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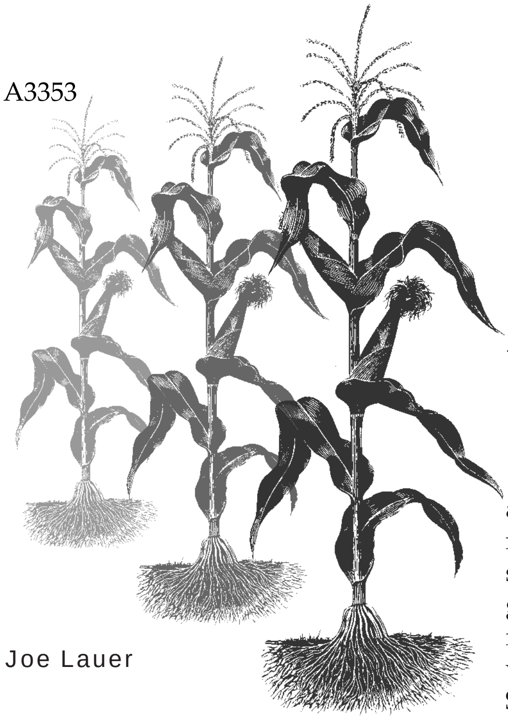

Corn replant/late-plant decisions in Wisconsin

Joe Lauer

Farmers are faced with corn replanting or late-planting 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.

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"

Replanting—the decision-making process

Poor seed germination or seedling emergence may necessitate replanting the field. To minimize losses, information must be collected and evaluated quickly. You'll first need to estimate three factors: stand population, plant health, and evenness of spacing. Then compare the yield potential of the existing stand to the yield potential of a late-planted stand. When deciding whether to replant, you'll also need to consider replanting costs, seed availability, rotation restrictions from previous herbicide applications, and possible alternative crops. Each step of the decision process is described below. Base your replant decision on proven agronomic facts rather than emotion.

1 Determine plant population

To determine the number of plants in an acre (plant density), count the plants in a row length that is equal to 1/1000 of an acre. This row length will vary depending on the width of the rows, so consult table 1 for the row length equivalents. To get a reliable average, sample 15 to 20 representative areas per 40 acres. If the stand is poor in spots, treat these areas separately from the rest of the field. Once you know the average number of plants per 1/1000 of an acre, multiply by 1000 to calculate the number of plants per acre.

How many plants? To estimate the number of plants in a 40-acre field planted in 30-inch wide rows, count the plants in row lengths measuring 17 feet 5 inches (from table 1). This gives the number of plants in 1/1000 acre. Sample 15 to 20 representative areas. If the average number of plants is 26.5, then the number of plants per acre is 26,500 (26.5 x 1000).

2 Evaluate plant health

At the same time that you're estimating the number of plants in the field, you should also evaluate the overall health of the plants. In each area you sample, examine 2 to 3 plants closely. Also try to determine the reason for the reduced stand so that you can avoid the problem in future plantings.

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 stand. If the growing point is not damaged, plants will usually recover and perform better than replanted corn.

The growing point of the corn plant remains protected below ground 2 to 3 weeks after emergence (figure 1). To evaluate the condition of the growing point, split the stem down the center with a knife. A healthy growing point will be yellowish-white and firm. Decayed, discolored tissue indicates a dead plant. Plants that are of questionable health should be counted as a half-plant when assessing the stand.

3 Assess the unevenness of stands

As you're determining plant population, also look at the number and size of the gaps in the field. If the stand has several small gaps of 1½ to 3 feet, deduct 2 to 10% from the yields listed in tables 2 and 3; if the field has numerous 4- to 6-foot gaps, deduct 10 to 20%.

4 Compare the yield potential of a reduced stand to that of a replanted stand

Knowing the difference between the yield potential of the remaining stand and what you can expect from a new stand will help guide your decision to replant. To make this comparison, use figure 2 to find out which relative maturity zone you're in. If you live in northern Wisconsin, with a relative maturity zone of 95 days or less, refer to table 2 for grain yield information; in southern Wisconsin, refer to table 3. To use these tables, read down the left column for the plant population at harvest. Then read across for the appropriate planting date.

To estimate the yield potential of a replanted stand, refer to the bold-faced columns. Note that full-season hybrids produce best yields at early planting dates. Shorter-season hybrids perform better than full-season hybrids in late plantings.

