exceed an average of 30,000 gallons per day (maximum of 60,000 gallons per day), average determined by measuring an average of the total daily waste discharges over a period of thirty (30) days.

Quality:

	NOT TO EXCEED		
Item:	Monthly Average	24 Hr. Daily Composite	Individual Sample
BOD	20 ppm	25 ppm	30 ppm
Suspended Solids	20 ppm	25 ppm	30 ppm

The above is a guideline that could be followed for any size operation. If the soil is sandy, a sealing type mud should be put in the bottom of the ponds. Barite, or driller's mud, worked into the bottom is good for this purpose.

Now that we had the pond, the next step was to charge it. Mr. Walter Klepfer, now a College employee, had been doing experimental work with soil bacteria privately for about 16 years. He observed, through experimenting with manure piles, compost piles, lignite deposits, etc., that certain types of the bacteria present caused a much faster rate of decomposition. This, of course, is common knowledge. However, he went on to select out those desirable types. His primary objective of developing this "culture" was to assist in farming operations.

He was later hired by the College to work in the Agriculture Department. The department began growing this bacteria in a large 5,000-gallon cement tank. To culture the bacteria successfully, it was necessary to feed it. This was accomplished by periodical applications of non-debittered brewer's yeast and sugar. The culture was used (and still is used) to spray on pastures and crop land. This helps restore soil micro-organisms that have been destroyed by improper farming methods. It proved quite helpful to speed the decomposition of chicken litter when applied directly to the floors of the houses, and to help speed up the making of compost.

When an aerobic lagoon system was adopted for the College, Mr. Klepfer recommended the bacteria culture be used to charge it. The culture had worked well to dislodge wastes in his own, and neighbors', disposal systems. In fact, usage of this culture helped keep the College septic system functional until the lagoon was completed. The culture has worked satisfactorily in the lagoon.

The oxidation pond is rectangular in shape, approximately 40 x 70 feet; 2,800 square feet; and 16,800 cubic feet. It successfully handled 350 people the first year; approximately 500 the second year.

The plans of this sanitation system call for all material to pass through a chopper before it is deposited in the lagoon. For several months the lagoon operated successfully without installation of the chopper. The fall of the land was such that it caused the material to tumble to the point of breaking into fine particles. The bacteria had no problem in completing the job of decomposition. Later, however, we installed the chopper to conform to state recommendations. It has proven to be an additional aid to digestion.

As the College grew, so did the volume of material dumped daily into the lagoon. When the lagoon would become overloaded, we would broadcast yeast and sugar on it, which would speed up the multiplication of the little "dung-eaters." Within a 24-hour period the balance was usually recovered. The original lagoon was designed to handle the wastes from 550-650 people. It was handling more than its supposed capacity before expansion was necessary. Installation costs of this type lagoon system will vary some according to layout. Ours cost around $18,000.

Expansion was achieved by the installation of a second lagoon adjacent to the first. An overflow pipe from the first is connected to the second lagoon. As excess digested liquid accumulates in the second pond, it is pumped off to be used for fertilizer. Some is applied by tank trucks and some is pumped direct to the fields through an irrigation line.

This year's first cutting of hay at the College was produced from a field fertilized with the digested liquid, which was applied through an irrigation sprinkler. This particular field is divided by the College airstrip. No liquid was applied to one side, while readily applied to the other. The fertilized section outproduced the other 3:1. We had an abundance of rain, so increase in production from moisture received by application of the liquid would be small.

Many ask if anything other than bacteria can live in the lagoon. As an example of some of the "life" in our lagoon, we have bacteria and our largest digestor is "George," an alligator.

Much information is available on lagoons, both general and technical. Books are regularly being published on the subject. One of the outstanding books is Advances in Biological Waste Treatment, sponsored by the Manhattan College, New York, published in 1963 by the McMillan Company, New York. In the back of this book is a bibliography which gives many sources of helpful material.

Waste control is a national problem. The conclusion of a conference on biological waste treatment several years ago was that the solution of the waste problem was to utilize natural microbiological processes.

Senator Jennings Randolph of West Virginia was a speaker at the National Pollution Exposition and Conference held at the Astrohall in Houston, Texas in April of this year. He spoke to 2,000 conference delegates from all across the nation. Never before had such a broad-based conference on pollution control ever convened. He had this to say: "Only recently have we become acutely aware of the fact that we are exceeding nature's ability and capacity to reprocess the kinds and quantities of wastes which are being produced."

An assistant Surgeon General of the United States, Dr. Richard A. Prindle drove this point home: "The deterioration of our environment is a problem so vast and urgent that anxiety about it must not be confined to elected officials, professional health workers and conservationists. Every level and facet of citizenry is affected and must be concerned."

This includes everyone of us here, our families, our communities and the institutions we represent.

Natural microbiological processes alone will never solve the colossal waste disposal problem of this nation and the world. But--sample aerobic lagoons do comprise one important link in the chain of needed answers and solutions.

LAG

AMBASSADOR COLLEGE
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HERBERT W. ARMSTRONG, *Chairman*

AGRICULTURE DEPARTMENT

COMPOST AND SOIL LIFE

Composting is necessary to build and maintain fertility in the soil. Nature is continually rebuilding the soil through composting. It is a vital part in maintaining balance. If composting were not taking place, the entire earth would be covered with dead plants. In converting dead plants into available nutrients, this process (composting) makes humus, builds fertility and supplies the food for more plant growth.

Some may wonder, "If composting is so important, why isn't it mentioned in Scripture?" The answer: It is. Quite prominently. But it is easy to read over because of changes in the language. Psalm 83:10 and Jeremiah 8:2, just in passing, mention that dung is intended for fertilizer, that it is "for the earth." But the best-known scripture, Luke 13:8, specifies manure as the supreme fertilizer. If "digging and dunging" a particular tree does not make it bear fruit, you may as well get rid of the tree because nothing will make it productive.

But these scriptures do not by any means indicate that manure should always be used in the uncomposted state, although in some cases it can. Compost piles are prominently mentioned in the Bible, but under another name -- dunghills. Dunghills are always compost piles. Pile up dung and barnyard litter and you can't get anything out of it but a compost pile. The frequency of the mention of compost piles in Scripture -- and the manner in which they were mentioned -- show that a writer could mention composting and the reader knew both what it was and how it was made. Notice!

Isaiah 25:10 mentions the raw materials: "As straw is trodden down for the dunghill." This comparison is useful only in a society in which the reader understands the composting technique well enough to get the point. Luke 14:34-35 tells us that if salt hasn't lost its flavor -- if it hasn't had any of its ten-to-fourteen minerals "refined" or leached out -- it is good for the compost pile. The same three basic ingredients -- manure, vegetation, minerals, including salt -- are still used today in making compost. Natural, unrefined salt has been used ever since ancient times both in compost heaps and as a fertilizer in its own right.

Mr. Turner says in his book, Fertility Farming: "... when compost is spread on the surface of the soil, and not ploughed in, it has the ability of increasing not only the nitrogen content of the soil, but also the phosphorus and calcium and potash. My knowledge of science is insufficient to explain why ... The fact is that they appear in abundance where surface organic matter is adequate ..." (pp. 34-35). On pages 39-40 he explains how: "Problems of so-called soil deficiencies --- certainly as far as the main elements are concerned -- have only arisen with the increasing failure to acknowledge and act upon this law" (that all which is removed from the soil must be returned to it) ... "Phosphate deficiency is one of the outstanding fallacies of science (in soil as distinct from certain types of solid rock). There is no such thing; or at least none that science can measure. All that the soil analyst can measure is availability. When the soil analyst tells us a field is suffering from phosphate deficiency he merely means that insufficient phosphate is available; in other words, that the soil does not contain enough organic matter to produce the necessary mineral-releasing acids in the soil. A soil only becomes 'deficient' when there is insufficient decaying organic matter upon it to release the mineral nutrients already present in an unavailable form....

"The solution therefore, to all apparent deficiencies, is adequate organic matter in the right place."

"Experience has shown me that the right place for organic matter is on or very near the surface of the soil."

From his conclusion: "We have had the audacity to assume that we know better than God. We have believed we could improve on the ways of nature and we find ourselves under the threat of famine, in spite of so-called scientific genius. God in His goodness has provided the means to abundance; we in our greed and arrogance have perverted and destroyed. The only way we can repair the harm we have done is to give nature a chance to work in her own way and, as far as we must interfere by way of farming and gardening, let it be in imitation of nature rather than in battle against nature" (pp. 248-249). Thus, we see the reason for Mr. Turner's wisdom and success. He realized God's way is best.

HOW TO MAKE COMPOST

One can obtain better results by decomposing an assortment of organic matter in a compost pile and then spreading the finished product in his fields. One who doesn't have enough livestock to supply all the manure he needs can usually scout around the countryside and find a few dairies and feed lots -- or poultry farmers -- with manure to sell inexpensively. Supermarkets usually allow one to haul off their vegetable trimmings at no cost. These two items -- manure and supermarket trimmings -- will form a pretty good basis for a compost pile even if you find little else. I have composted manure with just a little bit of garbage, leaves, and dirt in it. And even if these items should happen to be polluted with a little insecticide, that will not outweigh the advantages. The decomposition of the materials will generate many more microbes than the insecticide residues destroy. And the microbes will eventually break down and nullify most insecticides. Some insure best quality compost by growing cover crops to be mown and put in the pile.

Getting your next crop started off properly toward a good harvest depends largely upon getting a good supply of decaying organic matter--manure or preferably finished compost--into your soil before planting time. A compost pile is simple to work with, and utterly fascinating once you get started and see its results. It is as much fun as a new toy and as beneficial as a bank account. Even a beginner can make good compost.

The compost pile should be about five feet wide or more and built up in layers, like a cake--and can be either round or long and rectangular. For ideal results, the first layer should consist of about six inches of vegetation, preferably coarse, to let air in and excess water out. Next, put on a layer of manure, one or two inches thick, depending upon its type and richness. Dampen each layer of dry material as it is added to the pile. (Preferably with bacteria culture -- otherwise just water). On top of the manure put a very thin layer of topsoil -- a fraction of an inch -- and, if you have it, a few shovelfuls of compost from a previous pile. If you have none, use topsoil with decomposing vegetation in it -- such as is found in a forest floor or a littered barnyard corner. Next, put on a few handfuls of pulverized -- but otherwise untreated and unprocessed -- natural rock fertilizer if you have them -- such as rock phosphate, potash, limestone, marine sediment, diatomaceous earth, or even common dirt. The minerals and old compost are the "salt and pepper" of a compost pile. Now repeat the layering process all over again as long as you have materials or until the pile is about four feet high. The proportions of the material can be varied considerably as long as there is a good variety, so there will be a balanced meal for microorganisms and plants.

For ventilation of the pile, drive a husky stake or two down into it and shake them occasionally to keep air holes open. Or, you could build a four-inch flue of narrow boards, drill holes in its sides, and put it in the middle of the pile for ventilation. Even with proper ventilation, however, the temperature of a healthy compost pile will rise to about 160-180° Fahrenheit. This heat together with the fermentation of the pile will destroy all disease organisms and parasites, even tapeworms cysts. After several weeks the temperature will drop and the compost on the inside of the pile will be decomposed. The pile should then be torn down and repiled, with the undecomposed inside material put on the outside. Or, the outside material can be used to start a new pile and the fully decomposed inside material can be used immediately for fertilizer. A skiploader is useful when large amounts of compost must be made. The whole process of decomposition takes from two to six months -- or if the bacteria culture is used it can be ready in two to four weeks.

By working compost and manure into the top layer of your soil, its natural fertility will literally skyrocket and your plants will become healthy and insect repellent the very first season. You should, if possible, apply these principles to all your land and incorporate cover crops which are disked into the top few inches of your soil when the proper stage of development is reached. Cover cropping in this way is known as sheet composting.

Instead of burning or discarding leaves, garbage, and other refuse put it to use -- compost it. Every soil can use and needs the organic material compost supplies.

COP

AMBASSADOR COLLEGE
BIG SANDY, TEXAS 75755

HERBERT W. ARMSTRONG, *Chairman*

AGRICULTURE DEPARTMENT

PRINCIPLES OF POULTRY PRODUCTION

Today poultry farming has gone berserk. Actually some poultry farms are not even classified as farms, but appropriately named factories. Why? Because they treat the chicken as a machine and not an animal. The chicken is debeaked, decombed, dewinged, and declawed. It is shot full of vaccines, antibiotics, hormones, and other medicated food additives. It is put in a cage with water and feed passing by. It never experiences the taste of green grass or a fat juicy bug or worm. Is this the only way you can raise broilers or produce eggs profitably? Is there a simple, natural way for poultry production?

Modern production is oriented towards high production under unnatural conditions and depends upon the technological developments in medicine and nutrition for their success. The establishment of a poultry program should begin with an understanding of the natural laws involved. Basically they pertain to the selection and breeding of the birds, nutrition, sanitation and management practices.

The basis of the poultry flock should be the selection of the natural variety or varieties in the pure lines of birds best adapted to your area and suited to your purpose. It is rather difficult to find pure lines, so once a flock is established it would be desirable to raise your own replacements by selecting the best hens for brooding purposes and continually culling the poor producers and those lacking hardiness and resistance. Unfortunately crossbreeding programs are being used to gain hybrid "vigor" in place of selecting and mating for quality, resistance and production in the pure lines. (See Lev. 19:19.)

In mating birds of the light or egg breeds, such as Leghorns, generally one male is used for fifteen to twenty hens. In the general purpose breeds, such as White Rocks, one male with ten to fifteen hens is a better ratio. We are presently running one rooster for every ten hens in our layer flocks.

New stock to be added to the poultry flock should be isolated from the flock for about two weeks to make sure they do not have any disease or show the symptoms of disease infection.

Once you have obtained your chickens, how should you take care of them? First they must be fed. The best poultry rations can be the simplest if the feeds are grown "organically" on a fertile soil and if the birds are provided with tender green pasture or fresh greens daily along with adequate sunshine. Sunshine provides vitamin D. Green forage is high in the essential vitamins, minerals and high quality proteins required by poultry. In addition the bugs, insects and worms which chickens find provide protein and other "unknown factors" in the diet. A good pasture program will greatly reduce feed cost and help to maintain a healthy flock. Pastures should be rotated and tilled occasionally to prevent buildup of parasite and disease problems.

