

# Capital No Substitute for Soil Fertility

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**R**ECENT DECLINES IN TONNAGE OF LIMESTONE used on the farms in the United States from the peak amount in 1947 (under government subsidy) may seem to be due to the dictates of human nature. But in looking at that situation we dare not overlook the possible dictates also by Mother Nature as responsible. That capital will not substitute for soil fertility and move limestone as a form of that on to the soil is a disturbing behavior in economic thinking.

Those human dictates include soil testing, considered mandatory for government payments. We need to remind ourselves that the decline in limestone, even under payments, began as far back as 1947 when no soil tests were required. Soil tests, recently made mandatory, may be, decidedly disturbing in many instances, since very often they are dictates about using limestone to get rid of soil acidity, or to reduce the degree of acidity to a certain figure as measured by pH. If we are to follow Mother Nature's dictates in that regard we would forget about using limestone to "fight soil acidity," or to change the pH of the soil. Instead, we would start using it to feed the plants some calcium and some magnesium in the humid soil areas. Instead of making it mandatory to use enough lime to change the pH of the soil to certain values, we might well use soil tests to diagnose the deficiencies in the soil as regards amounts of exchangeable calcium and magnesium, the two reasons why limestone is applied to the soil.

## Must Consider Food Value

Of these two nutrients, namely calcium and magnesium, the soil must contain more in exchangeable supply than of any other nutrient element, or even of all the others combined, similarly held there. These again are Nature's dictates if we are going to

grow crops that mobilize other fertility elements along with the calcium into themselves. It is Mother Nature's dictate if crops are to get enough fertility from the soil to be creating significant amounts of proteins in plants like the legumes, which are the more nutritious forages rather than just fillers and foolers for our animals. This *is* also the case for the non-legumes given extra fertilizer nitrogen, now plentiful, and making them richer in protein. They may be richer in "crude" protein, that is, they are richer in nitrogen that might be measured as such and considered a protein. But without other fertility beside nitrogen, they will not necessarily be a "complete" protein in all that a protein must be if it is to (a) grow animals, (b) protect them from disease, and (c) make them fecund in reproduction.

Mandatory pH changes in the soil should disturb limestone applications when these soil treatments are guided by laboratory concepts of degree of acidity rather than by the degree of soil saturation with calcium and magnesium to fit the soil into the plant's nutrition according to natural laws and plant behaviors, of which the farmer is still the closest observer.

Another mandatory aspect in bringing on reduction in limestone use is very probably the insistence on applying, at once, all the limestone that one might believe the soil test suggests. Not all the limestone need be applied at once. Even a start, or a partial application, should be encouraged. This partial dosage of the soil's need would be more effective if the agricultural limestone were drilled into the soil. Results of tests of this practice at the Missouri Agricultural Experiment Station have demonstrated the better use by plants of limestone from limited and scattered points of it as concentrated reserves in the soil for root feeding, than from very fine stone intimately mixed throughout the soil body to offset its acidity. To insist that the total amount of limestone, suggested by the soil test, must be applied at once before allotments of pay are

made, allows no one to start on his liming program by partial applications in case his financial reserves prohibit doing more. Being mandative to that degree defeats itself. It disregards the facts of Nature long established; namely, that a slight help or just a start at better nutrition for the plant will get some plant response.

Surely no one will deny the wisdom of using soil tests, plant tissue tests, tests by the animals of differences in the nutritional quality of crops grown by liming over no-liming, or any other test to let us learn more about what services the liming of the soil is giving us. Soil tests have helped us to make the very progress that the whole liming program has brought about to date. The dictates by Mother Nature can be more clearly read by way of soil tests than without them. Unfortunately, the distorted interpretation of soil tests by human nature; the mandatory amounts of applications according to pH; and these in the total applications which the farmer's judgment says he can make as a beginning, have been the problem, and the disturbance. It has not been the basic facts given us by the soil tests.

When the peak of limestone use occurred as far back as 1947, and when there has been a decline in the national tonnage since that date, shall we view that curve as a report of no other factors than failing sales propaganda, poor appreciation by farmers of gift funds to conserve soil, inefficient teaching by county agents, and similar other human matters? Isn't it possible that inflations eventually must expend themselves? Isn't it possible, too, that the soil's response to more limestone is no longer registering so strongly by way of crop responses because other soil factors beside calcium and magnesium are coming in as limiting ones and as required soil treatments if better yields are to register the effects from liming? Isn't it possible, too, that with less emphasis on legumes, and more of it on non-legumes fed heavily with commercial nitrogen, that we are losing sight of those crops which formerly indicated

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Typical county soil testing laboratory in Missouri

the effects by limestone as it made up for them the shortages of calcium and magnesium in the soil from which they have been suffering most? Are we not growing more crops as bulk yields of less protein requiring less calcium from the soil as help for that?

