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## The University of Minnesota Supplemental Fertilizer Nitrogen Worksheet

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## The University of Minnesota Supplemental Fertilizer Nitrogen Worksheet

### Abstract

The University of Minnesota Supplemental Fertilizer N Worksheet was developed as a simple, quick, reliable, and inexpensive alternative decision aid tool to assess potential fertilizer N losses. The worksheet is a series of three questions with multiple-choice answers. Depending on the answers, numbers are assigned for each question that are summed, and then the recommendation is made for supplemental N applications. It has been used with success for 10 years in Minnesota as a decision aid as well as an educational tool regarding fertilizer N management strategies.

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## Introduction

Nitrogen (N) fertilizer management is a major component in crop production. Most corn producers apply the recommended rates of N fertilizers before the corn is planted with the assumption that N losses will be insignificant and crop N uptake requirements will be met. In most years, however, conditions for N loss occur in late May and June. These conditions are characterized by significant rainfall, which leads to saturated soils. Saturated soils are often times an indicator for N losses due to denitrification and/or leaching in the late spring.

Soil N tests have been developed and recommended to ascertain the N loss and/or N sufficiency in corn fields during this late May and June time period of potential significant N losses. While soil N tests are available for use each year, most agricultural professionals do not use the test due to the amount of time and effort involved with the soil sampling and analysis process. The urgency for quick decisions also is important because the potential window for applying additional fertilizer, if recommended, is small.

## Worksheet Principles

The authors developed a decision aid worksheet in 1993 in response to the hesitancy producers showed in taking soil and plant samples to make supplemental fertilizer decisions. The worksheet was based on both expert and heuristic models in making a recommendation. It was determined that in order to be effective, this decision aid tool needed to be based on scientific principle and research, require little effort and time on behalf of the user, and be simple and intuitive.

The worksheet uses three simple questions, with multiple-choice answers, to arrive at a recommendation. The worksheet has the advantages to users that the time and effort of collecting soil samples and the subsequent cost (and time) of analyzing these samples are not needed. Each of the questions and the multiple-choice answers is written in non-scientific language for ease in understanding by the producers.

The first question is used to indicate how much nitrate-N could be available for loss if conditions are favorable in late May and throughout June. The second question then indicates the likelihood of actual losses as these are a function of soil moisture at this time of year. Finally, in question three, the corn plant is evaluated on its N status.

Each of the questions asked in the worksheet acts as qualitative surrogates for quantitative information that could be measured with soil and plant sampling and analyses. However, the simplicity and convenience of the worksheet make it much more accepted by users.

## The Worksheet

This simple worksheet (Figure 1) helps people decide if supplemental, or extra, N fertilizer is needed. This decision aid is for situation when all of the fertilizer N was applied preplant, either in the fall or spring, and not for determining N rates in a split N program. Keep in mind that good judgment is still important in using this decision aid. The worksheet should be used in June.

**Figure 1.**  
University of Minnesota Supplemental Nitrogen Worksheet for Corn

	<b>Points</b>
<b>Question 1. When was the fertilizer N applied?</b>	
a) In the fall, with soil temperatures above 50F, 4 in. deep	5
b) In the fall, with soil temperatures below 50F, 4 in. deep	4
c) In the fall, with soil temperatures above 50F, 4 in. deep, with N-Serve	4
d) In the fall, with soil temperatures below 50F, 4 in. deep, with N-Serve	3
e) In early spring (end of March or in April)	3
f) In May	2
<b>Question 2. What was the predominant May soil moisture condition?</b>	
a) Normal or dryer than normal	1
b) Wetter than normal	3
c) There was/is standing water in the fields	4
<b>Question 3. How does the corn look today?</b>	
a) Taller than 15 inches and chlorotic	5
b) Shorter than 15 inches and chlorotic	3
c) Shorter than 15 inches and green	2
d) Taller than 15 inches and green	1
Total Points for this Field	—

With a cumulative score of seven points or less, the current fertilizer N program is fine. With a score of 10 or more, supplemental fertilizer N is recommended at a rate between 40 and 70 lbs N/acre. A score of eight or nine falls into a questionable zone, and it is recommended that you recalculate the worksheet in a few days because the corn height and/or color will likely change. The re-evaluation option is only viable as long as there are sidedress N options available.

## Summary

This worksheet has been used since 1993 in Minnesota. It has been used with great success, both as a decision aid as well as an educational tool regarding N management strategies. Over the years, the authors have edited the Question 1 in the worksheet to be more year-specific regarding fall fertilizer N management scenarios. Likewise, Question 3 has been altered in corn height standards based on the specific year. The worksheet is a template that can be altered as need be for a broad range of crop professional "experts."

The worksheet is a reliable, quick, and inexpensive decision aid for supplemental N fertilizer management. The worksheet provides "peace of mind" to many corn producers who worry about in-season N losses and fertilizer management.

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