Pasture alone will not provide sufficient energy (calories) and protein needs for optimum growth and production. The simplest manner of supplying the extra energy and protein is to provide "free choice" grain (whole grains are more palatable than finely ground ones) and protein supplement. This will allow the birds to balance their own ration. Grit should be made available if birds are not on pasture. Laying hens generally need extra calcium which can be provided by high calcium limestone or oyster shells.

When good quality organically grown feeds and forage are not available it will be necessary to provide special supplements of animal proteins, vitamins, and minerals in order to prevent poor growth and production and disease problems. While striving for a simple and balanced feeding program, one may find it necessary to compensate for present deficiencies by adding some supplements to the basic ration. We formulate our rations by:

1. Determining the availability and cost of feeds in our area.
2. Following guidelines in Morrison's Feeds and Feeding.
3. Actual experience with our flocks.

One should be able to grow a portion of his own feeds. When feeds must be purchased we suggest you use feeds not contaminated with antibiotics, hormones or other medications and use the natural supplements when they are needed.

Fresh clean water should be available at all times. If a flock shows signs of illness, we have found it helpful to add a small amount of vinegar (1 oz. per gal. of water) as a purifier in the water and as an aid in digestion.

Another very important point of care is sanitation. The poultry house should be cleaned preferably once a month or more often if needed. At each cleaning the building can be disinfected with a washing of hot lye water or another method is whitewashing several times a year. This will not only free the house of lice, mites, and disease germs, but gives the building a clean, fresh fragrance. After cleaning, the house should be bedded down with clean, dry bedding such as straw, sawdust, or corn cobs--whatever is available in your area. A good deep litter is very essential. Ground corn cobs are excellent absorbing litter. The feet and claws of poultry are made for scratching and their beaks for pecking. Throwing "scratch" grain on top of the bedding daily provides the need for scratching and pecking--giving the poultry much needed exercise to help maintain healthy bodies.

Problems with external parasites such as flies, lice, mites, ticks, fleas, bed bugs, chiggers, etc., can be overcome by good sanitation and dusting procedures. Lime sulfur or cresol spray can be used in houses and on roosts. Dusting with woodashes, diatomaceous earth or finely powdered sulfur directly on the birds, in the nests or in a scratch box will protect the birds.

Part of sanitation is providing adequate ventilation and area. The floor space that should be provided per bird will depend on such factors as type of floor, size of bird, temperature and ventilation. Crowded conditions cause birds to develop habits such as picking, feather eating, and cannibalism which are apt to result in poor growth, poor feed conversion and poor laying, as well as possible disease outbreaks. General recommendations vary from one square foot per bird for broilers to four square feet for the larger general purpose type hens. For ample roost space, allow eight inches for each bird. Laying hens need about one nest to every four birds or community-type nests can be used if preferred. If hens lay eggs on the floor or in feeders, it may be that there is too much light in the nest. Make the nest as enclosed and dark as possible.

Several poultry farmers try to increase egg production by leaving lights on all night. This is a means of "forcing" the chicken. If God had intended poultry to see at night, He would

have created them with cat eyes. Poultry's digestive tract usually completes its duty before the night is over, giving the system a time to rest. By leaving the lights on, the chicken will eat all night and its body will wear out in less than half the time it should.

Management is an overall key to successful poultry production. Planning the whole program with the right goals in mind is the first step. Secondly, common sense, securing the right knowledge and experience will prepare a manager to achieve the planned goals. It is not possible to give all the particulars needed for a successful poultry program in a letter. Much useful information can be obtained through your County Extension Agent, books and USDA publications, and experienced farmers.

A final point of success has to do with following the basic principles in selection, nutrition and management. Hard work and being a conscientious husbandman are essential aspects of a good manager. God promises to help those who will do things His way.

PLT

AMBASSADOR COLLEGE

Agriculture Department

AC RANCH Big Sandy, Texas 75755 P.O. BOX 927

REVITALIZE SOIL

AND

USE TEST RESULTS

To heal sick soil and bring it back into profitable production of high quality, health-sustaining crops, it is necessary to stop using the farming practices which have caused the trouble, and begin farming in accord and harmony with the natural laws God has set in motion. There is always the question, "Where to begin?"

A step should be taken to determine as much as possible where your soil presently stands, so a plan of action can be formulated. A soil test will give a guideline to the available N-P-K (nitrogen, phosphate, potash) and the pH level. As mentioned before, organic matter is the key to soil balance. This should always be increased. A soil test will help tell you what is "locked up".

For example, if the soil is too acid, organic matter and ground limestone will bring it back into the growing range so soil organisms can multiply rapidly and begin to work efficiently.

Soils low in phosphorus or potash may need an application of ground rock phosphate or potash rock. Since one application of these minerals lasts for a number of years, in most cases the soil organisms will begin to liberate sufficient supplies from the earth itself so further applications will not be needed.

Nitrogen-fixing bacteria live in nodules on the roots of legume plants such as clover, peas, peanuts, soybeans, cowpeas, vetch, and alfalfa. These bacteria are capable of adding as much as 200 pounds of nitrogen to an acre of soil each year.

Nitrogen can also be added by applying manure and compost. Most nitrogen of plant and animal remains is locked up and must be liberated by the living bacteria. Still other forms of nitrogen-fixing bacteria make nitrogen available to a plant directly from the air.

To help speed up the rejuvenation of soil, it may be advisable to spray a culture of soil bacteria on the fields. This is especially helpful if a farmer does not have enough compost to spread on the land to supply the bacteria. A culture of soil bacteria can be grown in a tank and sprayed on the field at a rate of 30 to 50 gallons per acre. We have used a bacteria culture on our farm in Texas with excellent results. However, you need to have some organic matter for the bacteria to work on. The bacteria culture is not itself a fertilizer. It only activates the soil. (Information on this culture is available on request.)

General Table of Fertilizer Application

I. Guide to balancing the pH level. (Rate per acre)

Limestone	1 ton brings up the pH level 1 point
"Organic"	250 lbs. brings up the pH level 1 point
KMP	200 lbs. brings up the pH level 1 point
Gypsum	1 ton lowers the pH level 1 point
Liquid Sulfur	5 gal. lowers the pH level 1 point

II. Source of Nitrogen Supply.
Green Manure Crop -- Disc in clover, or alfalfa, or rye, or beans, etc.

or	Approx. rate per acre		Garden rate per sq. yd.
	Medium to High	100 lb.	1/4 lb.
"Organic"	Medium	200 lb.	1/2 lb.
	Medium to Low	300 lb.	3/4 lb.
	Low	400 lb.	1 lb.

III. Source of Phosphorus
Rock Phosphate

	Medium to High	200 lb.	1/2 lb.
	Medium	300 lb.	3/4 lb.
	Medium to Low	400 lb.	1 lb.
or KMP	Low	200 lb.	1¼ lb.

IV. Source of Potash
Natural Muriate of Potash

	Medium to High	80 lb.	1/8 lb.
	Medium	120 lb.	1/4 lb.
	Medium to Low	160 lb.	1/2 lb.
or KMP	Low	200 lb.	3/4 lb.

V. Source of Major and Minor Elements
Bacteria (key to unlock soil)

	20-30 gal.	1/2 gal.

Fertile Mix contains sources of N-P-K and soil bacteria. It is a blended "organic", "KMP", and bacteria fertilizer.

Medium to High	300 lb.	3/4 lb.
Medium	400 lb.	1 lb.
Medium to Low	500 lb.	1¼ lb.
Low	600 lb.	1½ lb.

In summary, to restore soil balance and maintain your proper pH level, you need organic matter. When soil is not producing properly and its minerals are locked up because of soil imbalance, more organic matter and living organisms are needed.

If you have further questions regarding specific soil test results, please feel free to write again.

STR

SOIL INFORMATION SHEET

To aid in interpreting the soil test and making recommendations, fill in the following information sheet, and submit with your soil samples. Each soil sample should be marked with your name and sample number which should correspond with the information furnished on this sheet. See mailing instructions on opposite side under Step 3.

NAME_____ DATE_____

ADDRESS _____

CITY _____ STATE_____

A. SOIL CONDITIONS: (Use ditto and check marks wherever possible.)

Laboratory No. (Do not write in this space.)	Your Sample No. (Field)	Acres in Sample	Upland	Location		Irrigated		Soil Type (if known)	Remarks
				Bottom	Second Bottom				

B. CROPS TO BE GROWN

C. CROPPING HISTORY

Sample Number	Next 2 Crops				Last 2 Crops					
	Next Crop 19___		Year after 19___		Present or Last Crop 19___				Previous Crop 19___	
	Crop	Desired Yield	Crop	Desired Yield	Crop	Yield	Fertilizer			
							Grade	Lb/A	Crop	Yield

D. GENERAL: (Please answer following questions if applicable to these samples.)

1. Will small grain be grazed? No___ Yes___ Which fields?_____
2. Has lime been applied during past two years? Which fields?_____
3. Will grass be used for hay? No___ Yes___ Which fields?_____
4. Will grass be used for grazing? No___ Yes___ Which fields?_____
5. If grazed, how many animal units per acre?_____
6. Will a legume be grown in pasture? No___ Yes___ Which fields?_____
7. What is the primary pasture grass?_____

PROCEDURE FOR TAKING SOIL SAMPLES

Soil tests can be only as accurate as the samples on which they are made. Proper collection of soil samples is extremely important. Chemical tests of poorly-taken samples may actually be misleading.

Step 1. Take one soil sample from each uniform area of 10 to 40 acres in a field. In areas such as east Texas, one sample should represent only 8 to 12 acres; whereas, in areas such as the Coast Prairie, where some soils are more uniform, one sample can represent up to 40 acres. The sample should be taken from over all the area. This can be done by taking a small amount of soil from 10 to 15 different places. Place these in a clean container (bucket, paper sack, etc.), mix thoroughly, and take out approximately 1 pint for the composite sample. Avoid sampling unusual areas such a slight field depressions and small eroded areas.

Step 2. When taking the small samples use a small spade. Scrape the litter from the surface. (For pasture, sample to a depth of 4 inches.) To use a spade, dig a V-shaped hole and take a 1/2 inch slice of soil from the smooth side of the hole. Repeat in 10 to 15 different places.

Step 3. Fill out completely the information sheet on the opposite side. Enclose together with the soil testing fee in a stamped envelope and attach to the outside of package containing samples so that both will reach the laboratory together. Address the letter and package to:

Soil Testing
Ambassador College Agriculture Dept.
Big Sandy, Texas 75755

$1.50 will cover costs.
(NOTE: All these steps apply to a garden on a smaller scale.)

PRECAUTIONS

1. Avoid sampling spots in the field such as small gullies, slight field depressions, terrace waterways and unusual spots.

2. When sampling fertilized fields, avoid sampling directly in fertilized band.

3. Do not use old vegetable cans, tobacco cans, match boxes, etc., to submit samples.

4. Do not use heat to dry samples.

5. Be sure to keep a record for yourself as to the area represented by each sample.

6. Be sure sample numbers on the boxes correspond with sample number on the information sheet.

SSF

AMBASSADOR COLLEGE
Agriculture Department
AC RANCH Big Sandy, Texas 75755 P.O. BOX 927

OUR FRIEND, THE EARTHWORM

Few creatures equal the burrowing earthworm as a necessity to better health and greater growth to plant and vegetable life. The earthworm indirectly is of utmost importance to man.

The burrowing earthworm is nature's own plow, his chemist, his cultivator, his fertilizer, his distributor of plant food. The earthworm surpasses anything man has yet invented to plow, to cultivate or to fertilize the soil.

Some 2,500 species of earthworms have been described by zoologists, ranging from microscopic in size to monsters in South America and Australia that grow to seven feet long and more than an inch in diameter.

All are "headless," eyeless and toothless. There are no external antennae or feelers. From end to end the body is composed of ring-like segments.

The earthworm's internal system is highly complicated. In a comparative sense, the earthworm's system does to the soil what the modern refinery does to crude oil.

The earthworm has a multiple system of hearts, minute tubes circling that part of the alimentary canal between the pharynx and the crop. Through a complicated system, these hearts supply blood to all parts of the body.

Minus lungs, the earthworm "breathes" through its moist epidermis or outer skin. His blood corpuscles are colorless and float to the surface of each segment where they absorb the oxygen.

The earthworm is bisexual, that is, it contains both male and female organs of procreation. However, this doesn't mean that the earthworm can go through life and reproduce his kind without need for contact with others of his species, for the worm cannot fertilize its own eggs. Mating occurs at night in warm moist weather. Two worms, leaving the tips of their tails in their own burrows, stretch out and find one another in the dark and exchange masses of sperm. This isn't done in a few seconds. The worms secrete a slime covering over themselves and remain in one another's embrace for two or three hours.

Earthworm eggs hatch in about twenty-one days. The new worm appears as a short bit of whitish thread about a quarter of an inch in length. Within twelve to twenty-four hours, their color darkens. Once hatched, it is a case of each worm for itself.

Certain species of earthworms, particularly those that come to the surface and crawl during wet or rainy weather, are active at night. Other species are active throughout most of the day and night.

The earthworm literally eats its way through the soil, except when it is highly porous. Having no teeth, everything before it, if not too large to swallow, is sucked into its mouth.

Every piece of soil and decayed vegetable and animal matter taken in by the earthworm passes through its digestive system, which is equipped with a gizzard-like organ. Here the food value in the swallowed matter is extracted for use by the worm. The balance is carried by muscular action down through and out of the alimentary canal. These waste materials are called "castings." Worm castings are the feces (manure) of earthworms. They tend to be more neutral than the parent soil, whether acid or alkaline, thus causing the earthworm to be a soil balancer. They are also much richer in nitrates, organic matter, total and exchangeable calcium, exchangeable potassium and magnesium and available phosphorous than the soil from which they were made. These creatures work tons of rich material into the soil every year.

