

Soybean Nutrient Management Practices

Section 2: Nitrogen Management Practices

Jason D. Clark, Assistant Professor & SDSU Extension Soil Fertility Specialist
Peter Kovacs, Associate Professor in Agronomy, Horticulture and Plant Science
Jessica Ulrich-Schad, Associate Professor in Sociology
Anthony Bly, SDSU Extension Soils Field Specialist

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Introduction

Nitrogen is not commonly applied to soybean because it is a legume crop that develops a relationship with bacteria that takes atmospheric N and changes it into a form that can be used by the soybean plant. This relationship with bacteria and its ability to supply N to the crop is why SDSU does not recommend N fertilizer to be applied to a soybean crop. Overall, out of 486 growers surveyed in 2019, only 9% of them applied N to their soybean crop. These results show that overall, growers are following SDSU recommendations and not applying N to soybean crops. This section will go through the results of the 9% that did apply N to their soybean field, and we will evaluate how local factors including geographic location within South Dakota (SD), tillage type, and farm size may affect those decisions. Understanding these factors on farmer's decisions regarding N management practices can give guidance to government agencies, extension, and other professionals regarding needed research, educational resources, and training that are needed to help farmers adopt appropriate nutrient management practices.

Nitrogen Sources and Time of Application

Nitrogen fertilizer source or application timing used by farmers was not affected by location, tillage, or farm size. This result suggests that fertilizer sources are similarly available to farmers regardless of their location in SD and its associated precipitation amounts along with tillage type did not affect the fertilizer-N source decision. Farmers used urea the most (31%) followed by ammonium sulfate (18%) and then urea ammonium nitrate (UAN) 28% (6%), (Table 1). Nitrogen applications were by far applied as a single application (94%) with only a few farmers splitting up the N application (6%). The N applications were not applied in the fall or spring before soybean planting but were generally applied early in the growing season (85%) and the remaining at mid/late season (15%).

Table 1. Percentage use of N fertilizer source by application timing along with percentage use across N fertilizer sources and application timings.

Nitrogen Fertilizer Source ^a						
Application Timing	Urea	UAN 28%	UAN 32%	AA 82%	AMS	Across Products
Fall	0	0	0	0	0	0
Spring	0	0	0	0	0	0
Early Season	5	0.8	0.2	0	3	85
Mid/Late Season	0.4	0.2	0	0	0.2	15
Across timings	31	6	1	0	18	-
Note. Percentages may not add up to 100 as individuals could input data in multiple categories.						
^a UAN, Urea ammonium nitrate; AA, Anhydrous ammonia; AMS, Ammonium sulfate						

Enhanced Efficiency Fertilizer Use

Enhanced efficiency fertilizers—fertilizers with urease or nitrification inhibitors or a slow-release fertilizer—were minimally used by farmers in SD ($\leq 7\%$) (Table 2). Because of the low use of these EEFs an analysis related to the influence of location, tillage, and farm size was not completed. When EEFs were used by SD farmers when growing soybeans, they were most used in the spring (7%) and similarly used in the fall (3%) or in-season (2%) (Table 2).

Table 2. Percentage use of enhanced efficiency fertilizers in the fall, spring, or in-season across all enhanced efficiency fertilizers.

Variables	Percentage Use (%)
Fall	3
Spring	7
In-season	2

Nitrogen Rates

Fertilizer-N rates for soybeans across evaluated categories ranged between 20 and 26 lbs N ac⁻¹ (Table 3). These fertilizer-N rates were not influenced by location, tillage type, or farm size ($\alpha = 0.05$).

Table 3. Total fertilizer-N rate applied as affected by location, tillage system, and farm size.

Variables	Fertilizer-N (lbs N ac ⁻¹)
Location	
East	25
Central	21
Tillage	
No-till	18
Reduced	24
Conventional	26
Farm size (ac)	
>2000	28
1,000-1,999	20
500-1,999	20
1-499	26
^a Mean values with different letters within each column for each variable category (i.e. location, tillage, and farm size) are statistically different ($P \leq 0.05$). If no letters are present, then there are no significant differences.	

Nitrogen Placement

In this survey, we evaluated various placement methods when N was applied as a single application. Broadcast application of N in the early (47%) or mid/late growing season (29%) was by far the most common placement method (Table 4). All other fertilizer placement methods and application timing combinations were minimally used ($\leq 7\%$).

Table 4. Percentage use of N fertilizer application timing by placement method along with percentage use across application timings and placement methods.

Placement Method	N fertilizer application timing				
	Fall	Spring, Preplant	Early Season	Mid/Late Season	Across Timings
Broadcast: incorporated	0	0	45	2	47
Broadcast: not-incorporated	0	0	23	7	29
Banding: with strip till	0	0	7	0	7
Banding: under the row	0	0	5	0	4
Sub-surface banding: next to row	0	0	2	0	2
Sub-surface banding: mid row	0	0	7	0	7
Surface banding: next to row	0	0	0	0	0
Surface banding: mid row	0	0	0	0	0
Top dress: foliar feed	0	0	2	2	4
Across placement methods	0	0	89	11	-
Note. Percentages may not add up to 100 as individuals could input data in multiple categories.					

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