CONSERVATION TILLAGE - *(Woodruff)*

Conservation tillage offers distinct advantages but above average management is required to attain good crop stands and weed control. Management practices for conservation tillage vary depending upon the crop, soil type, and weed pressure. Listed below are some basic principles which apply to all conservation tillage systems.

Crop Rotations

Crop rotations for conservation tillage should be the same as for clean tillage. Certain pests tend to increase with continuous monoculture and reduce crop productivity. Rotating crops, especially grasses and legumes, is an important part of managing pests. Conservation tillage, in conjunction with crop rotations and appropriate varieties, can be especially valuable for maintaining good crop yields and reducing pests such as cyst nematodes.

Tennessee researchers report that the incidence of soybean stem canker is often higher with conservation tillage than clean tillage. Apparently, the mass of decaying residue on the soil surface favors the stem canker pathogen and causes a greater incidence of stem canker infection. Tolerance to stem canker varies widely among soybean varieties, therefore, an all-out effort should be made to use stem canker tolerant soybean varieties with conservation tillage.

Cover Crops

Winter cover crops are often used with conservation tillage to provide protection from soil erosion, moisture conservation, soil temperature modification, weed suppression, and sometimes nitrogen. Winter grass crops are best for soybeans. They are easier to establish than legumes and have fewer adverse effects on soybean stands and growth. Rye is the most commonly planted cover crop. Planting soybeans directly into growing cover crops often results in poor stands. For this reason, it is desirable to kill the winter cover crop with a contact herbicide 10 to 14 days ahead of the scheduled time of planting soybeans.

Establishment culture for winter annual grasses and legumes should be the same as those used when establishing them for forages.

Seeding Rates and Row Spacings

Good soybean stands are more difficult to obtain with conservation tillage than with clean tillage. To help reduce this problem, soybean conservation tillage seeding rates should be increased 10 to 15 percent. Conservation tillage seeding depths should be about the same as clean tillage. Some conservation tillage planters tend to make a furrow when planting. These should be adjusted so that the furrow depth is as shallow as possible. Deep furrows should be avoided since high intensity rains can wash excessive amounts of soil over the seed or concentrate herbicides near the seed and cause injury or stand reduction.

Soybeans do not normally accumulate quite as much vegetative growth with conservation tillage as clean tillage. Therefore, in late plant situations close rows could be especially important for conservation tillage. Row spacings of 36 inches are common for soybeans, but soybeans could

benefit from more narrow spacings of 20 to 30 inches. Narrow rows help insure full canopy development which can reduce soil moisture loss and suppress late emerging weeds.

Drill planting can be successfully used with conservation tillage but soil compaction can be a problem and getting acceptable crop stands is not easy. The soil compaction problem may be corrected by deep chiseling in the fall ahead of planting wheat or a cover crop. Winter grazing can fully reestablish soil hardpans on Coastal Plain soils. As such, drill planting is generally not a good planting behind winter grazing.

Stand problems with conservation tillage drill planting are usually associated with getting litter in the seed furrow and poor seed-soil contact. The litter problem can sometimes be reduced by using a smooth coulter instead of the normal fluted coulters on drill planters. To get uniform seeding depth, conservation tillage drills should be equipped with double-disk furrow openers and disks that have bands for depth control. Good seed-soil contact is essential so special narrow press wheels will usually be needed. Extra weights on the planter are often needed to help get adequate soil penetration and seed coverage.

Soil moisture and temperatures should be watched carefully. Planting should be discontinued during periods when soil temperature (at the 2-inch depth) exceeds 100°F. Better stands can be obtained with conservation tillage row planters than with conservation tillage drill planters. This is apparently true because row planters place seed in moist soil and give better seed-soil contact.

Improving No-Till Soybean Stands, Growth and Yield

An ever increasing amount of the state=s double crop soybean acreage is cultured by conservation tillage. Some farmers burn or remove wheat straw residue, others plant directly into this residue. This practice is discouraged for environmental reasons. Removing straw can facilitate use of machinery and often allows for better and/or less expensive weed control, but planting directly into wheat residue is encouraged whenever suitable no-till planting equipment is available. This reduces soil surface temperatures, conserves soil moisture and increases soybean yield. In years with hot May-June temperature this practice often allows for better soybean stands. Surface crop residues also reduce soil erosion and water runoff--benefits that are often not immediately recognized.

Getting adequate soybean stands and weed control are the biggest challenges with conservation tillage when planting into wheat residue. Wheat straw contains chemicals which reduce soybean germination and growth. Soybean planting must be done in such a way that wheat straw is kept out of the seed furrow. Wheat straw in the seed furrow also prevents good seed-soil contact and reduces germination. Modern conservation tillage planters have adjustments to pull wheat straw away from the seed furrow.

Careful straw management can also help aid chemical weed control efforts. Cut wheat as high as practically possible to allow more herbicide penetration to the soil surface - the area where it is needed most for performance. When applying postemergence directed herbicide sprays, rig equipment with press bars to push standing wheat stubble down and to the side so that it does not deflect herbicide sprays, injuring soybeans or reducing weed control effectiveness.

One-Pass Tillage/Planting

Clemson University has shown that one basic fertilization and deep tillage ahead of wheat planting in the fall can be sufficient for the wheat and subsequent summer soybeans. The tillage system consists of:

1. Deep turning or deep chiseling (11"-14") ahead of wheat planting.

2. Planting wheat in straight rows or in same direction that subsequent soybean crop will be planted.

3. Restricting subsequent field traffic to traffic lanes to minimize re-compaction of soil.

4. Using strip-till or no-till drill to plant soybeans in wheat row middles.

No-Till Recommendations

1. Rotate grass and legume crops to reduce disease and nematode problems.

2. Plant winter cover crops for erosion control, and moisture conservation. Use herbicide to kill cover crop when planting soybeans.

3. To insure adequate soybean stands with conservation tillage (1) adjust planters to pull straw and crop litter away from seed furrow, (2) increase seeding rate 10 to 20 percent and (3) use a narrow planter packer wheel (two inches wide or less) to break soil clods and insure good seed soil contact.

4. Decrease row width for conservation tillage, especially if planting is under less than optimum conditions.

5. If drill planting, use units with cutting coulter, double disk openers, depth bands or some means of positive depth control and narrow packer wheels.

6. Manage wheat stubble so that it does not interfere with soybean stands and herbicide performance. Cut it as high as practical to reduce dragging and use a lateral bar on herbicide sprayers to press it downward and away from herbicide spray.