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In this Issue:

1. Corn Seed Supplies
2. Corn following Sod
3. Hybrids for Ethanol
4. No-Till for Corn after Corn
5. Soybean Seed Rates
6. When Corn becomes a Weed

1. Corn Seed Supplies and Planting Dates

Dennis TeKrony, Jim Herbek, Chad Lee and Dennis Egli, Plant and Soil Sciences

- Corn seed supplies are expected to be tight.
- Replanting becomes a concern.
- Early planting increases risk of replanting.

Higher corn prices are going to increase acreage substantially in 2007, however there is much speculation regarding how many total acres will be planted in Kentucky and the corn belt. This increase has placed a greater demand on seed companies to supply the hybrid corn seed that will be needed. It has also caused concern among corn farmers and resulted in many rumors about limited seed supplies especially for the "exact" hybrid and genetics that the farmer may desire.
Many farmers have already booked or purchased corn seed, while others are still trying to locate the hybrids they want. Regardless of your situation the price of high yielding corn hybrids, especially "stacked' hybrids, will remain at or above last year's levels.

With seed supplies tight and prices high, this is not the year to plant too early or in stressful seedbed conditions, both of which could result in less than adequate stands and require replanting. Seed supplies for replanting may be either unavailable or limited to less than desirable hybrids.

So, how early can farmers start planting corn? Many factors such as weather, management capabilities, and total acreage to be planted play a significant role in determining the starting date. A farmer should consider soil temperature, soil moisture, tillage systems, and past experience as guidelines when deciding when to plant. Soil temperature is very critical. Planting should be started when soil temperatures at planting depth are above 50°F early in the morning and reach at least 55 to 60°F during the mid-day hours for several consecutive days. It takes corn seed a long time (three weeks or more) to germinate and emerge, if soil temperatures remain below 50°F after the seed has been planted. These long delays in emergence can occur if there is a period of prolonged cool and wet weather after planting. The longer the seed remains in cool soil before emergence, the greater the danger that soilborne pathogens and insects will cause reduced and non-uniform stands. Soil temperatures of 55-60°F should result in good seedling emergence, however, soil temperatures above 60°F are ideal.

Soil temperatures at a number of locations in Kentucky are often available through your local weather forecasts or through the University of Kentucky Ag Weather Center at http://wwwagwx.ca.uky.edu/cgi-bin/ky_clim_data_www.pl. As planting time approaches, check soil temperatures daily and look at extended weather forecasts as you decide when to start planting.

Many farmers are planning to plant corn following corn using either minimum or no tillage. These farmers should recognize that soil temperatures for no-till plantings following corn, soybeans or grass sod will be lower than in tilled soils because of the residue cover. Previous research at UK has shown that soil temperatures following no-till planting can be as much as 5 degrees cooler than bare soils, with the lowest temperatures under grass sod followed by corn and soybean residue. As a result, no-till planting may have to be delayed several days as compared to tilled soils. This study also showed that seed quality can make a difference as seed lots with high seed germination and vigor provided consistently higher emergence and stand under no-tillage than lower quality seed lots of the same hybrid.

A multi-year corn planting date study was conducted in west Kentucky at the University of Kentucky Research and Education Center to determine an optimum corn planting date period for maximum corn yields (see Table 1). Over the 6-year period, optimum yield occurred during the mid-late April planting period. The early April planting period yielded slightly less (average of 7%). The early May planting period also yielded slightly less (average of 8%). For planting periods of mid-late May and early June, average yield losses of 18% and 38% occurred, respectively, compared to the mid-late April planting period. An average yield loss of about 1%/day occurred if corn was planted beyond May 1.

Table 1. Planting date effect on corn yield for six years (2000-2005) and five no-till planting date periods starting in early April at intervals of about 2-2½ weeks, at Princeton, Kentucky.

