Extension FactSheet

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# Managing Tillage and Crop Rotations in Northwest Ohio

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## Changing Crop Rotations

### *More Corn Is Needed*

**What is causing the increased demand for more corn?**

- Greater ethanol production
- More livestock operations
- Steady export demand
- More industrial uses

### *Problems with Soybeans*

**What is causing the decrease in soybean acres?**

- Pest-related production problems. Although rust has yet to be identified in Ohio, there's a perception among some growers that rust in combination with other diseases (cyst nematode, sudden death syndrome [SDS], phytophthora root rot) and insect problems (aphid) are making soybean production less profitable.
- South American expanding production increasing world supply
- Corn to soybean grain price ratio favors corn

Higher corn prices are reflecting the market demand for increasing the supply of corn. Therefore, many farmers are considering more corn in their cropping mix.

## Managing the Risks of Continuous Corn

### *Crop Residue*

A 180 bu/acre corn crop leaves behind approximately 10,000 lbs of crop residue/acre. Major factors contributing to the yield drag of high residue continuous corn systems include:

- Cooler, wetter soils during and after planting
- Greater levels of disease inoculum
- Residue interference with planter row units
- Cooler and wetter soils during harvest
- Decreased efficacy of soil applied herbicides

**Tips for Reducing Residue Problems**: Use stalk chopper and knife rolls on combine heads, spread trash uniformly during harvest, avoid no-till where practical, avoid no-till planting on top of old rows, use row cleaners and seed firmers, consider strip tillage, select hybrids with good disease resistance, emergence, and seedling vigor.

### *Nitrogen Fertility Issues*

Corn following corn requires an additional 30 to 50 lbs/acre nitrogen on average. Nitrogen fertilizer prices are projected to stay higher than what they have

historically been. The widespread shift to corn from soybeans could make obtaining nitrogen more difficult. High clearance applicators may be needed to lengthen the sidedress nitrogen application window.

### *Insects*

Western corn rootworm problems may increase with continuous corn planting. Planting Bt hybrids resistant to western corn rootworm, using soil-applied insecticides, and high rate formulations of seed treatments can mitigate insect risks. Bt corn requires a 20% refuge planted to non-Bt corn to prevent resistance development. Rootworm problems on these acres may be managed with soil-applied insecticides, and high rate formulations of seed treatments.

### *Diseases*

Risk of many corn diseases increases when corn follows corn. The severity of several foliar diseases is closely associated with the presence of corn residues. Stalk rots and ear rots are more severe in reduced till continuous corn. Selecting corn hybrids with resistance to specific diseases and prompt harvest will help minimize yield losses to diseases. Consider burying residue to reduce disease inoculum. In the past, the use of foliar fungicides has not been considered economical. Strobilurin fungicides have received much attention recently but university data on their efficacy is limited.

### *Weeds*

Rotate herbicide mode of action to help prevent weed shifts and resistance.

## Northwest Ohio Crop Rotation Research Summarized

Long-term rotation experiments have been continuously maintained at the Ohio State University Ohio Agricultural Research and Development Center's Northwest Agricultural Research Station, Wood County, Ohio at 4240 Range Line Road, Custar, Ohio. Their objective has been to study cropping sequences and tillage effects on crop production. The experiments have been conducted on tile drained Hoytville silty clay soil. Much of Northwest Ohio's corn is produced on this soil or soils with similar characteristics. All yields are an average of at least three replications per treatment. Each experiment had the same planting date for that crop. All fertilizer rates were the same for that crop in each experiment.

