CLEMSON EXTENSION

SL 10 June 1993 SOYBEANS

Relay Intercropping With Wheat

INTRODUCTION

Doublecropping wheat and soybean is a popular cropping system across the southern U.S. Producers, however, are challenged by high costs, price volatility, and weather extremes which reduce profit potential, especially for soybean. For improved production efficiencies, and for meeting conservation compliance requirements on highly erodible fields, new environmentally sound and cost-effective reduced tillage ideas should be examined.

Relay intercropping or interseeding soybean into standing wheat is a concept which has been explored in the Midwest as a means of extending the growing season to facilitate doublecropping (Chan et al., 1980; Duncan et al., 1990; Jeffers, 1984; McBroom et al., 1981a, b; Moomaw and Powell, 1990; Reinbott et al., 1987; and Wendt and Nave, 1979). In the South, intercropping has been examined recently in Mississippi (Buehring et al., 1990) and South Carolina (Khalilian et al., 1990; Hood et al., 1991; Hood et al., 1992; Khalilian et al., 1991; Khalilian et al., 1988; Whitwell, 1991; and Wallace et al., 1992). Along with the fact that intercropping may allow for reduced inputs and more timely planting of soybean, the emphasis on conservation tillage technology has driven researcher and producer interest in this concept.

Since 1988, Clemson University researchers have investigated many of the equipment, energy, and crop and soil management factors associated with intercropping soybean and wheat. This leaflet outlines the advantages of intercropping, recent research findings, and guidelines for successful on-farm adoption of the system.

ADVANTAGES OF INTERCROPPING

Conventional doublecropping, a sequential planting of soybean after wheat harvest, is often fraught with poor stands, weed infestations, and delayed soybean planting due to adverse weather. With relay planting, soybean is interseeded into wheat one to three weeks before wheat harvest. This controlled-traffic concept has the following potential advantages over conventional doublecropping systems:

a) better utilization of soil moisture for soybean stands;
b) more timely field operations for soybean, including planting, spraying, and harvesting;
c) lower energy requirements;
d) less soil erosion and runoff, and therefore improved water quality;
e) reduced soil compaction; and
f) less herbicide use in some situations.

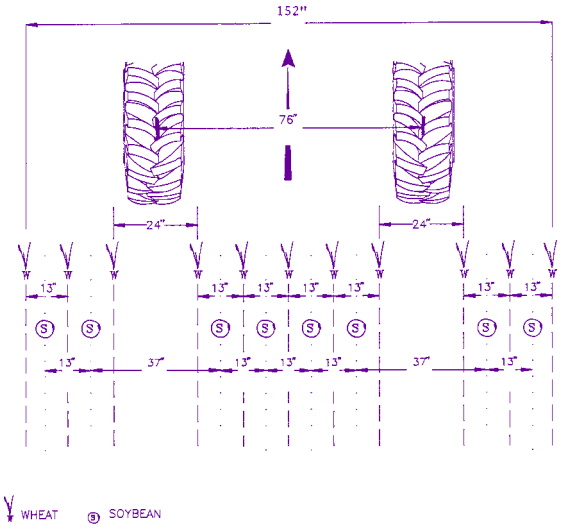

Figure 1: Interseeding scheme (76-inch wheel spacing for soybean/wheat (from Hood et al., 1992).