Planting Period (Planting Date Avg.)	Planting Date Range Over Six-year Period	Corn Yield (Bu/Acre)* (Six-year average) (2000-2005)	Average Yield Difference	
			(Bu/A)	(%)
Early April (April 7)	April 3-10	196	-14	(7)
Mid-late April (April 22)	April 17-27	210	0	(0)
Early May (May 9	May 5-13	193	-17	(8)
Mid-late May (May 24)	May 21-31	172	-38	(18)
Early June (June 9	June 5-14	130	-80	(38)

*Average of two medium maturity hybrids (Bt and non-Bt)

The dates in Table 1 are for results at Princeton, KY. To make these dates more applicable to your location, farmers in far western Kentucky can probably shift these dates ahead two to three days. Farmers in central and eastern Kentucky can shift these dates behind about seven days. For example, data from Princeton shows that an average planting date of April 22 over six years provided the best corn yields for Princeton, Kentucky. Farmers in Fulton County may want to adjust the ideal average planting date to April 20, while farmers in Hardin County may want to adjust that date to April 29 for their area.

As corn acreage increases in 2007 many farmers may feel they cannot afford to wait for perfect conditions to begin planting. Planting **too early** does not guarantee high yields (Table 1), and could result in a yield loss or extra costs if replanting is needed. This is especially true in 2007 where seed supplies are limited making replanting an undesirable option. For this reason we recommend that farmers carefully monitor soil temperatures and weather forecasts and delay planting as long as possible to achieve maximum seedling emergence and yield.

2. Agronomic Considerations for Corn following Sod

Chad Lee and J.D. Green, Plant and Soil Sciences
Ric Bessin, Entomology

- Corn following sod requires less Nitrogen
- Pest management is critical to a successful crop
- No-till is the preferred method on sloping fields.

Special Considerations

Corn following sod usually requires 25 to 50 fewer pounds of nitrogen per acre than corn following soybeans or corn. Weed control is essential to corn following sod, and may require two burndown applications prior to planting. Sod is known for having high insect populations, especially wireworm and white grubs. If present and not controlled, wireworms and white grubs will cause stand loss and loss of seedling vigor. Insecticide options include liquid or granular soil insecticides at planting or the use of an insecticide seed treatment. Typically, the higher end of the dose range on the insecticide label is required for control of wireworms. Voles and other small animals can cause problems in corn following corn. Early burndown of the sod will help by removing some of the plant in which voles can hide. In addition, about two bushels of cracked corn can be spread over each acre to help control voles. The voles will eat the cracked corn on the soil surface before digging out planted seeds.

Corn emerging through residue.

Till vs. No-Till, Advantages and Disadvantages

No-till conserves soil, organic matter and soil structure. Timely control of pests with chemicals is an absolute must for successful no-till corn following sod. No-till soils will warm more slowly and may require slightly delayed planting versus a tilled system.

Tillage warms the soil, buries some of the plant residue and exposes some insects to birds. However, tillage destroys soil structure and promotes erosion. Tillage is not recommended on sloping soils, which comprise much of the Kentucky landscape.

Till vs. No-Till, Practices Needed for Corn after Sod

No-tillage will require an early burndown of the grasses or forage legumes that may be present plus any weeds. No-till may require two applications for burndown of existing vegetation. If this sod is primarily fescue, then a high application rate of glyphosate (eg. 2 qt/A of Roundup Original) is recommended. If sod has both grasses and legumes, then glyphosate plus 2,4-D (1 qt/a) or dicamba (1 pt/a of Banvel) will be needed to control most of the vegetation. In some cases paraquat (eg. Gramaxone) instead of glyphosate may be used in combination with atrazine as part of a burndown program. A soil-residual herbicide should be applied at time of planting and a postemergence herbicide will likely be needed later in the season.

If tillage is to occur then the fields should be tilled early in the spring before fescue breaks dormancy. If the sod is thick, then a burndown may be needed several weeks before the tillage to prevent plants from wrapping on tillage equipment.

3. Corn Hybrids for Ethanol

Chad Lee, Plant and Soil Sciences

- Many farmers are curious about specific hybrids for ethanol.
- Starch and yields are critical factors.

Several corn hybrids have been identified by seed companies as being more suitable for ethanol production. Farmers and distilleries alike also are interested in this issue as well. Results from one year of testing indicate that starch and grain yield are important factors in determining which hybrids are better suited to produce ethanol.

