

have a wonderful ameliorating effect on the soil, making it much more friable, and the land is usually ready much earlier in the spring for cultivation. Sod-land that is to be plowed this spring should receive as much cultivation as possible, previous to seeding. After plowing, the land should be disced as deeply and as frequently as possible. The more the ground is worked, the less liability of insect attack. It is doubtful if land can be too finely prepared for spring sowing.

Crop rotation, of course, is another very important factor of control. Usually land that is not allowed to be in hay or pasture for more than three years, is seldom seriously injured. Unfortunately many farmers do not care to plow up a pasture or hay crop, as long as it looks like producing a crop. Herein lies one of the biggest mistakes. White grubs and wire-worms are always more abundant in grass pasture, particularly an old timothy sod. Not only that, but the longer an old timothy sod is allowed to stand the more impoverished the soil becomes. Continuous growing of timothy is very hard on the soil, and is one of the most potent factors of soil depletion on a large number of farms to-day. If farmers would grow more clover and less timothy, they would not be seriously troubled with the white grub, wire-worm, and the cut-worm, and the soil fertility would be very largely increased, instead of depleted.

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Making Rock-Phosphate Available.

Editor "The Farmer's Advocate."

Wide-spread publication has been given, during recent months, to certain results of experiments (conducted by the Rhode Island Experiment Station) which tend to discourage the use by farmers of fine-ground raw rock phosphate. This material is a natural fertilizer in which the element phosphorus can be purchased for about one-fourth of its cost in manufactured acid phosphate, and for about one-tenth of its cost in the more common and more highly manufactured so-called "complete" fertilizers.

All of the long-continued field experiments agree in showing that raw phosphate is by far the most profitable and economical form of phosphorus to use in rational systems of general farming, but they also show that the most satisfactory results are secured when conditions are provided under which the phosphorus is made available, and the best condition under which to use the raw phosphate is to apply it in intimate connection with decaying organic manures, such as farm manure, clover, or other green manures. (See Illinois Experiment Station circulars 127 and 165.)

The experiments referred to consisted in mixing raw phosphate with fresh cow dung, and allowing the mixture to stand in closed bottles or loosely covered pans in a dark cellar for about nine months. At the end of this time it was found that the availability of the phosphorus was not markedly greater than when first mixed with the dung, and this fact has been spread abroad by fertilizer interests in a way to discredit the use of raw phosphate, whereas the actual culture experiments conducted with these materials at the Rhode Island Station showed that the raw phosphate increased by 30 per cent. the effect of the "pan" dung as compared with the increase in yields when dung alone was used. The "bottle" dung gave poorer results than that which had been exposed to the action of air in the pans, but in both cases the average results show distinctly increased yields due to the raw phosphate, as will be seen from the summary on page 174 of Rhode Island Bulletin No. 151.

The fact is that the early fermentation of manures is alkaline in reaction, while, during the later stages of decomposition, acidity develops, and it is the acidity which aids in the solution of raw phosphate; but under the conditions of the Rhode Island experiment no acidity had developed at the end of the nine months.

More extensive investigations by the Wisconsin Experiment Station support the results of other investigators in showing an appreciable decrease in the solubility of phosphorus during the early stages of fermentation, both of manure alone and of manure and phosphate mixtures, not only with raw phosphate but also with acid phosphate, owing to temporary use of phosphorus as food for bacteria; but the Wisconsin investigators (Tottingham and Hoffman) also show that the decrease reaches a minimum, after which increase in solubility occurs, although the maximum increase has not yet been determined. The conclusion is drawn by them that "so far as pot experiments indicate conditions in field practice, the final results from mixing rock phosphate with fermenting manure appear to be advantageous."

But for the most positive and conclusive in-

formation, we must turn to those valuable field experiments of the Ohio Experiment Station, conducted by Director Charles E. Thorne during the past sixteen years. As an average of all crops harvested the yields have been practically the same whether the phosphorus was applied in raw phosphate or in acid phosphate costing twice as much money, although supplying only half as much phosphorus.

