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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:

<u>INORGANIC</u>	<u>ORGANIC</u>
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.

<u>NITROGEN</u> (Material)	<u>Per Cent</u>	<u>PHOSPHORUS</u> (Material)	<u>Per Cent</u>	<u>POTASH</u> (Material)	<u>Per Cent</u>
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 inoculated 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 matter needs 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 locking 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.

<u>Natural Rock Fertilizers</u>	<u>Organic Fertilizers</u>	<u>Diatomaceous Earth Sources</u>
Rhum Phosphate and Chemical Co. P.O. Box 361 Columbia, Tenn. 38401	Farm Guard Products 701 Madison N.E. Albuquerque, N. M. 87100	Perma-Guard Box 6607 North 60th Ave. Glendale, Ariz. 85301 (Insecticide and mineral supplement.)
Robin Jones Phosphate Co. 204 23rd Ave. Nashville, Tenn. 37200	Bactelife International Soil Conditioner Corp. P.O. Box 212 Caldwell, Texas 77836	
Fanning Soil Service 4951 S. Custer Road Monroe, Michigan 48161	Southwest Wholesale Co. P.O. Box 35052 Dallas 35, Texas 75200	
	Alginure Seaweed Products P.O. Box 693 Sidney, B.C., <u>CANADA</u>	
	Blenders, Inc. Lithonia, Georgia 30058	

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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