In 2006, the Kentucky Hybrid Corn Testing Program evaluated 32 hybrids for ethanol production. All hybrids were planted at three locations across Kentucky and grain yields were taken from each location. At one location a hand-pollinated test was conducted. Seed from these hand-pollinations were sent to IPG Labs in Illinois to determine how much ethanol could be produced from each seed lot.

The yields, seed characteristics and ethanol produced appear in Table 16 in the 2006 Kentucky Hybrid Corn Performance Report (PR-535). Each seed characteristic was compared with the amount of ethanol produced to determine which characteristic(s) was positively or negatively associated with ethanol production. As seed starch percentage increased, the gallons of ethanol per bushel of corn increased (Fig. 1). In addition, the gallons of ethanol produced per acre increased as corn grain yields increased (Fig. 2).

If an ethanol distillery were to select certain hybrids, then seed starch concentration is an important factor. If contracting acres of corn, then final grain yield is important. These results are from only one year of research and the trials will be repeated in 2007 to see if similar results occur. From these data it is too early to conclude whether a distillery should contract just one or two corn hybrids.

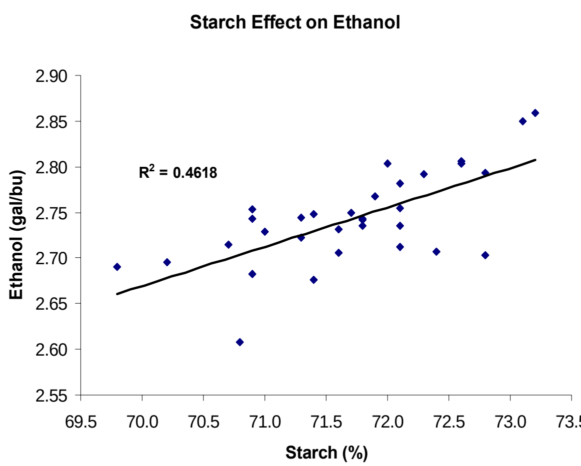


Figure 1. Relationship between seed starch concentration and the gallons of ethanol per bushel of corn.

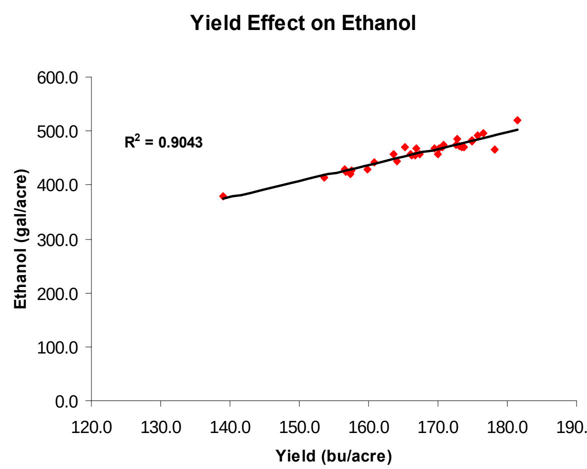


Figure 2. Relationship between yield of corn and gallons of ethanol per acre.

4. No-Tillage Makes More Corn After Corn

John H. Grove, Plant and Soil Sciences

- Corn after corn yields better in no-till.

Visiting the Farm Machinery Show last month, I came away with the impression that tillage machinery manufacturers see corn after corn as a marketing opportunity, assuming that Kentucky corn after corn growers are afraid of corn residues. Long-term research at the University of Kentucky shows that corn after corn yields are significantly greater with no-tillage soil management, where residues from the previous corn crop are left on the soil surface.

- Tillage required higher fertilizer N, to get less yield, than no-till.

The results of two long-term continuous-corn tillage trials are shown below. Both experiments are located on Maury silt loam soils, and involve both choices of primary tillage system and fertilizer nitrogen (N) rates. The first trial, comparing no-tillage and moldboard plowing, was started in 1970. In the second trial, begun in 1983, a large heavy disk, the chisel plow, and the moldboard plow were compared to no-tillage. In these two trials, a winter cereal (wheat, rye or triticale) cover crop was seeded over the entire plot area after corn harvest in the fall.

