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Agronomy Advice

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May 2002
Field Crops 28.42-35

Corn Replant / Late-Plant Decisions in Wisconsin

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Farmers are faced with corn replanting or late-plating decisions every year. Cold temperatures, wet or crusted soils, and/or pesticide or fertilizer injury may reduce seed germination and seedling emergence. After emergence, stands may be further reduced from insects, diseases, wind, frost, hail, and/or flooding. Stands too dense or non-uniform because of planter malfunctions or variable seeding depth may warrant replanting. Machinery breakdowns or wet soils may delay planting to where corn may not be economically produced and an alternative crop must be grown.

The major decision facing the corn farmer is whether it is more profitable to keep the original stand using a full-season hybrid or replant. Replanting may result in an optimum stand, but it would be planted at a later than desired date using a shorter-season hybrid. This publication describes how to make economically sound replanting or late-planting decisions.

Replanting - The Decision Making Process

Relationships between planting date, plant population and hybrid maturity must be known and this information used quickly to make the best of a less than optimal situation. Reasons for low stands must be determined so the problem can be avoided in future plantings. Observing stand uniformity, plant health, and potential pest problems, and knowing seed availability, alternative crops, and herbicide rotational restrictions enter into the decision. Base your replant decision on proven agronomic facts rather than emotion.

When stands after planting are less than ideal, compare the yield potential of the reduced stand to the yield potential of a late-planted stand. Observe and measure the existing corn stand plant population, their health, and the distribution or "eveness" of remaining live plants.

How To Determine Stand

To make this comparison, first take plant counts in several areas to accurately determine the existing corn stand population. Table 1 presents row length equivalents to 1/1000 acre for various row widths. For example, to determine the average number of corn plants in a 40 acre field planted at a 30 inch row spacing, measure 17 feet, 5 inches along a length of row and count the number of plants. If the average number counted in 15 areas of the field was 26.5 plants, then the average population for the field is 26.5 x 1000 = 26,500 plants per acre. If the stand is poor in spots, treat these areas separately from the rest of the field.

Table 1. Length of row equal to 1/1000 acre at various row widths.

Row width	Row length for 1/1000 acre
15	34’ 10"
20	26’ 1"
22	23’ 10"
26	20’ 1"
30	17’ 5"
36	14’ 6"
38	13’ 10"
40	13’ 1"

Determining Plant Health

It is easier to judge a reduced stand of healthy plants than one with weakened or partially damaged plants. When hail, frost or other damage occurs, wait 2 to 4 days with temperatures above 70 F before assessing the living stand. If the growing point is not damaged, plants will usually recover and perform better than replanted corn. The corn plant growing point remains protected below ground 2 to 3 weeks after emergence.

To determine growing point location and condition, split the stalk down the center with a knife. For normal, viable plants, the growing point will have a yellowish-white color and firm texture. Decayed, discolored tissue indicates a dead plant. Count plants of questionable health as a half-plant in stand assessments.

Yield Potential of Reduced Stand v. Replanted Stand

After taking a living plant population count, you can determine the yield potential of the remaining stand and compare it to replanting at a full stand rate (Tables 2 and 3). Note that full-season hybrids produce best yields at early planting dates, but with late plantings, which would usually occur in a replant situation, shorter-season hybrids perform better. Use Table 4 to determine the adapted Relative Maturity of corn hybrids that apply to your location and planting date.

Uneven Stands

Yields in Tables 2 and 3 are based upon uniform within-row plant distribution, but this seldom occurs in reduced stands. Yields are reduced about 2 to 10 percent if the stand includes several small gaps of 1.5- to 3- feet when 25 percent of the plants are missing. Numerous 4- to 6-foot gaps reduce yields by 10 to 20 percent.

Table 2. Expected corn grain yield for various planting dates and harvest populations in Relative Maturity zones of 70 to 95 days.

