

ULTRA NARROW ROW HARVESTING APPROACHES

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Abstract

The introduction of new varieties, weed control options and improvements in equipment technology have renewed the interest in drill seeded cotton. Twelve locations were initiated in five states to evaluate the concept of planting Ultra Narrow Row Cotton (UNRC). The one area that needs additional attention is that of harvesting. This paper will give an overview of some of the equipment utilized and the modifications.

Introduction

The practice of drill seeding cotton in narrow rows (7.5 - 10 inch) was once again evaluated across the cotton belt in the states of Texas, Louisiana, Mississippi, Arkansas and Tennessee in 1995. Results from previous studies conducted in the 1960's have shown this to be an alternative to conventional wide row cotton production (Kirk, et al., 1969). Improved cotton varieties, additional weed control options, system approaches, conservation compliance requirements, technological advances in planting equipment and the continued need for greater return on investment are all reasons associated with the resurgence. The one limiting factor that still remains is the development of a reliable harvester. Several variations of the basic finger harvester were evaluated this season.

Over the past 30 years there have been a few companies who developed and marketed a finger harvester. The differences between these units were very minute. The concept of fingers, made from angle iron, mounted to a central point and tilted at 15-20 degrees was utilized in all models. Cotton plants would travel between the fingers and thus cotton bolls would be removed as the machine moved forward. A "kicker-bar" was placed above the platform on most models to help remove the cotton bolls from the plant and also move the cotton from the platform to the auger.

There has not been a major engineering effort, other than those performed at the producer level, directed at this equipment in over 20 years. The system of using metal fingers to remove the cotton then roll it back with a kicker bar still works. However, with the advancement in technology that now powers these harvesters, the efficiency can be drastically increased. One area that greatly increases the efficiency is the addition of a saw-type cleaner (field

cleaners). The addition of field cleaning to remove sticks, burrs and other trash allow for stripper harvested cotton to be ginned at facilities generally regarded as only accepting picker harvested cotton (Table 1).

The equipment utilized this year included an Allis-Chalmers 760 and 880, John Deere 484, 7445 and 7450. All machines had field cleaners except for the JD 484. Finger harvester units included the Allis-Chalmers, John Deere and International models. Various modifications were made by the producers to individual harvesters.

Allis-Chalmers 760/880

Although the last AC 760 harvesters were built in 1974 they still maintain a high degree of reliability. The only differences in these machines were minor modifications to the finger units. In some cases the kicker-bar was either removed or adapted with some form of brushing mechanism. These variations included mounting brushes directly to the kicker-bar and a "rolling brush." The kicker-bar brush helps to sweep the cotton to the auger once the fingers have removed it from the plant. The rolling-brush runs on a chain and sprocket mechanism with one to four brushes that help remove the cotton bolls from the plant at the front of the platform and sweeps them to the auger. This method works extremely well where plant populations are thin or slow harvesting speeds are required. There is a tendency for cotton to roll off the front of the platform in these situations.

An area of concern with the Allis-Chalmers machine is the belt drive mechanism in the throat that is used for moving cotton from the header to the cleaner. When yields are high this system is easily overloaded and can become clogged (Kepner, et al., 1979). Due to the capacity of the belt auger, harvesting speeds of 3.0 mph or less are required.

John Deere 484, 7445 & 7450

All of the John Deere equipment performed very nicely with the Allis-Chalmers finger harvester. Some modification of the head is required for assembly on the John Deere machine. One of the JD 484 machines was equipped with a JD finger harvester manufactured in the 1960's, while the other was utilized the International model. The major difference between the two is that the JD harvester uses 2.0 inch angle iron for the fingers rather than the 1.0 inch used on the International and Allis-Chalmers versions. This in turn reduces the number of openings available for plants to travel. Spacing between fingers was less of a concern. Agronomic conditions were of greater concern at the location where the International head was evaluated. The plots for harvest were planted under a pivot in circular rows on 32 inch beds. This not only made driving very difficult but there was some cotton skipped over due to its fruiting position on the plant. These

two factors were taken into account at this location and harvest loss samples were taken from the plots.

A John Deere 7450, made available from John Deere Des Moines Works, was used to harvest the plots in LA, MS and TN. This machine was adapted with an Allis-Chalmers finger harvester with two kicker bars. Modifications include a reel speed valve and enlarging the feeder opening of the header. By enlarging this area, air movement between the header and the throat of the 7450 was greatly increased. This translated into greater harvesting efficiency in terms of moving cotton bolls from the head to the cleaner and harvesting speeds increased to 4-5 mph. Due to the and the higher plant populations the twin kicker bars were sufficient for moving the cotton speed of harvesting from the head to the auger. By using the fieldcleaner the stripper cotton was readily accepted by gins accustomed to ginning only picker cotton.

Two John Deere 7445's were modified to harvest narrow row plots on the Texas High Plains. One machine used an Allis-Chalmers head with a three brush system and the other used the International head with brushes attached to the single kicker bar. The Allis-Chalmers head was configured with one kicker bar using three full length brushes. Three brushes, 10 inches x 158 inches long, were attached to supports at equal distances, 120 degrees, around the kicker bar. The kicker bar in this configuration was turning at approximately 45 rpm. This proved to be somewhat fast as there was the tendency to throw cotton up and over the front of the machine. The fact that there was more contact between brush and fingers was helpful in keeping a continuous flow of cotton in the machine. Where cotton growth was held at 28 - 32 inches, field speeds of 5 mph were obtained. In rank growth conditions slower speeds were necessary to minimize the number of plants that were pulled from the field.

At one location we used a John Deere 7445 with the International finger harvester and an Allis-Chalmers 760. Both machines were equipped with field cleaners, which yielded some interesting numbers. There was a difference of 400 lb.in harvested weight per plot between these two machines. Gin samples were taken from each rep for determination of percent turnout. The JD 7445 had an 8% higher turnout than the AC 760 (Table 2). Advancements such as this are the very reason that UNRC is now a real possibility

Summary

The studies from this year have shown that there is machinery available to harvest ultra narrow row cotton. The addition and improvement of field cleaners has already helped in moving this system into some areas of the cotton belt. Although the finger harvester worked for small demo trials, much larger and more efficient units will be needed for commercial acceptance.

References

1. Kepner, R.A., Curley, R.G., Brooks, C.R., and V.T. Walhood. 1979. A Brush-Type Stripper for Double-Row Cotton. TRANSACTIONS of the ASAE.
2. Kirk, I.W., Brashears, A.D., and E.B. Hudspeth, Jr. Influence of Row Width and Plant Spacing on Cotton Production Practices On the High Plains. Texas Agr. Exp. Sta. Miscellaneous Publication 937. 1969.

Table 1. Mean Gin Turnout (%) for drill/stripper vs planter/picker plant/harvested cotton

<u>Location</u>	<u>Gin Turnout (%)</u>	<u>LBS/A</u>
ARKANSAS		
Picker	32.2	768
Stripper	27.9	765
LOUISIANA		
Stripper	27	929
MISSISSIPPI		
Picker	34	806
Stripper	32	1022
TENNESSEE		
Picker	32	815
Stripper	28	897

Table 2. Comparison of AC 760 vs JD 7445 Lint Turnout (%)

	<u>LINT TURNOUT (%)</u>	
	<u>AC 760</u>	<u>JD 7445</u>
Rep 1	20.92	29.57
Rep 2	<u>18.04</u>	<u>28.37</u>
<u>AVG.</u>	<u>28.97</u>	<u>20.92</u>