Early pre-plant weed control, using a combination of burndown and soil-residual herbicides, was applied to both experiments in the second or third week in April. Both were planted in late April-early May, at a rate of 27,000 insecticide-treated seed/acre, using a no-till corn planter equipped with row cleaners. Fertilizer N, as 34-0-0 (ammonium nitrate), was broadcast over the soil surface at planting. Post-emergence weed management was done if problems were identified.

For both experiments, yield results were averaged over the 2000 through 2006 growing seasons. In the first experiment (Figure 1), there is a strong positive response to fertilizer N in both tillage systems. There is a strong negative response to tillage. No-till averaged 8 bu/acre/year more than moldboard plowing, across all fertilizer N rates, and 16 bu/acre/year more at 150 lb N/acre/year, the optimum N rate. In the second experiment (Figure 2), there is again a strong positive response to fertilizer N in all four tillage systems and a negative response to tillage. Primary disc tillage was especially negative, averaging nearly 17 bu/acre/year less than no-till at the two highest N rates (135 and 200 lb N/acre/year). Chisel and moldboard plowing were less of a problem than disking, averaging 8 bu/acre/year less than no-till, but were more responsive (+11 bu/acre/year) to the greatest N rate. No-till corn yield increased only 4 bu/acre/year when fertilizer N was raised from 135 to 200 lb N/acre/year. With more tillage, more fertilizer N was needed, to get less corn. Tillage lowered corn yield potential on this soil.

Why were these results observed? 1) Crop residues are not the problem we often think they are. In Kentucky's mild fall-winter-spring climate, corn residues tend to break down. Residues from a 175-bushel corn crop in the fall become more like those from a 125-bushel corn crop by spring planting time. 2) However, 125-bushel corn residues can be a problem if your planter does not leave you with the desired plant population. In these two experiments, planter adjustment/row cleaners resulted in equal plant populations at harvest (23,600 to 24,100 plants/acre), regardless of primary tillage system. There was no loss of plants in the no-till system. 3) "Rain makes grain", but adequate rainfall can be poorly distributed. Until the crop canopy closes over the soil, crop residues slow evaporation and conserve soil moisture, buffering the crop against moisture stress between rainfall events. Tillage can reduce crop residue levels to the point that evaporative soil moisture losses become yield-limiting. 4) Soil structure is conserved in the no-till system. Better-structured soils retain more soil moisture after a rain, further buffering the crop against moisture stress, and long after the crop canopy has closed.

Taken altogether, crop residues are "not your enemy" in corn after corn production in Kentucky. No-tillage soil management is the key to optimal corn productivity in this "rotation".

Figure 1. Corn Grain Yield Response to Fertilizer Nitrogen In Two Tillage Systems (Experiment 1 - 2000 to 2006)

