More Seedbed Studies

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Last year we continued our study and comparison of the disk, lister, subsurface tiller and plow for preparing seedbeds for corn. This was the fourth year that these implements have been compared, but since they perform differently on different soils, we do not believe we have the complete answer about them yet. In only 1944 and 1945 have they been studied at a sizable number of locations and on several soils.

Most of the years during these studies have had plenty of rainfall, which we think is favorable to the plow. And so far the yield of corn has been highest, on the average, where the land has been plowed. If and when we hit a dry year, results may be considerably different.

Of course the immediate yield is only one consideration of the good farmer. He knows that he must control erosion, for if he loses the topsoil, his land is injured for all future crops.

The only place where we have definite information on the relative value of these seedbed preparing implements in saving soil is the Experimental Farm in Page County. In the past 3 years on Marshall silt loam at Clarinda, the plowed land has lost 4 to 10 times as much as plots beside it which have been subsurface tilled or listed.

We feel pretty sure that on land which washes easily, one loses more soil by preparing the seedbed with a plow than with these other implements. In all of these tests where we made soil loss comparisons, the farming was done on the contour—plowing, listing, subsurface tilling, disking, planting and cultivating.

In the past year the studies with seedbed preparation—tillage—had the same general set-up as in 1944. The work was carried on cooperatively by the Iowa Agricultural Experiment Station, Iowa Agricultural Extension Service and Soil Conservation Service of the United States Department of Agriculture.

Where Tests Were Made

Experimental work was carried on at the Soil Conservation Experimental Farm in Page County, the Agricultural Engineering Research Farm in Story County and in cooperation with 11 farmers of the western part of Iowa and 9 in central and eastern Iowa. At all of these places we compared the four implements—plow, lister, disk and subsurface tiller—both with and without applying fertilizer. Yields of corn were carefully measured.

In western Iowa we had three fields on Monona soils, three on Ida soils and seven on Marshall soils in Montgomery, Shelby, Crawford, Plymouth, Carroll, West Pottawattamie and Monona counties. In eastern Iowa we had fields on Tama silt loam, Fayette silt loam, Carrington loam, Clarion...
loam, Webster silty clay loam and Chelsea and Dickinson sandy loam—sandy soils found along the rivers of eastern Iowa. These eastern Iowa soils were located in Clayton, Delaware, Linn, Tama, Jasper and Marion counties.

Results With Plow

For years the method of preparing the seedbed has been to plow the land, then work it down with a disk harrow, spike-tooth harrow and other implements before planting corn.

Can we do the job just as well or better with some other implement that takes less power and makes the soil less likely to wash away?

Our tests indicate the greatest advantages for the plow are on poorly drained, poorly managed, or heavily cropped lands. Here the loosening up which the plow gives seems to be highly beneficial. Plowing loosens the soil more than the other tillage methods. This favors activity of soil organisms that break down organic matter and liberate plant food. It also steps up the feeding power of the plant.

On the eastern Iowa soils where we have been making these tillage tests, plowing in general, except on Tama silt loam, has given higher yields of corn rather consistently. Yields on these soils have been helped considerably by fertilizer.

In western Iowa on the soils where we have tried these implements, the difference in yields the past 2 years has been too small to be significant. The slight differences might be caused by something other than the method in which the seedbeds were prepared. Fertilizers have helped these soils but not as much as those in eastern Iowa.

There is, however, the mark against the plow in soil losses at Clarinda which one cannot well ignore (see accompanying chart). On land which washes, we certainly may well look for a better method of preparing seedbeds that will help control erosion.

Lister Has Its Place

For a good many years in parts of western Iowa, and especially in southwestern Iowa, the lister has been used rather widely. Our tests in comparing it with other implements show that listing has a definite place on Ida, Monona and Marshall soils throughout western Iowa. It saves time and power, makes weed control easier and if done on the contour cuts down on soil and water losses.

Where the lister works best is on well drained soil that is permeable—that is, the water passes through it readily. You can't use the lister on grass sod unless you list in the fall or very early spring.
and then bust the middles out at planting time. We found that plowing is the only completely satisfactory way to make a seedbed on heavy grass sods.

If one is listing on land where legumes are growing and the planting is not to be done until the middle of May, then the legumes should be killed early by using a subsurface tiller or by disking. This is necessary to prevent the growth of legumes in the spring from using up moisture which the crop may need later in the season.

Although the lister has been used very little in eastern Iowa, we feel that in some places there it might work very well. Our opinion on this is backed up by the results of the last 2 years on Tama silt loam where the yield without fertilizer following listing has been close to that from plowing. When fertilizer was used, the yields from listing have been slightly ahead of those from plowing.

The results in eastern Iowa on the Carrington and Fayette soils have been close between listing and plowing where fertilizer has been applied, though the yield from plowing has been slightly ahead. Plowing gave best results without fertilizer, too.

**With the Disk**

There seems to be no place for the disk harrow as the sole seedbed preparing implement for corn except on land which is loose—land which may have been in soybeans or sweetclover. You can't hope to make satisfactory seedbeds without too much cost with the dull, worn disk found on many farms. Offset disks, disk tillers, bush and hog harrows and similar implements with greater cutting power have possibilities.

The ordinary disk has no place in trying to prepare a satisfactory seedbed on heavy grass sod. It will not work up a good seedbed on poorly managed land. It will not cut deep enough to make a bed for the roots. You may be able to get a place for the corn to germinate in these unfavorable places, but there won't be enough loose soil for the roots to get down to feed properly.

