Introduction to
Opportunities Checklist for My Farm's Whole Farm Nutrient Balance

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Click here for introduction to WFNB

Introduction

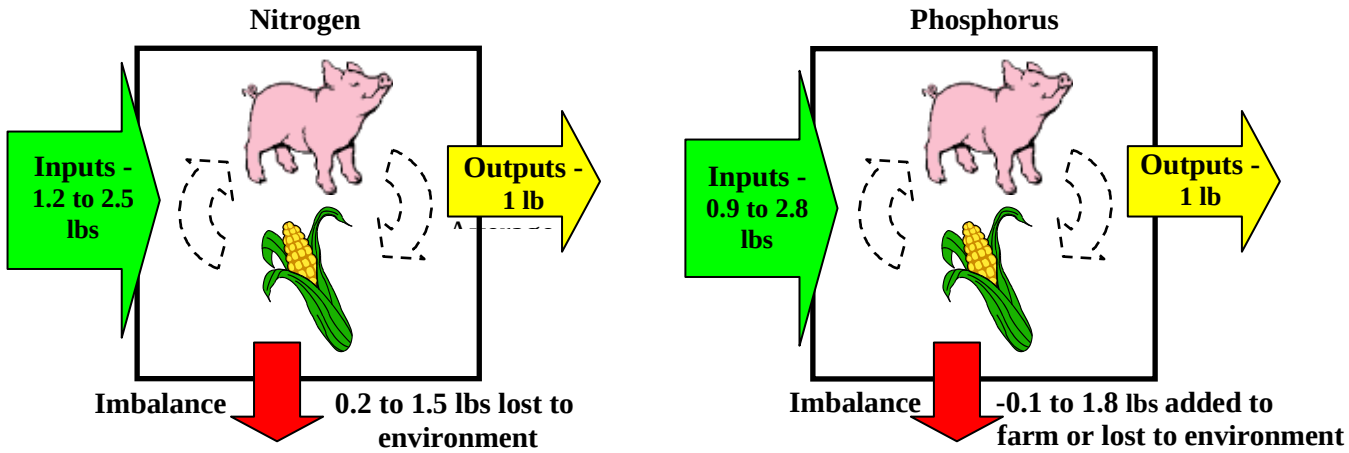
Whole Farm Nutrient Balance (WFNB) compares the quantity of nutrients arriving and exiting as farm products on the "whole" farm. Livestock farms often struggle with more nutrients arriving than exiting the farm resulting in losses of nitrogen (N) into the environment, accumulation of phosphorus (P) in soils, and higher P losses to surface water. For more information, see the fact sheet Whole Farm Nutrient Balance for Pork Production - An Introduction

For additional information:

- Whole Farm Nutrient Balance for Pork Production – An Introduction
- Calculating My Farm's Whole Farm Nutrient Balance
- On-Farm Lessons Learned for Whole Farm Nutrient Balance
- Whole Farm Nutrient Balance for Pork Producers – An Overview

Are swine farms commonly out of balance? A recent study of swine farms reveals some significant progress in managing nutrients, especially those nutrients associated with crop production. A 2006-07 study of 13 swine operations in Nebraska, Iowa, and Indiana revealed a reasonably wide range in imbalances, especially for P. Eight of the 13 farms were very close to a balance for P with few opportunities for improving. Seven of the 13 farms had an average N ratio of 1.5 pounds of inputs per pound of managed outputs or less. Because N is very mobile, it is next to impossible to achieve a 1 to 1 ratio without hurting animal or crop performance. These farms also provided several insights as to opportunities for improvements in management of nutrients in today's swine industry.

Figure 1. Range of whole farm nutrient balances observed on 13 Midwest swine farms.