Depositing castings is only a fraction of the good that earthworms do. They pull organic matter, such as dead leaves, down under the soil, and by their digestive juices break it down into a form usable to the plants.

Their burrows go down to eight feet or more below the surface, and they bring up rich minerals that plants need. The burrows improve aeration of the soil, permit the penetration of surface water, and help facilitate the downward growth of roots.

In the soil where the earthworms live, plant and vegetable life prospers. Earthworms are nature's own means of soil building and conditioning. The earthworm by its constant eating, pulverizing what it eats, and excreting it as castings, prepares the soil so that its mineral and chemical quantities are more easily absorbed by the tender roots of plants. The result is that we have a healthier plant, richer in chlorophyll; more fertile, healthier seeds; rapid, even growth; and if it is an edible plant, richer in food elements.

These advantages are the natural outgrowth of the burrowing earthworm. Nitrogen is much higher in the earthworm castings than in the native soil. Nitrogen is the first fertilizing principle to become depleted. But with earthworms functioning in the soil, nitrogen content is increased and will continue to remain as long as there are enough earthworms burrowing in the soil.

To the animal we have been pleased to call "lowly," God apparently assigned one of the mightiest tasks in the world--the task of keeping the surface of the earth forever renewed; the task of forever converting back into topsoil--humus--every bit of waste matter left over by man and beast, as well as every bit of dead vegetation, so that the earth might stay pure and able to support the life that God intends and keep the soil ever in a condition of health, wealth, and perfect harmony.

Of course the earthworm was given helpers to carry out his vast job. Helpers in the form of billions upon billions of tiny micro-organic creatures who do miraculous preliminary work. But the earthworm seems to be the chief executive, the co-ordinator, the homogenizer, and the final deodorizer, purifier and vitalizer of the waste. Not until it has been swallowed, digested, and excreted by him in particles that break down to the size of finely-ground black pepper, has the waste matter actually become earth again.

It was this stupendous assignment that man thought he could perform with man-made substitutes, evolved in the laboratories--lifeless substitutes which were supposed to maintain the life of the soil. No wonder we have come to such a mess soilwise and foodwise.

Commercial fertilizers used today have killed the earthworm and our soil does not have them. Lack of organic matter deep within, hence we have no earthworms.

You can't improve upon nature. Therefore, if we accept the earthworm as an important part of nature--as our friend, a natural friend--it behooves us to do our part to help and encourage the earthworm to do its part.

This is your new, perfect earth, made by nature's perfect earthmaker, the earthworm. Cherish it!

WRM

AMBASSADOR COLLEGE
Agriculture Department
AC RANCH Big Sandy, Texas 75755 P.O. BOX 927

I N S E C T I C I D E S

Insecticides affect all life on earth. Back in the 1900's natural methods of controlling certain types of insects were used. This was primarily done with sulphate and pyrethrum (taken from the dried center of certain flowers, mainly chrysanthemums). Nicotine from tobacco and rotene (from a legume plant of East India) were also used. These were a mild form of insecticide, yet did a very good job. After World War II, man began to use synthetic insecticides which delivered a much faster kill. In 1965 alone man used 900,000,000 pounds of these deadly synthetic (chemical) insecticides.

A form of arsenic was the first chemical insecticide. As insects became immuned and the kill lessened, more deadly poisons were introduced and became available on the open market. These fall into two main groups: 1) chlorinated hydrocarbons, of which DDT is one. 2) organic phosphorus. DDT was put on the market in the early 1940's. A German chemist developed it in 1939 and won a Nobel prize for this "great" achievement.

DDT has been used widely on every crop we grow. It is taken into the blood stream from the foods we eat, the liquids we drink and the air we breathe. This is done in most cases in quantities as small as 1/10 of 1 part per million, and soon builds up to 15 parts per million. This poison is stored up in the fatty tissue of the body and as it continues to build, causes a degenerative disease of the liver and other body organs. Tests show that men who work in DDT plants have accumulated as high as 648 parts per million. It is easy to understand why they are short-lived. DDT has infected our grain crops, hay crops, poultry and livestock feeds--even the milk we drink daily.

Then came chlordane, a little more deadly. In a 25 parts per million solution, one drop on the skin will cause poisoning and sometimes immediate death. Heptachlor came next, soon followed by epoxide, which is four times stronger than chlordane.

Next came the hydrocarbons. They included dieldrin, aldrin, and endrin. In solution they are 40 times more powerful than DDT. These are the insecticides that do such a fine job of killing birds, fish, and other wildlife.

The thions are being pushed as some of the best insecticides now available. Malathion and parathion are the most popular. One drop of parathion on the skin brings sudden death.

There is little wonder that our soil is dying, most of the life killed by poisons.

A visit with a bio-chemist who works for a large chemical company proved quite revealing. He mentioned that we had almost reached the limit concerning the effectiveness of poisons to kill insects. He said that over the years, the strength of the poisons has had to be increased to be effective. The insecticides developed would kill all but a few of the insects. Those not destroyed began to multiply at a much more rapid pace than before because there was no competition and more food. He went on to state there was only one stronger poison that could be used, and at only one-half part per million. If the solution were made any stronger, it would kill humans as quickly as insects. He did not say this, but it is easy to conclude that if for no other reason, man would be completely destroyed from insecticide or insect infestation in the near future.

The insects are only trying to do the job for which they were created--to destroy weak and sickly plants. Insecticides cause insects of necessity to mutate and become stronger in order to do their job. The poisons from insecticides are left in the soil which destroys soil life. The weakened soil produces weak and sickly plants which summon more insects, more and stronger insecticides are applied, and the drastic cycle continues.

Many people go right on ignoring facts and closing their eyes to them. "Educated society" has no solution.

ANSWER AVAILABLE

Healthy, living soil produces healthy plants with a built-in insect repellent. Certain spray or dust can be used while the soil is being enriched. We have found KMP (Diatomaceous Earth Insecticide) to be effective as a dry dust or mixed with water as a spray. The items mentioned earlier are quite helpful. Much can also be accomplished by introducing a natural enemy to the insects that are trying to be eradicated. (Rachel Carson's book, Silent Spring, offers helpful guidelines.)

Diatomaceous earth is not poisonous in any way. In fact, we use it in our livestock and poultry mineral. Neither will insects killed by KMP harm birds when the insect is eaten. Well, if it is not harmful to warm-blooded animals, and it doesn't poison the insect, just how does it work?

To understand the lethal effect on insects, we must first know a little about the insect. Most insects' shelter consists of a hard shell. Around the joints and spiracles insects secrete a liquid. What the KMP does is dehydrate the insect. It absorbs the moisture around the insect's joints, and demobilizes the insect. Being unable to move around to obtain food the insect dies. When the KMP is put under a microscope it looks like tiny pieces of glass. With this quality it cuts and severs the insect's skeleton shell. Once the shell is broken, liquid leaks out. With loss of only 10% of its liquid, an insect will die. Therefore, the insect is killed in two ways without poisoning it.

Another advantage of harmless insecticides over chemical insecticides is that insects cannot build a resistance to it. You will not have to add a stronger dose each time.

Diatomaceous earth does kill almost any kind of insect. There are some it does not. Don't conclude that KMP is a solution to all problems. Don't deem it as a panacea. Man did not create this element, he merely discovered it.

KMP works best when applied as a dust -- administered through an electro-static duster. "Perma Guard" is also a diatomaceous earth product and may be attainable in your area.

Through natural methods we can better keep God's agricultural laws. Remember, God has the power to rebuke the devourer.

"And I will rebuke the devourer for your sakes, and he shall not destroy the fruits of your ground, neither shall your vine cast her fruit before the time in the field, saith the Lord of Host" (Mal. 3:11).

INS

AMBASSADOR COLLEGE

Agriculture Department

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DIATOMACEOUS EARTH

Diatoms are microscopic, single-cell algae. The majority are exceedingly minute and one with a length of 1/200 inch is well beyond the medium size. They are known to occur in both fresh and sea water.

Both in fresh and sea water there are great numbers of free-floating diatoms which at times make up the main bulk of the minute sea life. The type that we use are fossil diatoms. The siliceous skeleton wall that remains after the death of the diatom has formed deposits generally a few feet in thickness. Most of these deposits were formed during the Noachian Flood.

Several fine deposits of this material have been made available to us with arrangements to procure as much as needed. We are using it at Ambassador College and feel it is very useful and helpful.

The industrial uses of diatomaceous earth are varied. It is used as insulation of boilers, refining of sugar, and in filtration processes. The oldest and best-known commercial use is that of a very mild abrasive in metal silver polish and toothpaste. It is also commonly used in paints and face powders. The amount used in polishes has increased greatly in recent years with diatomaceous dust as the base of silicon polishes for automobiles. One recent discovery is to use this material as a glaze for covering all types of pottery, especially the better grades.

As an insecticide, diatomaceous earth at Ambassador College is used as a means of protecting seeds against insects in grain storage (grain weevils), to destroy chicken lice, blue bugs, cattle lice, flies and ticks. It can be used for dusting fruit trees for various insects, for controlling tree bores in pine trees, and many insects in garden crops. The material gets its "killing" power as an insecticide by two methods: 1) Insects, worms, etc., breathe through the pores of their skin. The dust is so fine that it simply plugs these pores which causes the insect to suffocate, dehydrate, and die; 2) Fossil diatoms, when finely ground, have an abrasive action. Most insects and bugs have jointed appendages. When the material is applied, it enters these joints and dismembers them by the abrasive (cutting) action.

Diatomaceous earth is not poisonous and can be used on the soil as a fertilizer. Over a million tons are used annually in the United States alone. This material has great importance in agriculture as an insect repellant, a fertilizer, and moisture control in grain storage.

Application

There are three major ways natural diatomaceous earth (KMP) is used at Ambassador College:

1. As a fertilizer it can be applied on fields at the rate of 300 to 500 pounds per acre depending on how acid the soil is. It is high in phosphate, potash and has some nitrogen.

2. You may use it on all types of lice, ticks, blue bugs, and many kinds of worms and other insects as an insecticide. If used as a dust, it must be kept in a very dry place. It can be applied as a dust at the rate of 20 to 30 pounds per acre or as a spray using 20 to 25 pounds in 100 gallons of water. For best results, it is essential that the material be finely ground.

3. It is also very helpful in controlling moisture and insects in grain storage. Simply apply as the grain is being put into the storage bin at about seven pounds (KMP) per ton of grain.

When spraying this material as a fertilizer or an insecticide, be sure that the sprayer has a good agitator in it because the powder tends to settle out. KMP dust can be used in all types of orchards and groves, on fields, and gardens.

When KMP is used as an insecticide, applied in the dust forms, there is a problem of getting it to stick to the insect and the plant. Usually this problem occurs when the dust is not completely dry. There are instruments available on the market which produce an electrical negative charge which causes the material to stick and cling. Everything about us has a positive charge so the negative charge produces a magnetic effect. This instrument can easily be mounted on field or hand dusters. Brand names and availability may be provided if desired.

On the market, diatomaceous earth costs over twenty cents per pound. We can make it available from the Texas College at three cents per pound. This will just cover costs. It may be picked up at the college or we can ship it by rail or truck if the individual pays freight charges.

KMP

AMBASSADOR COLLEGE

Agriculture Department

AC RANCH Big Sandy, Texas 75755 P.O. BOX 927

BACTERIA--HOW THEY HELP PLANTS GROW

Bacteria are a minute form of life that live in the soil. They, along with millions of other living organisms such as fungi, algae, and protozoa, make up the life in the soil.

Each particle of soil under our feet is a little world of its own. Over each particle's surface is a thin film of water, teaming with many types of microbes. Bacteria are one of the smallest forms of these micro-organisms. They are so small and complex that science still has a great deal to learn about them.

Although little is known about their anatomy, much is known about their effect on all living things. Bacteria fall into several major classes with hundreds of varieties in each class. The ones with which we are concerned fall into three major groups which are: cellulose bacteria, nitrogen-fixing bacteria, and scripto bacteria.

The job of cellulose bacteria is to decompose the plant remains which litter the soil. They turn stems, leaves, roots, and virtually all vegetable matter into humus, decomposing or decaying organic material. As the cellulose bacteria decompose the plant matter, they liberate nitrogen and minerals, thus enriching the soil.

Nitrogen-fixing bacteria live throughout the upper layers of the soil. They fix nitrogen from the air and various plant and animal residues in the soil.

Scripto bacteria are disease fighting. They produce antibiotics to combat fungus diseases, nematodes, root rot, and insects.

These three basic types of bacteria are included in the package you may request. They are very important in unlocking the minerals and nutrients already in the soil. A soil may be high in various elements; however, without life, without soil bacteria, a limited amount and number of the elements can be utilized by the plants. Basic soil bacteria will help you have a balanced soil that will supply your crops with proper nutrients and fight off disease and insects.

The Care and Use of Bacteria

Instructions upon receiving one pound of bacteria material:

1. Add material to one gallon of water.
2. Add one pint (or about 3/4 lb.) of non-debittered Brewer's yeast.
3. Add one-half pint (one lb.) of sugar or molasses (this feeds the bacteria and causes it to multiply).

Care

1. Let mixture set about four days at 70° Fahrenheit. It reproduces most rapidly at 70°, but will not die at another temperature.
2. After four days add this to 50 gallons of water. (Use a wooden or cement container.)
3. Also add five pounds non-debittered Brewer's yeast and five pounds of sugar or molasses.
4. Let mixture set until bubbles begin rising. After 30 hours or longer (can be up to 7 days) depending upon the temperature, it is ready for application. The bacteria should be refed in three weeks if not used. You can save a gallon if you wish to begin a new batch. Also, you can make larger quantities at one time. The above is simply a feeding guide.

Application

Bacteria may be used in fields at the rate of 20 to 30 gallons per acre with a regular sprayer (garden rates - ½ gallon per square yard). It is helpful to then disc it in. On pasture land apply when soil is wet or apply more gallons of water to the mixture per acre. It may also be applied by letting it drip into irrigation water as it is being applied in the field.

