MECHANICS OF MINIMUM TILLAGE POTATO PLANTING

by

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Introduction

The minimum tillage culture of potatoes, as tested last season, included fall land preparation without spring preparation, and neither fall nor spring land preparation. Several quite successful grower attempts at minimum tillage included some preplant tillage prior to planting.

The mini-till concept was intended to reduce spring wind erosion of the soil. But many secondary benefits could result, such as reduced labor and machinery costs, etc.

The primary objectives last season were to define soil and cover crop conditions that would allow satisfactory planting of potato seed, and to determine how to manage a cover crop which had become excessively large. The amount of surface residue needed to keep sandy soil from eroding in 70 mph winds with gusts to 90 mph depends upon the type of soil, its condition, type of residue and how well the residue was anchored. In some cases, double disking of the winter cover crop and leaving clumps of sod on the surface were enough. The soil blew out of the roots, but detrimental erosion did not occur.

Planting potatoes mini-till into disked ground may cause some difficulty, depending upon the amount of crop residue. Fields previously in silage corn were successfully planted into disked residue with conventional equipment. The corn residue was successfully kept in the top 2 to 3 inches of the soil, away from the seedpiece, by careful planter adjustments.

In general, potatoes can be planted directly without prior soil preparation and without causing planting problems if the amount of crop residue is small, and if the planter is equipped for mini-till planting.

If crop residue is heavy or a large cover crop is present, undercutting or disking prior to planting increases planting difficulties. Heavy surface residues or cover crops that are firmly anchored in the soil are easier to plant through than if loose. Loose residue pushes ahead of the planter, wadding up and plugging the machine. Anchored residues divide and are rolled to the side when a clearing shovel is used, leaving an eight-to-ten-inch wide strip free of cover crop or plant residue.

Mini-till Potato Planting

The modifications needed on a planter to perform mini-till planting into heavy residues or cover crops are shown in Figure 1.

The eight-to-ten-inch wide lister shovel is set to run just deep enough to split the cover and throw it aside, leaving a cleared path about eight to ten inches wide. The shovel must be set at a very shallow angle.

The 16-inch sweep loosens the soil 6 to 8 inches deep thereby undercutting the cover crop 8 inches to either side of the seed row.

The planting shoe is four inches wide causing the seed pieces to fall in a narrow row that can be easily covered by the small covering disks. The soil is firmed over the seed with a packer wheel equipped with a zero-pressure tire. Modifications which reduce the number of

of projecting bolts, etc., and increase the clearance so that surface residue will slip around the shoe are necessary.

The covering disks are 12 inches in diameter and adjusted so that they pull soil only from the area that was cleared by the clearing shovel. The seedpieces are covered with a 3-1/2 to 4 inch layer of firmed, residue-free soil.

With the addition of a colter in front, it was possible to successfully plant into a dense crop of hairy vetch about two feet tall. Plots with tall, dense crops of wheat, winter graze, Austrian peas, and mustard were successfully planted in early May without the colter.

Post-plant Tillage

The implements on the mini-till planter destroy most of the cover crop in the potato row and up to eight inches on either side of the row. The remaining cover crop may be cultivated out when the potatoes are of sufficient height to control wind erosion. Complete kill of the cover crop is facilitated by spraying with herbicide prior to potato plant emergence.

Beware at the time of cultivating out to remove cover crop between the rows and not transplant it into the potato row. Shallow set sugar beet knives on long, single shanks are used close to the rows. The knives tend to push the debris away from the potato rows while at the same time slightly filling in soil around the plants. The knives should be staggered to reduce clogging. A 20-inch sweep is mounted on a second tool bar so that the shank travels in the center between the rows. By this arrangement all of the soil between the rows of plants is undercut.

Tubes welded along the bottom of the 20-inch sweeps make it possible to apply suspension fertilizer and insecticides in the proper location beneath the soil surface at the time of the first cultivation.

Mini-till Potato Harvest

Harvest problems due to mini-till ranged from essentially none to severe, depending upon the amount of surface residue or cover crop regrowth existing. Green, soddy regrowth caused difficulty in several instances, especially on harvesters without tilt tables to roll the potatoes out of the sod. Devining rollers helped, though at times the sod was too great for the rollers to handle. In heavy sod, the rollers also eliminated some of the potatoes. A grid made by weaving rubber strips over the deviner chain helped carry off some of the sod with the vines. This past season, fall green regrowth was also a problem in conventionally-tilled fields.