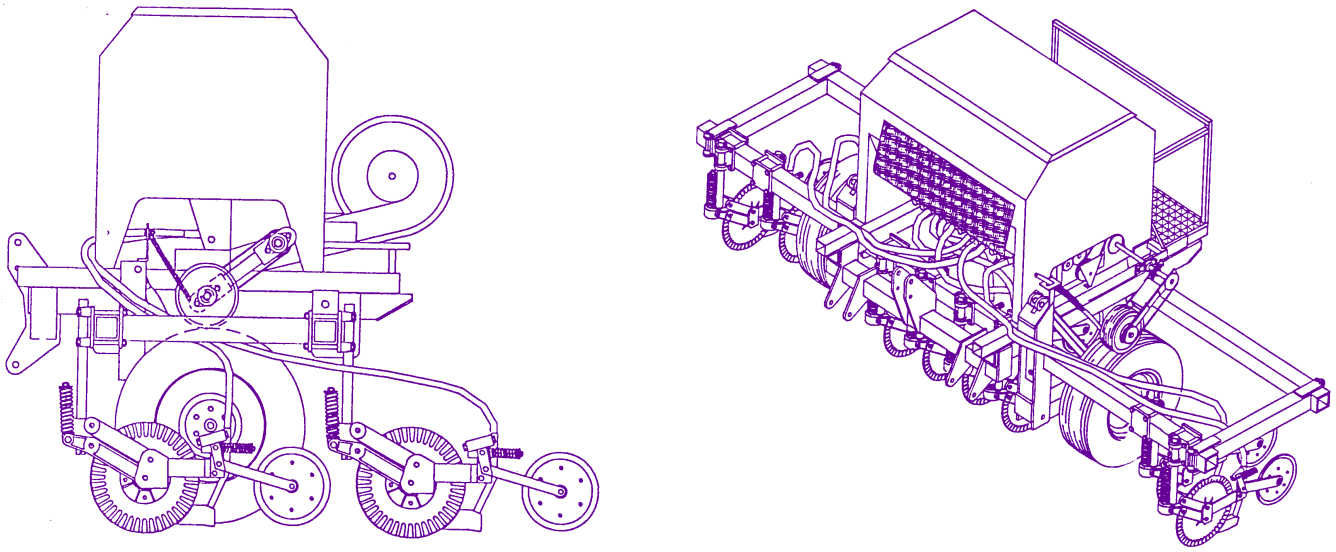

Figure 2: New, three-point hitch version of the interseeder drill design manufactured by Valkenburg Equipment Co., Greenwood, SC (from Hood et al., 1992).

RECENT RESEARCH FINDINGS

One planting scheme used for intercropping soybean and wheat in the South Carolina research is shown in Figure 1. For planting both crops, a special interseeder drill has been developed by Clemson University agricultural engineers and is commercially available from Valkenburg Equipment Co., Greenwood, SC (Figure 2). The drill plants 11 rows of wheat (13-inch spacing) in the fall, leaving two 24-inch lanes for traffic (76-inch wheel spacing).

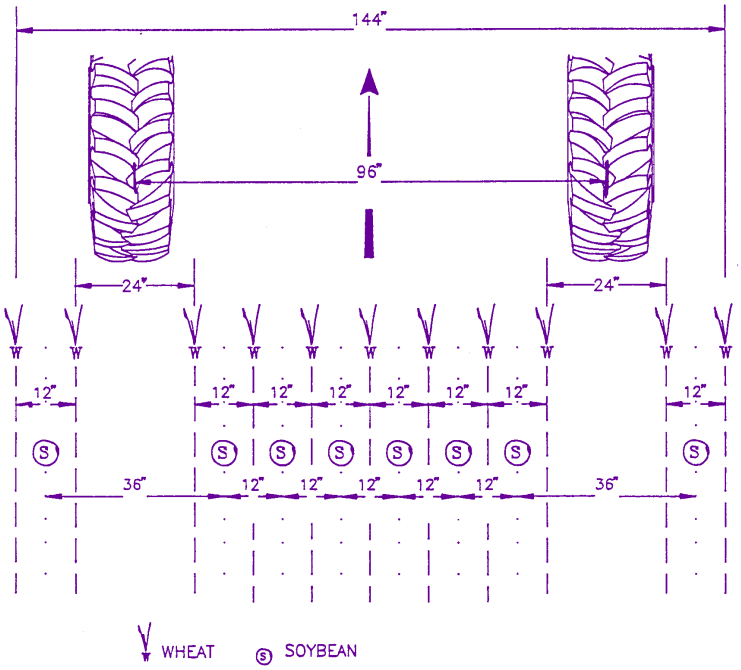

Figure 3: Interseeding scheme (96-inch wheel spacing) for soybean/wheat (from Hood, et al., 1992).

This pattern allows interseeding of 8 rows of soybean in mid- to late-May (soil moisture permitting) when wheat is in the hard dough stage, about two to three weeks before the expected date of wheat harvest. There is also an interseeder drill configuration available for wheel traffic with a 96-inch spacing (Figure 3). Since most tractors are set up with the 76-inch wheel spacing, the scheme shown in Figure 1 is the most popular in on-farm producer trials.

The following is a list of findings from the Clemson intercropping research effort which will impact producer acceptance of this planting concept.

1. Crop yields

Wheat yields in the wide-row pattern for interseeding have been similar to wheat planted in conventional drill spacings in Coastal Plain soils (Khalilian et al., 1990). However, at the Simpson Research and Education Center near Pendleton, SC, in soils typical of the Piedmont region, wheat yields were 15 to 20 percent lower due to reduced tillering in the wide-row scheme (Wallace et al., 1991).

For soybean, yields were significantly higher for interseeding vs. conventional no-till subsoil planting in 38-inch rows after wheat harvest in the Coastal Plains (Khalilian et al., 1991). For Piedmont conditions, interseeded soybean yields have been at least as high as drilled monocrop soybean or conventional wide-row no-till soybean planted after wheat harvest (Wallace et al., 1992; and Hayes et al., 1991). In

Kansas, intercropped soybean yields were reported to be lower following high-yielding wheat than following lower-yielding wheat (Duncan et al., 1990), but in South Carolina, similar soybean yields were obtained following three wheat varieties which produced varying yields (Wallace et al., 1991). In general, less inhibition of soybean growth and yield by the wheat crop has been observed in South Carolina as compared with more northern or midwestern locations, and is probably related to the short (two to three week) period of overlap between the two crops in South Carolina (Wallace et al., 1992).

2. Deep tillage

Research at Blackville, SC, in Coastal Plain soils indicates that the need for deep tillage before planting soybean is eliminated if a good job of deep tillage is done before wheat planting in the fall. Then, if the controlled-traffic pattern is utilized with herbicide/fertilizer applications and interseeding, a savings of $8-10 per acre is possible (Khalilian et al., 1991).

