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Corn and Soybean Replant Decisions

Deciding whether to replant a sparse stand is one of the more difficult decisions a corn or soybean grower will face. The difficulty of this decision stems from the difficulty of predicting how the effectiveness of replanting will be affected by the combination of planting date and changing environmental conditions. However difficult, replant decisions are made by at least some Missouri farmers every year.

This guide provides a step-by-step procedure for estimating dollar gain or loss from replanting. This procedure involves a careful study of the field in question and an analysis of its yield potential. Follow these steps:

1. Determine the cause of the sparse stand.
2. Determine the stand density and condition of the stand.
3. Determine the yield potential of the sparse stand.
4. Estimate the expected gross revenue from the sparse stand.
5. Estimate the yield potential and gross revenue from a replanted stand.
6. Estimate the cost to replant.
7. Determine whether replanting will pay for itself.

A worksheet and link to a spreadsheet tool are given at the end of this guide. Both can help estimate the costs and benefits of replanting.

Cause of the sparse stand

Accurate determination of the cause of the sparse stand is an essential first step because a sparse stand can also result when replanting unless the cause is identified and corrected. Causes of sparse stands before emergence include poor seed quality, improper seeding practices, low moisture availability, soil crusting, saturated soil, herbicide injury, insect feeding and disease infection. Stand density can be reduced after emergence by weather events, diseases or animal feeding. Replanting should be contemplated only if the cause for the sparse stand can be corrected.

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In most instances, planting into existing sparse stands is not recommended because stands with a mixture of plant sizes and maturities perform poorly. This is particularly true with corn. You can remove existing stands with either herbicides or tillage. Replanting without tillage saves time and soil moisture without diluting existing preemergence herbicides.

Stand density and condition

An accurate estimate of the remaining live plant population is necessary to determine potential yield of the sparse stand. If possible, wait several days to determine if plants are alive or regrowth is possible. The number of areas to be sampled depends on the uniformity of the damaged stand. With nearly uniform damage, fewer areas need to be sampled. Always remember that some portions of the field may not need to be replanted. Count the number of live plants in the appropriate areas, and calculate stand. As you count plants, you must decide if the plant is healthy or at least capable of recovery. Do not count weak plants or plants damaged beyond reasonable potential for recovery. To estimate stands after hail or animal damage, note which parts of the plant are damaged and how they affect the potential for regrowth. Leaf removal, for example, is far less serious than bruising of the lower stem.

Be sure to note the condition of the remaining plants and of the field, including the extent of plant defoliation, the presence of large gaps in stands and the amount of weed pressure.

Count plants in an area for which you know the dimensions so that you can calculate the number of plants per acre. You can simplify your calculation by counting plants in a length of row equal to one-thousandth of an acre and multiplying by 1,000. Table 1 provides the row lengths equivalent to one-thousandth of an acre for 15- , 20- and 30-inch wide rows For drilled soybean, use the hula hoop method and refer to Table 2.

Yield potential of the sparse stand

Yield is greatly influenced by both environment and genetics. Corn and soybean yields are most affected by weather conditions in July and August, respectively. As

Table 1. Row length that equals one-thousandth of an acre.

Row width	Row length that equals 1/1000 acre
30 inches	17 feet, 5 inches
20 inches	26 feet, 2 inches
15 inches	34 feet, 10 inches

Table 2. Hula hoop method for estimating population of drilled soybean.

Number of plants in hoop	Inside diameter of hoop (inches)				
	30	32	34	36	38
	Thousands of plants per acre				
2	18	15	14	12	11
4	35	31	28	25	22
6	53	47	41	37	33
8	71	62	55	49	44
10	89	78	69	62	55
12	107	94	83	74	66
14	124	109	97	86	77
16	142	125	110	99	89

To perform the hula hoop method, randomly toss a hoop onto the field. Count the number of plants inside the hoop. Then use this table to determine the number of plants per acre: In the first column, find the number of plants in the hoop. Follow the row across to the column for the hoop's diameter. The number indicated is in thousands. For example, if 12 plants are inside a 34-inch hoop, the field contains about 83,000 plants.

it is nearly impossible to predict in May or early June what weather events will occur in July or August, assume normal weather patterns unless you have good reason to believe differently.