5 Calculate replanting costs

Replanting decisions must include the costs of extra tillage (equipment, fuel, and labor), planting, seed, and additional pesticides, if required. These expenses often amount to $20 to $40 per acre. Late-planted corn for grain will also have the cost of extra drying.

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, maturity differences can be a problem at harvest due to wet grain. Also, since the younger plants are at a competitive disadvantage, they will yield considerably less than corn from the first planting.

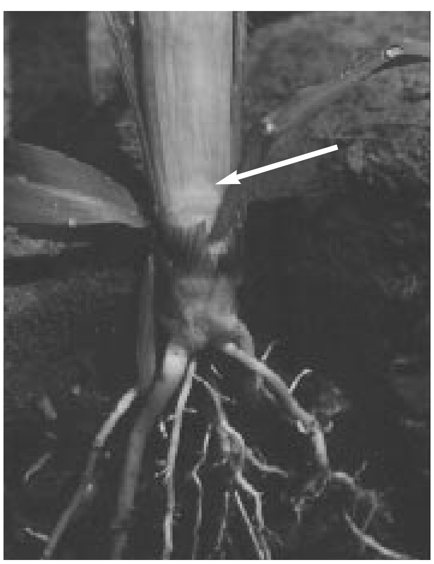

Figure 1. On healthy plants, the growing point is yellowish white.

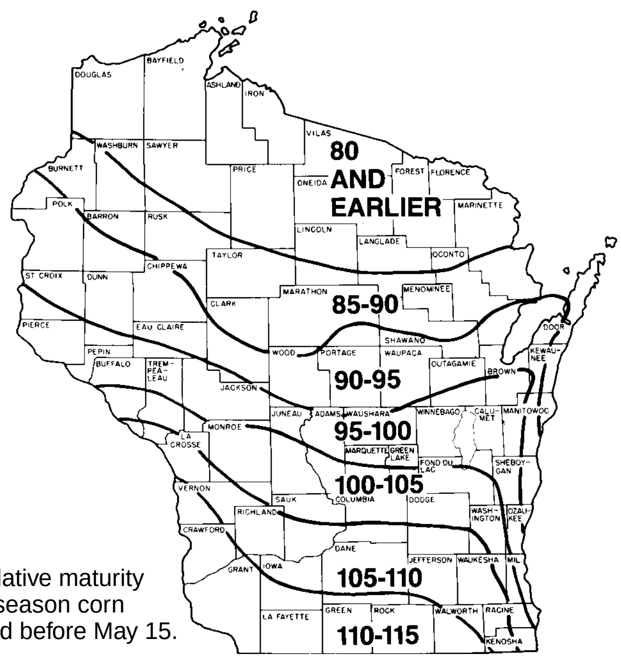

Figure 2. Relative maturity zones for full-season corn hybrids planted before May 15.

Northern Wisconsin—relative maturity zone, 70–95 days

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

harvest	planting date													
pop'n	April 20		May 1		May 10		May 20		June 1		June 10		June 20	
	% 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 bold. 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.

Southern Wisconsin—relative maturity zone, 95–115 days

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

harvest	planting date													
pop'n	April 20		May 1		May 10		May 20		June 1		June 10		June 20	
	% 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 bold. 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.

6 Factor in risks of replanting

There is no guarantee that replanting will produce a full stand. If the factors that reduced the initial stand—such as diseases, insects, or herbicide injury—are still present, the replanted corn will likely also suffer. In addition, untimely rains may delay replanting and poor growing conditions for the remaining season may lower grain yields more than indicated in tables 2 and 3.

Remember, the information in tables 2 and 3 can only provide guidelines to help you make decisions about replanting—it will not apply to all situations. Each case must be evaluated individually.

Late planting

Whether you're replanting or late planting, the following information will help you make the best management decisions.

Hybrid maturity

When planting corn later than May 15 to May 20, use shorter-season hybrids. To determine the best relative maturity for your situation, refer to table 4. For additional information on hybrid selection and performance, consult Extension publication *Selecting Corn Hybrids* (A3265).

In most years, corn planted after June 5 in northern and central Wisconsin and after June 10 in southern Wisconsin will not mature with reasonable grain yield and moisture content. However, corn silage from shorter-season hybrids may still have acceptable quality when corn is planted by June 10 in northern Wisconsin and by June 20 in southern Wisconsin. Corn planted after this time will likely contain little or no grain, producing only stover (stems and leaves).

