The Value of Organic Matter

By William A. Albrecht

THE declining numbers of acres left for growing crops, and the dwindling supply of soil fertility, are bringing home to us the necessity of properly fertilizing our soils. The tonnage of available barnyard manure has long been insignificant as a source of fertilizer supply. Gradually we are coming to realize the basic fact that our soils are being rapidly worn out, because of our old concept of using them as a source for cash crops rather than as a means of growing crops completely to nourish our animals and ourselves.

Organic matter, such as animal and plant manures and accumulated virgin soil, has always been the most desired form of fertility for growing our crops, and thereby in turn to feed well our farm animals and ourselves. Now that we have mined most of the original organic matter supply, to say nothing of the inorganic, we are debating the question among ourselves as to whether we can produce good foods and feeds from our crops when they are grown without organic manures to help fertilize them.

Potential Values of Organic Fertility

Soil itself originated from the rock minerals. In trying to learn what the soil feeds to the plant, we made a list of the inorganic elements found in the plants after reducing them to ashes. Inventories of the inorganic elements in the plants were then matched against inventories of the soil's similar contents. Such knowledge built up the inorganic concept. This knowledege also is serving well for our testing of the soil's needed supplies as against the growing plant's contents; for we have learned that a growing plant contains 13 or more essential inorganic elements which move into the crop from the soil. By the help of such tests, we make our decision when buying needed chemical fertilizers to act as supplements to the incomplete plant and animal matter of the soil.

Success to date in improving the yields of our crops, by means of commercial fertilizers, has naturally emphasized the crop's need of inorganic nutrients from the soil. Unfortunately, such success, in some instances has made us prone to discredit the value of both plant and animal manures. It has encouraged us to believe that manure is worth no more than the total of nitrogen and inorganic elements it contains. Yet tests have shown otherwise when plants are grown by hydroponics, or water culture. The growing of plants in pure water, to which has been added the chemical equivalents of the manure's ash components, is not the equivalent of growing them in rotted manure itself.

Organic processes in general, however, and most biochemical reactions, do not give such speedy comparative performances. Even some inorganic reactions, particularly those including the element silicon, making up such large molecules as the clay, are slow and sluggish. Only lately have we become able to build up organic compounds like the synthetic fibers (rayon, vicara, orlon and others of industrial output) to substitute for those created naturally. Something of this sort may later become applicable for soil use.

Plants will grow when fed on strictly inorganic elements in water, but that fact is no refutation of the possibility that such a seemingly good diet for plants might not be a better one if supplemented by some organic compounds. The limitations of hydroponics indicate how much such plant growth procedure differs from that of plants growing in the soil.

Hydroponics may grow the plant, but this is not a process necessarily duplicating those activities involved in growing plants in the soil, even insofar as inorganic nutrients are concerned. Consequently the fact that plants can be grown with reasonably good yields, on wholly inorganic materials, does not prove that plants, if grown by different dynamics within the soil, may not take from the soil some organic compounds serving best for plant nutrition.

Soil Organic Matter Serves to Grow Antibiotics

The pioneer farmer looked much to the organic matter of the soil to produce the crops for feeding his young animals. Early sales of commercial fertilizer, particularly in the South, met with resistance, due to the farmers' just contention that bird guano from South America helped their crops more than they were helped by Chile saltpeter.

Now we find that the antibiotics are doing wonders for us. Water extracts of the organic matter in soils serve as growth hormones in the laboratory for test plants. Hogs have long had the habit of rooting. They have been grown more rapidly under experiment if allowed on pasture, or if fed some sod soil or its equivalent in antibiotics, as compared to strictly dry lot feeding. Isn't it then time that we open our minds to the possibility that organic compounds, as well as inorganic, may be needed for better plant and animal nutrition, and for superior reproduction of their respective kinds?

Mushrooms are a food crop that grows by feeding wholly on organic matter. They grow in the dark; consequently they do not use energy directly from the sunlight. For energy, they must absorb organic compounds, and burn them or respire them. They create living organic matter by using dead and decaying matter.

How the Hogs Voted

Some field tests have been conducted at the Missouri Station on the use of various kinds and combinations of organic and inorganic fertilizers for growing field corn. In these tests corn was grown on three plots treated as follows: (1) limestone, (2) limestone and phosphorus, and (3) limestone, phosphorus and potassium. On these three experimental plots sweet clover was grown as a green manure crop, then plowed under ahead of the corn. As a control, corn was also grown on three comparable plots which received exactly the same inorganic fertilizer applications (1, 2 and 3), but in this case the sweet clover was allowed to occupy the plots for the entire season. The sweet clover plants grew to maturity and produced seed; the seed was harvested and the remaining plant residues were then plowed under in the Fall to be followed the next season with a corn crop.