Harvest population	Planting date: April 20	May 1	May 10	May 20	June 1	June 10	June 20
	percent of expected yield						
36000	96 *82*	100 *89*	97 *89*	86 *82*	63 *65*	39 *46*	5 *18*
34000	95 *81*	99 *88*	96 *88*	85 *81*	63 *65*	39 *46*	5 *18*
32000	94 *80*	98 *87*	95 *87*	85 *80*	62 *64*	38 *45*	5 *18*
30000	93 *79*	97 *86*	94 *86*	83 *79*	61 *63*	38 *45*	5 *18*
28000	91 *78*	95 *85*	92 *84*	82 *78*	60 *62*	37 *44*	5 *18*
26000	89 *76*	93 *83*	90 *83*	80 *77*	59 *61*	37 *43*	5 *17*
24000	87 *75*	91 *81*	88 *81*	79 *75*	58 *59*	36 *42*	5 *17*
22000	85 *73*	89 *79*	86 *79*	76 *73*	56 *58*	35 *41*	5 *16*
20000	82 *70*	86 *76*	83 *76*	74 *70*	54 *56*	34 *40*	4 *16*
18000	79 *68*	83 *74*	80 *73*	71 *68*	53 *54*	32 *38*	4 *15*
16000	76 *65*	80 *71*	77 *70*	69 *65*	50 *52*	31 *37*	4 *15*
14000	73 *62*	76 *67*	74 *67*	65 *62*	48 *49*	30 *35*	4 *14*
12000	69 *59*	72 *64*	70 *64*	62 *59*	46 *47*	28 *33*	4 *13*
10000	65 *55*	68 *60*	66 *60*	58 *56*	43 *44*	27 *31*	3 *13*

Figures for shorter-season hybrids are in italics. The actual Relative Maturities of short-and full-season hybrids vary with location and soil type. See Table 4 for more specific Relative Maturity values.

Table 3. Expected corn grain yield for various planting dates and harvest populations in Relative Maturity zones of 95 to 115 days.

Harvest population	Planting date: April 20	May 1	May 10	May 20	June 1	June 10	June 20
	percent of expected yield						
36000	96 *91*	99 *95*	95 *93*	85 *87*	63 *71*	40 *55*	8 *32*
34000	97 *92*	100 *96*	96 *94*	85 *87*	63 *72*	40 *56*	8 *32*
32000	97 *92*	100 *96*	96 *94*	86 *87*	63 *72*	40 *56*	8 *32*
30000	96 *92*	100 *96*	96 *94*	85 *87*	63 *72*	40 *56*	8 *32*
28000	96 *91*	99 *95*	95 *93*	84 *86*	63 *71*	40 *55*	8 *32*
26000	94 *89*	97 *93*	93 *92*	83 *85*	62 *70*	39 *54*	8 *31*
24000	92 *87*	95 *91*	91 *89*	81 *83*	60 *68*	38 *53*	7 *31*
22000	89 *85*	92 *88*	89 *87*	79 *81*	58 *66*	37 *51*	7 *30*
20000	86 *82*	89 *85*	85 *84*	76 *78*	56 *64*	36 *49*	7 *29*
18000	82 *78*	85 *81*	82 *80*	72 *74*	54 *61*	34 *47*	7 *27*
16000	78 *74*	80 *77*	77 *76*	68 *70*	51 *58*	32 *45*	6 *26*
14000	73 *69*	75 *72*	72 *71*	64 *65*	47 *54*	30 *42*	6 *24*
12000	67 *64*	69 *66*	67 *65*	59 *60*	44 *50*	28 *38*	5 *22*
10000	61 *58*	63 *60*	60 *59*	54 *55*	40 *45*	25 *35*	5 *20*

Figures for shorter-season hybrids are in italics. The actual Relative Maturities of short-and full-season hybrids vary with location and soil type. See Table 4 for more specific Relative Maturity values.

Example:

Here’s an example of how to use Tables 1-3 to make replanting decisions:

Jane and John Farmer planted a full-season corn hybrid May 10 near Oshkosh, Wisconsin, with a desired harvest population of 28,000 plants per acre. Emergence appeared complete by late May, but only 14,000 living plants per acre were present, and the stand was somewhat uneven. While it would be possible to rework the field and have it ready to replant by June 1, would it be worth it?