Water varies in different areas in regard to acid and alkaline content. The bacteria will die in highly acid conditions. We have found diatomaceous earth acts as a buffer to help control the pH or acid balance. If you have trouble keeping your culture alive, we would recommend that you add one-half pound of diatomaceous earth to 10 gallons of water.

The bacteria can also be used on gardens, shrubbery, flowers, and lawn--applied with a sprinkling can or small hand sprayer. Be sure your sprayer is clean and free of insecticides. If in doubt about it being clean, baking soda and warm water solution is very effective and will clean the sprayer. Agitate this solution in your sprayer about 15 minutes. Then drain out completely and the sprayer is ready for use.

To help cover the cost of starter bacteria, you may contribute $1.50 per package. Soil bacteria represents only one facet in maintaining a balanced and living soil, but it is one of the basics for right agriculture.

BAC

AMBASSADOR COLLEGE

Agriculture Department

AC RANCH Big Sandy, Texas 75755 P.O. BOX 927

Ph. 636-4311

" O R G A N I C "

S O I L C O N D I T I O N E R

Builds and Conditions the Soil

Natural organic matter is one of the three basic soil constituents. A shortage or lack results in a decrease in living organisms, an unbalanced or "locked up" soil. More organic material in your soil results in more life, health and fertility. Organic matter is the only source of food supply for micro-life. In healthy soil it coats each particle of rock and mineral. It is the main key to life in the soil.

In supporting soil bacteria and micro-life, organic matter aids in the bringing of insoluble soil minerals into solution. It also increases the water-holding capacity of the soil, absorbing more than one hundred times its own weight in water. This moisture is then retained for future use and released to the plant as needed.

Other values of "Organic" include improving aeration and the physical condition of the soil, regulating soil temperature, reducing erosion and serving as an important source of nitrogen and plant food elements, increasing productivity.

Most soils continue to lose their organic matter because of false and improper agricultural practices. Fertilizer does have a definite good or bad effect on bacteria, earthworms and other forms of life. Care must be taken so one does not destroy but rather feeds and sustains the life in the soil. You can't get too much organic matter in the soil!

How can you get more organic matter in your soil? By using proper tillage methods, plant legumes, cover (green manure) crops. Keep something growing on your land at all times and apply organic matter (manure, etc.) whenever it is available. It takes thousands of pounds of plant matter and much time to make a few hundred pounds of composted organic matter. The organic soil conditioner makes available concentrated

organic matter which starts working as soon as it is applied to the soil. This natural soil conditioner also contains a rich supply of minerals. It is 75% organic and 25% mineral.

Though the bulk of the conditioner is raw concentrated organic matter, it contains many trace minerals and elements. These minerals though minor in volume, are major in importance. They affect the health of plant, animal and man, and are essential for proper soil balance.

Briefly, to skim the importance of these trace minerals and their function, they are needed to make the elements available in the soil to produce rich, healthy crops. They affect the production of protein, proper reproduction, photosynthesis, health and strength as well as normal growth.

Some of these trace elements found in "Organic" are:

Aluminum	Germanium	Silica
Barium	Iron	Silicon
Bismuth	Lead	Silver
Cobalt	Magnesium	Sodium
Calcium	Manganese	Strontium
Carbon	Molybdenum	Sulphur
Chlorine	Nickel	Titanium
Chromium	Nitrogen	Vanadium
Copper	Potassium	Zirconium
	Gallium	

This material is an excellent plant food for field crops, gardens, trees, house plants, and shrubs.

"Organic" is being made available through the Agriculture Department, Big Sandy. Ten lb. bags can be ordered by mail for $1.50 per bag, plus freight. Large quantities are available FOB our warehouse.

ORG

AMBASSADOR COLLEGE

Agriculture Department

AC RANCH Big Sandy, Texas 75755 P.O. BOX 927

F E R T I L E M I X

A Natural, Organic Soil Conditioner
Mineral Fertilizer with Soil Organisms

"Fertile Mix" contains soil building products such as high organic mineral, natural diatomaceous earth and soil bacteria. It is a well-balanced, blended soil conditioner impregnated with new soil bacteria. These natural substances are nature's helps to restoring fertility in depleted and "locked up" soil; which are described in the following paragraphs.

"Organic" soil conditioner contains approximately 75% concentrated organic matter. It starts working as soon as it is applied to the soil by feeding the living organisms and supporting the bacteria that makes plant food available. The many tons of nitrogen in the air are obtained through the fixation of nitrogen in the soil by certain bacteria. Because this mineral compost feeds the soil bacteria, it makes available nitrogen.

Minerals needed in the soil include many trace elements that are sometimes present only in microscopic amounts, but are vital to plant growth. The so-called minor or trace elements may be minor in volume, but they have a major importance in their effects upon the health of animal or man. While a few elements are needed in varying amounts to produce rich crops, still trace elements are needed to make those elements available to plants.

Some of the trace elements found in high organic mineral soil conditioner are:

Iron	Calcium	Lead	Nitrogen
Copper	Sodium	Silica	Vanadium
Nickel	Gallium	Cobalt	Germanium
Potassium	Magnesium	Sulfur	Carbon
Aluminum	Chlorine	Chromium	Molybdenum
Titanium	Zirconium	Bismuth	Strontium

Diatomaceous earth contains many of the essential elements required in the soil for plant growth. This material is a natural deposit of fertilizer that nature placed in one of its reservoirs, so it would be available for transporting to depleted soils everywhere. The very nature of diatomaceous earth is to serve as a normalizer and supply plant food. It helps unlock other essential elements of the soil, encourages better soil life, and is generally the protector of the soil. It stimulates root growth. It is longer lasting than synthetic substitutes and will not burn plants. It builds soil and soil texture.

What is soil bacteria? In order to complete the cycle of life in the soil; the uniting of ions; transporting elements to their proper place; nature requires the help of literally millions of microbic workers. These helpers are the bacteria and can be termed the life-giving factor of soil.

Good life productive soil has millions and millions of living organisms in every cubic inch. These living organisms (nature's workers) are truly the life of the soil and organic matter is their only source of food supply. Without these living organisms dead plants will not rot, minerals will not dissolve, no nitrogen is fixed and the glues to build soil structure are not produced.

Soil bacteria has proved most effective in ridding crops of nematodes and is also effective in combating other diseases and insects of the soil.

To help you restore vital organic and humus matter, unlock your soil, "Fertile Mix" is available to be picked up in large quantities from the Agricultural Warehouse at Ambassador College, Big Sandy, Texas, for $4.00 per hundred weight. It is quite costly to send it by motor freight; however, if you desire, it can be sent FOB.

AGRICULTURE DEPARTMENT
Big Sandy, Texas

AMBASSADOR COLLEGE

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Ph. 636-4311

YEAST FOR BACTERIA GROWTH

The Use of Non-debittered Brewer's Yeast in Soil Bacteria Reproduction

Natural yeast contains many enzymes and unidentified vitamins needed by living things. This starter yeast is made by fermentation of waste sulfite liquor from paper pulp.

The yeast becomes a non-debittered Brewer's yeast after it has fermented grain (converted sugar or sugar derived from starch into alcohol by the many enzymes of yeast). This yeast, filtered from beer or ale after fermentation, is high in protein (about 50%). It is filled with unidentified vitamins and enzymes which remain very active.

In drying or debittering the yeast it is commonly heated sufficiently (pasteurized) to kill the yeast cells and destroy the fermenting power so it may be used as a food supplement. Without this debittering or pasteurization process fermentation might be produced in the digestive tract, causing severe indigestion if used as a food.

De-bittered yeast is the commonly purchased dried Brewer's yeast which has had the life taken out of it. Some types cause a bitter flavor and so they are killed by heat. Often it is also fortified with vitamins. Because the heating process kills the life, it will not work in rapid reproduction of your bacteria culture for lack of the needed enzymes. Therefore, only non-debittered Brewer's yeast works!

Why are these enzymes important? These enzymes are produced by the yeast, and released for the feeding of bacteria. Not only does the bacteria feed on these enzymes, but it thrives and reproduces dozens of times more rapidly on the fermentation products these yeast cells cause. The

enzymes of yeast convert the sugar or molasses you put into your bacteria mixture into alcohol. They change an organic substance like sugar into a more simple substance the bacteria can directly use. The sugars are oxidized to CO_2 by the bacteria, causing bubbles to rise, a gassy fermentation, and a foul odor. This is one way you can tell if your bacteria is alive. Be encouraged and realize your bacteria is almost ready for application when bubbles rise, cloudy or gassy fermentation takes place and there is an offensive odor.

For best results from a properly fed culture, you must use an active non-debittered Brewer's yeast. It helps food become available in the right amounts for use by the bacteria. Man does not yet understand all that is involved.

Where can you get it? Non-debittered Brewer's yeast can be ordered from: St. Louis Brewer's Yeast Corp.; P.O. Box 65; St. Louis, Missouri 63119.

Cost? The smallest amount available is 50 pounds at 30¢ per pound. Amounts of 100 pounds and larger are presently 15¢ per pound (you pay the freight in both cases). If you would like smaller amounts of yeast, you may order from: Ambassador College; Agriculture Department; Big Sandy, Texas 75755. A donation of 30¢ per pound will help defray costs.

AGRICULTURE DEPARTMENT

NBY

AMBASSADOR COLLEGE

Agriculture Department

AC RANCH Big Sandy, Texas 75755 P.O. BOX 927

GROWING YOUR BACTERIA CULTURE

1) How can I tell if my bacteria is alive?

A scientific way to check if bacteria is alive is to put it under the microscope. Since you probably don't have a microscope, try the following test:

1) Put a drop on a glass slide. If the droplet has some body to it and doesn't spread out flat, it is probably teeming with bacteria. (You may compare it with a regular drop of water.)

2) After the mixture has set from 30 hours to a week (depending on the temperature), bubbles will rise. This is a sign of life.

3) If the mixture is cloudy, it is a good sign of life.

4) An offensive odor is also a sign of life.

We have completed several tests trying to find out how long bacteria would live in the package in which it is sent out. After twelve weeks in a hot, dry place, the bacteria was still alive and active. Though the material was very dry, when water was added to it the bacteria was fine.

2) When should the bacteria be applied?

Any time is fine to apply the bacteria. When the ground is moist is the best time, and it is better if it can be disced into the soil. However, we have applied it with good results on crops, especially wheat and oats, after it was several inches high.

3) How may I keep bacteria alive throughout the winter months?

Some keep an active culture of it in their basement by covering it to prevent freezing. If you do not need an active culture for application to plants or indoor gardens, you might keep a small source in your freezer. It will keep if frozen

according to limited experiments conducted here at the College. You need not be concerned about the condition of the bacteria outdoors as it becomes dormant during the winter months.

4) What about containers for bacteria?

Metal barrels might harm the bacteria, and the bacteria will eat holes in the barrel in a very short period of time. We put bacteria in a galvanized metal tank and within three months the tank had been eaten through. Maybe you won't have this problem, because of a different type water. Our water here is a little on the acid side and this contributed to the problem.

Those who haven't been able to locate a wooden barrel have had satisfactory results by purchasing a concrete tile and putting a bottom in it. In areas where they make sewage tile or septic tanks you can get a tile very reasonable and by setting it on the ground and pouring a little concrete in the bottom this makes an excellent tank. This way you can regulate whichever size you need for the amount you want to use on your land.

Some have asked how a cardboard barrel sprayed with plastic or a new polyethylene plastic liner would effect bacteria. We have not used a container of this type; however, we feel that the container should be satisfactory.

Note: It would be best to make a starter gallon and save some back, just to make sure you have good bacteria if one type of barrel does not work.

If you adhere to the above guidelines and carefully follow the directions accompanying the bacteria instructions, you should be able to reproduce your own culture with no problem.

Bac-2

CONQUER DISEASE -- THROUGH AGRICULTURAL LAW!

Ambassador College UK
Agriculture Department

Many people, looking at the state of agriculture today realize that serious problems beset the industry at almost every turn. The headache of finance looms overall, but it is more a SYMPTOM than a CAUSE in the business of farming!

Man's animals on the other hand, are plagued with internal and external parasites in every country on earth. Many fail to conceive, others abort and lots of them bring forth weak and diseased offspring. Our plants suffer massive annual attacks by fungi, insects and a host of other pests. At the same time our soils have become lamentably deficient in fertility and available nutrients.

The end result of all these problems is that food producers have sought the costly help of those offering substitutes for healthy soil, sound pasture management and good husbandry! Some will take longer than others to finally realize that pharmaceuticals for agriculture, artificial fertilizers, hormones, weedicides, pesticides, fungicides and all the other 'CIDES are nothing more than an expensive delusion!

Both farmers and consumers are together on the wrong road. Ultimately they must both retrace the steps they have mistakenly taken in the name of PROGRESS. Imagine the soul-searching it will take to abandon an industry that presently feeds 70 million tons of chemical fertilizers per year into the soils of U.S.A. -- a globe-encircling industrial colossus that funnels double the American per acre rate of application into European farmland and double that again into the soils of Japan!

It will take some time to wean farmers from their dependence on antibiotics. In Britain for example, (as far back as 1967) they were feeding their animals 168 tons of antibiotics in a single year! (Pharm. Journal, Nov. 29, 1969).

Belfast City veterinarian, Dr. J. F. Gracey declared at the end of 1968 that -- "Northern Ireland had gone antibiotic mad." He said -- "We spend six times as much on drugs as any area of comparable size in the United Kingdom, yet Northern Ireland is losing £15 million a year through animal disease." ("Farmer and Stockbreeder", Nov. 19, 1969. p. 9).

One might also cite the problem of leaf diseases in grain production and reflect on the need for drastic change in man's attitude toward one more of his current difficulties.

According to Dr. W. C. James there is an annual £40 million loss in yield from the British barley crop, due to leaf diseases ("New Scientist", Dec. 11, 1969, p. 551). However men indulge in curious forms of self-deception. The farmer could turn to a system that will eliminate these huge and unnecessary losses. Does he? No, instead he desperately seeks the services of those who gear themselves for a profit-making multi-million pound fungicide and pesticide attack on the problem.