A recent Ohio bulletin (No. 246), by Ames and Gaither, reports that the plowed soil of an acre of two-million pounds weight contains as an average 6 pounds of available phosphorus (soluble in weak nitric acid) where the land has been unfertilized, 5.8 pounds where "complete fertilizers" have been used, 8.9 pounds where manure alone has been applied, 11.7 pounds where manure and acid phosphate have been added, and 36.1 pounds where the fine-ground raw rock phosphate has been applied in connection with manure. These results plainly reveal both the availability and the cumulative effect of raw phosphate used in rational systems and in larger amounts than are required for the crops removed.

The data from the analysis of the soils after many years of farming under these different systems strongly support a suggestion made on page 257 of "Soil Fertility and Permanent Agriculture," namely, "that nitrogen must limit the crop yields" in these Ohio experiments, and that the plots receiving the raw phosphate (and containing more phosphorus, now in available form) would probably out-yield the plots receiving acid phosphate, "if more clover were plowed under or if more manure were returned so as to remove the nitrogen limit."

While the raw rock phosphate used in these long-continued field experiments has already paid back \$7.20 for every dollar invested (a considerably higher return than from acid phosphate, on the money invested), the returns would be still greater if manure were applied to the phosphate plots in proportion to the crops produced instead of continuing the past practice of applying only the same amount as where manure alone is used, and where the crop yields are much smaller.

When we consider that the air above each acre of land contains 70 million pounds of nitrogen, and that normal corn-belt soil contains as an average about 1,200 pounds of phosphorus and 35,000 pounds of potassium in the plowed soil of an acre of two million pounds weight, then we should expect substantial increase from the system of farming practiced by the Ohio Station, in which clover is used to secure nitrogen from the air, and organic manures are plowed under to liberate both potassium from the soil and phosphorus from the raw phosphate applied with the manure. This, with the addition of limestone as needed, provides a truly permanent and profitable system of soil improvement, and the results secured, as noted above, are in striking contrast to those reported in a recent valuable bulletin (No. 155) of the Indiana Experiment Station, showing that as an average of seventy-three different tests in many counties the value of the increase in crops of corn, oats, wheat, hay, and potatoes was only \$1.13 for every dollar invested in "complete" commercial fertilizers when applied to common loam and clay soils of that state.

In the interest of general prosperity and of increased food supplies, farmers should be encouraged to use their limited means for the purchase of liberal amounts of those materials that must be purchased if truly permanent systems of agriculture are to be adopted in the corn belt. University of Illinois. CYRIL G. HOPKINS.

Ear-Testing Seed Corn.

To secure a perfect stand of vigorous hills of corn it is imperative that the seed be tested by the ear, and poor ears rejected. This is easily done by placing six kernels from each ear in a shallow box filled with sand or sawdust to the height of the longitudinal and transverse strings or wires which divide it into squares, the kernels from each ear being in a square of its own, commencing at one corner of the box and working towards the opposite one. Each square is thus numbered automatically by the order in which it comes. The ears themselves are laid away on a table or on shelves, and on the butt of each is stuck with a pin or pasted with mucilage a small piece of paper or cardboard bearing its number. The kernels under test are covered with a sheet or sack, and sand placed on top of this, the sand being kept moist. In a week's time the boxes may be uncovered and the kernels examined for germination. Where all six kernels are found sprouting evenly and strongly the ear from which they came may be counted a good one to shell for planting. When one or more kernels of the six show slow germination or no sign of it at all the ear will be discarded or at least laid away for use only in case of shortage. It is somewhat slow but very interesting work making these tests and gives one quite an education of judging seed-corn. But he need never expect to become educated past the necessity of testing, for among corn kernels as among animals there are disappointments and blanks.