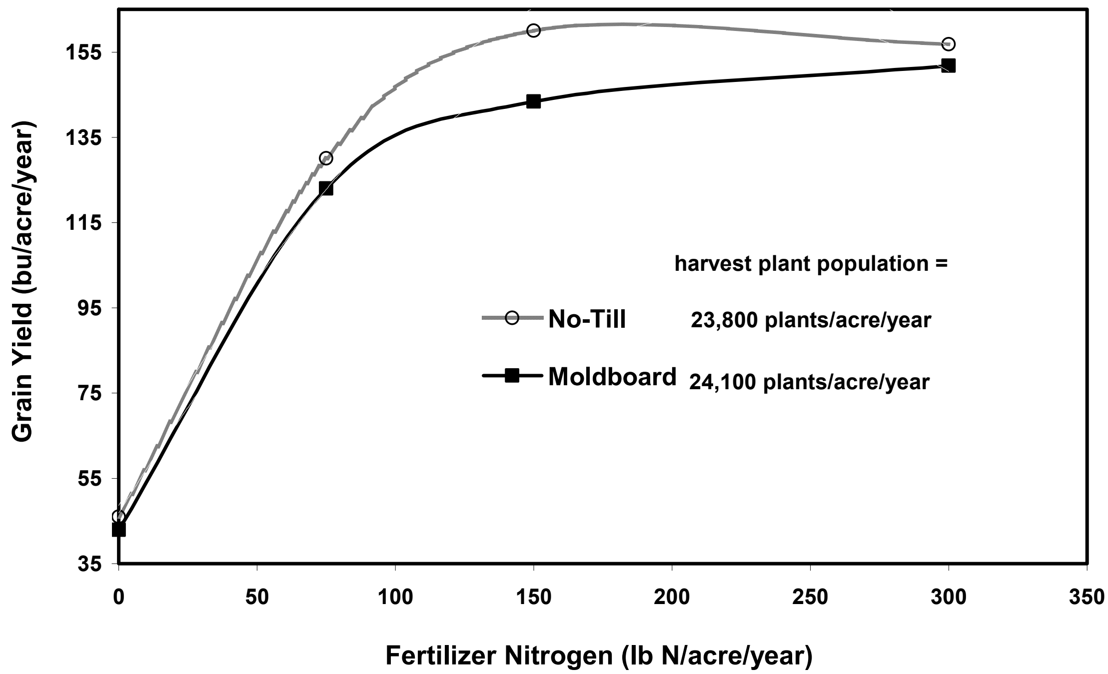
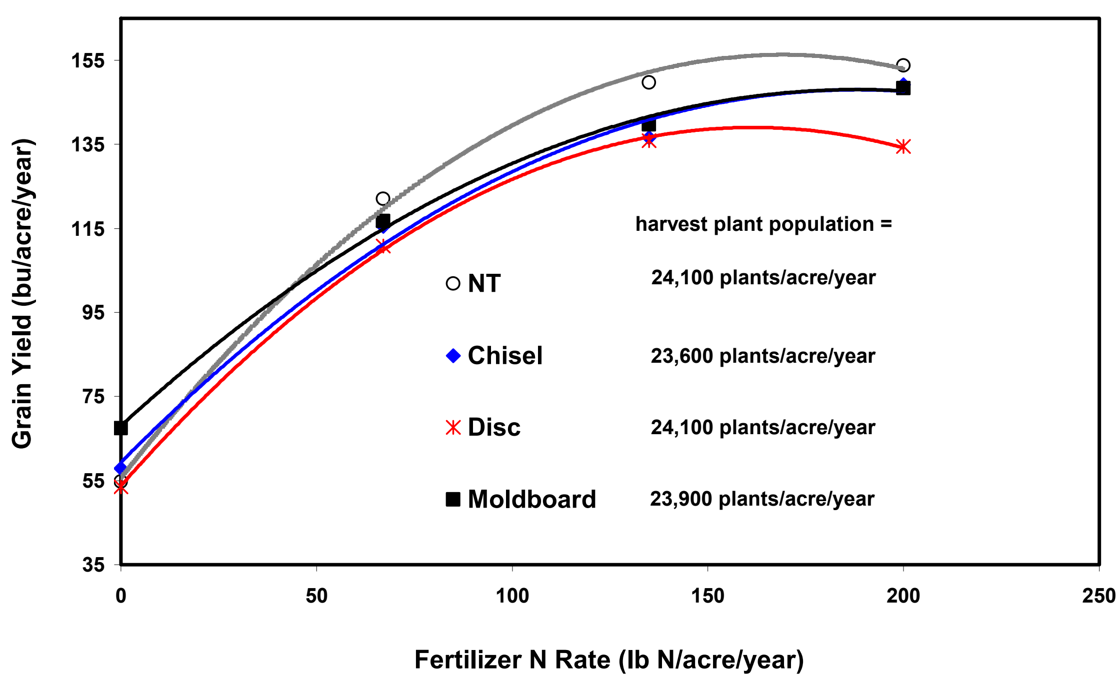


Figure 2. Corn Yield Response to Fertilizer Nitrogen In Four Tillage Systems (Experiment 2 - 2000 to 2006)