PROGRESS is then measured by deducting the farmer's outlay to the drug industry from the loss said to have been avoided by employing such new-found scientific tools. Thus by subtracting one LOSS, (the cost of fungicides etc.) from that even greater LOSS, (the estimated annual crop damage) -- we come up with a net GAIN!!

Surely it would be more realistic to ADD the cost of the chemical treatments to the total estimated crop damage and show a gross LOSS. After all, neither the initial damage from leaf diseases nor the costly chemical treatments should have been necessary!

This of course is NOT the way man thinks today. Sick soil, plants, animals and people have throughout history been an acceptable economic loss. You may say that mankind continues to wage a herculean struggle in treating the symptoms of these troubles, but the fact that they occur is still shrugged off as inevitable.

Good News!

We however, bring you good news! Agricultural research on the Campuses of Ambassador College has revealed that man's worldwide problems in food production are far from "INEVITABLE"! We also know that they are the direct result of broken laws.

Even after admitting this, most of us still retain a little gnawing doubt as to whether the correct way does really work. What you probably need is some concrete proof -- some solid practical examples of where other people have definitely been rewarded with unquestionable success. The following quotes have been searched out and specially selected with this very purpose in view. They are also chosen because they cover for you most of the major aspects of food production.

Study them and see for yourself something of the rewarding success other people have had as they have harmonized their activities with natural law.

PLANTS

Sugar Beet

"... first let us see whether we have grounds for believing, or even hoping that manure or compost possesses any curative properties. Let us, for a start, consider that job that Dr. H. C. Young did on sugar beets in Ohio. Dr. Young is no wild-eyed fanatic. He is on the staff of the Ohio Agriculture Experiment Station, and, as reported in "Sugar" for June, 1944, he was called in by the sugar growers to tell them what was the matter with their beet fields. Dr. Young found them so infested with black root disease that yields had dropped from 18 tons per acre to 5, and some of the land was being abandoned as unworkable. What did he do? Did he spray the beets? Did he treat the seed with antiseptics? Did he fumigate the soil? No, he fed the soil organic manures. Did it work? It did. The yield of beets rose from 5 tons per acre to (in some cases) over 20 tons, and Dr. Young reported that THE CONTROL OF BLACK-ROOT DISEASE IS NOW POSSIBLE 'with the use of ample manure or other organic matter to plough under.'" ("Make Friends With Your Land", by L. Wickenden, p. 20).

But as this author said himself, -- one swallow doesn't make a summer so let's pass on to another crop.

Sugar Cane

Now see what the results have been in curing outbreaks of the dreaded Mosaic Virus. This scourge came close to destroying the industry in Louisiana and it has been a plague wherever cane sugar is grown!

"The chief chemist of the South African Sugar Company, Mr. G. C. Dymond, as reported in Sir Albert Howard's "The Soil and Health", began experimenting in 1938 on the use of compost for checking the disease. He planted two plots, side by side: one was treated with compost, the other was not. In each lot virus-infected cane was planted. During the following two years, the cane in the untreated plot showed 100% infection; in the treated plot, 60%. In the third year infection in the treated plot dropped to 25%, and in the fourth year to zero."

This is a most significant result, but what follows is even

more important -- "Cuttings from the cane which had recovered from the disease were planted out in a composted lot and maintained their immunity. A row of 100% infected cane was planted adjacent to this plot but infection did not spread to the healthy cane, proving that it had become immune. Dymond, in reporting these results in 1944, wrote:

"'The point to be emphasized ... is not so much that (diseased) cane can stage a comeback ... but that the fundamental principle of soil fertility ... may be applied to any suitable variety of sugar-cane. In this way only can the industry be assured of healthy seed and healthy crops in perpetuity.'" (ibid. p. 21).

SEEDS

Dr. William Albrecht from Missouri put his finger right on the very centre of the soil fertility problem and its effects when he said: "That we are pushing crops to the fringes of soil fertility for their survival is indicated by the common farmer report when he says, as an example, 'I MUST GET SOME NEW SEED. MY OAT CROP IS RUNNING OUT.' He is merely reporting that the regular use of some of his own grain as seed for the next crop, while depleting the neglected soil fertility, has demonstrated the extinction of that species. It is showing that it can no longer survive in that soil-climate setting. If its own seed will not be its reproduction, shall we not see the advent of a failing physiology because of failing soil fertility, that was formerly protection against diseases and pests under natural survival?" ("Digest No. 3 Natural Food Associates", p. 51).

Ryegrass Rejuvenation

Friend Sykes who before his death was a practical English farmer writes: "A few years ago I was approached by an eminent firm of seedsmen with the following proposition:

'One of the most valuable strains of perennial ryegrass is Aberystwyth S.24. ... seed for it has been grown for many years in the north of Ireland. The growers in that region have applied sulphate of ammonia in such heavy dressings that the seed has altered its character considerably. Whereas they used to harvest half a ton of seed to the acre, with a 97 per cent germination in fourteen days, and would add to this two tons of

hay per acre, now after several years of this forcing treatment, they have reduced the germination to about 55 per cent, and the hay yield has fallen to as low as fifteen hundredweights to the acre. With your organic methods of farming, we are wondering whether it would be possible for you to regenerate this seed, and to grow a large area, so proving the value of your theories.'

"... I agreed to try this experiment and promised to grow a hundred acres of this ryegrass for seed. ... The first year, the crop did not come at all well. We cut and dropped it. The second growth was rather more pleasing, and this was heavily grazed with cattle. Their dung and urine fell on the previously dropped crop and made a sheet of humus-forming material. During the winter, this sheet of humus decomposed, and in the second year we had the most success successful crop of ryegrass that I have ever seen. the acre and two tons of hay. ... the seed ... tested 89 per cent germination in three days, and 98 per cent in fourteen days. This startling change from low-germination seed was achieved within two years, and is unmistakable evidence of the virility which an all-organic soil can produce." ("Food, Famine and the Future", Friend Sykes, pp. 120-124).

HORSES

Stamina and Health

Fairfield Osborne writes that: "A dramatic example of the relationship between land health and animal health is provided by the decline and rebuilding of the fortunes of one of the great thoroughbred racing and breeding stables in America within the last fifteen years. This establishment for decades had been one of the most consistently successful in the history of the American turf.

"... Commencing with the year 1933 the fortunes of the enterprise, as to both racing and breeding results, began to dwindle. Each year fewer and fewer races were won despite training. Further, and even more alarming, breeding results began to decline, fewer mares each season came in foal, and mares began to drop stillborn or deformed colts. So bad did the situation become that during the entire year 1941, with some sixty brood mares to draw from, barely a race was won and breeding results were equally disappointing. The owner was told by various racing experts that it was apparent that the bloodlines of his stallions

and mares had 'run out' and that there was nothing for him to do but dispose of his horses for the best prices he could get and start anew.

"... It was found that the soil had in fact slowly and insidiously lost its natural fertility. ... It was observed that scarcely an earthworm was left on the entire property. A major programme of soil building was then undertaken. Cattle were introduced, manure was widely used, green crops were grown and ploughed under, and even, when the time was right, earthworms were reintroduced. Within two years the results on the track and in the breeding farm took a marked turn for the better. Improvement thereafter was consistent and rapid and by 1946 the stable was the third highest winner of races in the entire country and the breeding results had returned to their earlier excellent standard of mare fertility and sound colts." ("Our Plundered Planet", F. Osborn, p. 80-81).

CATTLE

Foot and Mouth Disease, etc.

Sir Albert Howard related his experiences with cattle and their related diseases during his many years of practical experience in India (from 1910 to 1931):

"I was naturally intensely interested in watching the reaction of these well-chosen and well-fed oxen to diseases like rinderpset, septicaemia, and foot-and-mouth disease, which frequently devastated the countryside. None of my animals were segregated; none were inoculated; they frequently came in contact with diseased stock. As my small farm-yard at Pusa was only separated by a low hedge from one of the large cattle-sheds on the Pusa estate, in which outbreaks of foot-and-mouth disease often occurred, I have several times seen my oxen rubbing noses with foot-and-mouth cases. Nothing happened. The healthy well-fed animals reacted to this disease exactly as suitable varieties of crops, when properly grown, did to insect and fungus pests -- no infection took place." ("An Agricultural Testament", Sir Albert Howard, p. 162).

"It was soon discovered in the course of this work that the thing that matters most in crop production is a regular supply of well-made farm-yard manure and that the maintenance of soil fertility is the basis of health." (ibid, p. 165).

Mastitis

Newman Turner -- another practical British farmer, writes in a way that will raise the eyebrows of many readers!

"There was a time when I followed all the correct routines in the anti-germ warfare. My cows, my staff, my milking parlour and milking machine were almost continually submerged in disinfectant! I should have thought it impossible for the most evasive germ to penetrate the armory of my germicidal front. But cows continued to go wrong in the udder with monotonous regularity. I might as well have saved my time. I decided I would save my time and stopped all the complicated procedure of germ warfare, incidentally saving myself a considerable sum of money formerly spent on disinfectants. The germ now had a free hand. My herd was completely defenseless. Maybe the germs took pity on a defenseless enemy, for though I might have expected now to find mastitis rampant in every udder in the herd, the disease went quietly on as before, just as though the disinfectants had never been there at all!

"I concluded that both the experts and I had been chasing an illusion, and I decided to experiment on a different line altogether. After the experimenting with the application of the virulent discharged from an infected quarter to the udder of a healthy cow without result, I changed my attitude to the germs completely." ("Fertility Farming", Newman Turner, p. 218).

HUMANS

Health Under War Conditions

"Dr. Scharff, chief officer of the Singapore Health Department, reported in 1943 that, under his supervision, a group of 500 coolies were given the use of 40 acres of vegetable allotment on which to grow their own vegetables. The preparation of compost was undertaken on a large scale, this compost being the only fertilizer used. He reported 'a surprising improvement in stamina and health' not only among the coolies themselves but among their women and children dependents; also that the health of the group was 'outstandingly better' than, that of other groups similarly placed but not enjoying the benefit of a diet of compost grown food." ("Make Friends With Your Land", L. Wickenden, p. 98).

Linkage Between Health and Soil Fertility

"One authority, chairman of the Department of Soils at the University of Missouri, has reached the conclusion, ... that soil fertility on an individual farm can be so depleted through failure to return manure, crop residues and other enriching elements as to change that farm within a single human generation from a place of good health to one of deficiency diseases for the farm animals and for the families that live upon it. He further observes that the same crops, still growing after decades of farming, may have gone over from protein-producing, mineral-supplying sustenance to vegetation mainly of fuel and markedly lacking in the nutrients that are required to maintain health. The changes may occur without any diminution in the bulk of the crops or, in other words, the tonnage output of the farm." ("Our Plundered Planet", F. Osborn, p. 81-82).

Mexico -- A Tragic Example!

Noted Austrian soil scientist A. France-Harrar writes: "In 1952 Mexico showed more than 40% destroyed land ("man-made desert"). Of this soil only 72% still appears capable of being irrigated and at the same time of being supplied with sufficient organic matter.

"... A general test for the deterioration of soil by loss of humus is the ripening time of maize. At the time of the conquistadors maize ripened everywhere in the country in 3 months. Now it takes 6-7 months. On a completely eroded tableland the small maize grains which thrive there are not ripe in less than 11 months." ("Humus: Bodenleben und Fruchrbarkeit", Bay. Landwirtschaftsverlag, 1957).

SOIL FERTILITY

All of these examples appear to have one thing in common -- success has been achieved through the medium of fertile soil. But what is a fertile soil? Simply stated, it is one that is rich in humus. Then -- what is humus?

Selman A. Waksman, professor of Soil Microbiology, Rutgers University, is probably the world's leading authority on the subject of HUMUS. He states that: "Humus is a product of decomposition of plant and animal residues, through the agency of

micro-organisms. The chemical composition of humus is determined by the nature of the residues from which it is formed, by the conditions of its decomposition, and by the extent to which it is decomposed. Chemically, humus consists of numerous organic complexes, the major group of which consists of lignins and lignin derivatives and of proteins; a minor group contains carbohydrates, fats, organic acids, alcohols, and other carbon compounds." ("Humus", Selman A. Waksman, p. 185).

Waksman clearly and dogmatically states that: "A decrease in the organic matter content of the soil accompanies soil deterioration and is in itself a cause for further deterioration of the soil, whereas an increase of the content of organic matter and nitrogen is a symbol of soil improvement." (ibid., p. 413).

"Such physical characteristics of the soil as its structure, texture, moisture holding capacity, and temperature, are modified by the presence and abundance of humus. As a result of the various ... reactions between humus and the inorganic constituents, the acidity of the soil, its colloidal condition and its base exchange capacity nutrient availability are greatly affected." (ibid. p, 414).

Official Blindness!

These numerous examples may well raise the question -- if the above individuals have an understanding of at least certain aspects of natural law, is there no such knowledge in official circles or records? Yes there is!! And the most generous view is that it lies buried, forgotten or lost in the agricultural archives of recent history!

Professor Barry Commoner, of Washington University, cites the embarrassing official example of the Sanborn Field Trials at the Agricultural Experiment Station in Missouri, U.S.A.: "Here in 1888, the director of the Station, J. W. Sunburn, established a series of long-term experimental plots to study the effect of different agricultural practices on crop yield, and on the nature of the soil. In 1942, the Station published a remarkably revealing account of 50 years of patient study of these plots.

"Proper crop rotation and the use of manure (organic) ... maintained the organic nitrogen content (humus) of the soil.

"In contrast, with no fertilizer added, the organic nitrogen, and with it soil productivity, declined drastically;

"... The Sanborn Field studies also included experiments with chemical fertilizers ... which provided nitrogen in the form

of nitrate ... it failed to maintain the organic nitrogen content of the soil." And over a period of 50 years this soil lost two-thirds of its original soil organic nitrogen.

Professor Commoner continues by saying -- "To quote the 1942 report: 'The organic matter content and the physical condition of the soil on the chemically-treated plots have declined rapidly.'" ("Soil Association Journal", April 1968) .