### Table 1: Results of 44 Years Continuous Corn vs Rotation

Established by Triplett and Van Doren, current Principal Investigator—Dr. W. Dick

| Tillage | Crop rotation | Corn yield—bu/acre | Rotation advantage |
|---|---|---|---|
| | | Average—last 7 years | |
| No-till | Continuous Corn | 139.5 | |
| No-till | Corn Soybean | 170.8 | + 31.1 bu |
| Plow | Continuous Corn | 156.0 | |
| Plow | Corn Soybean | 153.8 | - 2.2 bu |

| Tillage | Crop rotation | Corn yield—bu/acre | Rotation advantage |
|---|---|---|---|
| | | 2006 data only | |
| No-till | Continuous Corn | 136.4 | |
| No-till | Corn Soybean | 172.8 | + 36.4 bu |
| Plow | Continuous Corn | 166.1 | |
| Plow | Corn Soybean | 142.9 | - 23.2 bu |

## Table 2: Results of 23 Years Continuous Corn vs Rotation

Established by Randall Reeder

| Tillage | Crop rotation | Corn yield—bu/acre | Rotation advantage |
|---|---|---|---|
| | | Average—last 9 years | |
| No-till | Continuous Corn | 152.4 | |
| No-till | Corn Soybean | 180.7 | + 28.3 bu |
| Plow | Continuous Corn | 163.1 | |
| Plow | Corn Soybean | 175.1 | + 12.0 bu |

| Tillage | Crop rotation | Corn yield—bu/acre | Rotation advantage |
|---|---|---|---|
| | | 2006 data only | |
| No-till | Continuous Corn | 150.0 | |
| No-till | Corn Soybean | 177.7 | + 27.7 bu |
| Plow | Continuous Corn | 165.4 | |
| Plow | Corn Soybean | 178.4 | + 13.0 bu |

## Table 3: Results of 4 Years Continuous Corn vs Rotation

Established by Alan Sundermeier

| Tillage | Crop rotation | Corn yield—bu/acre | Rotation advantage |
|---|---|---|---|
| | 2003-2006 | 2006 data only | |
| No-till | CCCC | 124.8 | |
| No-till | SCSC | 167.8 | + 43.0 bu |
| No-till | CCSC | 144.2 | |
| No-till | SCSC | 167.8 | + 23.6 bu |
| No-till | CSCC | 149.7 | |
| No-till | SCSC | 167.8 | + 18.1 bu |
| No-till | CSWC | 139.8 | |
| No-till | SCSC | 167.8 | + 28.0 bu |
| Chisel plow | CCCC | 147.9 | |
| Chisel plow | SCSC | 177.9 | + 30.0 bu |
| Chisel plow | CCSC | 162.6 | |
| Chisel plow | SCSC | 177.9 | + 15.3 bu |
| Chisel plow | CSCC | 167.3 | |
| Chisel plow | SCSC | 177.9 | + 10.6 bu |
| Chisel plow | CSWC | 174.6 | |
| Chisel plow | SCSC | 177.9 | + 3.3 bu |

C—corn; S—soybean; W—wheat

For the two multiyear crop rotation studies, yields for corn after soybean, averaged across tillage, were 10 to 13% greater than yields after corn. However, the magnitude of the rotation effect was strongly influenced by tillage. In no-till systems, corn following soybean yielded 19 to 22% more than corn following corn. When tillage was used, the yield advantage was far less pronounced with yields for corn after soybean averaging 1% less to 7% more than those after corn.

The variability in rotation effects on crop yields was particularly evident in the 2006 experiments. Yields for corn after soybean, averaged over tillage, were 4 to 27% higher than those of corn after corn. In no-till, yields for corn following soybean were 18 to 34% greater than yields for corn following corn. When tillage was used, there was considerable variation in yield response to rotation among the experiments with two of the three experiments showing yield benefits (8 to 20%) from rotation with soybean and one experiment showing lower yield (-14%) for corn grown in rotation.

## Consider the Following Management Issues Before Changing Crop Rotations

- Higher level of management needed
- Yield loss from corn after corn versus corn in rotation
- Tillage to reduce residue problems will result in higher costs and greater erosion potential
- Higher nitrogen rates when corn after corn
- Higher pest control costs
- Greater potential for bottlenecks in planting, nitrogen application, and harvest operations
- Are future market prices stable?

Consider the risks before switching more acres to corn.

## References

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