

Wheat Nutrient Management Practices

Section 1: Wheat Starter Fertilizer Practices

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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, below the surface banding, and surface banding. 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 18% of the time with below the surface banding and other placement methods (surface band, broadcast, etc.) only being used 1 to 2% of the time (Table 1). Of the respondents that did apply starter to their wheat crop only tillage and farm size affected its use with location in the state, education, or degree earned not influencing whether starter was applied. Farmers that used starter and no-till or reduced-till systems used the in-furrow starter placement more often (80-89%) than those with conventional tillage systems (57%). Additionally, the farmers with more acres (>1,000 ac) also tended to use in-furrow starter applications more (87-89%) compared to farms with <1,000 ac (63-75%). Regardless of location, age, or college education farmers were similarly likely to use in-furrow starter (80-94%). In-furrow compared to banding starter between rows or other types of starter placement methods were also by far more commonly used as in-furrow use ranged between 63-94% and banding and other methods used ranged between 1-43%. In-furrow is likely most popular as it requires the least amount of equipment added to a planter.

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

Starter Placement			
Variables	In-furrow (%)	Banding (%)	Other (%)
Overall	18	2	1
Location			
Central	85	9	6
East	94	0	6
Tillage			
No-till	89a	8	3b
Reduced	80a	0	20b
Conventional	57b	0	43a
Farm size (ac)			
>2000	87a	11	3b
1,000-1,999	89a	7	4b
500-1,999	63b	0	38a
1-499	75b	0	25a
Age			
18-40	88	0	13
41-59	84	11	5
60+	85	8	8
Education			
College degree	92	3	2
No college degree	80	12	4
^ 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 (10-15% of farmers), followed by K, S, and Zn (1% of farmers) with all other nutrients not being reported as being applied in the starter fertilizer. (Table 2).

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

Nutrient	Percentage of Respondents (%)
Nitrogen	15
Phosphorus	10
Potassium	1
Sulfur	1
Zinc	<1
Iron	0
Boron	0
Manganese	0
Copper	0
Chloride	0
Molybdenum	0

Nutrient Rates Applied as Starter Fertilizer

As part of the 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 below and above ground bands and any other method that was not applied with the seed. We are only presenting the results for N, P, K, S, and Zn as rates were not given for the other nutrients. Rates of N and P below the surface banding applications and in-furrow applications were generally similar 37-46 lbs ac⁻¹. For in-furrow and side banding applications, N and P were generally applied at the highest rates (37-46 lbs ac⁻¹). The remaining nutrients (K, S, and Zn) were only applied in-furrow with K and S being applied at 12-17 lbs ac⁻¹, and Zn at 5 lbs ac⁻¹. The lower K, S, and Zn rates as starter are likely due the lower rates of K, S, and Zn typically recommended for wheat to optimize yields.

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

Nutrient	Wheat (Nutrient Rate: lbs/ac)	
	In-furrow	Side band
Nitrogen	45 $\pm$ 49	43 $\pm$ 46
Phosphorus	37 $\pm$ 11	46 $\pm$ 15
Potassium	12 $\pm$ 5	-
Sulfur	17 $\pm$ 8	-
Zinc	5 $\pm$ 5	-



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