Haughley is another conveniently ignored experiment. Many so-called knowledgeable people in agriculture would be spared embarrassing questions if it would only lie down and fade away, or die!

Sir Albert Howard was knighted for 'fathering' the modern concepts of organic residues and their fundamental link with the health of the biotic pyramid. But his work now appears to be officially treated with studied indifference and relegated to the dusty shelves of the second-hand book shop!

The work of Sanborn, Haughley, Howard, Turner, Sykes, Wickenden and many others may be buried and pass away, but they have each helped the researches of The Agriculture Department on the Campuses of Ambassador College. We are learning how to re-plan the production of health-giving food in the world tomorrow. And if we can help you to gain further understanding in the right management of your environment, we will be pleased to do so.

GARDENING MADE EASY

by The Department of Agriculture
and Environmental Research,
Ambassador College, U.K.

Many have written to our Agriculture Department asking for guidance on gardening. As a result of this, we are now happy to present the following brief outline of the main points. It should help and encourage you to produce a successful garden. Success is not difficult: it depends on how well we follow a few simple laws God has laid down. That means we must learn to work WITH God's creation and not AGAINST it as man has usually done!

1. WHY HAVE A GARDEN?

A. Anyone who GROWS HIS OWN food will assure you there is no substitute for the flavour and quality of freshly picked, home-grown produce.

B. You are largely what you eat and if most of your diet is produced on unhealthy soil, you will be susceptible to regular bouts of sickness and disease. The fact that most Western food producers rely on artificial fertilizers is proof that the majority of market produce is raised on unhealthy soil. If the situation was otherwise, the fertilizers would be unnecessary! Most farmers and gardeners also depend heavily on poisonous chemical sprays to control "weeds", insects, fungi, and micro-organisms. On HEALTHY SOILS THESE "AIDES" FROM THE CHEMICAL INDUSTRY ARE UNNECESSARY. The degree to which they are used is an indictment against the poverty which wrong methods have wrought on millions of acres.

C. The amount you can save by growing some of your own needs can be most effectively set aside in the family budget. It will provide that little extra premium one usually has to pay for naturally grown produce in those now not-so-rare Natural Food Shops.

D. Most gardening activity is limited, in countries like Britain, to the most pleasant period of the year and this is a grand opportunity to involve your family. Gardening is a healthy and rewarding activity in which every member can take part. You not only work together as a family, but literally work along with God and His creation in the particular environment which He has given you.

2. SOIL PREPARATION

A. Don't waste your time trying to grow vegetables in poor soil. Raising the level of soil fertility should be your first task if you want to establish a successful garden. Regardless of the general soil type in your area, the ground surrounding your home has probably been at some time a mixture of builder's rubble and subsoil which has been excavated for the foundations.

Over the years there will have been some build-up of soil fertility from the plant and root residues of all growth that has volunteered on your plot of land. However, if you want to get a healthy garden started quickly, a soil test will give you a general idea of the condition of your ground.

An enquiry at any office of the Ministry of Agriculture, a farmers' organization, a grain merchant, or a plant nursery and seed merchant will give you information on where you can get a soil test done for a few pence.

If the soil is not in a balanced state you can take a few simple steps to bring this about very quickly. Soil lacking in organic residues is "unbalanced" and will usually be in what is described as an ACID condition. In rare instances (such as chalk and limestone areas) it may be alkaline. Most of the plants we are interested in growing will do best in conditions that are chemically very near neutral.

The pH scale is a set of numerical values which indicates how far a soil is one way or the other from neutral. 7 is the figure assigned to neutral. Readings above 7 indicate degrees of alkalinity and below 7 shows acidity. The addition of chalk or ground limestone will neutralize your soil if it proves on test to be acid. The supplier of this material will give you a fairly accurate guide on quantities, otherwise write to the Farm Programme at Ambassador College, Bricket Wood, St. Albans. We can advise you.

B. To control undesirable "weed" growth on any new area you wish to incorporate in your garden, you can loosen the whole area with a strong gardening fork. As each fork-full of soil is loosened, the plants can be shaken free, and removed, but on no account should you turn each fork-full of earth upside-down !

We feel that a more satisfactory approach is to cut the grass down and let it rot where it falls. Immediately after cutting, the whole area should be given a heavy dressing of compost and/or straw. Compost should be at the rate of approximately 10 tons per acre (or 4 1/2 lbs. per square yard), and straw over the compost to

give a total depth of plant matter around 6" to 8".

This thick layer of organic matter has a number of beneficial effects:

1. Preserves an even soil temperature all year round.
2. Reduces evaporation under dry, hot and windy conditions.
3. In wet weather it absorbs large quantities of moisture, thereby reducing the chances of waterlogging and soil erosion.
4. Its buffering effect on acid soils helps correct pH.
5. Ensures a rapid build-up of microorganisms.
6. Moisture and temperature control promotes rapid organic decomposition by microbes and earthworms.
7. Reduces sunlight preventing unwanted "weed" growth.

C. If you completely lack access to organic residues, do as we did on the farm here in Hertfordshire during our recent Sabbatical Year: allow a maximum of volunteer growth. Then mow it every time it reaches 3" to 6" in height and leave the clippings spread evenly over the entire area. (Remember, too many clippings at any one time will kill the plants you are relying on to produce more "green manure".) We even sowed down special crops for this purpose; e.g. Sweet Clover, Lupins, Mustard, Chicory, etc. A mixture of quick growing grasses, clovers and herbs is best.

D. Points A, B and C are the foundation of your future success. Take some time and trouble over this stage. (It is similar to house painting -- the amateur always wants to rush in and begin using the brush, forgetting that the most important part of the job is the preparation!)

E. Whatever tillage you decide to do should be confined to the top 4" of the soil and any action that buries organic residues should definitely be avoided. The old practice of "digging the manure well-in" is NOT recommended. It slows down decomposition and puts much of the plant food out of reach of surface rooted species.

3. PLANTING AND THINNING

This should usually be done in rows. That way most of the ground can be kept covered with mulch, the rows can be close together, and you will thereby avoid wasting much of your garden in path space. Remember paths represent back-breaking labour in "weed control". This form of exercise is neither pleasant nor profitable.

After most planting, a certain amount of thinning-out will be necessary as plants won't do their best if they are too crowded.

The first thinning will usually be done after the seedlings have become reasonably well established. Some experience will show how plants can be left a little thicker than is desirable for maximum growth at maturity. As the crop approaches maturity, early "picking" can be done in a way that will thin the main crop out uniformly and to a degree that will allow the majority of the plants to reach their full potential.

4. RAISING SEEDLINGS

A. Remember you are practicing a superior system of gardening, so any seedlings you can raise yourself will be better than you can expect to buy. The importance of this point will increase with your own experience and also with the length of time you have been observing God's laws of soil management (See point 9). Get seeds into the ground early, so your plants are in the advanced seedling stage (ready to be transplanted) as soon as extreme weather conditions have passed.

B. Your seedling bed should be located in a warm sheltered position in the garden. Sowing under glass frames is a great help for early germination in most climates. Generally, frames should be angled to catch any early morning winter sun that is available.

C. Successful germination depends a lot on sowing at the correct depth and maintaining adequate conditions of warmth and moisture. Seed size is a good guide to planting depth. The small seeds should be covered with the least soil. Generally speaking, even the larger kinds should be sown a lot closer to the surface that the current practice. (Wheat, for example, is often sown at a depth of 2 1/2" to 3" to achieve germination before surface moisture disappears. A build-up of organic residues would retain the moisture and shallower seeding gives faster root development.)

D. It is also of prime importance to obtain strains of seeds that are suited to your seasonal conditions. One should make every effort to secure seeds raised on fertile soil and without the aid of "artificial" fertilizers. When you achieve high fertility conditions, you should save most of your own seed for the next season. (We have had evidence here in the gardening department at Bricket Wood of quality improvement over three seasons. It was found that by saving certain of our own seeds each year, the results were better than the previous year.)

E. Don't allow yourself to be hypnotized by colorful propaganda about specially bred, high-yielding, new varieties. These days we are quite accustomed to seeing such glowing

predictions crumble into the dust within a few short seasons. On average it will be wiser to go for some well-known variety that "somebody's father, or even grandfather used to plant!"

5. SUNLIGHT

In laying out your garden area, it is absolutely vital to select a sunny (and, if possible) sheltered area. The latter can always be taken care of with an artificial windbreak if necessary, but there is no substitute for sunlight! Over-hanging branches are one of the most common offenders.

6. HOW MUCH SHOULD YOU PLANT?

A. This is quite an important question if your area, your time, or your energy is strictly limited. The simplest rule is to plant "LITTLE AND OFTEN". It is better to sow a couple of rows 10' or 12' long (for the average family) every two to three weeks than one large area. This way a relatively small garden will keep the family in fresh produce for many weeks. These row sizes would apply particularly to such crops as: Peas, Beans, and Lettuce. For Cabbages and Cauliflowers, the quantity could be halved.

B. Remember plants like Parsnips, Brussel Sprouts, Spinach and Leeks will occupy the ground for almost a whole year!

C. If you are very restricted in your garden area, concentrate on such crops as Carrots, Parsnips, Onions, Beans and Salad vegetables. Then you might think of extending to Cabbage, Potatoes, etc.

7. WHEN TO PLANTS

A. Buy a gardening book that gives you a sowing and planting guide for each week of the year. It should also give you the appropriate plant spacings. A general guide to space requirements is the size of a plant when it reaches maturity.

B. Note the variation from year to year of the time on the Roman Calendar when God's Annual Holy Days occur. They can vary by as much as four weeks in any nineteen year time-cycle. You should expect to move your planting dates up to two weeks either side of the time recommended by anyone who is unaware of God's Sacred Calendar.

8. PEST CONTROL

A. Do not sow plants of the same family in the same part of your garden year after year. Rotation of the various vegetables helps reduce insect and fungal attacks. Your soil will remain healthier and yields, too, will be higher. Don't even have plants of what is regarded as one family follow one another. Melon, cucumber, squash and pumpkin should not follow each other. Another group that should not be planted after their own kind are cabbage, cauliflower, brussel sprouts, radish and turnip. Some claim it is unwise to plant tomatoes after beans or peas. Tomatoes can be successfully alternated with radish, cress or lettuce.

B. Some study of the way in which crops should be associated will be very helpful to the average gardener. This includes the relationship between crops growing beside each other, as well as following one another. Plant combinations are important in successful gardening. Most of the leafy vegetables plus tomato, cucumber and squash are regarded as "heavy-feeders" of available soil nutrients. It is desirable to precede their planting with a plentiful dressing of well-rotted manure. Root vegetables are generally regarded as lighter feeders.

A cover crop of legumes should be included in any form of rotation. Any of the clovers or lucerne will be very helpful in raising the level of available nitrogen in the soil.

Remember also that peas and beans are legumes and therefore soil improvers. Some believe a crop of lucerne will lower wireworm infestation. It is claimed that a crop of ryegrass will reduce pink root on onions. These are just two examples of pest control through soil fertility.

9. ORGANIC RESIDUES

A. Be sure to conserve all residues. In a small garden they are probably best fed back to the soil through a compost heap. (Many books will give detailed guidance on this simple process. Perhaps the best is by the father of modern composting -- Sir Albert Howard. His book is called "An Agricultural Testament" and is published by Oxford University Press, London.)

B. If at all possible you should secure some barnyard manure for your garden, irrespective of whether you are making compost or not. We feel that the best balance of micro-organisms will be obtained from the manure of ruminants. Our order of preference is -- cattle, sheep, goats, poultry and last of all horses. We will

not recommend pig manure.

C. There are other satisfactory activators for the compost heap if animal manure is unavailable. We have used one that is made in the London area: QR Activator made by Chase Organics (GB) Ltd., Shepperton, Middlesex, England.

10. SOIL CULTIVATION

A. Most gardeners, even with a mulching system, will do a certain amount of cultivation and much frustration will be avoided if the soil is worked at the correct time. Clay soils can be particularly difficult to work with, both when too wet and too dry. There is a short, in-between period with most of them when they can be cultivated with minimum effort.

If your soil sticks to the garden tools unduly, then it is too wet and you should allow it more time to dry out before attempting to work with it.

If it is dry and comes up in hard lumps, you should water it, or wait for rain and catch it as it dries out next time.

These conditions are completely relative to the state of your own soil at any given time. If, for example, your present soil is a stiff and unyielding clay, it won't be easy to work with even in its optimum state!

B. As a beginner it will not be necessary for you to spend a lot of money on tools. The three main things you will need are: a good strong garden fork (not over-large if you are a woman), a claw cultivator (or hoe), and a rake with strong teeth.

11. SABBATICAL YEAR

"Six years thou shalt sow thy field, and six years thou shalt prune thy vineyard, and gather in the fruit thereof; but in the seventh year shall be a sabbath of rest unto the land, a sabbath for the Lord: thou shalt neither sow thy field, nor prune thy vineyard." (Lev. 25:3-4)

In a purely physical sense, the Sabbatical Year is an observance God has commanded to focus man's attention on the need to maintain the level of those vital organic residues in His soil.

Man has displayed before his very eyes a God-created natural system of regeneration. The life-cycle of every plant begins in the soil and ends there too, through death and microbial decomposition. This cycle is going on all the time, but it is more dramatically fulfilled every year in the leaf-cycle of the deciduous trees. We

also see the yearly growth pattern of the annual plants. All this evidence points man to the fact that plant-life depends on the decayed residues of pre-existing plants. (Rom. 1:20)

The return of organic residues to the soil is fundamental to the success of all agriculture. The continued supply of nutritious food for mankind cannot be maintained any other way!

But mankind has deliberately rejected the laws of God; to the point that he is now unaware of any command to rest the land. Man is using "chemical" fertilizers in a desperate attempt to suspend the penalty for non-observance of the Sabbatical Year.

For fuller details on this observance you can write to the Agriculture Department, Ambassador College, Bricket Wood, St. Albans, Herts., and we will be happy to send them to you.

