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STRIP TILLAGE IN FIELD PEPPERS

FINAL REPORT

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ABSTRACT

A strip tillage system was compared to conventional tillage in field peppers grown on a light, sandy soil. Monitoring showed that there is a potential for a 34% reduction in fuel use for strip tillage vs. conventional tillage. Yields from the strip till were 5% higher than the conventional. Weed control was more difficult in the strip tillage system because the rye could not be worked in until it was 1 metre tall.

STRIP TILLAGE IN FIELD PEPPERS

BY

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INTRODUCTION

Peppers grown on light, highly erodeable soils need protection from wind in order to reduce the damage caused by blowing soil particles. The strip cultivation system is one way of reducing this wind damage as well as possibly reducing the fuel use by reduced traffic across the field.

OBJECTIVE

An on-farm test was set up in cooperation with the farmer near Wheatley. By comparing fuel use per hectare for both the strip cultivation system and conventional tillage, the fuel savings should be evident.

TEST

Two different tillage systems were compared to arrive at the fuel use per hectare in the spring preparation of the seedbed for peppers up to and including planting. In the fall of 1983, all the land which was to be planted into peppers was planted with a rye cover crop. This rye served a two fold purpose, first it acted as a cover crop to hold the light soil in place and prevent erosion by wind, and secondly, it adds organic matter to the soil in the form of a green manure. One hectare was planted in the conventional manner and 6 hectares were planted using the strip tillage system.

The basic operations carried out in the various tillage systems are outlined below.

CONVENTIONAL TILLAGE:
- disc 13 cm deep, twice
- disc & packer
- planting

STRIP TILLAGE:
- work strips 50 cm wide x 13 cm deep directly over the pepper rows
- Lilliston cultivator to incorporate herbicides
- planting
- cultivate between pepper rows to incorporate rye

The strip tillage system involves only working a strip of soil 50 cm wide directly over the pepper rows rather than working the whole field as in conventional tillage. A PTO powered roto tiller, 1.5 m wide was used in the strip tillage system. Some of the tines were removed so that only two strips 50 cm wide were being worked. The tine setup on this particular roto tiller limited the spacing which could be achieved. With a 50 cm wide strip worked, it was felt that cultivation of the crop after planting would be easier. A

rye strip 40 cm wide was left untouched between each worked strip. When the field was finished alternating strips of worked soil and rye strips could be seen across the field. The machine worked the soil to a depth of 13 cm while travelling at a speed of 6 km/h. With this, the rye was well incorporated and as a result no regrowth of rye occurred. It had been killed. Two small crow foot packers were added to the back of roto tiller to firm the seedbed left by the tiller. It was felt that without this packing operation, the worked strips were left too loose and were prone to drying out. The rye remaining between the worked strips remained more or less intact and kept growing. The rye grew to a height of 1 m before it was worked in between the rows.

Straight coulters in front of the transplanter shoes aided in cutting the rye residue and prevent balling and plugging during the planting operation. The peppers were planted in 90 cm rows with a plant spacing of 40 cm.

The rye strips between the pepper rows effectively formed a mini windbreak between each pepper row. Temperature measurements at plant level in the strip till field and conventional field showed no differences in maximum or minimum daily temperatures. In other words, the plants in both fields experienced the same daily temperature fluctuations. Little, if any, wind damage was noticed in the strip till portion of the field.

Rainfall in the Wheatley area in 1984 was very unusual. In mid May 150 mm of rain fell which caused some problems at planting. The next rainfall, amounting to 18 mm, came in late July. After planting near drought conditions persisted until near harvest. This is not a normal condition for this area.

Fuel use results:

CONVENTIONAL		STRIP-TILL	
2 x dis	23 ℓ/ha	Work Strips	13 ℓ/ha
disc & packer	18 ℓ/ha	Cultivate to incorporate herbicide	7 ℓ/ha
	41 ℓ/ha	*3 x cultivate to kill rye between rows	21 ℓ/ha
			41 ℓ/ha

*With chemical killing of the rye early in the spring it is felt only 1/3 of this fuel would be required to incorporate it between the rows.

Adjusted total:

$$41 - (2/3 \times 21) = 27 \text{ ℓ/ha}$$

$\therefore$ Percentage fuel reduction $= \frac{(41 - 27)}{41} \times 100$

$= \frac{14}{41} \times 100$

$= 34\%$ (potential savings)

From these results it appears that there is no reduction in fuel use in conventional vs. strip till. It must be kept in mind that three passes with a cultivator were required to work in the rye strips. However, with only one pass required to work in rye that has been chemically killed in the spring, the strip till system will potentially use 34% less fuel than conventional tillage.

PROBLEMS

1. The planter wheels tended to slip off the unworked rye strips in the strip till system causing deeper planting depth as well as crooked rows. The reason for this was that the unworked strips were saturated with water from the 150 mm rain shortly prior to planting. This amount of rainfall is not normal for this area at planting time.

2. The rye strips between the rows were left untouched and because of rainly weather in the spring reached a height of 1 m before attempts were made to incorporate it. Trying to chop this rye down and work it into the soil proved a major problem. A multivator, a roto tiller consisting of multiple individual driven tine assemblies, was tried, but the rye was too long and tough and merely wrapped on the shafts. The tines then failed to penetrate the soil and merely rolled along on top of the ground. Lilliston rolling cultivators were finally used to knock the rye down and work it into the soil.

3. Weed control in the strip till system was more difficult because of the heavy rye straw cover between the rows plugging the cultivator. This problem was not experienced in the conventional part of the field. To eliminate some of the problems experienced with the rye this past year, in 1985 the rye will be worked in strips the same as this year and at the same time the remaining strip killed with Roundup applied with a wick bar. Land slated for pepper production next year has already been seeded down with rye.

CONCLUSIONS

1) Strip tillage could potentially use 1/3 less fuel per hectare compared to the conventional tillage system, if chemical control of the standing rye is used.

2) No wind damage of transplants was experienced due mainly to the windbreak effect of the inter-row rye strips. Winds capable of moving soil particles were experienced on at least 5 occasions. The orientation of the rows does not really matter, the rye will serve to reduce wind induced damage.

3) The strip tilled part of the field yielded 5% higher than the conventional possibly due to the increased moisture holding capacity of the strips containing the rye. The summer of 1984 had very little rain, creating almost drought conditions in the Wheatley area.

YIELD

STRIP TILL	18.5 t/ha
CONVENTIONAL	17.6 t/ha

4) Weed control in the strip till trial was more difficult because of the rye stubble.

5) Packers had to be pulled behind the roto tiller to firm the loose soil and prevent it drying out.

6) Differences were noticed between the two trials as far as colour and size of plants was concerned. The peppers on the conventionally tilled soil appeared darker green and somewhat smaller than those in the strip till. Leaf analysis showed that the nitrogen and phosphorous levels were nearly identical in both trials. These levels fall well within the normal levels for leaf analysis.

% NITROGEN	% PHOSPHOROUS	
2.42	0.155	STRIP TILL
2.88	0.175	CONVENTIONAL

7) For 1985 it is planned to combine the stripping and planting operations into one pass over the field.

SUMMARY

The strip tillage system in peppers did show a potential 34% fuel savings compared to conventional tillage. No wind damage was experienced in the strip tillage trial even though numerous strong winds hit the area. This means that the rye strips serve to protect the fragile transplants from this kind of damage. The fact that the strip tillage trial yielded 5% higher than the conventional trial shows that this system has potential. Some fine tuning of the system is required to handle the rye strips.

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