Hidden Hungers Point To Soil Fertility

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Hunger is not a new problem. Next to the sex instinct, it is the principal force driving man and beast into action. It projects one into areas where he had not previously ventured either in body or in mind.

Today we understand hunger as world-wide in extent and importance. We are examining deeply enough into it to distinguish its "hidden" forms. We recognize these as due to shortages, not so much in the bulk of the food as in its nutritional qualities. We have not yet been able to tag all the different organic and inorganic compounds that provide these qualities, but have come to believe that many are *grown into* our foods. Consequently, we are thinking about deficiencies in the fertility of the soil as responsible for the failure of food to fully satisfy our body needs.

Simplest Forms of Life Hunger for Fertility of the Soil

Hidden hungers are not experienced by man only. Even the microbes, the lowest forms of life, within the soil have their hidden hungers. Organic matter of the soil, which is the source of their energy food, accumulates in some nutrient-mineral deficient, or acid, soils while the microbes literally starve. In the face of abundance, hidden hungers exist for nitrogen, calcium and other elements on the soil fertility list. Under such conditions there is a surplus of bulk and a shortage of protein-producing, growth-promoting compounds. Consequently only limited supplies of energy foods serve, and then probably inefficiently.

Sweet clover, fed as a green manure to the soil bacteria may cause hidden hunger for potassium. While this popular, soil-improving legume grows and feeds ravenously on calcium, it can make bulk despite a meagre supply of potassium. It grows well enough on a pile of crushed limestone suitable for fertilizer use. But, it has manufactured little potassium into itself and to satisfy the microbes, decaying it in the soil, should be supplemented by potassium which they must take from the soil. Thus, the corn crop, which is expected to benefit from this green manure as a supplier of nitrogen actually is robbed by it of potassium in the process. In such cases, the soil microbes, too, are struggling to cover their hidden hunger.

Soil Microbes Pass on Their Hungers to Our Crops

Mature sweet clover residues of late summer, and straw left after the combine, plowed under before seeding a wheat crop represent hidden hungers of microbes for nitrogen. Whether these microforms of life so fed may not be suffering hunger for other elements of fertility has not yet been fully established. This soil condition also represents the hunger of the wheat crop for nitrogen, but this one no longer is hidden from us. However, we have not appreciated the fact that the wheat crop "eats at the second table," and that the microbes in their hunger for nitrogen are literally passing the hunger on to the wheat crop.

Since wheat manifests this nitrogen hunger in the autumn or at a season when soil moisture is ample, we have not been so prone to blame the drought for it as we are when corn shows these same symptoms in the summer. That crop's hidden hunger for nitrogen has been too readily interpreted as excessive thirst and consequently the weather —beyond our control—is the scapegoat

while we do nothing about the deficiency in fertility. It is important to note that both the corn crop and the soil microbes are well supplied with energy—the one from the sun making photosynthetic compounds and the other from similar but decaying carbonaceous compounds. Both, however, are suffering hidden hungers for small amounts mainly of nitrogen, by which their surplus energy foods can be converted into proteins and their diets properly balanced. It is through difficultly-synthesized substances like the proteins that cell multiplication is possible and by which the stream of life is kept flowing and shortages of them really provoke the hidden hungers.

Fertile Soils Grow Bigger Fish

Even the lower forms of green plants, like the plankton in our fish ponds suffer hidden fertility hungers. In turn, the fish with their hunger for "grow foods" in more and better plankton do not multiply or grow so rapidly as when the fish ponds are properly fertilized. One dare not believe, however, if a little fertilizer in the fish pond is good, that more will be better. For then the plankton may have hunger for carbon dioxide, of which only limited amounts can go into solution in the pond water. Curing hidden hungers calls for an understanding of their physiological causes in even so simple a practice as feeding fish.

Wild animals well up in the biological scale have their hidden hungers too, though the fact is not always associated with the fertility of the soil. Animals that are strictly herbivorous feeders are not commonly found on the highly leached soils of the tropics. Instead buffaloes, elephants, antelopes and other grass-eating species are found on the prairies and savannas. They subsist on vegetation produced in areas of lesser rainfall, on calcareous soils, where natural legumes are abundant, and on soils which under cultivation produce the hard, or high-protein wheat. Soils given less to production of proteinaceous products and more to vegetation of carbonaceous contents give us forms of wildlife compelled to eat the seeds, the growing tips of branches, and other plant parts representing the maximum concentration of the plant's proteins. The ecological picture of wildlife is a pattern of placement where the animal is not destroyed by hidden hungers for the proteinaceous, mineral-rich foods that favor reproduction more than for those that serve mainly to lay on fat.