5. Soybean Seeding Rates – How Low Is Too Low?

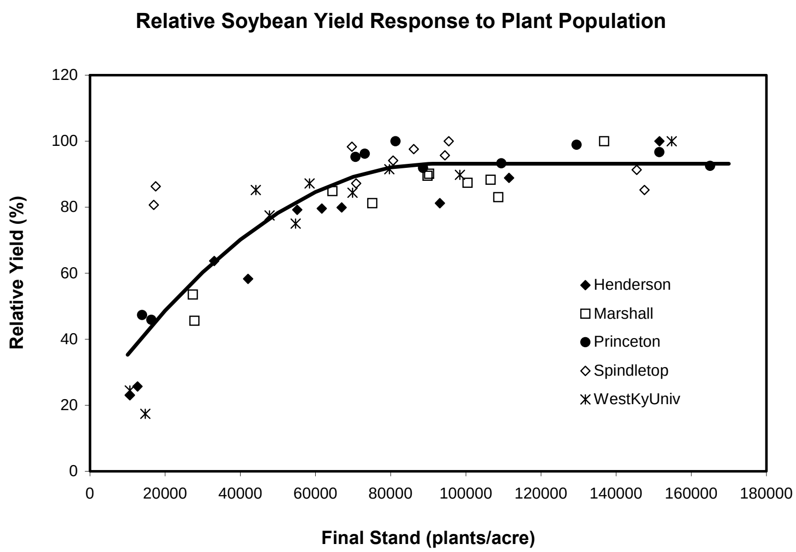
D.M. TeKrony, D.B. Egli, and Chad Lee, Plant and Soil Sciences

- Less soybeans are needed to reach maximum yield.
- If planting early, then keep seeding rates higher.

Lowering soybean seeding rates will save farmers money, but lowering them too much could cost them money at harvest time. The question is 'how low is too low'? Recent research at a number of locations in Kentucky has shown that 80,000 plants per acre in 15 inch rows will produce just as much yield as 190,000 plants per acre that was recommended traditionally (Fig.1). The minimum population is probably closer to 100,000 plants per acre for later plantings and may be as much as 150,000 plants per acre for double cropped soybeans.

While most of the recent data supports lower stands getting high yields, the challenge is determining how much of the seed you plant will germinate. Under ideal conditions –where soil temperatures are at least 60 °F at planting depth and there is adequate soil moisture, then final emergence should be close to the germination percentage on the seed tag. If you plant 90% germination seed in ideal conditions you can expect 90% emergence.

Figure 1. Soybean populations effect on yield.

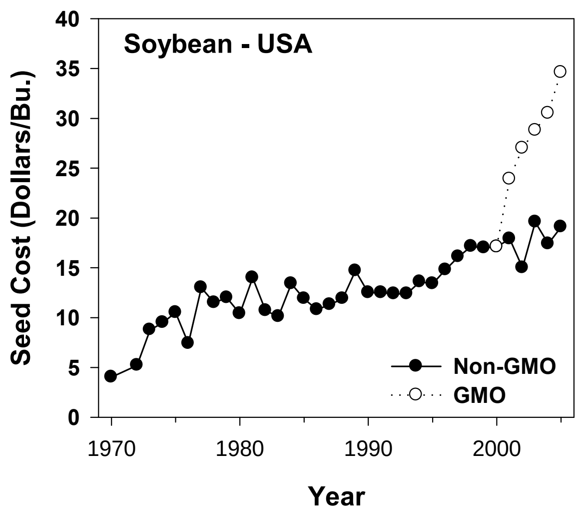


If conditions are not ideal, emergence will be less than the germination percentage on the seed tag, and the final stand could be unacceptable. Less than ideal conditions occur if you plant too early when soil temperatures are low (below 60°F), heavy rain produces a crust immediately after planting, or if there is poor soil-to-seed contact or heavy weed pressure from live weeds. Emergence under stress conditions such as these will probably be less than the germination percentage on the seed tag, and the final stand could be unacceptable. In our field research near Lexington, we often recorded emergence percentages of less than 50% in April plantings when soil temperatures were low. Remember that seedling emergence must be at least 80% to get the 80,000 plants you need when you plant 100,000 seeds per acre. Eighty percent may not be possible if there is a lot of stress in the seed bed.

