



Decision Support System for Plant Nutrient Management

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An interactive web-based computer program has been developed to provide assistance on making decisions related to plant nutrient management from commercial fertilizer and animal manure. It can be accessed on the World Wide Web at: <http://www.soiltesting.okstate.edu/> under **Soil Test Interpretation** or run on a stand-alone program for PC with the same functions. This decision support system allows users to obtain fertilizer recommendation based on soil test results, to calculate the amount of fertilizers needed to supply major nutrients for a selected crop, and to compute values of animal manure used as nutrient source. The program consists the following five sections:

Part 1. Introduction

This is the first screen of the program, which allows you directly access to different sections of the program by clicking the buttons on the left. You may proceed step by step from the top to the bottom, or go directly to your interested part and get results.

Part 2. Soil Test Interpretations

Currently, fertilizer and lime recommendations based on soil test results can only be made for one crop and a specific yield goal by OSU Soil, Water and Forage Analytical Laboratory (SWFAL). Producers, crop consultants and extension educators, however, often need recommendations for different crops from the same soil test. This part of the program allows you to enter soil test results and then it generates lime, macro- and micro-nutrient recommendations for any of the major crops grown in Oklahoma at the yield goal of your choice.

The interpretation of soil test results is based on Extension Facts No. 2225, *OSU Soil Test Interpretation* and other relevant references developed in Oklahoma. Therefore, this program is developed for fertilizer recommendations in Oklahoma, especially for interpreting soil test values from SWFAL. It is not intended for use with soil test results from other laboratories due to differences in testing procedures, and field calibration, and philosophy of making fertilizer recommendation.

To use the program, you should first replace the default soil test values with numbers of a soil test report, select a crop intended to grow and enter a realistic yield goal for that crop. Certain crops do not require a yield goal. Crops and suggested yield goals are shown in Table 1. New recommendations of N, P and K will be generated in appropriate boxes after soil test results are entered. Both pH and buffer index need to be entered for an accurate lime recommendation also. Secondary and micronutrients recommendation will be made if you checked the box before **Detailed Test**. The default values are presented as a reference, they are not recommended for your situation by any means.

Table 1. Crop Codes and Suggested Yield Goals

CROP CODE	CROP	YIELD GOALS	FORAGE TYPE
1	Wheat	15 - 100 bu/acre	
2	Barley	15 - 100 bu/acre	
3	Oats	15 - 100 bu/acre	
4	Grain Sorghum	30 - 230 cwt/acre	
5	Corn	40 - 200 bu/acre	
6	Cotton	.5 - 2.5 bales/acre	
7	Corn Ensilage	5 - 30 tons/acre	Silage
8	Sorghum Ensilage	5 - 30 tons/acre	Silage
9	Fescue	1 - 5 tons/acre	Hay
10	Orchardgrass	1 - 5 tons/acre	
11	Ryegrass	1 - 5 tons/acre	Hay
12	Weeping Lovegrass	1 - 5 tons/acre	Hay
13	Bermudagrass	1 - 7 tons/acre	Hay
14	Peanuts	&	
15	Soybeans	&	
16	Mungbeans	&	
17	Cowpeas	&	
18	Guar	&	
19	Small Grains for Grazing	.5 - 3 tons/acre	
20	Legumes in Pasture	&	Hay
21	Alfalfa	&	Hay
22	Sorghum-Sudan Hay	0 - 15 tons/acre	Hay
23	Garden		
24	Lawn		
25	Native Hay	1.0,1.5,1.6 tons/acre	Hay
26	Hairy Vetch		Hay
27	Other Clover		Hay
28	Millet		Hay
29	Wheat Silage		Silage
30	Feed Mix		Feed
31	Peanut Hay		
32	Orchard, Peach, Grape, Apple	Trees/acre	
33	Roses - No Recommendation		
34	Bluestem	1 - 5 tons/acre	Hay
35	Arrowleaf Clover	&	Hay
36	Jose Tall Wheatgrass	1 - 5 tons/acre	

& means no yield goals are needed.

Part 3. Nutrient Sources

The amount of nutrients recommended for the crop based on soil test report you entered in Part 2 can be satisfied by using different commercial fertilizers or animal manure. Common chemical N, P and K fertilizers can be selected from the column on the left side. You can also specify any combination of N, P and K by selecting **User Specified**. Amount of the fertilizer chosen to provide nutrients needed will be provided in one or more options.

Major types of manure are listed on the right side column. Select the type of manure to be applied as a fertilizer and enter the nutrient content from a lab report in the appropriate boxes. Make sure the unit of nutrients you entered is the same as shown. Some types of manure use lbs. per ton, but others use lbs. per 1000 gallons as their units of nutrients. The amount of manure needed to provide N, P₂O₅ and K₂O will be presented under Option 1, 2 and 3, respectively.

The amount of nutrients recommended is the total for the crop. Split application at different time may be needed for better efficiency and to minimum negative impact on the plant. Application rate of manure can be based on plant nitrogen requirement, but excess P and K may be applied. Applying based on either P or K requirement and supplement with commercial N fertilizer is more economically sound and environmentally acceptable.

Nutrient Availability of Animal Manure

Not all the nutrients in the manure are available to crops during the year of application because some are in the organic form and others can be lost during application. Therefore, an availability index (percent of nutrients available) is used for rate calculation based on the amount of nutrients available during the first year. The nitrogen availability indices used for this program are listed in Table 2. Ninety percent of P and K is considered available during the first year and 10% for future years for all manure types. Either higher or lower availability than those used for this program may be seen in individual cases, however, the program does not allow to use different availability index at the present time.

Table 2. Average Nitrogen Availability in Animal Manure Used in the Program

Manure Type	1 st Year Availability	Future Availability
Feedlot manure	50%	20%
Poultry litter	50%	20%
Dairy manure	50%	15%
Swine lagoon effluent	35%	10%

Part 4. Value of Animal Manure

Manure contains valuable plant nutrients and organic matter. It is a valuable resource rather than a waste if managed properly. The nutrient value can be calculated based on the unit price of commercial N, P and K fertilizers. Find out the market price of different fertilizers from a farmer coop or fertilizer dealer and enter them into appropriate boxes on the left site. Cost per pound of N, P₂O₅ and K₂O will be calculated and used for value of manure computation.

The total potential value of N, P and K in the manure can be obtained by selecting **Based on Manure Composition** on the left side box. However, the actual value is based on the needs of the field receiving manure. For example, no credit should be given to phosphorus if no P is recommended by Part 2. The values may be different if the application rate is based on different nutrient requirement of the crop. Select the options on the right side box to see values.

The actual value of animal manure should be higher than calculated above since manure contains micronutrients and organic matter, which would improve crop growth but not included in the calculation. Manure can also maintain or increase soil pH in acid soils. Those values are not easy to quantify.

Part 5. Summary

This page presents all the information generated in Part 2, 3 and 4. To make changes on this page, you need to go back to Part 2, 3 or 4 and make changes.

This instruction and F-2225 can be viewed by clicking the buttons bellow the shaded area.