

Soybean Nutrient Management Practices

Section 1: Soybean Starter Fertilizer Practices

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October, 2026

Introduction

Starter fertilizers are commonly used in the northern part of the U.S. as soils are normally cool and wet during planting. These cold and wet soils also tend to slow root growth and limit uptake of some nutrients. Placing nutrients close to the corn seed can increase early season growth and reduce grain moisture at harvest. Common methods of starter fertilizer application include in-furrow, 2x2, and surface banding. However, soil texture, temperature, soil moisture, and sometimes tillage type can vary the effect of starter fertilizers on soybean yield. South Dakota has varying moisture conditions with greater precipitation in the east and decreasing going west. Tillage type used and soil textures also vary across the state. In this section, we will evaluate the results from the 2019 nutrient management survey to help us better understand the local factors that influence the use of various starter fertilizer practices. The local factors evaluated include geographic location within SD, tillage type, farm size, and age and education of farmer. Understanding these factors on farmer's decisions regarding starter fertilizer use practices can give guidance to government agencies, extension, and other professionals regarding needed research, educational resources, and trainings that are needed to help farmers.

Placement of Starter Fertilizer

Overall, placement of starter fertilizer was applied in-furrow 20% of the time with 2x2 and other placement methods (surface band, broadcast, etc.) only being used 4% of the time (Table 1). Of the respondents that applied starter fertilizer to soybean, most of them used the in-furrow placement method (70-94%) compared to the 2x2 or other placement method (3-25%). The use of starter applications were influenced by only field location with no minimal effects of tillage type, farm size, age of farmer, or education level. Based on location, farms in central compared to eastern SD were more likely to use in-furrow starter (94% vs. 75%), but farms in eastern SD were more likely to use 2x2 or other placement methods (12-14% vs. 3%). However, these results still show that the in-furrow method is much more likely to be used compared to the 2x2 or other placement methods.

Table 1. Percentage of respondents that used starter fertilizer, their placement method, and nutrients applied with starter overall and as affected by location, tillage farm size, age, and education level.

Starter Placement			
Variables	In-furrow (%)	2x2(%)	Other (%)
Overall	20	2	2
Location			
Central	94a	3b	3b
East	75b	14a	12a
Tillage			
No-till	82	11	8
Reduced	70	10	20
Conventional	78	11	11
Farm size (ac)			
>2000	81	16	3
1,000-1,999	79	12	9
500-1,999	80	0	20
1-499	75	0	25
Age			
18-40	73	9	18
41-59	84	14	2
60+	76	9	16
Education			
College degree	75	15	10
No college degree	83	8	10
^A Percentages with different letters within each column are statistically different ($P \leq .05$). If no letters are present, there are no significant differences.			

Nutrients Applied in Starter Fertilizer

Across all respondents, N and P were the most common nutrients applied in a starter fertilizer (18-19% of farmers), followed by K and S (1-2% of farmers). The application of specific nutrients was not influenced by field location, tillage type, farm size, age of farmer, or education level. .

Table 2. Percentage of respondents that applied various nutrients in their starter fertilizer.

Nutrient	Percentage of Respondents (%)
Nitrogen	19
Phosphorus	18
Potassium	2
Sulfur	1
Zinc	0
Iron	0
Boron	0
Manganese	0
Copper	0
Chloride	0
Molybdenum	0

Nutrient Rates Applied as Starter Fertilizer

As part of the 2019 survey, we also asked the rate that each nutrient was applied. Based on the information received table 3 contains the mean rate and the standard deviation of the various nutrients applied in-furrow and as a sideband that includes 2×2, surface band and any other method that was not applied with the seed. We are only presenting the results for N, P, K, S, Zn, Fe, B, and Mn as rates were not given for the other nutrients. Generally, rates of side band applications were greater than in-furrow applications. This is likely due to potential salt and ammonia toxicity that can occur from fertilizers placed close to the seed that are not an issue when fertilizer is further from the seed. For in-furrow applications, P was generally applied at the highest rate (25 lbs ac⁻¹) followed by N and S (4-7 lbs ac⁻¹), with all other nutrients being applied at 1 or less lbs ac⁻¹. For side banding applications, N was typically applied at 11 lbs N ac⁻¹ and P at 42 lbs ac⁻¹.

Table 3. Mean nutrient rate (± standard deviation) applied in-furrow or sideband (i.e., 2×2 or surface band) to soybean crop.

Nutrient	Soybean (Nutrient Rate: lbs/ac)	
	In-furrow	Side band
Nitrogen	7 ± 9	11 ± 6
Phosphorus	25 ± 23	42 ± 17
Potassium	1 ± 1	-
Sulfur	4 ± 4	-
Zinc	1 ± 1	-
Iron	0.1 ± n/a	-
Boron	0.2 ± n/a	-
Manganese	0.2 ± 0.2	-
^a If “n/a” is in the place of the standard deviation, it indicates only 1 response was recorded from the survey so no standard deviation could be calculated.		



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