SUCCESSFUL RIDGE-TILL IMPLIMENTATION ON A PRODUCTION COTTON FIELD

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ABSTRACT

During field scale implementation of ridge-till cotton production system, several problems were encountered that would not normally be considered problems in small plot work. These problems involved bed forming, cover crop selection and establishment, burn-down, planting, cultivation and stalk destruction. This paper discusses how the problems arose, how to avoid them, and how we dealt with some of them.

INTRODUCTION

The need to be in compliance (meet requirements to participate in USDA farm program) on highly erodible soils used in cotton production has made many growers look at alternative production systems that do not incorporate crop residue. One system that appears favorable for cotton production is a ridge-till system. The ridge-till system could have several advantages which are (Anon. b., 1988):

1. Will reduce water erosion.
2. Will reduce chemical run off.
3. Will reduce time requirement of crop production.
4. Will reduce machinery cost.
5. Will reduce soil compaction.
6. Will allow for earlier planting.
7. Will improve soil structure beneath the ridge.
8. Will provide excellent seed bed at planting time.
9. Will protect young cotton seedlings from wind injury.
10. Will promote earliness.

This ridge-till production system was evaluated on silt loam soils in Northeast Louisiana (Hutchinson et al.. 1991 and Paxton et al., 1993) and found to be as profitable as conventional or no-till systems.

Arkansas has many loess derived soils that are very similar to those found in the Macon Ridge area of Northeast Louisiana. Many Arkansas farmers are confronted with needing to convert to soil conserving systems to continue to be in compliance. We initiated experimental plots, at the Cotton Branch Experiment Station located at Marianna, AR, on loess derived soils in 1993 to confirm results obtained in Louisiana. We also used ridge-till in an 18 acre field in cooperation with a local farmer. Our idea here was to verify the feasibility of the ridge-till system on a production scale field. We also wanted to identify problems that occur in field scale systems that are not apparent in small plots. Our experience with the field scale implementation is reported herein.

MATERIALS AND METHODS

A field classed as highly erodible consisting of a Loring-Calloway-Henry (Anon. a, 1977.) soil complex was selected. This field had been planted with ryegrass at 30 lbs. per acre on Sept. 8, 1992. The ryegrass cover crop was burned down about the first of April using 12 oz. of Roundup" D-Pak plus 1% surfactant and again the middle of April using 24 oz. of Roundup D-Pak plus 1% surfactant. (Mention of manufacturers is for the convenience of the reader only and implies no endorsement on the part of the authors or the University of Arkansas.) The field was planted on May 8 with 5 to 7 DPL5O cotton seed per foot. The cover crop was again burned down on May 12 using 1.5 pt. per acre Gramoxone plus 0.5% surfactant. The crop was cultivated using a Sukup high residue cultivator on June 3, July 1, and July 23. Fertilizer consisted of 40 lbs. N per acre applied preplant and 60 lbs. N per acre side-dressed on June 8. Weed control consisted of 1.5 lb. Cotoran and 2 qt. MSMA applied on a 14 inch directed band on July 1 and 23. Hand hoeing was used for a few weed escapes and bad spots on July 23. Beds were built for the 1994 crop on August 3, 1993 using a Sukup bed shaper on a high residue cultivator.

The crop was defoliated on Sept. 30 with 1.5 pt. Folex and 1 pt. Prep. The crop was harvested twice, Oct. 14 and Nov. 15. A wheat

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cover crop for 1994 was planted about Oct. 15. 1993.

DISCUSSION

For practical implementation of ridge-till systems, we found several factors which are not normally considered to be of practical importance to require very close attention. We have labeled these as keys to success and will discuss them in temporal order.

Key 1: Bed Forming. Beds need to be established at the lay-by cultivation of this years crop for next year. The height and symmetry of the beds is extremely important. The Sukup manufacture recommends 9 inch high beds. However, on the hard loess soils a 5 to 6 inch bed was as tall as the high residue cultivator would cultivate properly. Higher beds resulted in the plow not going under the debris in the center of the furrow and clogging up. Disc bedders make a non-symmetrical bed that the planting equipment will not follow properly. To obtain a bed with the correct symmetry it is almost essential to form it with the ridging attachment on the high residue cultivator.