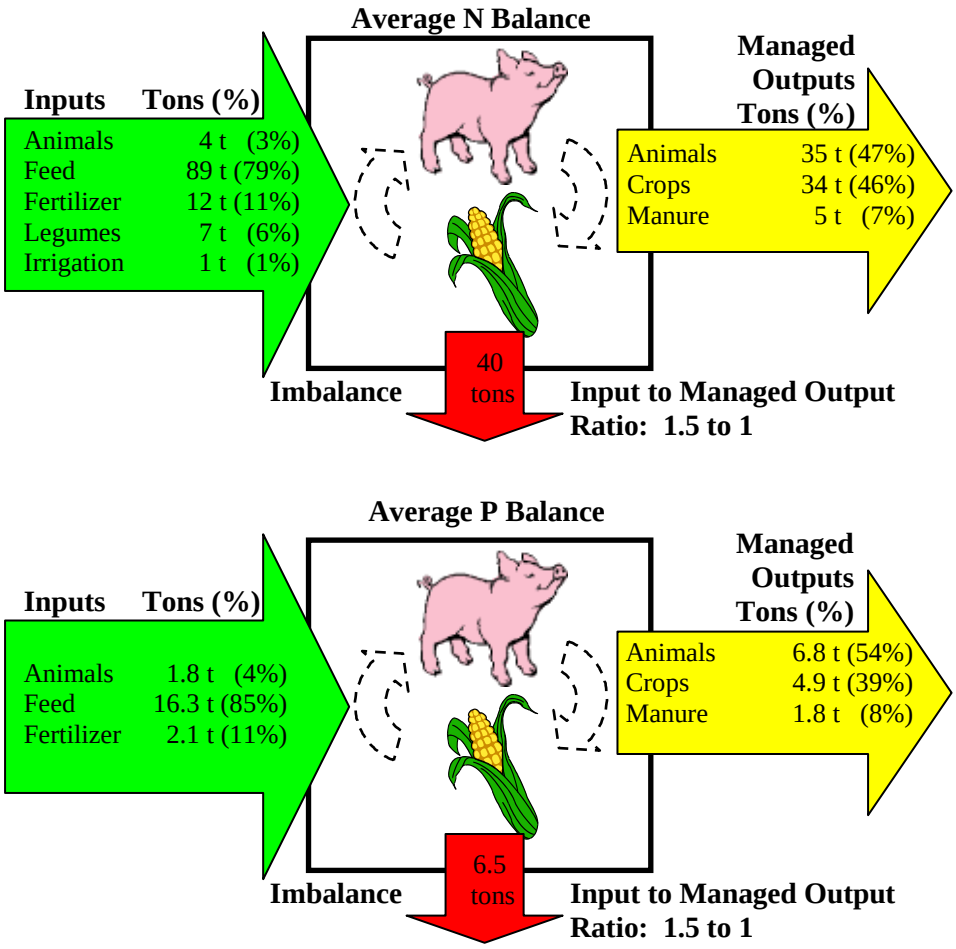
Causes and Solutions

What are the primary causes of imbalance? Historically, we have assumed that the imbalance is caused by manure nutrients not being utilized efficiently resulting in purchases of N and P fertilizers. Nutrient management plans are strongly encouraged and often mandated for the purpose of improving efficiency of manure nutrient use. As illustrated in Figure 2, fertilizer inputs are a small fraction of total inputs for the 13 sampled farms. The participating farms have generally implemented a nutrient management plan. Future improvements in WFNB will not result from more efficient use of manure to replace fertilizer.

Reductions in nutrient losses to the environment may depend upon the following changes:

- Conversion to a more efficient storage system. Some farms store manure in an anaerobic lagoon that "lose" a significant portion of the N and settle out much of the P, not taking advantage of the P-rich sludge. Storage and handling systems that conserve nutrients can provide an option for reducing commercial fertilizer nutrient inputs on some farms.
- Purchased feed is commonly the single largest nutrient input to swine farms as was the case in all 13 participating farms. For swine farms with an imbalance, reducing purchased feed inputs through efficient feed management practices or possibly greater on-farm production of feeds can provide significant value for improving WFNB.

Figure 2. Average whole farm nutrient balance for 13 Corn Belt farms for 2006 and 2007.



- Farms that have not implemented a nutrient management plan will benefit from efficient use of manure nutrients to replace commercial fertilizer. A nutrient management plan detailing manure and fertilizer application rates and speedy incorporation of manure will improve WFNB.
- Increased export of manure nutrients is beneficial, especially for farms with a limited land base. A combination of purchasing commercial nitrogen fertilizer, allowing crops to remove an accumulation of soil P, and marketing manure to neighboring crop producers can help improve balance.
- Opportunities to reduce harvesting and/or storage losses of crops can contribute to an improved balance.
- On some farms, N inputs as legumes or irrigation water can contribute to an imbalance. On average, these inputs were small for the participating farms. An alternative to legume crops like soybeans might be available to some farms. Farms with a large irrigation N input (high nitrates in water supply) can and should credit this nitrogen source resulting in a smaller fertilizer N input.