Soybean seed is expensive (Fig. 2), but replanting or losing yield may be even more expensive. Ideally you would avoid planting in high stress situations (especially too early), but, if you must, assuming 60% emergence is probably pretty safe unless the stress is severe. In this case, planting 130,000 seeds per acre with 60% emergence will get you the 80,000 plants you need. Using high quality seed (high germination and vigor) will also help you get the stands you need for maximum yield.

Ideally, you would avoid planting into stressful situations, but you don't live in an ideal world. Often you are faced with planting soybeans early into a stressful situation or not getting them planted at all. We understand the challenges you face. At the same time, if you can avoid planting soybeans too early, you can save on seed costs while maintaining high yields. But be careful.

Figure 2. Soybean seed costs have increased dramatically since RR soybeans.



6. The Challenge of Managing Corn as a Weed in Corn Fields

Jim Martin and J.D. Green, Plant and Soil Sciences

There are circumstances where corn is considered a weed and needs to be killed in corn fields. Controlling corn is especially difficult when the crop is also corn. The fact that some corn hybrids also have herbicide-tolerant traits can be good or problematic, depending on the situation. Hybrids with glyphosate tolerance (e.g. Roundup Ready, Agrisure GT, etc.) will not be controlled with glyphosate. Likewise, corn hybrids with the Liberty Link trait will not be controlled with Liberty; and Clearfield or IT hybrids will not be controlled with Lightning herbicide.

- Replanting corn and volunteer corn usually require controlling unwanted corn in corn.
- Control options can be complicated by herbicide tolerance traits.

The following are two scenarios where unwanted corn can be a problem in corn fields.

Replanting Corn:
Fields prone to flooding or planted early are at risk of having poor corn stands. Cases involving an extremely low population may warrant destroying the initial stand and replanting back to corn. Planting a conventional hybrid that has no herbicide-tolerant traits allows the greatest flexibility for managing the initial stands where replanting is a high risk.

Volunteer Corn:
It is anticipated volunteer corn will be more of an issue this season than normal due to a late harvest and corn plants that lodged last fall. Based on University of Illinois research, corn yield was reduced 42 to 60 percent due to interference from volunteer corn plants.

Managing volunteer corn can be even more challenging than controlling initial stands in a replant situation. It is difficult to get thorough spray coverage of volunteer corn plants growing in clumps that originate from ears. Also, emergence patterns of volunteer corn may be more erratic than corn that is planted at a uniform depth.

Based on limited research, control of volunteer corn can be erratic; consequently there are more questions than there are solutions. The cool and cloudy weather that often occur in early spring is believed to be one factor that contributes to erratic control of corn with herbicides. Control of corn can be achieved more effectively and consistently in other crops such as soybeans. However, if growing soybeans is not feasible, growers may want to consider options listed in the following table.

Table 1. Strategies for Managing Corn as a Weed in Corn.

Type of Corn to be Controlled	**Type of Corn to Plant and Herbicide to Spray** [1]			
	Conventional Hybrid (no herbicide tolerant trait) Glyphosate **[Preplant ONLY]**	Glyphosate Tolerant Hybrid [2] Glyphosate	Liberty Link Hybrid Liberty	Clearfield or IT Hybrid Lightning
	Potential for Success [3]			
Conventional (no herbicide tolerant trait)	+	+ +	+	+
Glyphosate Tolerant [2]	—	—	+	+
Liberty Link	+	+ +	—	+
Clearfield or IT	+	+ +	+	—

[1] Consult label for rate and timing of application for optimum control. Some corn hybrids have stacked traits that provide tolerance to more than one of the above herbicides. Applying glyphosate, Liberty or Lightning to emerged plants that do not have the appropriate herbicide tolerance will kill or severely injure corn.

[2] Glyphosate Tolerant hybrids may be designated as Roundup Ready, Roundup Ready 2, Agrisure GT, or GT.

[3] Potential for success:
- Will not control corn
+ May control corn depending on suct factors as emergence pattern, size
++ High probability to control corn

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