NDSU Manure Application Calculator for Corn

About the Spreadsheet

- Please "Enable Active Content" (Microsoft Excel disables those functions as default) on Microsoft Excel so the calculator can perform as expected.

- The fields highlighted in light blue throughout the spreadsheets are customizable and producers should add/change the values in those cells to reflect the values of their operation.

- This calculator was designed to serve as a tool for producers to assess the nutrient value, on a cash basis, of beef feedlot manure when compared to commercial fertilizer, and to assist them with nutrient management on their operation.

- On the calculator home screen, producers can select if the manure is going to be applied to meet "Nitrogen Crop Requirements" or "Phosphorus Crop Requirements". When applying manure to meet "Nitrogen Crop Requirements", the spreadsheet calculates the "Application Rate" (Line 7.6) that will supply the total amount of N recommended for corn (Line 6). Because the recommended rate may be considered too high for some producers, there is a cell to enter the "Actual Manure Application Rate" (Line 7.7), that can be the same or smaller than the one listed on Line 7.6. Rates higher than the one on Line 7.6 are not recommended, since that would result in over application of nutrients, which can become an environmental issue.

- The calculator provides a "Nutrients Balance" (Line 7.4) taking into consideration the nutrient contributions from manure and commercial fertilizers (when appropriate). A negative number means that there is a deficit of that specific nutrient and that amount should be supplemented using a commercial fertilizer. This rate is shown on Line 7.5 (for the fertilizer sources listed in each spreadsheet).

- The "Manure Net Cash Value" is calculated taking into consideration the amount of nutrients applied as manure and the cost per unit of N, P_2O_5, K_2O and S in each of the fertilizers listed on the spreadsheets. Therefore, a change on the source of N (Urea, Anhydrous Ammonia, or UAN-28%) or P (11-52-00 or 18-46-00) will change the final "Manure Net Cash Value". The consideration or not of S application will change that value as well.

- This calculator is not intended to provide N recommendations for corn production in ND. For that, producers are directed to the North Dakota Corn Nitrogen Calculator' website, to determine the N recommendation for their operation, and then enter that number on Line 6 (Nutrient Recommendation), under the Nitrogen column of this calculator. The nutrient recommendations for P

and K are calculated according with the equations presented for corn in the publication SF-882 (Revised) (North Dakota Fertilizer Recommendations Tables and Equations).

- This calculator can be used to: 1) calculate nutrient balance when using manure and different sources of commercial fertilizer; 2) calculate the individual cost of nutrients plus the application cost when applying manure and/or fertilizer; 3) assess the maximum cost for manure per load; 4) determine the maximum manure hauling distance; 5) determine the amount of manure and number of loads necessary for a specific field.
- The calculator has an option to perform the calculations using average values for manure nutrient content. As the amount of nutrients in manure show great variability, it is strongly recommended that producers have an analysis report for the manure that they are planning to apply on their fields. For that reason, the default option selected for the question "Do you have a manure analysis report?" is "YES" (Lines 5 and 6 in the furthest right column).

Spreadsheet Content

General Information

General information about the user's field (ID, area), soil (nutrient content) and yield potential.

Manure Incorporation - Please Select One

The amount of the Ammonium-N that will be available for the crop is affected the number of the days that the manure remains in the soil surface without being incorporated. This choice will be reflected on the Nutrient Availability Factor (Line 7.1) and on the amount of N that will be available from manure to the crop (Line 7.2).

Nitrogen Source - Please Select One

Select from the dropdown list the N fertilizer you will be using on your operation. When a new source of N is selected, the spreadsheet automatically recalculates a series of new values associated with the N content and the cost of the new N source selected.

Phosphorus Source - Please Select One

Select from the dropdown list the P fertilizer you will be using on your operation. When a new source of P is selected, the spreadsheet automatically recalculates a series of new values associated with the P and N content and the cost of the new P source selected.

Do you have a manure analysis report?