12. TITHING

A. If you are unfamiliar with God's law of tithing, you should write to Ambassador College and request your copy of the booklet, "Ending Your Financial Worries". It will give you a very good understanding of this matter which is vital to your success in any walk of life.

B. Many who know about the principle of tithing ask if they should tithe on the produce of their vegetable garden and if so, then how can they go about it?

The answer to the first part of the question is: Yes, God definitely commands tithing -- even on garden vegetables. "And ALL the tithe of the land ... is holy unto the Lord." (Lev. 27:30). "Thou shalt truly tithe ALL the increase of thy seed that the field bringeth forth year by year." (Deut. 14:22).

Then how do you tithe such things as beans and cabbages etc,? When you understand that tithes are to go to God's Ministry, it is then only a matter of how far you are from one of His representatives. If distance makes it quite impractical, we are to follow the principle set out in Deut. 14:24-25, "And if the way be too long for thee, so that thou art not able to carry it; or if the place be too far from thee ... then shalt thou turn it into money." This money can then be carried or sent to the appropriate destination.

If your tithe has to be converted into money, the amount can be calculated from the ruling market price. You know the sources from which you would have to buy, had God not blessed you in your garden and it is a simple matter to find out current prices.

SUMMARY

Yes, gardening can be easy if you follow the principles outlined in this article. On the other hand, it can be very hard and unrewarding work. Fortunately back-breaking labour and loss through disease are not things we just have to put up with in gardening. Many people have this idea because of the mistakes of others. Obedience to God's laws will produce abundant fruits, healthy, exercised bodies and a real sense of accomplishment.

Hundreds of books have been written on the subject of gardening, so it can't be adequately covered in twelve short points, but if you understand:

1. WHY YOU SHOULD HAVE A GARDEN -- you will have a real goal to success.
2. SOIL PREPARATION -- you can make almost any soil produce.
3. PLANTING AND THINNING -- your garden lay-out will be successful.
4. RAISING SEEDLINGS -- you will have the right strains ready for planting at the right time.
5. SUNLIGHT -- the garden will be correctly positioned.
6. HOW MUCH YOU SHOULD PLANT -- you can make the minimum area produce the maximum results over the longest time.
7. WHEN TO PLANT -- you will avoid many disappointments.
8. PEST CONTROL -- you will preserve nature's balance.
9. ORGANIC RESIDUES -- you will avoid artificial fertilizers and produce vegetables of quality.
10. SOIL CULTIVATION -- you will make hard work easy and get better results at the same time.
11. THE SABBATICAL YEAR -- and observe it at the right time, God will bless you for it.
12. TITHING -- you will be blessed accordingly.

All twelve of these points are a matter of physical obedience and the last two have a vital spiritual significance. Taken as a whole they can help you to live a fuller life in many ways and you will be continually reminded that -- "... neither is he that planteth any thing, neither he that watereth; but God that giveth the increase." (I Cor. 3:7)

Even so, your problems won't all evaporate overnight! In which case if you think we can be of any help in your efforts to provide your family with a healthy diet, please feel free to write to us for further information.

AMBASSADOR COLLEGE

Agriculture Department

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MILKING ON THE SABBATH

Milking on the Sabbath is a question and problem we have had to face here in Texas. After a period of experimenting, we have quit milking from sundown Friday to sundown Saturday. So, far, it has been practical and beneficial.

Overall, the animal health has improved. There has been a slight increase in milk production. We have little to no mastitis problems now, whereas, we had some because of lack of cleanliness and substandard mechanical handling in conjunction with resting the cows on the Sabbath. I am sure all this together has produced the result we are getting. (Of course if you lack faith you have lost before beginning.) The cause of every mastitis case that has appeared since we have begun this program has been traced to mechanical malfunction or a wrong handling practice.

Here is an outline of what we do:

We feed regularly throughout the week until Friday. At noon on Friday we lock the cows in a dry lot (water o.k.) away from any feed except dry hay. We milk Friday evening before the Sabbath giving them one half ration in the manger before the Sabbath, letting it simply lie there until the cows are turned out around noon on Saturday. If your feed (other than that fed during the milking period) is pasture, simply open the gate to the pasture. All we do on the Sabbath is open a gate.

We milk then again Saturday evening after the Sabbath and again begin giving the cows a full ration of feed at this milking period.

This procedure is working fine here, however, we are still experimenting. The decision of following it is entirely up to the individual. If you decide to go ahead with it, we would appreciate hearing your results. Please feel free to write us if you have further questions.

AGRICULTURE DEPARTMENT

SABBATH DAIRY MANAGEMENT

Ambassador College (UK)
Agriculture Department
1971

Many dairymen upon learning of God's weekly and annual Sabbaths are faced with the dilemma of how to continue with their dairy programme and keep God's commands regarding His Sabbaths.

"Remember the Sabbath day, to keep it holy. Six days shalt thou labour and do all thy work: But the seventh day is the Sabbath of the Lord thy God: in it thou shalt not do any work, thou, nor thy son, nor thy daughter, thy manservant, nor thy maidservant, nor thy cattle, nor thy stranger that is within thy gates:" (Ex. 20:8-10). God set apart the Sabbaths to teach us His laws and purposes that we may receive His abundant blessings.

The practices of modern agriculture have come into vogue without regard for God's laws. Because of this, God's ways seem strange and burdensome to today's world. But remember, the Israelites coming out of Egypt faced similar problems (Ex. 16:4, 25-28).

Now the question is -- what can we do to avoid milking and other farm work on God's Sabbaths?

A diversified farm programme should actually be planned AROUND God's Sabbaths. Agriculture should present the most wholesome and balanced way of life possible for mankind, instead of the highly specialized, competitive systems now being practiced. We each need to plan and work toward a well-balanced, diversified farm for the whole family.

Here in Bricket Wood we are trying out a system which we believe is new to the dairy industry. We know it will work, and think it may be the ultimate answer, even for millennial conditions.

Our cows are milked only ONCE a day, and they suckle their own calves throughout the entire lactation. The calves graze in the pastures with their mothers all day, then they are shut in the special calf-pen overnight and the cows are milked each morning.

At first, this will sound to be a most unlikely way of operating a full scale dairy operation and there are always built-in prejudices which we all acquire through growing up with certain practices. These must be overcome before our ideas can be changed. One of the first questions we can then ask ourselves is this: As God meant man to use the milk of animals (Gen. 18:8) would it then be His intention that we should place the growth-rate and general health of the next animal generation in jeopardy? EVERY farmer knows this is exactly what dairymen have

done for years, and a large part of the veterinary bills of the Dairy Industry are sad proof of this widespread mistake!

We introduced this "new system" in 1967 and it is working out very well. We knew it would work before we started because it is, after all, nothing more than an adaptation of the way the "milkers" have been handled on sheep and cattle stations for generations.

Admittedly the station milking cows usually get the best feed available, but it is worth noting that these cows always produce the healthiest-looking calves!

Cows under this form of management each raise a calf that is as saleable as those produced by the best beef cows. At the same time they also supply a satisfactory level of milk and cream for home use. Therefore it is felt that these dairy-type cows are more than paying for the extra feed received.

Our thinking here in Bricket Wood was that the College has a need for both meat and milk, so why not apply this "old Bushman's" system to a full-scale dairy herd, and produce both at the same time. We did, and it works!

If the calves are not shut away from the cows on Friday evening, they will do the milking for us on the Sabbath. (The calves could be shut in their yard on Sabbath morning if it was felt necessary to milk the cows immediately after the Sabbath. A number of other variations will readily come to mind after a little thought.)

Every farmer needs to be away from his job for a few days during the year and this system (operated in the right way) will enable him to leave his dairy cows and calves grazing in the pastures, just as if they were a BEEF herd!

Could anything be simpler than this, and at the same time get away from the modern trend toward specialized agriculture, as well as practise a more natural type of stock management?

Every individual who will seriously think of putting such a system into practice is sure to come against problems and difficulties. Farmers need to realize that "difficulties" over Sabbath-keeping are not limited to those who work in the towns and cities!

"Difficulties" over Sabbath-keeping stem mostly from ideas formulated in our own minds during years of ignorance. In 6,000 years it has never been natural for man to keep the Sabbath (Rom. 8:7).

If God's Holy Spirit is not working powerfully in us as farmers, we will not "bend over backwards" to avoid even inadvertently putting our

foot on God's time. Every one of us must constantly be in an attitude of mind where we would literally fear and quake at the thought and consequences of our wrong actions (Ex. 31:14-15; 35:2).

It would do us all good to read Num. 15:32-36, every time we find our mind coming up with human reasoning over points of Sabbath-keeping in Agriculture (See also Isa. 56:2, 58:13-14 and Ezek. 20:12-13).

An operational problem we have come up against is a low butterfat level in the milk from some cows. This is because the calves are getting more of the cream than the humans. One way this can be overcome is by putting the calf back onto the cow before turning her out of the milking shed. The hungry calf will cause her to "let down" that last pint or two of rich, creamy milk that she has been holding back until last. As soon as the dairyman sees she has "let it down", the calf can be removed and most of this final milk taken, either by machine or by hand.

Another method would be to wean some of the older calves and at most times of the year rely on these cows to lift the overall butterfat of the herd. Those particular cows would then have to be milked perhaps once on the Sabbath.

We find the most important thing is to persevere and this system WILL work. It obviously takes many more cows to produce the milk figures of the past and admittedly cow numbers cannot be increased on most farms.

But slashed milk production is offset by good returns from high quality young beef. These young animals command top prices in the meat markets of the world and the farmer also receives added financial protection through diversification.

A longer-term but equally valuable benefit that will keep on increasing over many years is IMPROVED ANIMAL HEALTH. Farmers hardly need reminding that this is a triple-headed blessing! Improved animal health means first -- higher production, then longer productive life and finally a saving on veterinary bills, wasted man hours and premature animal deaths.

One example is worth quoting: a recent television documentary showing the financial plight of modern agriculture cited an interesting case. A hardworking young family on a small dairy farm netted only £102 after a year of tough slogging and enormous hours. Only one significant point slipped by without a worthwhile comment -- the veterinary bills for this farm amounted to £12 per week! An extreme example perhaps, but the viewer was given no indication that there was anything unusual about such a huge outlay. By implication, £12 per week for veterinary services

was accepted as an unavoidable and legitimate expense on a balance sheet that left this farmer with only £2 per week

Yes, obeying God's laws really does pay dividends.

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SOURCES OF INFORMATION

The following books along with our article, "The Truth About Chemical Farming," will help you become familiar with the principles of natural farming.

The Soil and Health by Sir Albert Howard describes organic agricultural experiments on several continents in the first half of this century. He presents thoroughly documented information and was knighted by the English monarch for his agricultural research. The book is published by the Deven-Adair Company, 23 East 26 Street, New York. Another excellent book by the same author is An Agricultural Testament published by the Oxford University Press.

The Living Soil by Lady Eve Balfour describes the experiments of many top agricultural scientists showing the relationship between the organisms of the soil and health of crops and man. It is also published by Deven-Adair.

A very comprehensive 900 page book on raising fruits and vegetables is: How to Grow Vegetables and Fruits by the Organic Method, published by the Rodale Press, Emmaus, Pa. This is the best book we have seen on this subject and the cost is about $7.00. The Complete Book of Composting with over 1000 pages of information on methods of making compost successfully, is also available from the same publisher at the same price.

A book which shows the fertility chain in soil, a blueprint for soil management, the dynamic natural laws which rule the land giving man his food is Farming with Nature by Joseph A. Cocannouer published by the University of Oklahoma Press, Norman, Oklahoma.

Books describing actual experiences and large acreage and tillage and fertilization practices of two famous English organic farmers are: Modern Humus Farming by Friend Sykes and Fertility Farming by Newman Turner. Both are published by Faber and Faber limited, 24 Russell Square, London W.C.L.

Make Friends With Your Land by Leonard Wickenden, a professional chemist who approaches soil, animal, and human health from a chemist's scientific viewpoint. Mr. Wickenden, in a very readable, easily understood style covers many aspects of soil health, including a very good chapter on composting, available in many libraries, and in stores for about $3.00.

A book on tillage practices, but now out of print and available only in some used-book stores, is: Plowman's Folly by Edward H. Faulkner. Good public libraries should have at least some of these books. Anyone in the business of farming and who can afford the reasonable cost will find these books worth buying.

A magazine on natural farming is Mother Earth, the Journal of the Soil Association. This is the best technical journal on organic agriculture we know of. It is available for $10 per year. It is somewhat technical and hard to understand. Quarterly, New Bells Farm, Haughley, Suffolk, England.

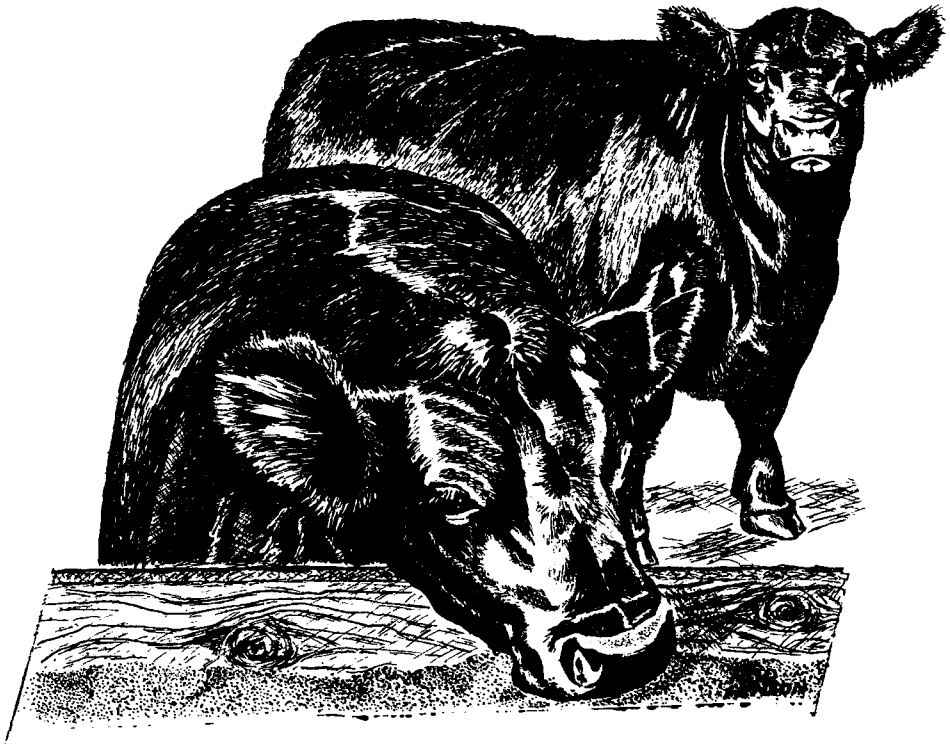
Two American publications we find helpful are: Organic Gardening and Farming, by the Rodale Press, Emmaus, Pa., at a subscription rate of $5 per year, and Natural Foods and Farming by Natural Foods Associates, Atlanta, Texas, at the same rate.

