



Whole Farm Nutrient Balance

Livestock System Progressive Planning Fact Sheet

Natalie Rector and Dann Bolinger, Michigan State University Extension

A significant component of the long-term sustainability of a dairy or livestock farm is the balance of nutrients generated in animal manure and wastewater with the nutrients utilized within a cropping system. Since phosphorus is generally considered the most limiting nutrient for whole farm balance, it is the nutrient upon which whole farm nutrient sustainability is based. The fundamental question is whether or not there are enough spreadable acres to accommodate the corresponding animal production system. To estimate this balance, the estimated removal of phosphorus from the soil by the farms typical crop rotation on spreadable acres is compared to the estimated manure and wastewater phosphorus generated.

Components

- 1.) SPREADABLE ACRES: Quantify the number of acres available for manure and/or wastewater application (spreadable acres). Excluded acres include:
 - Fields with soil test Bray P1 phosphorus in excess of 300 lbs/acre.
 - Fields that will not receive manure because of excessive distance from farm or some other logistical or contractual reason.
 - Acres that will not receive manure due to setbacks
- 2.) CROP NUTRIENT UTILIZATION: Estimate the crop utilization of phosphorus from the total spreadable acres. Using the number of acres of each crop produced in a "typical year," actual or estimated actual yields and the accepted crop nutrient removal rates for Michigan (listed in the Manure Management and Utilization GAAMP) calculate the total phosphorus removed by the cropping system in a "typical year."
- 3.) MANURE NUTRIENT PRODUCTION: Estimate the total phosphorus generated annually in manure and wastewater from the dairy or livestock operation using one or both of the following methods:
 - A.) BOOK VALUES: Using table 6 from "Manure Characteristics" (MWPS-18, sec 1) calculate the estimated manure nutrients generated as excreted based upon "typical" animal categories and numbers. Note that book values can vary widely from actual farm conditions.
 - B.) FEED RATION MASS BALANCE: Estimate total phosphorus excretion by subtracting phosphorus leaving the farm system as products (e.g. meat, milk, eggs) from the total phosphorus consumed by the animals in their diet. Production records including product production quantities and animal diets are essential to the utilization of this method; however, this method of estimating phosphorus excretion is considered to be the most reliable prediction method currently available.
- 4.) WHOLE FARM NUTRIENT BALANCE: Compare estimated manure phosphorus generated with estimated phosphorus utilized in the cropping system on spreadable acres. Phosphorus utilization should be at least equal to – and preferably in excess of – phosphorus production in the animal production system within a reasonable margin of error.

If crop nutrient utilization is inadequate, then steps should be taken to bring the whole farm nutrient status into a favorable balance before this option can be considered successfully completed. Opportunities to reduce manure phosphorus relative to crop utilization may include one or more of the following:

- Increasing the number of spreadable acres through land purchase, rental, or easement agreements.
- Manage animal diets to reduce phosphorus excretion relative to animal product production.
- Identify acceptable methods of exporting manure nutrients from the farm system such as the sale or gifting of manure as compost. Note that documentation and other requirements may be necessary to support this form of nutrient exporting.

Resources

Assistance for conducting a whole farm nutrient balance is available from MSU Extension, commodity groups, Conservation Districts, USDA-NRCS, certified CNMP providers, and a variety of other private consultants.

Written guidance can be found in the Generally Accepted Agricultural Management Practices (GAAMP) for Manure Management and Utilization available from Michigan Department of Agriculture.
<http://www.michigan.gov/mda>

Timing

A Whole Farm Nutrient Balance can be completed anytime of the year.