The roaming of wild animals, and their ravaging of farm crops usually connotes an effort to satisfy hidden hungers. In leaving the forest to graze on fertilized land, the deer signals his recognition of better nutritive values in the feed growing there. When they break through the fence dividing the fertility depleted pasture from the virgin soil of the highway or railroad right of way, domestic animals likewise reveal their intuitive recognition of the dependence of the feed for nutritive quality upon the fertility of the soil. They are driven by particular hungers to risk their lives against the barbed wire just as the wild animals risk their lives in coming into the open for feeds grown on better soil.

In pointing out the animal's ability to detect differences in the grazing according to differences in soil fertility—almost beyond the capacity of chemical means of detection—we are apt to think of differences only in the ash constituents. We forget that the animal is not looking to the plants for service as haulers of minerals but rather as synthesizers of the many organic and organo-mineral complexes that build the animal body and supply energy to keep it in action. Some of these complexes have been catalogued as we consider them in making up a ration or a diet. Can we doubt that many yet remain to be listed? Their complete chemical nature and the many kinds of services they perform

are still unknown facts. It is the still unlisted complexes that may be the main provokers of the hidden hungers.

Prevention Simpler Than Cure

Fortunately, we are better able to combat these hungers at the point of origin, namely in the soil, than at any later stage in the agricultural assembly line. At that point, the problem is no more complex, probably, than supplying one or more of a few simple inorganic elements. A little effort there cures the deficiencies that cause the hidden hungers of the soil microbes and the plants. Properly fed plants prevent deficiencies in their synthetic products that serve as animal feeds and human foods. Here are solved the problems of providing the hosts of essential chemical compounds, the required amino acids, the necessary vitamins and the specific fatty acids. These problems of provision in the diet are more nearly insurmountable than those of getting some dozen elements, both major and "minor," applicable as fertilizers on the soil. At any later stage the problem is more complex and the situation more prone to induce the micro-hungers.

Lespedeza hay grown after phosphate application and fed to sheep caused them to grow fleeces that were low in fat or yolk and that scoured out too poorly to be carded except as broken fibers. Yet the same plant species grown on soil given both lime and phosphate helped to grow fleeces of heavy yolk and wool that scoured well and carded out as fibers of good quality for spinning and weaving. Treating the soil to grow good quality wool was as simple as giving the soil some extra fertility in the form of calcium. Just what should have been chosen as the particular supplement to make this deficient lespedeza hay better sheep feed so as to make better wool is a problem not so simply and easily solved. It is clearly a case of hidden hunger, the *cure* of which is extremely perplexing but the *prevention* of which is as simple as the practice of liming the soil.

In our thinking about "diseases," both empirical and scientific knowledge are influencing us to think less about cure and more about prevention by ministrations to sick soil. Once the mind thinks soil fertility, observations come rapidly. Calves eating plaster, not the exposed first coat but the hidden last coat, in a fine barn prompted a farmer to ferret out a magnesium deficiency in his soils. Prompted by curiosity and intelligence to use some magnesium as a fertilizer he started a train of apparent miracles, including the curing of scours in calves, and some reduced mortality, less mastitis in the cows, better alfalfa, better corn, and other blessings in his farming program. When other major and minor elements given the cattle make them negative to the blood test for brucellosis, and when medical research is pointing to similar good suggestions of improvement of undulant fever patients, these are no longer hidden troubles. Attention to the soil fertility, the point of their origin as deficiencies rather than as diseases, is making them major hungers for major attention by more of us than those in the curative professions alone.

By Saving Our Soil We Save Ourselves

It can truthfully be said that rapid progress is being made in recognizing hidden hungers. Many of them are now being prevented because they are being diagnosed as originating in our declining soil fertility. Foremost among the gross nutrient factors of serious decline are those connected with the synthesis of proteins by plants. Soil treatments are no longer appreciated only because they encourage production of greater bulk per acre. They are being made on in-

creasing acreages because they add nutritional qualities to relieve the long chain of hidden hungers coming up from the soil through the entire biotic pyramid to torment man at the top.

For better reproduction of farm animals, and for the better health for them and for ourselves as well, we are becoming increasingly concerned to know more about the fertility of the soil as the means by which such good fortune can be guaranteed. The disturbing and perplexing micro-hungers are hidden mainly from our thought, our recognition, and our full appreciation of their origin. They are not hidden from our body physiology nor from our mental processes when as little iodine, for example, as a fraction of a grain coming from the soil up through the plants to us is all that "stands between us and imbecility." It is a good sign for the future that we are coming to realize that our hidden hungers are provoking deficiencies in mind as well as body. We are coming to think about keeping up the soil in order to keep us mentally able to realize that our hidden hungers are pointing to the soil fertility as ready means for their prevention.

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