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Making Corn Replant Decisions

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Introduction

When the stand of corn from the initial planting is not what a corn producer desired, whether or not to replant becomes an issue. Will the original stand or a replanted stand be the most profitable? The first step in determining the yield potential of the original stand involves taking detailed stand counts. This often is more complicated than simply counting plants, as factors such as plant health and stand uniformity often complicate things. The yield potential of the original stand must then be compared with what one expects from a replant. If a replant will yield more than the original stand, the cost of replanting and other management and risk factors associated with a replant must be considered before arriving at a final decision. Many of the items discussed here are considered in greater detail in a recent Journal of Production Agriculture paper by Benson (1990).

Evaluating a Stand

Determining a Stand

Stand counts must be taken at random in several places in a field. If areas within a field are not damaged uniformly and are large enough to manage separately, consider this in your stand counts.

Due to the obvious yield penalty for delaying a replant, waiting until one is absolutely sure of the final stand is a luxury one seldom has. For this reason a working knowledge of how the young plant grows and develops and how to "read" early growth problems is essential. You need to know what healthy radicle and seminal roots, the growing point, mesocotyl and coleoptile look like on small seedlings. At what depth is the seed and what are the moisture and soil conditions around that seed?

Look for premature opening of the coleoptile point, discoloration of the mesocotyl due to disease, abnormal or restricted roots. Be able to locate the growing point and examine it for discoloration, an early indicator of plant death. Perhaps even more difficult to evaluate is the value of plants that survive, but are seriously delayed or injured. Also, how do you adjust yield for stand gaps?

An added complication can be where hail or insect defoliation is involved. Recent research on the effect of uneven plant growth

as well as information related to stand gaps will be presented later.

Yield Expectations

The relationship between plant stand and yield will vary between regions of the country, states, areas of a state and even between fields on a farm. For a given location, the optimum stand can vary due to moisture stress, hybrid, soil fertility (especially N) and yield goal. Thus, it is impossible to construct a base table to represent all cases.

Tables 1 and 2 are examples from Iowa (central Corn Belt) and Minnesota (northern Corn Belt) respectively where relationships between percent yield, planting date and stand are listed. This relationship is crucial when comparing stand levels at various planting dates. In general, the penalty for lower stands and planting after the optimum date, for a given location, is less as one moves south in the Corn Belt. A somewhat extreme example of the performance of different hybrids at various stand levels is given in Table 3.

Once in a while one is asked if a too thick stand should be replanted or somehow "thinned"? Corn producers tend to be especially concerned about this when soil moisture reserves are low. Attempts to thin stands uniformly are seldom successful. A four year Iowa study shown in Table 4 indicated that replanting of "excessive stands" of an April 26 planting on either May 16 or June 5 would not have been the correct decision. It needs to be pointed out that weather was favorable, a hybrid tolerant to high populations and adequate fertility were all factors in this outcome.

Stand Uniformity

It is assumed that stands reported in studies were reasonably uniform both in height and distribution within the row. In many fields where replanting is being considered, the stands are not uniform. Johnson and Mulvaney (1980) considered the effect of within-row gaps in their replant studies. They found that small gaps (14-33 in.) reduced yields about 2%, while large gaps (4-6 ft.) reduced yields about 5%.

Trials by Ford (1987) compared the effect of planting alternating seeds (50% of the stand) within the row at different times. When alternating seeds were planted 7 or 14 days later than the base planting, yields were reduced about as much as if the entire stand was planted 7 or 14 days late. Although the yield loss due to 50% of the stand emerging late was substantial, it alone did not justify replanting. Carter and Nafziger (1990) in joint studies in Wisconsin and Illinois indicated that even when up to 50 or 75% of the stand emerged 2 weeks late, the yield

loss was not enough to justify replanting. Although uneven plant size alone in most cases does not justify replanting, one must consider this as an additional factor when the original stand is lower than desired.

Destruction of leaf area on small plants is seldom as serious as appearance might indicate. Watch for regrowth of the youngest leaf from the whorl as an indicator of recovery. Plant survival is the key issue as on 5-leaf or less (color visible) corn, hail charts indicate no yield loss for defoliation.