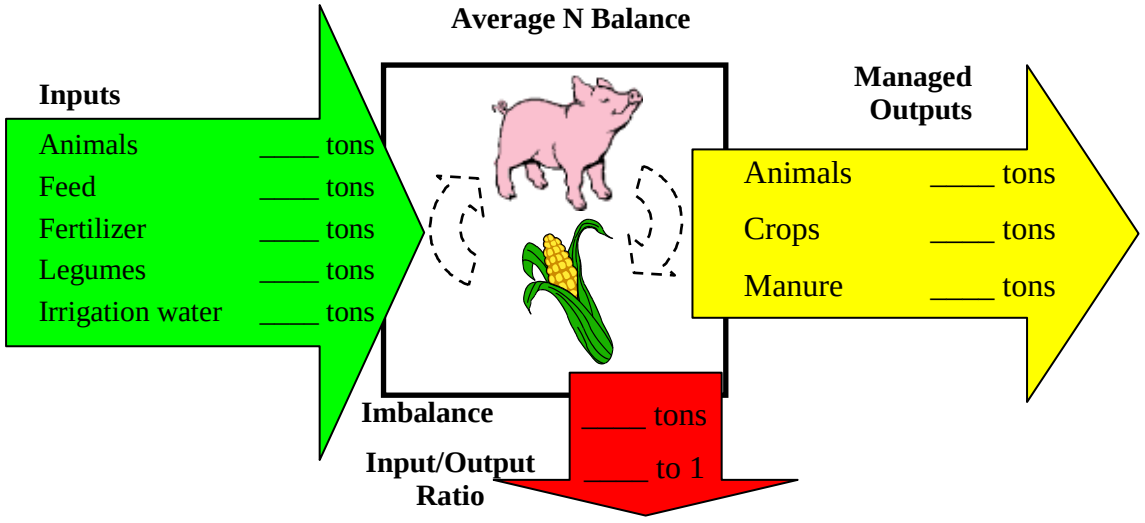
Tools

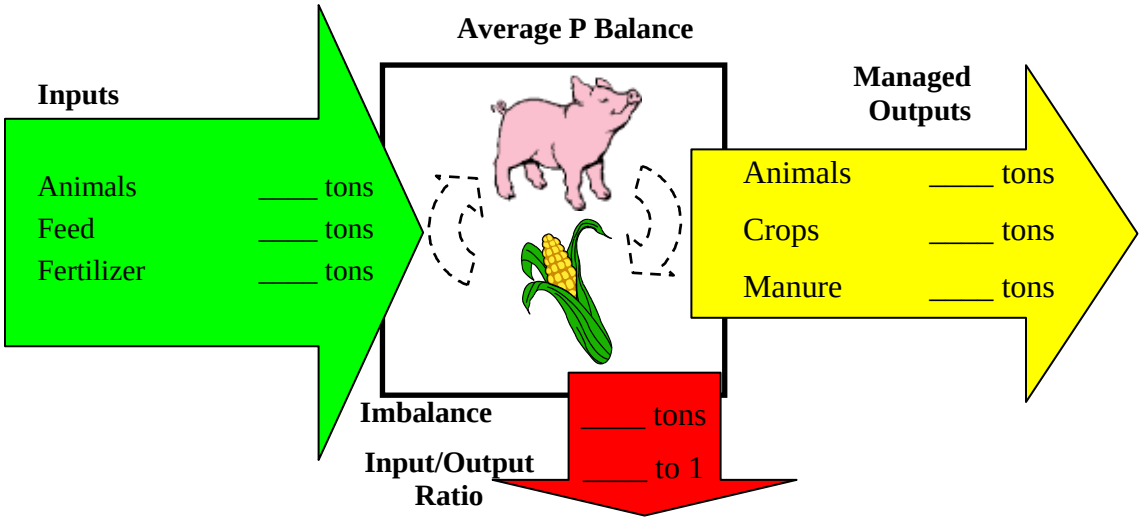
Whole Farm Nutrient Balance Calculator for Swine Farms

Opportunity Checklist: How Does My Farm Measure Up?

Step 1: Summarize my farm's Whole Farm Nutrient Balance by using a WFNB calculator[1].

Whole Farm Nutrient Balance for _____ (name of farm) during _____ (year).





Introductory menu for WFNB Resources

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How Does My Farm's Balance Compare With Expectations?

Step 2. How does my farm's balance compare with a recommended balance? Review the topics in the left hand column and circle the most appropriate answer from the middle three columns. If a "moderate" or "big" opportunity exists to improve a whole farm nutrient balance (WFNB), check the recommendation in the last column.