3. Weed management

Field observations have shown that, with interseeding, herbicide inputs may be less than for wide-row no-till or conventional tillage doublecropping systems (Whitwell, 1991).

4. Crop growth

Even though interseeded soybean often are etiolated or spindly due to shading from the wheat crop before and for some time after wheat harvest, growth and development are more or less normal once the plants "outgrow" the effects of early shading. Research has shown no differences in yield between interseeded and monocrop soybean planted the same day (Wallace et al., 1992).

5. Equipment technology

The interseeding drill design incorporates a Gandy Air Applicator (seed metering) and Yetter Seeder Coulters (seed furrow openers). This new technology drill has enhanced field success and producer acceptance of interseeding (Hood et al., 1992). Producers can use the drill for conventional no-till drilling of crops such as wheat and soybean by adding additional Seeder Coulters (up to 16). Also, a tow version of the drill is available which lowers the tractor power requirement to about 60 hp.

GUIDELINES FOR SUCCESS

To optimize yields and returns from intercropping soybean and wheat, the following guidelines are suggested.

1. Field selection

Choose fields for intercropping that are relatively free of perennial weeds and grasses, hard-to-control broadleaf weeds, or nematodes parasitic to soybean. Soils should have productive potential for high crop yields, e.g., at least 50 bushels for wheat and 30 bushels for soybean.

2. Deep tillage and controlled traffic (wheat)

If soil hardpans or traffic pans exist, practice deep tillage in the fall before planting the wheat. In the light-textured Coastal Plain soils, deep tillage with a chiselplow or Paratill 1 to 2 inches into the B horizon (clay) will provide optimum crop yield response. To reduce compaction, it is desirable to avoid secondary tillage such as discing. Using a soil smoothing device after deep tillage is preferred. Also, it is important that trips across the field be minimized for application of topdress nitrogen and/or pesticides for wheat. If possible, all traffic should be confined to the wheel tracks set up when planting wheat in the fall.

3. Wheat variety

Select an early- or medium-maturing, high-yielding wheat variety with good disease resistance and strong straw strength. Successful interseeding is difficult if the wheat is lodged. However, if lodging or other problems (e.g., deficient soil moisture) prevent interseeding, the soybean crop can still be planted after wheat harvest with the interseeder drill.

4. Wheat seeding rate

The seeding rate for wheat should be the same as for conventional drilled plantings. This will result in more plants per linear foot of row, but about the same number of plants per area, as in drilled plantings.

5. Weed control (wheat)

Since there may be more winter weed pressure due to the wide-row spacing (and due to spacing for wheel tracks), weed scouting should be done during the wheat tillering stage. Herbicide(s) should be selected based on weed species present.

6. Nitrogen topdress/herbicide application for wheat

All nitrogen topdress and herbicide (or other pesticides) application trips should be accomplished with equipment set up in the same wheel spacing (76 or 96 inches) as the tractor and interseeder drill. The width of application equipment (e.g., boom width) should be set up for a swath width of 13 or 39 feet, if feasible, to match the interseeding drill pattern.

7. Soybean variety

A fast-growing, high-yielding Group VII or Group VIII soybean variety should be chosen. If nematodes are present in the field, select a variety with resistance.

8. Interseeding soybeans

Plan to interseed soybean at approximately 3 to 4 seed per row foot no earlier than May 15 to May 31, when wheat is in the hard dough stage, and about 2 to 3 weeks from harvest maturity. Since wheat is using soil moisture at high rates during this period, it is very important to plant in soil moisture adequate for germination and emergence. Shortly after soybean emergence, the seedlings will become etiolated (spindly) while growing in the shade of the wheat. Once the wheat is harvested in early June, the plants quickly outgrow the effects of early shading by wheat.

9. Wheat harvest

The wheat should be harvested as soon as possible after harvest maturity and ideal seed moisture are reached. If combine wheels do not match the wheel traffic pattern, harvest at an angle or perpendicular across the crop rows. Combine wheel traffic will not significantly damage soybean stands during the first three to five weeks after planting. During harvest, it is imperative that the wheat straw be chopped and spread evenly across the combine swath. If feasible, curtains can be attached to the rear of the combine to force all straw into the wheel tracks. This will aid in preventing weed emergence in the open tracks.

10. Weed control (soybean)

After wheat harvest (ASAP), scouting should be done to assess the weed situation (i.e., species, size or growth stage, intensity, etc.). Postemergence herbicide(s) should be selected based on scouting results for each field and applied according to label directions. Use application equipment set up in same wheel spacing (76 or 96 inches) as the interseeder drill.

11. Costs and returns

The potential for cost savings (e.g., for fuel, equipment, and herbicides) and increased soybean yields for interseeding vs. conventional doublecropping depends on the field environment, weather, and other management factors. Each producer must assess his own farm situation to determine if interseeding fits. Enterprise budgets should be prepared based on local conditions, keeping in mind the producer's management capabilities.

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