Mini-till Yields and Quality

Potato yields in the cover crop tests (at the Othello Research Unit) wherein the foliage was tall and dense, were all equal to or better than the average for the Columbia Basin. Twenty individual plots were in the 30 ton per acre range, and one plot exceeded 39 tons per acre. There is still much to be learned.

Yields in commercial mini-till fields ranged from 11 to over 30 tons/acre. One mini-till field produced 24 tons per acre though the fertilizer ran out early, and the plants died in about 120 days. The yield was normal for that length of growing season. An eight acre no-till field, which had been in potatoes the year before and had no cover crop, was mini-till planted and yielded 27 tons per acre. A field previously in silage corn was disked before planting, but not plowed, and it yielded 3 0 tons per acre. In another instance, the mini-till half of a circle yielded 26 tons/acre, three tons more per acre than the conventionally-tilled half.

Where mini-till yields did not meet normally expected yields, the reasons were generally problems associated with fertilizer, cover crop and water management. Such problems

are to be expected with a new management system because experience in anticipating crop needs under these conditions is not yet available. In some cases, no explanation for yield reduction was found, but the fault did not appear to lie with the mini-till concept.

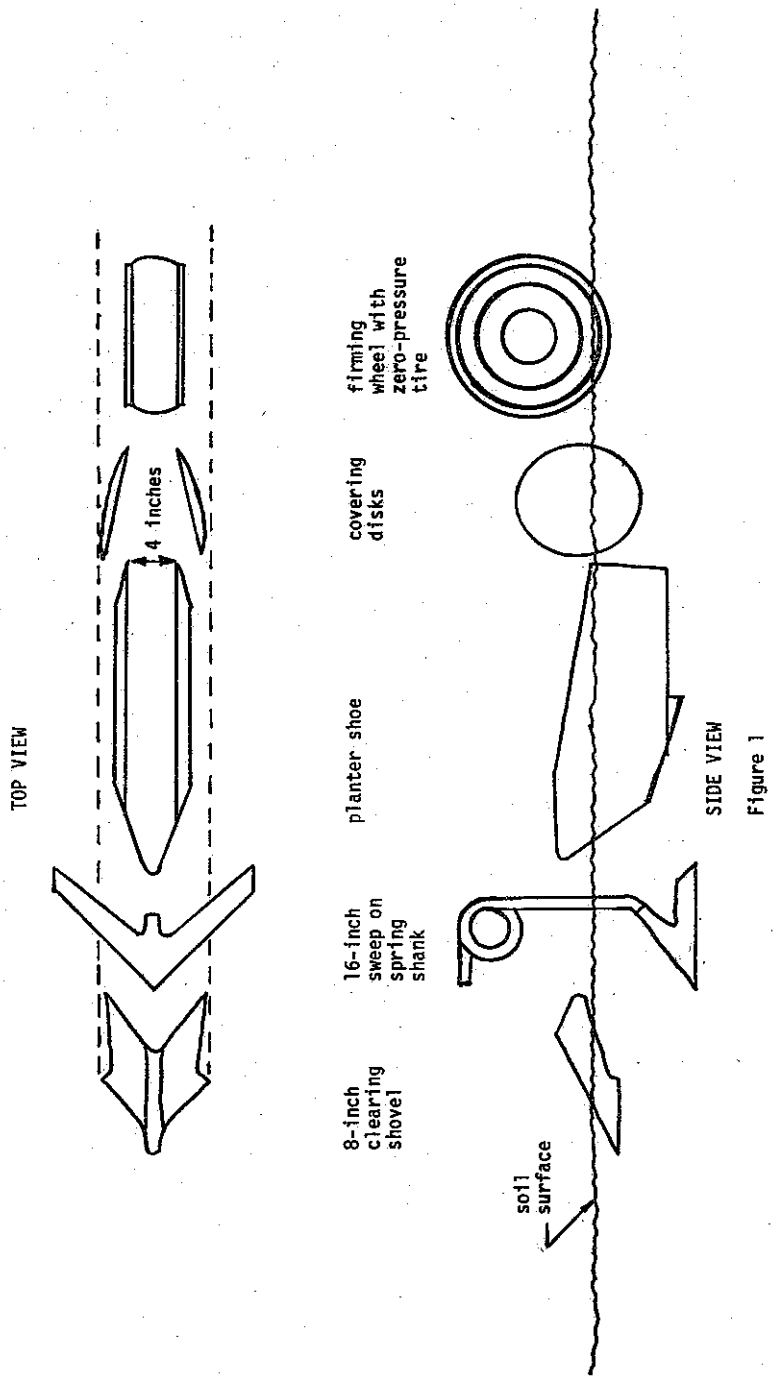

Figure 1