Crop Residue Management... Gaining Ground In The 90's
CTIC Alliance for Crop Residue Management

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Tips for Profitable Crop Residue Management Systems

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The profitability of any conservation tillage system is a function of two factors. The first is maintaining yields economically equal to conventional systems. Yield is a very important consideration when evaluating the profitability of most systems. The second is cost and level of production inputs. Both of these factors are discussed in this paper. Residue management is only one important ingredient in a sustainable system. Other factors will determine the profitability of the system.

CROP SEQUENCE

When reducing tillage to leave crop residue on the soil for erosion control the **crop sequence becomes more important** than with moldboard plowing systems. Rotate corn and small grain with low residue crops such as soybeans, sugar beets, edible beans, or sunflowers. Some optimal crop sequences are: corn and soybeans; small grain and soybeans; and corn and alfalfa. Avoid corn after corn and small grain after small grain. If these crop sequences are needed, use deep full width tillage such as chisel plowing or discing to reduce residue levels. Shallowly incorporated residue with enough on the surface to control erosion is the best strategy if corn or small grain must follow themselves. Planter or drill mounted tillage tools to clear the row area are also more important.

What's important for profitable crop production with residue management systems in Minnesota?

CORN

1. Keep crop residue out of the seed furrow to ensure stand establishment and optimum early growth. If the soil has been tilled and crop residues are mixed with soil, this is less of a problem. If the preceding crop is corn, it is more of a problem. The worst case is when corn residue is pushed into the seed furrow with planter mounted disc openers or coulters and is in contact with the seed. Germination is delayed due to slower absorption of soil water (poor seed to soil contact). Early growth may be delayed due to allelopathy (chemicals leaching out of crop residues). Soybean residue is much less detrimental even if some of it ends up in the seed furrow of corn.

2. Keep crop residue clear of a wide strip to minimize reduced temperature effects. Corn is the most temperature sensitive crop grown in Minnesota. To minimize the potential for reduced growth due to the soil temperature reduction associated with cover by crop residue keep a strip about one third of the row area wide (10" with 30" rows) to less than 10% cover. This is most effectively done with the use of planter mounted tillage tools such as clearing discs, sweeps, brushes, rolling fingers, or plows.

3. Apply P and K in a band close to the row. In western Minnesota P is more important, and in eastern Minnesota K is more important but both should be applied. This application can be made in the fall with systems that will not disturb the band with spring tillage or the application can be made with the planter. Yield responses with conservation tillage have been consistently about 4 to 6 bushels per acre with high testing soils but much higher with medium to low testing soils. About 80% of the response is obtained with the first 20 to 40 pounds per acre of P_2O_5 or K_2O. Low rates are effective!

4. Manage N so that it is not limiting. Anhydrous ammonia has been the most consistent source of N. Don't broadcast--apply urea sources of N (urea-ammonium nitrate solutions, and urea) on high residue fields without incorporation or injection. Volatilization losses of N with these sources can exceed 20% when temperatures are warm.

Corn yields have been similar among tillage systems when the above considerations have been made in a total management system. The reduction in inputs due to time, machinery, and fuel can result in a savings of $3.00 to $15.00 per acre depending on the specific system. With systems that eliminate full width deep tillage there may be a small increased cost for perennial weed control. Cultivation has been shown to be more important in residue

management systems. Cultivation with cultivators equipped for high residue levels can cost several dollars per acre more than conventional models.

SOYBEANS

1. Soil temperatures in furrow residue, stand establishment, and row-applied P and K are less important than with corn.

2. Weed control is important. Weed control is important for all crops grown with residue management systems, but until recently herbicide options have been limited with soybeans. Know your weeds and develop a control strategy.

3. Crop residue stubble has not been a problem at harvest. Soybean yields have been similar to conventional systems when weeds are controlled. With recent herbicide options the cost of weed control with residue management systems can be similar to conventional systems.

SMALL GRAIN

1. Small grain residue in the seed furrow often results in stand loss and delayed emergence. This is primarily due to slower absorption of soil water because of poor seed to soil contact and allelopathic inhibition. Small grain response to crop residue is similar to corn in this respect, although soil temperature reduction has little effect. If small grain follows small grain, keep residue out of the seed furrow. Especially avoid situations where crop residue is folded into the seed furrow by coulters and "cradles" the seed. Planting when surface crop residues are relatively dry and are cut more easily with coulters is advisable. Experience has shown that avoidance of planting in the direction of stubble orientation also helps the effectiveness of coulters.

2. Do not surface-apply urea sources of N without incorporation. The nitrogen caution is similar to corn because of the potential of volatilization losses. With conservation tillage systems there is less nitrogen released from soil organic matter. The nitrate test becomes more important to assess the nitrogen status of the soil. Again, anhydrous ammonia has been the most consistent source of N.

3. Wheat (especially winter wheat) should be monitored for leaf disease and a fungicide considered if following wheat.

4. Row applied P and K is important. Small grain yields have been similar if a compatible rotation is selected and other production considerations are made. Rotation is especially important for this crop. Input costs savings can range from $3.00 to $15.00 per acre.

ALFALFA

1. Direct seeding alfalfa in high residue management cropping systems has been shown to result in similar stand density as conventional systems if good seed to soil contact and planting depth is achieved with conservation drills.

2. In the establishment year of direct seeded alfalfa, weeds have not generally been a problem. This has been largely due to the control provided by proper cutting schemes. Once alfalfa is established, weeds are no more of a problem than in conventional systems.

3. Soil pH should be determined in the corn year before alfalfa establishment. If lime is required there should be enough tillage to get incorporation to 3-4 inches.

4. Even if soil pH is not a consideration, it is advisable to do enough tillage to level "corn row ridges" before alfalfa establishment.

5. Alfalfa has been shown to be a "surface feeder" of P and K. Topdress applications based on soil tests on established stands has been effective.

Alfalfa production with residue management systems has been similar in profitability to conventional systems. Reduced tillage costs are sometimes offset by the higher drill ownership costs when using a conservation drill.

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