Use Tables 3 and 4 to estimate yield potential. Data in Tables 3 and 4 are expressed as a percentage of "expected yield" under normal conditions. You or your crop adviser must determine this expected yield. Neither overestimate nor underestimate expected yields for the location and soil type in question. An accurate estimate is essential to a proper replant recommendation.

Expected revenue of the sparse stand

The decision to replant will be based on what you expect the grain to be worth at harvest. Current market price will probably not be the market price at harvest. Use a market advisory service or the futures market (less local basis) to estimate the price at harvest time.

The predicted market price can greatly influence replant decisions, so make an honest prediction.

Table 3. Estimated corn yield potential at various plant populations (yield as percent of expected).

Population	Yield environment	
	Normal	High*
	Percent of expected yield	
36,000		100
34,000		99
32,000		98
30,000	100	96
28,000	99	93
26,000	98	90
24,000	95	87
22,000	92	82
20,000	88	77
18,000	83	72
16,000	78	67
14,000	73	62
12,000	68	57

*High-yield environments consistently produce yields of more than 190 bushels per acre. Soils are deep with excellent water-holding capacity. Irrigation is common.

Table 4. Estimated soybean yield potential at various plant populations (yield as percent of normal).

Population	Row width (inches)	
	30	7
	Percent of expected yield	
120,000	100	100
110,000	99	98
100,000	98	96
90,000	97	94
80,000	95	92
70,000	92	89
60,000	87	85
50,000	81	79
40,000	73	71
30,000	60	58
20,000	46	43

Determine income by multiplying predicted yield by the predicted market price.

Table 5. Effect of planting date on corn and soybean yield in central and north Missouri.

Corn		Soybean	
Planting date	Yield as percent of expected	Planting date	Yield as percent of expected
May 1	94	May 8	99
May 6	92	May15	98
May 11	89	May 22	96
May 16	86	May 29	93
May 21	83	June 5	89
May 26	80	June 12	84
May 31	77	June 19	79
June 5	75	June 26	72
June 10	71	July 3	65
June 15	65	July 10	54

Table 6. Effect of planting date on corn and soybean yield in southeast and southwest Missouri.

Corn		Soybean	
Planting date	Yield as percent of expected	Planting date	Yield as percent of expected
April 1	99	May 8	100
April 6	98	May 15	99
April 11	96	May 22	98
April 16	94	May 29	96
April 21	91	June 5	93
April 26	88	June 12	89
May 1	85	June 19	84
May 6	82	June 26	79
May 11	79	July 3	72
May 16	75	July 10	65
May 21	70		
May 26	65		

Yield and income from replanted field

Delayed planting will usually decrease yield potential. The amount of decrease is difficult to predict. Use Tables 5 and 6 to estimate the effect of planting date on yield from replanted fields.

Once yield is predicted, determine income by multiplying yield by the predicted market price. Use the same predicted market price that you used in estimating expected gross revenue of the sparse stand.

Cost of replanting

Even if yield from replanting would be greater than that from the damaged field, the cost of replanting may still exceed the value of the additional yield from replanting. Therefore, you must estimate as accurately as possible the following costs.

Seed cost: Determine cost of seed by multiplying unit cost by the seeding rate. In many instances, seed companies reduce seed prices if their products were initially used in the sparse stands.

Fuel, machinery and labor costs: Include all fuel and machinery costs associated with replanting. Reduced tillage or no-till methods will reduce these costs. Custom charges for planting or chemical application can be used but may overstate the cost of replanting if you use your own equipment.

Pesticide costs: Usually additional preemergence herbicide will not be necessary unless tillage is performed. If you do not use tillage to remove the existing stand, a burndown herbicide application is necessary. Include only those costs that would not be incurred from already-planned herbicide applications. If the sparse stand resulted from disease or insect damage, additional fungicide or insecticide may be needed.