Key 2: Cover Crop Selection and Establishment. Attention needs to be paid to selecting a cover crop. Factors to consider are (1) seed cost, (2) growth habit, and (3) ease of killing in the spring. In our area ryegrass, rye, wheat, vetch, and crimson clover are currently recommended. Ryegrass is extremely hard to kill and is a noxious weed if the field is rotated to wheat. Rye has a high seed cost and grows very fast in the spring and may not be manageable. Wheat is cheap, does not produce too much stover, and is easily killed with 12 oz. of Roundup D-Pak. Vetch has expensive seed and can be hard to kill in the spring.

In this area with seedling rice in the vicinity (within 1 mile), Gramoxone drift can give severe rice injury. Crimson clover has expensive seed. Cover crops need to be established early enough in the fall to allow enough heat units for growth and development prior to extended cold weather. For our area a establishment window is from Oct. 1 to Oct. 15. Adequate soil moisture needs to be available for germination and establishment. If adequate moisture is unavailable, delay planting until enough rain has occurred to provide moisture. Seed after defoliation so that sufficient residue is on the soil surface to help hold the seed on the beds. It makes little difference if the crop is drilled or aerial seeded. Utilizing the above window, we have obtained a stand of clover, rye, and vetch every year for the last 20 years in a cover crop study.

Key 3: Burn-down. Burn-down at least 10 days prior to planting so that insect problems will be minimized. Burn-down can be earlier for various reasons such as:

(1) Insurance so that if the cover crop is not killed you have another opportunity to spray it again prior to planting.

(2) The bio-mass of the cover crop is becoming too great so that equipment utilized later will not work properly. If too much stover is produced, then consider Shredding the cover crop at about a 10 inch height. Frail mowers give a much more even distribution of stover and make subsequent operations more trouble free.

(3) It appears to be a dry spring and the cover crop is using up the stored soil water.

Key 4: Planting. Beds need to have top barred off so that there is a clean area to plant in. Some soils will require this operation to be done separate from the planting to keep the planter from "balling" up with mud. Herbicide incorporation is best done as a separate operation prior to planting. It is almost essential that planters have a guidance system of some sort to hold them on the center of the bed. The seedling rate needs to be increased about 20% compared to conventional tillage.

Key 5: Cultivation. A high residue cultivator is a must for first cultivation. If beds are too high, then use smaller sweeps to loosen the soil and then plow with wider sweeps.

Key 6: Stalk Destruction. A key to subsequent operations is uniform distribution of crop residue. Rotary mowers tend to concentrate the debris on one of two rows and will occasionally leave a large pile. Frail mowers do a much better job of evenly distributing stalk residue. In addition Arkansas law requires a frail mower be used if stalks are not incorporated into soil.

Even though 1993 was a terrible cotton year, the ridge-till yields were about the same as conventional production. A cost comparison (Table

1) shows that cover crop seed and burn down gives almost equivalent costs as conventional mechanical seedbed preparation.

Table 1. Costs and income from cotton production under ridge-till and conventional tillage systems.

	Ridae-Till	Conventional[1]
Seed Bed Prep	$ 16.23	$ 20.16
Fert. & App.	$ 22.65	$ 22.65
Planting	$ 19.70	$ 16.37
Post Plt. Cult. &Weed Cont.	$ 64.77	$ 64.77
Insect Cont.	$108.38	$108.38
Harvest	$ 86.38	$ 86.38
Total Costs	$318.11	$318.71
Total Income[2]	$339.34	$339.34
Net Income[3]	$ 21.23	$ 20.63

[1] Conventional was same as ridge-till except for planting and burning down a cover crop and the addition of two disking, floatation, bedding, and do-alling operation in seedbed preparation.

[2] Yield times ten year avg. price of $0.59 per lb. plus USDA deficiency payment of $0.2055 per lb. (estimated) for base yield of 500 lbs. per acre.

[3] Total income minus total cost.

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