A conventional mechanical transplanter was modified for operation in chemically killed sod and non-tilled soils. Modifications included use of rolling coulters, double disc openers, gauge wheels, narrow press wheels and ballast weights on the frame and press wheels. Tobacco, tomato and pepper plants were transplanted into chemically killed sods and cereal-straw residue without regard to weather or hard, dry soil conditions. The no-tillage transplanter operation was adequate under all conditions encountered. Transplant survivability was slightly lower for no-tillage crops due to non-machine factors including increased insect and disease activities.

INTRODUCTION

Tobacco and vegetable crops are entirely grown under tilled conditions. Surface residues are buried by plowing and the soil is maintained weed free and friable by periodic cultivation. Tillage serves to conserve soil moisture and facilitate planting. After planting, cultivation also covers weeds in the row and provides additional support to the plants during wind storms by “hilling” soil around them.

These tillage practices may involve plowing, disk- ing, field cultivating, row cultivating and possibly other machinery operations. Tractors heavily weighted to meet these tillage operation demands for drawbar power cause soil compaction in the root zone. Timely planting, weed control and machine harvesting depend upon favorable soil moisture conditions for sufficient flotation of the tractors and machines. Tillage leaves the soil vulnerable to wind and water erosion and injures crop plant root systems. Tillage-loosened soil splatters onto crops, lowering tobacco quality and increasing the incidence of disease on vegetables.

No-tillage tobacco and vegetable production has advantages which will encourage grower acceptance. Tobacco, vegetables and possibly other specialty crops could be grown on slopes normally eroded when cultivated. No-tillage transplanting and some harvesting operations would not be curtailed by rainy weather because machinery mobility is maintained on sod-covered soils. Soil moisture is conserved by the mulching effect of the killed sod and previous-crop residue (1, 4). Soil splatter damage to crops would be eliminated (2, 3). Tillage machinery and labor would be replaced by a single high speed application of a sod-killing chemical. Soil compaction would be reduced by the elimination of high-draft requiring tillage implements.

Unlike growing corn and soybeans, the success of growing specialty crops, either under tillage or no-
of the frame for both opener penetration and furrow closing. Variable weight of riding workers and soil hardness necessitate the use of this much ballast weight even if it is not needed under all conditions (Fig. 3).

NO-TILLAGE TRANSPLANTER EVALUATION PRELIMINARY

Replicated field plots and demonstration fields were established with burley tobacco, tomatoes and bell peppers during the 1969 and 1970 seasons. Because the furrow opener design was substantially improved for the 1971 season, preliminary data will not be reported. The no-tillage transplanting system worked well enough to encourage continued efforts to develop it as a cultural practice for tobacco and certain vegetable crops.

EXPERIMENTAL PROCEDURE

Replicated, randomized split plots were used at two locations for burley tobacco and another for tomatoes and bell peppers. No-tillage transplanting was compared with conventional transplanting at each location. Plant survival was used for evaluating the no-till transplanting performance. All plot areas were surface broadcast fertilized and treated with residual insecticide and combinations of herbicides. It is assumed that the levels and timeliness of these applications did not affect transplant functions because the machine has been demonstrated to perform adequately in living sods. Water was applied with the transplanting at the rate of one cup per plant. The tomato and pepper plots were irrigated immediately after transplanting.

All plots were established using bare-root plants. The resistance of the plants to mechanical damage was considered to vary more with the degree of wilt than with variety differences within each species. The tomato plants were uniformly topped after breakage

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**Table 1. Transplant Survival Results**

<table>
<thead>
<tr>
<th>EXPERIMENT IDENTIFICATION</th>
<th>MEAN PLANT SURVIVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco—Maine Chance Farm</td>
<td>No-Tillage*</td>
</tr>
<tr>
<td>Tobacco—Eden Shale Farm</td>
<td>96.5 ± 1.6%</td>
</tr>
<tr>
<td>Tobacco—Horticulture Farm</td>
<td>97.5 ± 4.6%</td>
</tr>
<tr>
<td>Tomatoes—Horticulture Farm</td>
<td>97.0 ± 3.1%</td>
</tr>
<tr>
<td>Bell Peppers—Horticulture Farm</td>
<td>97.0 ± 3.1%</td>
</tr>
</tbody>
</table>

\* Standard deviations are given for each mean computed from 10, 8, 6 and 10 samples, respectively.

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(Tobacco Science 45)
occurred due to entanglement of large tops in the machine.

RESULTS

Burley tobacco survivability differences were not significant at one location and were highly significant at the other location (Table 1). Survivability was above 90% for 14 out of 18 no-tillage replications and was more variable than for conventional tillage as indicated by the larger standard deviations.

No-tillage tomato survival was slightly higher and less variable than for conventionally transplanted tomatoes for the eight plot replications tested. Bell pepper survival was significantly less and was more variable for no-tillage than for conventional transplanting.

DISCUSSION

No-till tobacco plots had lower transplant survival than did conventionally tilled plots. This was also true for bell peppers but not for tomatoes. The differences appeared to be caused by factors other than mechanical damage inflicted by the transplanter.

The killed sod and previous crop residues are a potential source of undisturbed plant pests and disease organisms which may attack newly transplanted plants before they become established. These factors were not eliminated from the experiments and could not be evaluated. The no-tillage transplanter is considered to be able to produce plant stands as good as those resulting from conventional tillage if these cultural factors are controlled.

The no-till transplanter operation was adequate under all conditions encountered which included two fields and several demonstration plots in addition to the reported experiments. No adjustments nor modifications were necessary throughout the transplanting season. The machine was operated by many persons including farmers, researchers and technicians without difficulties.

The modified transplanter should be equipped with a runner-type shoe and conventional press wheels for operation in freshly tilled fields.

SUMMARY

The no-tillage transplanter was functionally adequate to establish tobacco, tomato and pepper plants in killed sod and crop residues. Slightly lower transplant survival on no-tillage plots indicates the need for improvements in the total cultural practice to produce plant stands as good as those produced by conventional tillage methods. Added precautions against insect damage is the most obvious requirement for transplant survivability.

LITERATURE CITED