For practices listed below, circle the answer listed to the right best describing your situation.	Little opportunity for nutrient balance improvement	Moderate opportunity for nutrient balance improvement	Big opportunity for nutrient balance improvement	If moderate or big opportunity for improvement exists, where should I place my focus first?
Nitrogen WFNB[1]	Ratio of less that 1.5 ton inputs to 1 ton managed outputs	Ratio of between 1.5 and 2.5 ton inputs to 1 ton managed outputs	Ratio of greater than 2.5 ton inputs to 1 ton managed outputs	Practices that impact N use.
Phosphorus WFNB[1]	Ratio of less that 1.2 ton inputs to 1 ton managed outputs	Ratio of between 1.2 and 2.0 ton inputs to 1 ton managed outputs	Ratio of greater than 2.0 ton inputs to 1 ton managed outputs	Practices that impact P use.
Nitrogen Inputs (Green Arrow Above)	Check those inputs that contribute less than 10% of all inputs: ___ Feed ___ Fertilizer ___ Animals ___ Legumes ___ Irrigation Water	Check those inputs that contribute 10% to 40% of all inputs: ___ Feed ___ Fertilizer ___ Animals ___ Legumes ___ Irrigation Water	Check those inputs that contribute more than 40% of all inputs. ___ Feed ___ Fertilizer ___ Animals ___ Legumes ___ Irrigation Water	Sections related to nitrogen inputs greater than 40% of all inputs
Phosphorus Inputs (Green Arrow Above)	Check inputs that contribute less than10% of all inputs. ___ Feed ___ Fertilizer ___ Animals	Check inputs that contribute 10% to 40% of all inputs. ___ Feed ___ Fertilizer ___ Animals	Check inputs that contribute greater than40% of all inputs. ___ Feed ___ Fertilizer ___ Animals	Sections related to phosphorus inputs greater than 40% of all inputs
Manure Output – Would moving manure to off-farm uses (e.g. neighbor's crops) improve balance?	Sufficient land[2] exists for utilizing all manure nutrients on-farm. Farm[3] has more than: ___ 200 ac. per 1,000 finishers or ___ 450 ac. per 1,000 sow/boars or ___ 50 ac. per 1,000 per nursery pigs.	Sufficient land[2] exists for utilizing N but not P in manure on-farm. Farm[3] has more than: ___ 150 ac. per 1,000 finishers or ___ 200 ac. per sow/boars or ___ 40 ac. per nursery pig.	Insufficient land[2] does not exist for N and P in manure on-farm. Farm[3] has less than: ___ 150 ac. per 1,000 finishers or ___ 200 ac. per sow/boars or ___ 40 ac. per nursery pig.	Section on exporting additional manure to off-farm users
	My farm is located in a county where greater than 100% of county's crop N and P removal can be supplied by manure. (See Figure 3)	My farm is located in a county where 50 to 100% of county's crop N and P removal can be supplied by manure. (See Figure 3)	My farm is located in a county where less than 50% of county's crop N and P removal can be supplied by manure. (See Figure)	
	My farm is located in a county where greater than 100% of county's crop P removal can be supplied by manure.	My farm is located in a county where 50 to 100% of county's crop P can be supplied by manure. (See Figure 3 – bottom map)	My farm is located in a county where less than 50% of county's crop P removal can be supplied by manure. (See Figure 3 – bottom map)	

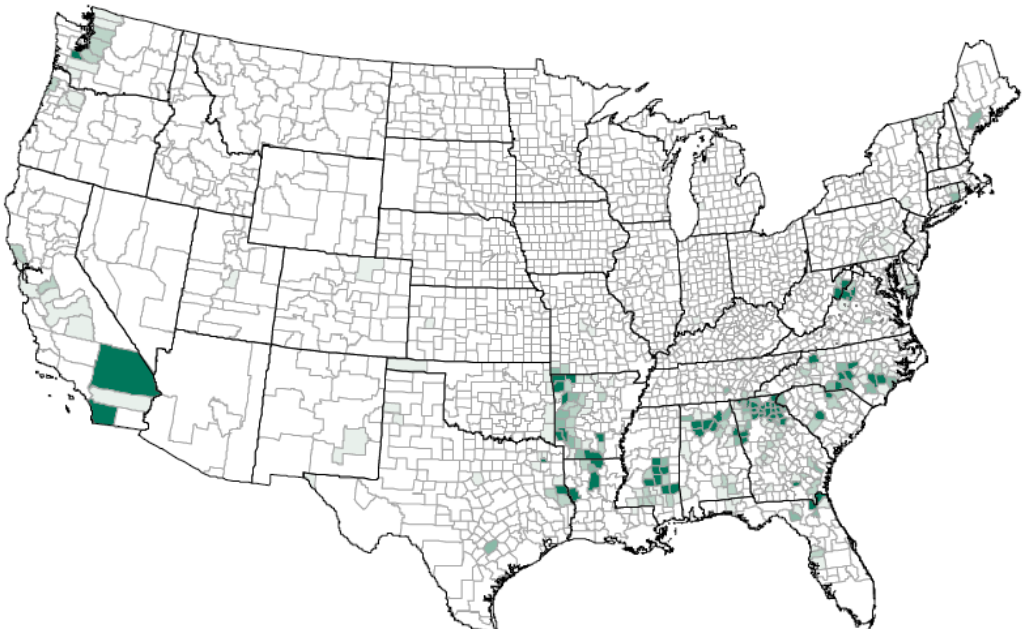
[1] An anaerobic lagoon loses 75% or more of the N as volatilized ammonia and approximately 75% of the P as settled solids until solids are removed. N and P ratios of less than 2 to 1 are unlikely unless the anaerobic lagoon is replaced by an alternative storage system that better conserves nutrients.