Using Table 3, a full-season hybrid planted May 10 in the Oshkosh area (95- to 100-day Relative Maturity) with a desired harvest population of 28,000 plants per acre should produce 95% of a maximum possible yield. In this case, a remaining stand of 14,000 plants per acre would result in 72% of maximum yield minus 2% for some unevenness, equaling a 70% yield potential. If the farmer used an earlier hybrid (80- to 85-day Relative Maturity, Table 4) and replanted to a stand with 28,000 plants per acre on June 1, the yield potential is 71% (Table 3).

It is unlikely that the extra 1% gain (71% minus 70%) in yield potential would make it worth the time and effort to replant. For example, if the Farmer’s expected yield potential is 130 bushels per acre, this amounts to an increase of only 1.5 bushels per acre.

Remember the information in Tables 2 and 3 are only guidelines to help you make decisions about replanting. It will not apply to all situations. Each case must be evaluated individually.

Replanting Costs

Replanting decisions must incorporate the costs of extra tillage (equipment, fuel, and labor), planting, seed and additional pesticides, if required. This often amounts to $20 to $40 per acre. Late-planted corn for grain will also have the cost of extra drying. Extra interest on borrowed money will be required for replant expenses.

Replanting costs can be reduced by replanting at a low seeding rate alongside or over the original row to "fill in" the stand without tearing it up. However, although this option saves costs, uneven within-row plant spacing and maturity differences are a problem.

Replanting Risks

There is no guarantee that replanting will result in a full stand. Diseases, insects or herbicide injury that reduced original stands may again cause reductions in replanted corn. Rain may further delay replanting after the field is re-worked and less than average growing conditions for the remaining season may result in grain yields much lower than those indicated in Tables 2 and 3.

Late Planting

The following management practices apply to late planting -- either delayed initial planting, or a replant situation.

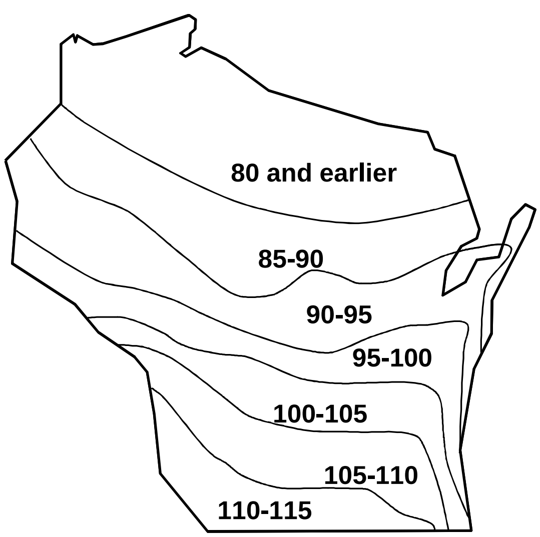

Figure 1. Relative maturity zones for full-season corn hybrids planted before May 15.

Hybrid Maturity

When planting corn later than May 15 to May 20, use shorter-season hybrids. Table 4 lists alternate hybrid Relative Maturities for delayed planting dates for the standard Relative Maturity belts shown in Figure 1. For additional information on hybrid selection and performance, check Extension publication A3265 - Selecting Corn Hybrids.

With average growing conditions corn planted after June 1 to June 5 in northern and central Wisconsin and after June 10 to June 15 in southern Wisconsin, will probably not mature with reasonable grain yield and moisture content, even with very early hybrids. However, corn silage from shorter-season hybrids may still have acceptable quality when corn is planted until June 20. Corn planted after June 20 will likely contain little or no grain, and only stover (stems and leaves) will be produced.

Table 4. Relative maturity of adapted corn hybrids for different planting dates and relative maturity zones in Wisconsin.

Full-season relative maturity zone	Relative maturities** for late planting			
	May 20	June 1	June 10	June 20
Planting before May 15	Days Relative Maturity			
80 and earlier	75-80	75-80 (silage)	--	--
85-90	80-85	75-80 (silage)	--	--
90-95	85-90	75-80	75-80 (silage)	--
95-100	90-95	80-85	75-80 (silage)	--
100-105	95-100	85-90	75-80	75-80 (silage)
105-110	100-105	90-95	80-85	75-80 (silage)
110-115	105-110	95-100	85-90	75-80 (silage)

* To determine the Relative Maturity belt for your location, see Figure 1.

** These Relative Maturities are for grain unless silage is indicated. Relative maturities for silage can be 5 days longer than those listed.