To work up a seedbed with a disk on some of these soils may require so many trips across the field that there is no saving in time or labor. Then, too, chopping up soil as much as this will destroy soil tilth. The surface runs together and crusts over causing serious washing. It also cuts down aeration.

**The Subsurface Tiller**

The subsurface tiller has promise of success, we believe. This machine consists of sweeps which the first time over will cut and loosen the soil about 3 inches deep, and the second time over 5 to 6 inches. It loosens the soil without turning it.

The tiller won't work satisfactorily alone on sod, but elsewhere there is no good reason why such a machine can't be made to work. It may be that we do not have the right machine yet, but the principle on which it operates should succeed.

On most of the soils where we have been using it the last 2 years it has produced corn yields somewhat lower generally than the plow and lister. On some of the central Iowa soils it has not shown up as well as the disk.

In western Iowa (Marshall, Ida and Monona soils) it has produced yields about the same as the plow and the lister. At the Experimental Farm at Clarinda in the last 2 years, the corn yield following subsurface tillage has been about 82 bushels of corn as compared with 85 bushels from plots beside it which have been plowed.

**Fertilizer Results**

We have known that in some instances low yields from subsurface tillage, disking and listing have been the result of not enough potash and nitrogen being available in the soil to produce satisfactory growth and yields.

In the past two years we brought in corn plants from several farms. The plants were analyzed. We found that they were lower in nitrogen or potash when grown on land that was listed, subsurface tilled or disked than on plowed land. So it was a case of the plant food nutrients being less available or that the soil was not well enough aerated for the nutrients to be taken up by the plants. That's why the crops made less growth in the early part of the season and showed signs of starvation. Adding fertilizer helped overcome the nitrogen or potash deficiency.

The fertilizer used in our test this last year was a complete fertilizer—3-12-12. About 170 pounds of this was applied to the acre. This amount would supply 20 pounds of potash, 20 pounds of phosphoric acid and 5 pounds of nitrogen to the acre.

In western Iowa this amount of fertilizer gave about the same increase in yields from the different types of machines—from 4 bushels on the disked plots to 6 bushels for
subsurface tilled seedbeds. That is, fertilizer increased the yields, but the difference between tillage practices has not been enough to be significant. The small difference in yield might have been due to something besides the tillage practices.

We have had rather large increases from the fertilizer on some of the eastern Iowa soils. On the Fayette and Carrington soils, fertilizer stepped up the yield of corn about 8 to 9 bushels an acre when the seedbed had been prepared with the lister or disk. It made practically no change when the land had been plowed and only about 3½ bushels when the subsurface tiller had been used.

On the Clarion and Webster soils which are found in north central Iowa, fertilizer increased the corn yield with the different types of implements from about 5 to over 10 bushels an acre. This is the average for 1944 and 1945. The results are shown in the accompanying table.

Saving of Power

No further study was made of the comparison of power used between plowing and other methods of preparing seedbeds. In studies of former years in which the Bureau of Plant Industry, Soils and Agricultural Engineering of the USDA cooperated with the Iowa Agricultural Experiment Station, it was shown that preparing the seedbed with the plow took the most power of any of the methods. Subsurface tillage requires less power than plowing, with diskng next and listing lower than other implements studied.

So we feel justified in continuing to study the comparative yields with these different methods, for if we can find one that will produce as good yields as plowing with a lower cost for power, easier weed control, plus soil and water conservation, then it will reduce the cost of producing our corn crop.

Whether to change the method of preparation must be based in part on the type of soil and the comparative yield which can be expected. We are pretty certain that on soil which washes badly, plowing is more detrimental than some of these other methods. With the corn borer wintering in corn stalks, implements that leave trash on the surface should be avoided unless the stalks are shredded to destroy the borer.

We feel that there is much yet to learn about building seedbeds properly for corn. They must be loose, yet not too loose nor too fine. We must keep in mind that we are building a root bed as well as a place for the seed to germinate. Continued years of study in Iowa and elsewhere should eventually teach us just how to make the best seedbed for corn.

Ladino Clover Shows Promise

LADINO CLOVER shows much promise as a pasture crop for some parts of Iowa and for certain purposes.

The Iowa Station has been testing it along with other legumes and grasses in small plot and field trial plantings over the state. Ladino clover has been compared with biennial white sweetclover, birdsfoot trefoil, Korean lespedezza and the Iowa pasture mixture (sweetclover, red clover and alsike clover) on nine different locations in western, southern and eastern Iowa. The seedings were made in the spring of 1943 on renovated bluegrass pasture which had been limed and phosphated where necessary.

Without exception, Ladino clover developed the best stand and showed the greatest vigor of growth in bluegrass pasture in the seedling year. After grazing, Ladino clover was the first to recover.

In rating the various legumes in the spring of 1945, Ladino clover excelled in vigor of growth, stand and recovery. In southern Iowa on the less fertile land, birdsfoot trefoil was a close second in stand and amount of growth. Korean lespedezza ranked last in forage contributions and ability to maintain itself in a bluegrass sod, while sweetclover and the Iowa pasture mixture were intermediate.

As a result of the performance of Ladino clover and the fact that it is a perennial, it shows promise as a part of pasture seed mixtures for use in southern and eastern Iowa. More tests will be made to find how well it is adapted to western Iowa.

Vitamin A value in Iowa butter was highest during July and August in 1943-44, but didn't reach the peak until October in 1944-45.