[2] These estimates apply to systems that conserve N and P (e.g. below barn pit with immediate incorporation of manure during land application.). An anaerobic lagoon with sprinkler application of manure will require less than 20% of the indicated land base for N and approximately 30% of the land base for P.

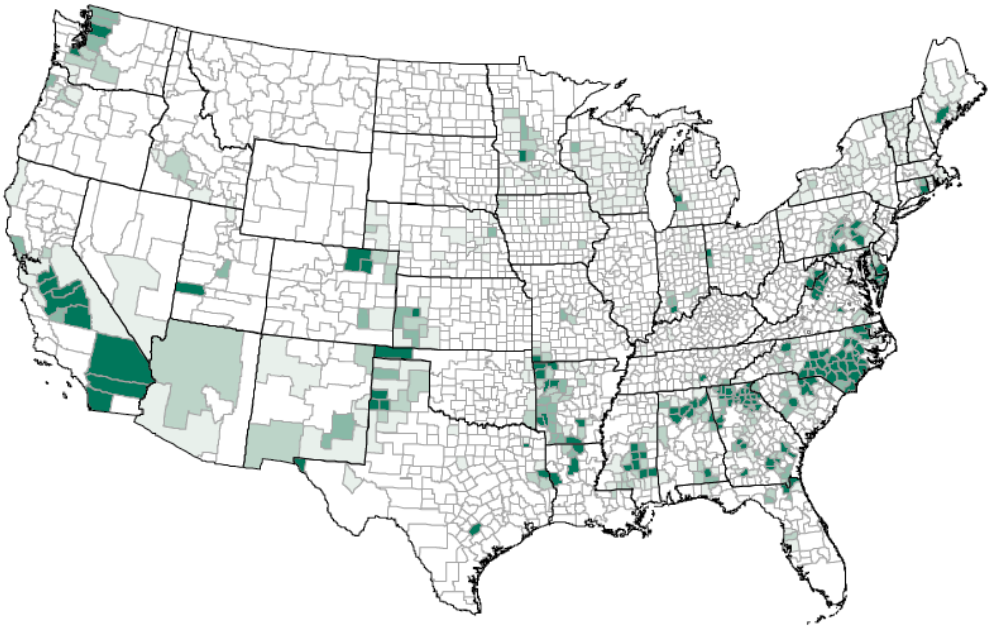
[3] Assumes manure is applied to cropland in a corn (averaging 180 bushels/ac) and soybean (averaging 60 bushels/ac) rotation.

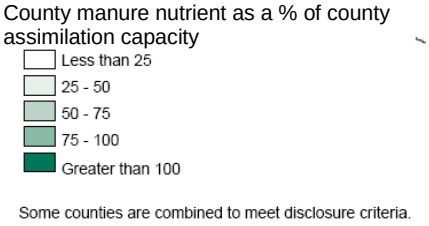
Figure 3. Comparison of county assimilative capacity with available manure nutrients

Nitrogen



Phosphorus





Source: Noel Gollehon, Margaret Caswell, Marc Ribaudo, Robert Kellogg, Charles Lander, and David Letson. 2001. Confined Animal Production and Manure Nutrients. http://www.ers.usda.gov/publications/aib771/. Economic Research Service, USDA Agriculture Information Bulletin No. (AIB771). 40 pp.