To illustrate: We procured our corn last year for "Weldwood" from a first-class grower, and the Longfellow in particular was a very fine grade. But a test of this variety showed the following result: Out of some two hundred and twenty ears, twelve had two or more kernels out of six that failed to germinate while seventeen other ears had one poor kernel out of six. Of the Bailey corn we had not time to test very much, but a few ears put into the boxes showed to our surprise very much poorer than the Longfellow and much slower in starting than the kernels representing a bag of White Cap corn obtained from Pelee Island. Unusual pressure of work, resulting from building and fencing is our only excuse for not having tested all the corn as we shall endeavor to do this year.

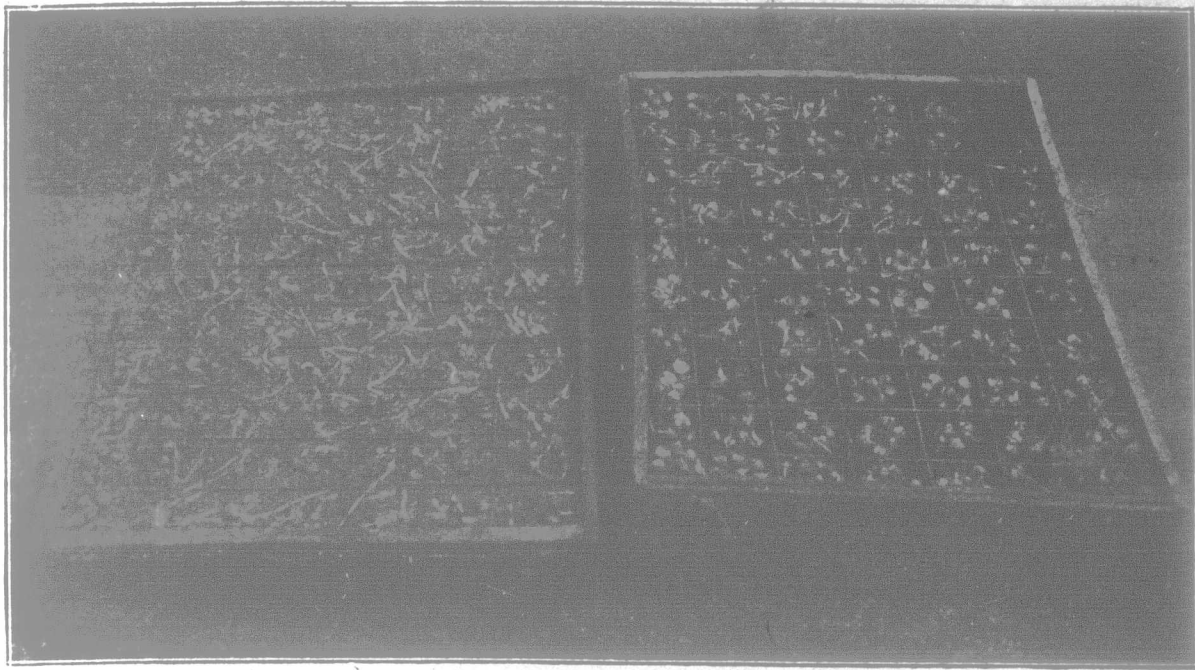
Ear-testing is particularly important where corn is grown for husking and a full uniform stand of about three kernels per hill is desired. It is, however, also important when growing for ensilage purposes, for here, too, one desires a full even stand. It does not altogether serve the purpose to plant an extra quantity when the corn shows poor germination for this cannot be depended upon to give a stand of uniform thickness. More important still, it will be found that corn which tests low is likely to have many kernels of low vitality even among those that sprout. To get a good vigorous crop one needs corn which will all start strongly and to this end ear-testing is essential. The work is interesting, can be done at odd times or rainy days and will usually be well repaid.

THE DAIRY.

Parturient Troubles in Cows.

INJURIES TO THE TEATS

The chief injuries of the teats consist of fissures or cracks, frequently noticed a few days after parturition. Though apparently unimportant they may become troublesome and serious if



An Individual Ear Test.