#### Limestone for "Sustaining" Fertility

The fertility aspects, other than limestone, are emphasizing themselves enough to demand more of the farmer's fertility-purchasing power. He is now making investments in "starter" fertilizer almost to the exclusion of having any purchase power left for "sustaining" fertility in the form of limestone. When the high cost of production demands higher acre yields, which are not to be had without heavier applications of starter fertilizers, there is little chance that soils will be built up in the mineral reserves or in the sustaining fertility of which limestone is the major one. Annual applications of complete fertilizer at smaller outlay per acre will hold on while periodic applications, every eight to ten years, of large outlays in limestone and phosphatic rock will be less common. A study of the sales of these fertilizers in their decline may be consoling even if they are not desirably prophetic.

This is the normal and expectable rural economics of buying only what one can afford in relation to one's earnings, regardless of government subsidies, sales promotions, soil tests, or what have you. Mother Nature determines the earnings according as we know what the soils require as plant nutrition on most soils that now includes much more than an occasional heavy dosage of agricultural limestone.

As for the aspects of economics still further considered, it is a prevalent but erroneous belief that "we can now substitute capital for soil fertility" with our greater knowledge of fertilizers and their recent availability in abundance, especially nitrogen "the real booster of crop yields." There may be the belief that government subsidies will increase yields too, when it has been the belief that "the yields of soybean seed per acre in Missouri were pushed up from 11 to 30 bushels by the price of the beans going up." Nature's contribution in the form of well distributed rainfall isn't guided by the price curves. Nor do such economic behaviors of crop values to humans determine the soil fertility values to crop physiology. Unfortunately, funds in our banks don't have creative capacities that can be so directly demonstrated. We can't imagine funds in the vaults creating a crop of corn, or having a litter of pigs there. Some natural factors and forces come into play and our interpretation of agriculture as if it were wholly economics has been one of the reasons why we have not seen some of the subtle forces of Nature under the declining curves. Among those are many others beside that of tonnages of limestone used on the farm under government subsidy. The curve without subsidy has been on a continued but steady rise, inflation or no inflation, to suggest the significance of biological necessity rather than of economics.

#### Soil Depletion A Vital Factor

According to our economics of agriculture we make no allowance for the fertility of the soil thrown into the bargain when, for example, a sale of a bushel of corn is made. The fertility costs add up to at least 30 cents.

With the price of corn at \$1.50 per bushel, that amounts to 20 percent of the sale value of the grain or of the products marketed. That represents the rate at which the farmer is liquidating his fertility capital, or is liquidating what he really bought when he purchased the farm. But yet, our economics for agriculture classifies that transaction of selling corn as taking a profit of \$1.50, in the case of the landlord.

Should you buy a limestone quarry and start marketing the minerals out of it for agricultural production, you would be allowed 15 percent depletion. Economics of industry allows for mineral depletion in its business of mining, but allowance for mineral depletion of the soil has not yet had consideration as a fair help to the farmer for maintaining his capital and maintaining his business.

When the curve of agricultural limestone tonnage used started declining in 1947 does not that have a portent much more significant than merely one of poor sales propaganda and the neglect of the farmer to grab at federal gift money? Isn't it telling us that the time has come when mining the soil more by means of most any single fertility element applied isn't holding up crop production for profit to buy more fertility? Isn't it also telling us that if the fertility of the soil is to be conserved that conservation must be practiced by the farmer given the economic advantages by which he can do it himself as a business operator perpetuating his business? If he is to maintain the fertility capital in the soil at the high level required to feed all of us, then all of us must help in giving him depletion allowances to stay in the business just as we give non-agricultural businesses and industries the economic advantages by which their invested capital is protected.

Decrease in liming the soil even under federal stimulation by subsidy to the point where federal money is begging to be used has a real significance in connection with agriculture. That decline deserves careful consideration. It tells us that capital in ever larger sums will not substitute for the creative power of fertility in our soils now declining at rates quite significant but still not generally recognized. How long we can remain oblivious to that fact may be much shorter than appreciated when we keep emphasizing the surpluses and our peak productions. We always come to the soil as the last thing in our thinking, and are reminded that capital cannot substitute for the stuff that really creates.

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