BKL

Howdy~

a brief *look* at

A.C. AGRICULTURE



Big Sandy, Texas

WELCOME TO THE A. C. RANCH

The Ambassador College Agriculture Department was established in 1965. As a part of the College, its motto is "Recapture true values." The Ranch stresses character development and education; pioneering from the ground up. Before we tell you more of our story we wish you a hearty WELCOME and hope you'll tour the Ranch and farm - noting much is still in the developing potential stage.

The Ranch operates on a total of 2500 acres of which 240 acres are in cultivation. The remaining area is pasture and timber land. These acres are all being utilized for experimentation and for providing meat, dairy and vegetable produce for our local College and for the Ambassador College in Pasadena, California.

Special work is being done in the two main areas of soils and plants. We feel certain basic and natural principles in the agriculture field have been lost, overlooked or ignored. In soils we are working to restore varying types of soils to natural fertility and to maintain this fertility by improvement of the ecology of soil micro-biology.

The work under study with plants consists of their ecology in relationship to their economic value. In this study we are not stressing monetary value over a short period of time, but including their value to soil tillage and fertility and to animal life.

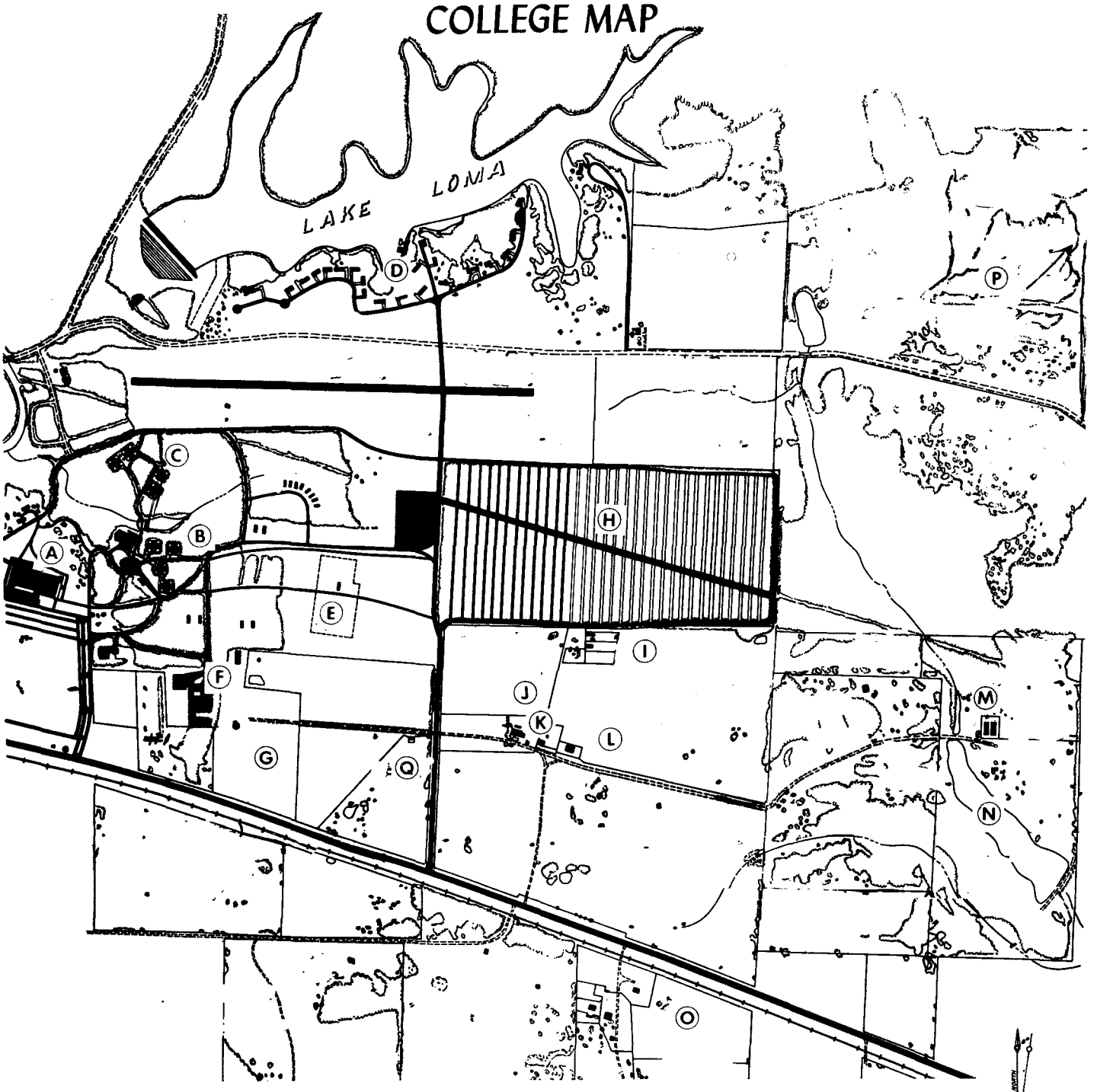
Work being done in our beef program includes disease prevention and health maintenance through proper natural nutrition. Careful selective breeding is being done to improve beef quality and quantity. Emphasis is also being placed on breeding for a high ratio of feed conversion from feed most economical and available to this area.

We feel more attention should be given to promoting the interrelationship and inter-dependency of the agricultural fields to produce healthy human lives.

Our main enterprises consist of: Beef fattening and beef breeding, Broilers and laying flocks, Field crops, Soils and pastures, Dairy, Sheep, Goats, Turkeys, Horses, Silage and haylage, Greenhouse work, Natural fertilizers and Insect control.

Visitors are welcome to see the operation and to receive information they feel would be helpful to them.

COLLEGE MAP



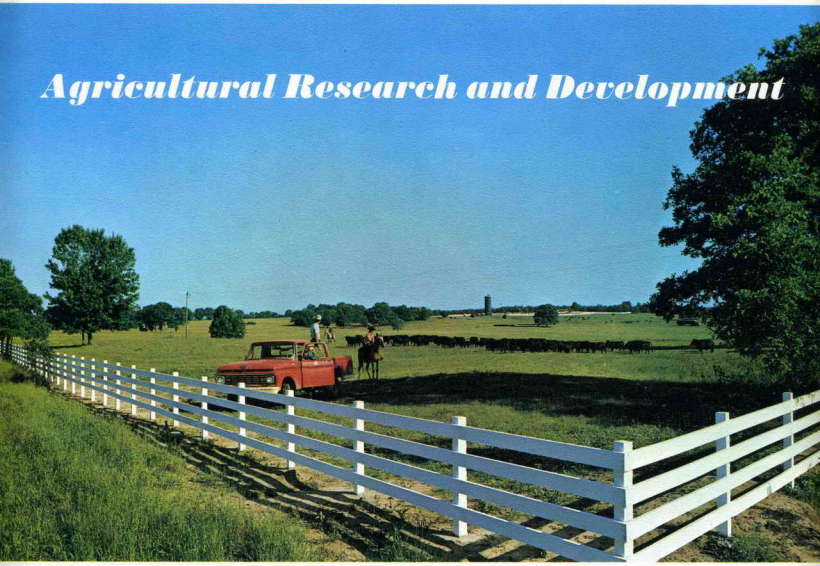
– Legend –

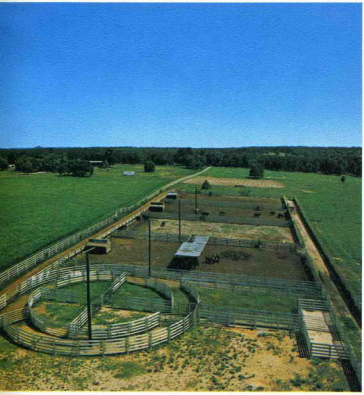
- Ⓐ Field House
- Ⓑ Women's Dorms
- Ⓒ Men's Dorms
- Ⓓ Faculty Row
- Ⓔ Booth City
- Ⓕ Transportation
- Ⓖ Garden
- Ⓗ Pine Grove
- Ⓘ Poultry Area
- Ⓙ Experimental Plot
- Ⓚ Warehouse, Bins, & Grinder
- Ⓛ Feed Lots & Harvestore
- Ⓜ Greenhouses
- Ⓝ Ranch Recreation Lake
- Ⓞ Location of Sheep, Goats & Turkeys
- Ⓟ Follow Road to Dairy Location
- Ⓠ Stable Area

For Your Information

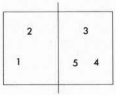
Beef	Over 400 beef cattle are regularly maintained on the Ranch. They include Angus, Hereford, and Scottish Highlander. Of special interest will be the new blue Smith Harvestore Silo containing much of the feed to fatten the cattle in the feed lot.
Dairy	A Jersey herd is raised to supply milk for the College.
Crops	In addition to the many pasture grasses raised and harvested, various field crops grown include milo, winter and spring wheat, oats, soybeans, rye, barley and corn.
Fertilizer	Fertilizer is prepared at our own warehouse. It includes diatomaceous earth (KMP) and a mined "organic" material. Our laboratory cultures soil bacteria which is added to our fertilizer for the purpose of helping to restore soil life.
Food Processing	This area receives the raw products produced on the Ranch. It packages and freezes beef and garden vegetables for use by the Ambassador Colleges and faculties here and in Pasadena, California.
Garden	Over 26 different vegetables are grown in the garden. Many of these vegetables are stored in the College fruit cellar and the freezing unit for later use in the dining hall.
Goats	A small herd of Angora goats is kept on our place.
Greenhouse	Two greenhouses specialize in growing fresh, vine ripened tomatoes the year round - again utilized by the College.
Horses	Most of the 12 horses are in the stables and pasture near Highway 80.
Poultry	The Ranch poultry enterprise consists of layers and broilers as well as replacement stock. The breeds include White Rock, white and brown Leghorns.
Sheep	Dorset and Delano Marino sheep are the two types of sheep we have on the A.C. Ranch.
Turkeys	One of the most beautiful sights on the Ranch are the 12 Royal Palm turkeys.

Agricultural Research and Development

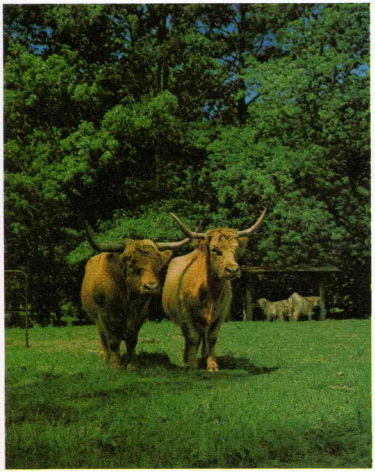


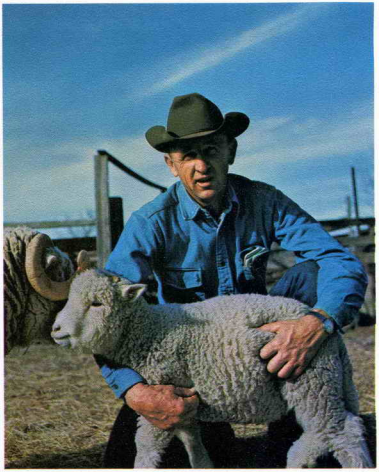


Experimental farms on the 4,400-acre Texas campus and the 200-acre English campus are making significant contributions to agricultural knowledge, testing methods of soil development, and improvement of livestock and plant production. Both facilities maintain experimental programs in conjunction with state and national agencies in striving to better our understanding of proper agricultural techniques and procedures. This facet of our Extension Education Program is quickly growing in international prominence in helping thousands to find better farming techniques. The advisory service maintained by both the Texas and English offices continues to help others to find better means to upgrade production.



1. Feed lots on the Texas campus.
2. Our Black Angus herd comes to feed on the Big Sandy pasture land. Blue skies and adequate pasture offer ultimate conditions for experimentation in animal husbandry.
3. Mr. Dale Schurter, Supervisor of the Ambassador College Ranch, Big Sandy, Texas.
4. Mr. Walt Curtis checks out the quality of spring lambs.
5. A matched pair of Highlanders makes a striking pose. Along with pure bred White Face and Black Angus cattle we maintain a herd of Scottish Highlanders for experimental and meat production purposes.





Agricultural Research and Development in the Green Belt

The 200-acre farm facility found on our Bricket Wood campus provides optimal conditions for our program. From these headquarters, we are able to help agronomists in England and Europe to find better ways to practice their trade.

1. Peter Alter and escorts check the progress of their carrot patch. Students in the Agronomy Sciences classes learn first-hand knowledge through individual maintenance of experimental plots.
2. Linda Shaklee approves of the newest tomato crop.
3. Mr. & Mrs. Sutcliffe inspect the greenhouse tomatoes on our Bricket Wood campus. Mr. Sutcliffe is the Supervisor of our Bricket Wood farm program.
4. Haying time brings forth the sweet smell of new-mown hay. Valuable lessons here by future agronomists will bear fruit in coming years.
5. Mr. Sutcliffe inspects part of a newly purchased lot of milking Shorthorns. Our experience in the English climate finds this breed very promising.
6. At 2200 pounds, our reserve champion Milking Shorthorn bull is a whale of a lot of cow.