Pest Control

It is usually easier to control weeds in late corn plantings than in early plantings. Late tillage kills many germinated weeds and crop seedlings are more competitive due to warmer temperatures. For replant situations, weed control must take into account any previous herbicide applications. If herbicides were applied pre-emergence or pre-plant incorporated, their effectiveness may be reduced by the time corn is replanted, especially if the field is tilled before replanting.

Insects normally are a greater threat to late plantings than weeds. Later plantings may have more feeding from second-generation European corn borers, and silk feeding by corn rootworm beetles may also be more severe. Soil rootworm insecticide will need to be applied if the field was tilled since the initial planting application.

Effects of Early Freeze on Yield Potential

Earlier than normal autumn frosts can devastate late-planted corn. Yield is decreased if late-planted corn does not reach physiological maturity before plants are damaged by a freeze. Grain from corn plants killed by a freeze before maturity may be slow to dry down, and it tends to be brittle after artificial drying -- making it more likely to break during handling. Test weight also will be lower when corn is prematurely killed.

If late-planted corn does mature ahead of frost, grain will be wetter and probably have to dry down in weather less favorable for drying. Table 5 lists grain characteristics and appropriate management considerations for corn killed at various growth stages.

Crop Choice

If planting is delayed past the time acceptable corn production can be expected, consider planting an alternative crop. Compare the relative yield potential and current price of an alternative crop for a given date with that of late-planted corn.

For example, corn yield potential of a late planting declines at a faster rate than the yield potential loss of soybeans. After June 1, it may be advantageous to plant soybeans, instead of corn, if this fits your rotation. Sunflowers and buckwheat are other grain crops that can be planted very late. Forage sorghum, sorghum-sudan crosses or sudangrass can help boost forage supplies and be planted into July. For more information on late-planted forage crops, see Extension publication A1119 -- *Supplementary and Emergency Forage Crops.*

You must consider prior herbicide and fertilizer applications, desired rotation, livestock feed requirements, and the possibility of erosion on slopes when you are choosing a crop to plant late. For more information on herbicide rotational restrictions, see UW Extension publication A3646 -- Field crops pest management in Wisconsin.

Summary

A corn replant or late-plant decision is often difficult. Decisions need to be based on sound agronomic and economic principles and the farmer's ability to utilize the crop as silage, if it doesn't reach maturity. The original stand must be accurately counted and evaluated for uniformity and overall plant health. The expected yield for the original stand is then compared to potential replant yield from the later-than-optimum replant date. Identifying stand problems early will help minimize yield reductions from late plantings.

Table 5 Grain characteristics and management considerations of late-planted corn killed by frost at various growth stages.

Growth Stage	Grain characteristics	Management Considerations
Corn Killed in Dough Stage	• Kernels contain about 70% moisture. • About one-half of mature kernel dry weight accumulated. • Grain will unlikely achieve maximum yield potential unless stalk, ear and some lower leaves survive.	• Corn can be used for good quality silage, but entire plant must be allowed to dry to about 65% moisture.
Corn Killed in Dent Stage	• In early dent, kernels contain about 55% moisture and are 3 to 3½ weeks from maturity • About half of mature dry weight has accumulated.	• Corn will make good silage when harvested at a whole plant moisture content of 65%. • Can be harvested for grain after long field-drying period.
Corn killed in late dent	• Kernel moisture is decreasing and yield is within 10 percent of final mature dry weight when kernels are past half milkline. • Grain yields will be reduced and test weights low. • If plant is only partially killed or the crop is close to physiological maturity before the freeze (kernel milk line half-way or closer to tip), yield loss will be only 5 to 20 percent, and test weight will be lower.	• Corn will make good silage when harvested at a whole plant moisture content of 65%. • Can be harvested for grain after long field-drying period.
Corn Killed When Physiologically Mature (Black Layer)	• Kernel moisture is 28 to 35% depending on hybrid. • Killing freeze will not affect grain yield or quality.	• Dry-down rate of grain depends on hybrid and environment. • Can be harvested for high-moisture grain or for grain after field drying.

For a more detailed description of the growth stages of corn, see Special Report 48 - How a Corn Plant Develops.