Deciding whether to replant—a case study

A full-season hybrid was planted on May 10 near Oshkosh, Wisconsin with a desired harvest population of 28,000 plants per acre. By the end of the month, the 40-acre field had produced only a marginal, uneven stand. Would there be enough of a yield gain to justify replanting the field to a short-season hybrid on June 1?

1. Determine plant population. Sampling in 20 areas shows a plant population of 14,000 plants per acre.
2. Evaluate plant health. Examining the growing point of 2 to 3 plants in each sampling area reveals little damage from disease or insects.
3. Assess the unevenness of the stand. The field has several small gaps in it which would reduce yield by about 2%.
4. Compare yield potentials. Oshkosh, Wisconsin has a relative maturity zone of 95 to 100 days (figure 2). Using table 3, we learn that the full-season hybrid can produce only 72% of the yield (May 10 planting; 14,000 plants). Deducting an additional 2% from the yield due to uneven distribution, leaves a maximum yield potential of 70%. By comparison, a field replanted on June 1 at a rate of 28,000 plants per acre would have a yield potential of 71% (table 3).
5. Calculate replanting costs. The difference in yield potential is only 1% (71% versus 70%). Assuming an expected yield of 130 bushels per acre, this difference translates to an increase of only 1.3 bushels per acre. In this case, the gain is not enough to offset the time and costs involved in replanting.
6. Factor in replanting risks. The risk of untimely rains and increased insect pressure combined with the possibility of an early fall frost diminish the already marginal gains from replanting this field.

In this case study, the original planting would be better left to mature, despite the reduced yield potential.

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

full-season relative maturity zone[a]	relative maturities[b] for late planting: May 20	June 1	June 10	June 20
85 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)

[a]*Use figure 2 to determine the full-season relative maturity zone for your location.*

[b]*These relative maturities are for grain unless silage is indicated. If planting the field for silage, add 5 days to the relative maturities listed for grain.*

The limiting factor of late-planted corn is the yield loss from early fall frosts. 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 drying—making it more likely to break during handling. Test weight also will be lower when corn is prematurely killed.

Even if late-planted corn matures before a killing frost, the grain will still be wet and will probably have to dry down in weather less favorable for drying. Table 5 describes grain characteristics and management considerations for corn killed at various growth stages.

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

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

stage of growth	grain characteristics	management considerations
dough	■ Kernels contain about 70% moisture. ■ About 45% of mature kernel dry weight has accumulated. ■ Grain will not achieve maximum yield potential unless stalk, ear, and some lower leaves survive.	■ Corn can be used for silage, but entire plant must be allowed to dry to about 65% moisture.
early dent	■ Kernels contain about 55% moisture and are 3 to 3½ weeks from maturity. ■ About 50 to 60% of mature kernel dry weight has accumulated. ■ Grain yields will be reduced by 40 to 50% and test weights will be low. ■ If plants are only partially killed, yield loss will be 25% and test weight will be lower than normal.	■ 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.
late dent	■ Kernels contain about 40% moisture ■ Yield is within 12% of final mature dry weight. ■ Grain yields will be reduced and test weights low. ■ If plants are only partially killed or if the crop is close to physiological maturity before the freeze (kernel milk line half-way or closer to tip), yield loss will be 5%, and test weight will be slightly lower than normal.	■ Corn will make best silage when harvested at a whole plant moisture content of 65%. ■ Can be harvested for grain after long field-drying period.
black layer (physiologically mature)	■ Kernels contain 28 to 35% moisture 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.

Pest control

It is usually easier to control weeds in late corn plantings than in early plantings. Late tillage kills many germinated weeds. In addition, crop seedlings are more competitive due to warmer temperatures. Note that if you're replanting the field, your weed control decisions *must* take into account any previous herbicide applications. The effectiveness of preemergence and preplant-incorporated herbicides may be reduced by the time corn is replanted, especially if you till the field before replanting.

Insects normally are a greater threat to late plantings than weeds. Later plantings may have more feeding damage from second-generation European corn borers; 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. For more information on these pests, see Extension publications *The European Corn Borer* (A1220) and *Corn Rootworms* (A3328).

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, the yield potential declines faster for late-planted corn than for 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 can be planted into July.

When choosing an alternative crop, be sure to consider prior herbicide and fertilizer applications, desired rotation, livestock feed requirements, and the possibility of erosion on slopes. For more information on herbicide rotational restrictions, see Extension publication *Field Crops Pest Management in Wisconsin* (A3646).

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