As a result of these treatments and applications, higher yields were obtained when larger and more complete combinations of inorganic fertilizers were used as in plot No. 3. However, there was no significant difference in corn yield between using the sweet clover planting, earlier in the season as a green manure crop, as compared with letting it mature.

The grain grown on each of these plots was harvested and later put in separate compartments of self feeders, and made available to hogs. The hogs voted, as manifested by their appetite, in favor of organic matter in the form of mature sweet clover residues (plus the fertilizers used in plot No. 3), as compared to the clover as an immature green manure crop.

Organic Compound Cycles

Recent research by Dr. Francis M. Pottenger, Jr., of Monrovia, Calif., points out that differences in the way the feed was handled or processed, for the animal making manure

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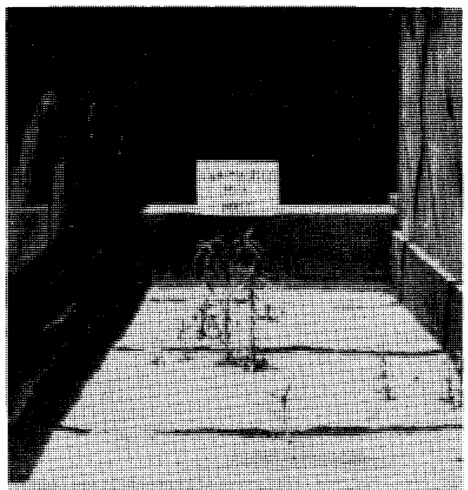

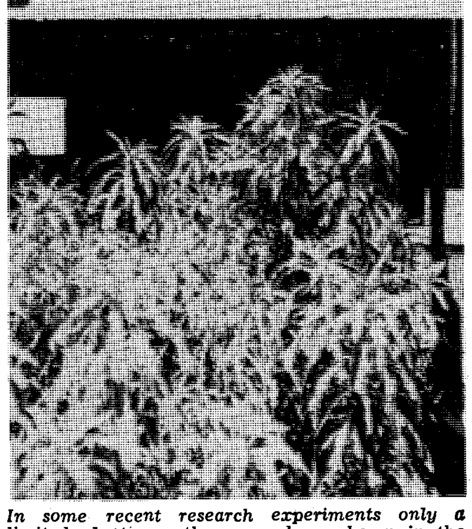

In some recent research experiments only a limited plant growth occurred, as shown in the upper photograph, when the soil was fertilized with dung from cats which had been fed only heated milks. On the other hand, dense, healthy plant growth resulted when comparable soil was fertilized with the dung from cats fed on natural (raw) milk.

In recent tests at the Missouri Station these hogs voted, as manifested by their appetites for corn, in favor of using the mature sweet clover crop for organic matter as compared with plowing it under as an immature green manure crop.

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from it, may be reflected as corresponding differences in the character and manner of growth by the plants and their seeds on soil fertilized with such manure. For example, some dwarf bean plants were grown on the sand of various pens into which cats had buried their dung for the two preceding years. The pens included cats fed alike in all respects except for differences in their milk, which included: (a) condensed, (b) evaporated, (c) pasteurized, and (d) natural (raw) milk.

At the end of the tests, it was clear that the four different kinds of milk, fed to the cats, produced different growth effects on the bean plants which had been fertilized by these various cat dungs in the sand pens. Dung from all the cats that wer fed heated milk produced only sparse plant growth. On the other hand, dung from cats fed the natural (raw) milk produced such fertile soil that a dense, healthy plant growth resulted

The first weed, growth later was removed, and the pens were then seeded to the ordinary white bean of dwarf growth habits. It was most surprising to note that in all six pens, in which the buried dung was from cats fed the heated milks (condensed, evaporated and pasteurized), the bean plants grew only as dwarf plants. But in the two pens in which the buried dung was from cats fed unheated milk, the bean plants grew, not as dwarf plants, but as pole beans with their vines going to the top of the screened sides of the pens. Here is an illustration that organic compounds, as well as the inorganic elements, may be travelling in cycles: first, from the soil into the plant, for their build-up into more complexity there; then into the animal, for possible digestive simplification there and later, through the excretions back to the soil, for another cycle of nutritional service.

It is particularly significant that the illustration cited relates to the amino acid tryptophane, which is the major deficiency protein of the corn grain.

When the effects from fertilizers on soils are measured only by yield variations in vegetative bulk, recorded as tons and bushels, there is little chance that we shall recognize crop differences demonstrating the varying effects between the use of inorganic and organic fertilizers. Our animals, however, tell us that the crop's nutritional quality reflects the different organic and inorganic compounds feeding the plants. When we learn to measure the crop's responses to soil fertility by more than bulk values and ash differences, then the contributions of the soil, both organic and inorganic, to plant nutrition will be more correctly realized.