Nutrient Mass Balance Software

Introduction

For the sustainability of the dairy sector in New York State, it is important to find ways to enhance profitability while minimizing environmental loss of nitrogen (N) and phosphorus (P). This requires farms to maintain sustainable whole-farm nutrient mass balances (NMB). An NMB is defined as the difference between the amount of N, P, and potassium (K) imported through purchased feed, fertilizer, animals, and other organic material (e.g. bedding, poultry manure, food waste, etc.), and the amounts exported off the farm via milk, meat, crops, manure and/or compost (Fig. 1). Such assessments can help identify management alternatives that can enhance whole-farm nutrient use efficiency (and hence reduce nutrient losses) and increase farm profitability. Here we describe how to use the Nutrient Mass Balance software to derive a farm's N, P and K balance.

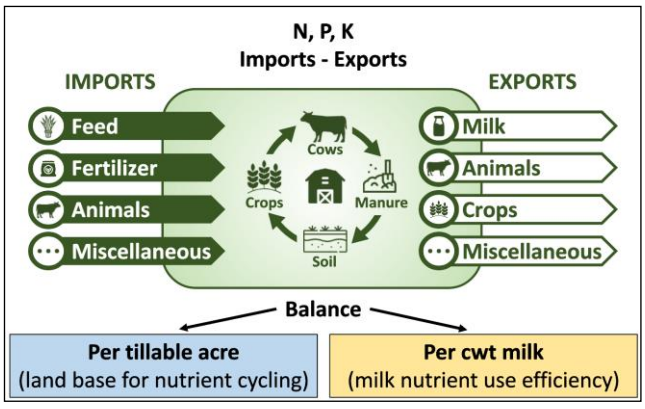

Fig. 1: A farm nutrient mass balance is the difference between nutrient (N, P, and K) imports and exports.

What Can Nutrient Mass Balance Do?

An NMB analysis can help a farm determine where the greatest nutrient use inefficiencies occur. A software program ("Nutrient Mass Balance") was developed to allow users to:

- Calculate the amount of nutrients being imported, exported, and recycled through the production of pasture and crops.
- Calculate the amount of nutrients being imported to the farm in the form of purchased feeds (i.e. not homegrown), fertilizers, animals, and other organic material (e.g. bedding, poultry manure, food waste, etc.).
- Calculate the amount of nutrients being exported from the farm including, feed, milk, animals, crops, and manure/compost.
- Generate reports that show farm N, P, and K imports and exports as two key performance indicators (KPIs): pounds per tillable acre, and pound per hundredweight (cwt) of milk sold.
- Identify areas of concern and opportunities for more efficient nutrient use that, if addressed, could increase profitability and reduce environmental impact.

Where Do I Start?

Step 1: Obtain the NMB Input Sheet

- This form can be downloaded from the Whole-Farm Nutrient Mass Balance and Carbon Footprint Assessment webpage of the Nutrient Management Spear Program. (http://nmsp.cals.cornell.edu/NYOnFarmResearchPartnership/MassBalances.html).

Step 2: Record Keeping

- Throughout the year, keep records of the quantities of feed, fertilizer, and other materials purchased as identified in the Input Sheet.

Step 3: Fill out the Input Sheet

- Fill out the green sections of the Input Sheet (print, pdf, or spreadsheet) only. The additional blue sections can be completed for a separate greenhouse gas report.
- At the top of the sheet, write down the producer and farm information including the number of farm tillable acres (owned and rented) and animals.
- Fill out the Crop production section including farm-produced crops and pasture. Forage analyses are helpful to obtain accurate values for crude protein, P and K.
- Fill out the Imports section which includes all feeds, fertilizers, animals, and bedding

purchased or brought onto the farm. Forage analyses are also helpful for this section. If feed composition values are not available from farm analysis or from feed companies and nutritionists, the software provides standard, "book values" for common feeds.
- Fill out the Exports section which includes any crops, milk, animals, and manure or compost that is sold or moved off the farm.

Step 4: Download & install the NMB Calculator
- This software requires Windows XP or later and at least 5 Mb of storage.
- Download free of charge from the same project website. After clicking on "Download the Nutrient Mass Balance Calculator", click "run" and follow the on-screen instructions. The program installation will place the program name in your Start menu.

Step 5: Fill out the NMB Calculator
- Click on "Start Program" to see the screen below (Figure 2). For help, download the User Manual on the same website**.**

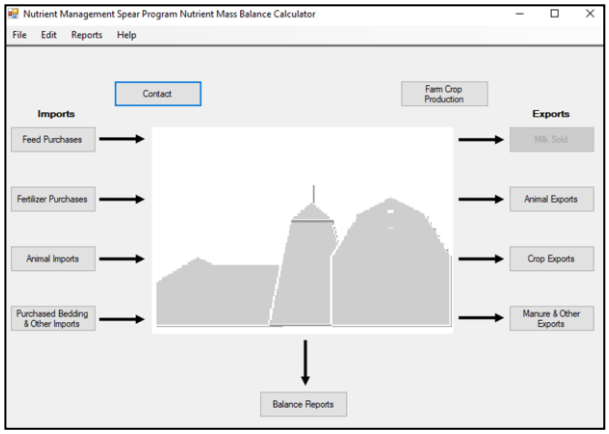

Fig. 2: NMB program Menu. Import buttons are on the left, export buttons on the right.

- Start with "Contact" and enter the information from the completed Input Sheet into the appropriate fields.
- Continue to fill out the Calculator with the corresponding Input Sheet information by clicking "Next" to go to the next input screens.
- Data are automatically saved as you move from one data entry field to the next.
- For the Farm Crop Production Screen, remember to enter crop and pasture production on rented as well as owned land.
- For Animal Imports and Exports remember to enter animals spending a period of time off farm.
- When you are finished with entering all the information from the Input Sheet, click on "Home" to return to the main menu. Click on the "Balance Reports" to see the results of your NMB assessment.
- You can save your data into a format to send to Nutrient Management Spear Program to obtain a NMB Report by choosing "Export Data for Cornell" in the File drop down menu at the top of the screen. You must then attach the resulting file ("YourFarmName_Year.zip") to an email and send it to qmk2@cornell.edu. Once processed, the NMSP team will email you a full report that includes interpretations. For more detail on the reports, see Agronomy Factsheet #128. All NMB data/results are kept strictly confidential.

For Support and/or Training

If you need help transferring your information from the Input Sheet into the software, send the completed Input Sheet to Quirine Ketterings, Nutrient Management Spear Program, 323 Morrison Hall, Cornell University 14853 (email: qmk2@cornell.edu).

Additional Resources

- Cornell Nutrient Management Spear Program Agronomy Fact Sheets #85: Feasible Whole-Farm Nutrient Mass Balances; #128: Reading a Whole-Farm Nutrient Mass Balance Report: http://nmsp.cals.cornell.edu/guidelines/factsheets.html
- Whole-farm Nutrient Mass Balance program webpage: http://nmsp.cals.cornell.edu/NYOnFarmResearchPartnership/MassBalances.html

Disclaimer

This fact sheet reflects the current (and past) authors' best effort to interpret a complex body of scientific research, and to translate this into practical management options. Following the guidance provided in this fact sheet does not assure compliance with any applicable law, rule, regulation or standard, or the achievement of particular discharge levels from agricultural land.

For more information

Cornell University Cooperative Extension

Nutrient Management Spear Program
http://nmsp.cals.cornell.edu

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