Expectations from a Replant

Numerous planting date studies from the Midwest give a good basis for the yield expectations of late planting dates. Table 5 gives yield and grain moisture results for a 5-year study in Iowa. Data from such studies were combined with population studies in constructing Table 1. One must be careful in hybrid maturity selection for replanting so that the correct maturity (high probability of maturity at frost date) is selected for later planting dates. If by using Table 1 and making proper adjustments for nonuniformity of stand and other negative factors you find that replant yields will be less than expected yields from the lower than desired original stand, the decision is not to replant. However, if the replant will likely yield more, the cost of replanting and the risk of getting a stand from the replant need to be considered.

Summary

The basic information needed to make the best economic decision has been discussed. However, the following factors must also be considered:

1. There must have been a reason for the poor original stand (i.e., soil conditions, disease, herbicide injury, insects, planted too deep, etc.). What is the potential for this affecting the replant crop?

2. Soybeans rather than corn may be the replant crop of choice starting about mid-June.

3. Be sure the herbicide program allows for a switch of crops.

4. Recognize that many replant decisions are made based on emotion -- try to bring technical information into the decision.

Although a corn replant decision can be very complicated, the major factors in most decisions for a given location will be:

1. What will be the surviving stand from the original planting and the yield expectation based on stand level, plant health, and stand uniformity?

2. What is the yield expectation for a full stand at the possible replant date?

3. If a replant will yield more than the surviving original stand, the cost of replanting and other management and risk factors associated with a replant need to be considered before arriving at a final decision.

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Table 1. Corn grain yields in Iowa at various planting dates and stands expressed as a percent of the optimum stand and date.

Planting Date	Plants per acre at harvest				
	10,000	14,000	18,000	22,000	26,000
	% yield				
May 1	67(67)†	82(82)	93(93)	98(98)	100(100)
May 20	62(64)	76(78)	85(88)	91(94)	92(95)
June 1	56(59)	69(72)	78(81)	83(87)	84(88)
June 10	47(51)	58(63)	66(72)	70(76)	71(77)
June 20	38(42)	45(51)	51(58)	54(62)	55(63)

†Values in parentheses are for southern one-third of Iowa.

Table 2. Corn grain yields in Minnesota at various planting dates and stands expressed as a percent of the optimum stand and date. Adapted from Hicks (1979).

Planting Date	Plants per acre at harvest								
	14,000	16,000	18,000	20,000	22,000	24,000	26,000	28,000	30,000
	% yield								
Before May 1	67	74	79	84	88	92	94	97	100
May 1-10	67	74	78	83	87	89	91	92	93
May 11-25	67	74	76	79	81	84	85	86	87
After May 25	61	65	68	71	73	75	76	76	76

Table 3. Performance of two corn hybrids at different stands in northwest Iowa.

Harvest Stand	Yield		Doubles†	
	Hybrid A	Hybrid B	Hybrid A	Hybrid B
plants/acre	------- bu acre ------		---------- % ----------	
15,000	162	132	55	6
18,000	166	154	33	5
21,000	167	159	12	3
24,000	166	160	0	0

†Percent of main plants producing more than one ear.

Table 4. Influence of planting dates and stands on corn grain yield in north central Iowa, 1984-87.

Planting Date	Plants per acre at harvest				
	22,000	26,000	30,000	34,000	38,000
	---------- bu acre ----------				
April 26	155	159	163	159	161
May 16	147	153	152	154	145
June 5	125	124	128	128	127

Table 5. Influence of planting date and hybrid maturity on corn grain yield and harvest grain moisture in north central Iowa (5 year average).

Hybrid Maturity	Planting Dates					
	May 10-15	June 1	June 10	June 20	July 1	July 10
	bu acre					
Adapted	144	124	103	84	42	14
Early	142	126	102	83	48	20
Very Early	112	100	98	83	48	23
	% grain moisture					
Adapted	21	27	34	42	58	69
Early	18	21	27	32	46	59
Very Early	14	17	22	25	37	50