Additional costs: Costs include interest on loans associated with replanting, increased dryer costs for late maturing corn, and labor costs not already covered.

For purposes of this analysis, none of the other costs of production are important. Fertilizer, chemical and other costs already incurred in production are considered sunk costs that do not affect the decision to replant. These costs affect profitability, but the replant decision addresses only the question of whether the increased revenue from replanting exceeds the increased cost associated with replanting.

Making the decision

Estimate net income by subtracting the cost of replanting from expected income. To determine if replanting is appropriate, compare the net income from replanting with the income from a sparse stand. Even if this comparison is positive, you still may not wish to replant. Other demands on your time and competing crop management issues are important considerations.

The worksheet on page 4 can help organize important information and arrive at a well-informed decision. A completed worksheet example is illustrated as well.

Additionally, the Replant Decision Aid (https://extension.missouri.edu/media/wysiwyg/Extensiondata/Pro/CornSorghum/Docs/ReplantDecisionAid.xlsx) is a Microsoft Excel spreadsheet that is available to help with the replant decisions.

Corn/Soybean Replant Worksheet

A. Estimated stand density of sparse stand	plants/acre
B. "Expected" yield in bushels/acre	bu/acre
C. Effect of sparse stand on yield potential (from Table 3 or 4)	%
D. Estimated yield from sparse stand (line B × line C ÷ 100)	bu/acre
E. Estimated market value of crop	$/bushel
F. Estimated income from sparse stand (line E × line D)	$/acre
G. Extra herbicide needed due to sparse stand	$/acre
H. Expected net income from sparse stand (line F – line G)	$/acre
I. Estimated cost to replant (total of lines 1 + 2 + 3 + 4 below) 1. Seed _____ 2. Fuel, machinery, labor _____ 3. Pesticides _____ 4. Additional costs _____	$/acre
J. Effect of planting date on yield (from Table 5 or 6)	%
K. Estimated yield from replanted stand (line B × line J ÷ 100)	bu/acre
L. Estimated income from replanted stand (line E × line K)	$/acre
M. Net income from replanted stand (line L – line I)	$/acre
N. Profit or loss from replanting (line M – line H)	$/acre

Note: Sparse stands may also result in some additional expenses. Defoliated plants and sparse stands may require an additional herbicide application.

Corn Replant EXAMPLE*

A. Estimated stand density of sparse stand	**14,000** plants/acre
B. "Expected" yield in bushels/acre	**165** bu/acre
C. Effect of sparse stand on yield potential (Table 3, normal yield environment for 14,000 population)	**73** %
D. Estimated yield from sparse stand (line B × line C ÷ 100)	**121** bu/acre
E. Estimated market value of crop	**$6.50** /bushel
F. Estimated income from sparse stand (line E × line D)	**$785.87** /acre
G. Extra herbicide needed due to sparse stand	**$10.00** /acre
H. Expected net income from sparse stand (line F – line G)	**$775.87** /acre
I. Estimated cost to replant (total of lines 1 + 2 + 3 + 4 below) 1. Seed **$45.00** 2. Fuel, machinery, labor **$15.00** 3. Pesticides **$0.00** 4. Additional costs **$5.00**	**$65.00** /acre
J. Effect of planting date on yield (Table 5, expected yield for May 21 planting)	**83** %
K. Estimated yield from replanted stand (line B × line J ÷ 100)	**138** bu/acre
L. Estimated income from replanted stand (line E × line K)	**$895.50** /acre
M. Net income from replanted stand (line L – line I)	**$830.50** /acre
N. Profit or loss from replanting (line M – line H)	**$54.63** /acre

* Assumptions: (1) Corn planted in central Missouri. (2) Original planting date was April 28. (3) Earliest replanting date is May 21.

Note: In this example, the grower would probably replant corn if it did not interfere with soybean planting or some other activity. However, if wet soil conditions were present so that replanting was delayed until May 31, it may not pay to replant.

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