Minimum Seed Bed Preparation

M. G. FRAKES[1]

Heavy sugar beet soils, in the eastern area, when packed down by excessive tillage operations or heavy rains, result in a condition of very poorly aerated soil. This induces excessive attacks by blackroot organisms and causes nitrogen deficiencies as well as poor growth generally. It has been shown conclusively that sugar beets are very sensitive to excessive soil packing and conditions of poor aeration **(1)** , (2) .[2]

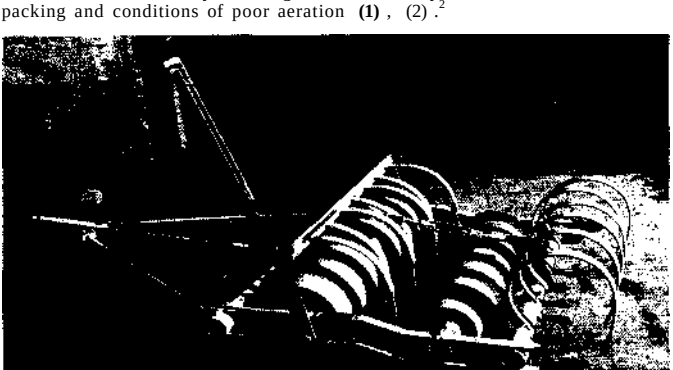

Figure 1.—A "Once Over Tiller" with a double bank of spring teeth which are independently adjustable for depth. It is attached to a two- or three-bottom plow and prepares the seed bed at the same time the soil is plowed.

It would appear that the idea of double discing, two or three harrowings, leveling and a final harrowing for "weed control" to produce a "fine, firmly packed" seed bed is not the best procedure for obtaining a seed bed under Michigan conditions. Excessive soil packing by tractor wheels and heavy machinery, plus subsequent rainfall, packs heavy soils to a point where yields of sugar beets, and other crops as well, are materially reduced. This is especially true of soils which have been heavily cropped with cash crops and in which the soil organic matter is low. Also, yields are particularly sensitive to soil compaction in those areas where drainage is a problem. Consequently, sugar beet growers are rapidly adopting a system of minimum seed bed preparation.

[1] Agricultural Research Director, Michigan Sugar Company, Saginaw, Michigan.

[2] Numbers in parentheses refer to literature cited.

What Is Minimum Seed Bed Preparation?

"Minimum Seed Bed Preparation" is a system whereby a grower plows his soil with a leveling or mulching tool attached to the plow. The soil is worked and packed somewhat in the same operation as plowing. Several tools are commercially available for attaching to plows for this purpose although sections of spike-tooth harrows, spring-tooth harrows or even a heavy plank or post have been attached to level off the newly turned furrows. One of the commercial-type tools used for this purpose is shown in Figure 1. This particular tool, called "The Once Over Tiller" breaks up clods, packs the soil to a limited extent and the adjustable spring teeth permit a slight mulching of the soil to aid in preventing crusting by subsequent rains.

Immediately after plowing with one of these tools attached to the plow, the field is planted. It is more advantageous if the field is planted the afternoon of the day on which plowing was accomplished. Many growers have two tractors in the field, one plowing and the other planting. The important point is that no tractor goes over the newly plowed ground until the one which pulls the drill.

Precautions

As with any new practice which is adopted by growers, it is necessary that certain precautions be taken in some phases of the process. It is necessary that the tractor be centered in the rows in accordance with the drill so that it will be easier to cultivate. If the tractor wheels are not centered directly between the rows when planting, subsequent operations with the cultivator may cause some difficulties. In the eastern area, a four-row drill is used in planting 28-inch rows. The cultivating is accomplished with four-row cultivators. Some difficulty may be encountered if this procedure is used with a six-row drill, using narrower rows which are cultivated three rows at a time.

When planting in loose soil, such as is accomplished with this system, the surface is not altogether smooth. Consequently, some growers have encountered difficulty in adjusting gauge wheels for mechanical thinners. This problem has been overcome by the use of gauge wheels directly on the sugar beet row itself.

The use of minimum seed bed preparation as described herein is not a cure-all for plowing soil too wet. The soil should be plowed with the optimum moisture content as with any other system of seed bed preparation. It is important that the planting operation occur very soon after plowing.

Results

Many growers have obtained excellent results with the use of minimum seed bed preparation other than the obvious saving which is accomplished both in time and expense in preparing a seed bed. Some of the results obtained have been:

1. Quicker and better emergence.
2. There are fewer weeds up to cultivation time. Sugar beets get

a head start over weeds and they can be easily controlled. It has also been noted that there are considerably fewer weeds in crops, such as corn or beans, when this method of tillage is used.

3. It has been found there is more moisture available for summer growth. The spring rains which occur in Michigan very often run off of soils which have been packed excessively. With minimum seed bed preparation, a three- to four-inch rain will sink into the soil and will be available for later growth of the plants.

4. It has been noted that there was less crusting in those fields which have been prepared with minimum seed bed preparation. The soil is more friable throughout the root zone all during the growing period.

5. Higher yields have been obtained in a majority of the cases. Many times a grower has doubled his yield. However, such drastic increases occur on soils relatively low in organic matter or where drainage is at a minimum. These cases refer to the six- to seven-ton yield farm, which, following this method of tillage, has produced 12 to 14 tons per acre. We have found that where this practice is followed on the 12- to 14-ton per acre sugar beet farm the yield increases but two to three tons.

6. In those years in which there is an excessive amount of rainfall in the spring, as often occurs under Michigan conditions, it is sometimes possible to get a crop planted using minimum tillage when time is at a premium. We have had many cases *in* which the use of minimum seed bed preparation meant the difference between getting a crop and no crop at all.

Perhaps equally as important as minimum seed bed preparation is the practice which should be followed, either with or without this system, and that is what we term "Deep Tillage."

What Is Deep Tillage?

"Deep Tillage" is the use of Graham-Hoeme plows, field cultivators with part of the teeth removed, or any other deep tillage implement used on a field to break up the hard compact layer often called the "Plowsole." This should be done in August or September. The primary purpose of deep tillage is two fold:

1. To control perennial weeds, primarily quack grass.

2. To enable soil moisture to penetrate the soil and be available for crops the following year.

It is important that this process be accomplished in August or September, rather than later in the season. Deep tillage as late as November will have very little effect on control of quack grass. By this time, the quack grass roots have been built up with plant food to a point where they can overwinter readily. However, if killed in August or September before the roots have a chance to store food reserves, the winter freezing will kill the greatest majority of them.

During a wet growing season plants have sufficient moisture to maintain proper growth. However, during **a** dry growing season, the effect of deep

tillage in conserving moisture and preventing runoff makes water available to growing plants which results in many cases in the difference between an outstanding crop and a crop failure.

It is important that deep tillage tools **not** be used when the subsoil is wet. Consequently, deep tillage should not be practiced in the spring as this will have a tendency to "puddle" the soil and do more damage than good.

Summary

It is being recommended to sugar beet growers in Michigan that they prepare their seed beds with a minimum of operations. These are to include, where possible, the use of deep tillage tools in August or September to break up plow sole or other compacted areas to the greatest depth possible; to spring plow with a leveling tool or mulcher attached to the plow and to plant immediately after plowing, without further working of the soil.

In a majority of cases this procedure has resulted in less incidence of disease, better emergence, fewer weeds and greater yields. In no case have yields been depressed by use of the tillage methods described.

Literature Cited

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