If "YES" is selected, the user will be asked to enter the values for Ammonium-N, Organic-N, P_2O_5, K_2O and S (all in lbs./ton) in line 7. If "NO" is selected, all the calculations will be done using average nutrient values for manure. Those average values are listed in the “Tables” tab in the Excel workbook.

Fertilizer (Sources and Prices)

The fertilizer sources listed in both spreadsheets are the ones most commonly used for crop production in ND.

Manure Nutrient Content (Line 7)

This refers to the nutrient content listed on your Manure Analysis Report. Make sure to use the values that are listed as lbs./ton.

Manure - Actual Application Rate (Line 7.7 - Nitrogen Spreadsheet)

In Line 7.6, there is a calculated "Application Rate" that will supply all of the N required by the crop. If manure is the only source of N to be used, the values in Lines 7.6 and 7.7 should be the same. If the value in Line 7.7 is smaller than the one on Line 7.6, the amount of manure to be applied will not be enough to supply all of the N required by the corn. So, some extra N has to be supplied as commercial fertilizer. The amount of nutrient will be shown in Line 7.4 (Nutrients Balance), as a negative number, and the fertilizer rate will be shown in Line 7.5.

Commercial Fertilizer (Line 8)

Calculates the commercial fertilizer needs for corn based on the sources of nutrients selected when there is no manure application.

Costs (Line 9)

The cost per unit of nutrient (N, P_2O_5, K_2O and S) contained in the manure or commercial fertilizer is the same, and it is based on the price of the different sources of N, P, K, and S fertilizers. With that in mind, the cost of N ($/ac, Line 9.1) for “Manure” and “Fertilizer” should be the same if the other sources of nutrients (P, K and S) would have no N. As an example, the most commonly used source of P fertilizer in ND is 11-52-00, which contains 11% N. Therefore, that N should be accounted for in the balance of nutrients and a lower rate of N fertilizer should be applied per acre, resulting in a slight lower N cost per unit area when using only commercial fertilizer. When relaying only on commercial fertilizer applications, producers will have a cost associated with each individual nutrient (S only if needed) recommended for corn production. When manure is used as source of nutrients, producers will see a cost associated with the target nutrient (N or P), and for those nutrients which the manure application did not reach the corn nutrient recommendations, which need to be supplemented as commercial fertilizer. In the case of N, the cost of the supplemental N fertilizer will show as a white line in the large

gray box (on top of the “Print Nirtogen Report” button). The cost to apply that supplemental fertilizer amount is figured out in the application cost.

Additional Nutrient Value (Line 10)

The calculation of the additional nutrient values when applying manure is different when using the N or P spreadsheets. When using the first spreadsheet the N value is based on the assumption that 15% of the organic N in the manure will be available for the second year plus all the other nutrients (P_2O_5, K_2O, and S) provided with the manure application. When using the P spreadsheet, the additional nutrient value of manure is calculated based on the value of the amount of N provided in the first year, plus the assumption that 15% of the organic N in the manure will be available for the second year, plus all the K_2O and S provided with that manure application. For this calculator, the commercial fertilizer additional nutrient value is considered the N amounts present in P and S fertilizer sources used in the calculations (i.e. 11-52-00 is a source of P, and it contains 11% N; 21-00-00-24 is a source of S, and it contains 21% sulfur).

Manure Cash Value (Lines 11 and 14)

The “Net Cash Value” per acre (Line 11) is calculated by the following expression: (Fertilizer Total Cost, $/ac) - (Manure Total Cost, $/ac) + (Manure Additional Nutrient Value, $/ac) - (Fertilizer Additional Nutrient Value, $/ac). Due to the natural high soil K content, several producers do not apply K fertilizers. For that reason, in Line 12 there is a “Net Cash Value” without considering the K_2O additional nutrient value in manure. Lines 13 and 14 show the net cash values for the whole field, based on the area entered in Line 2.