WIN²ME
Western Integrated Nutrition and Nutrient Management
Feed Management Education for the Agri-Professional

101 - Nutrient Management at the Whole Farm Level – A Dairy Example

- by Joe Harrison, Washington State University

Disclaimer
This fact sheet reflects the best available information on the topic as of the publication date.

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Introduction

Nutrient management at the whole farm level includes consideration of import of nutrients to the farm, movement and transformation of a given nutrient within the farm operation, and export of nutrients off-farm in the form of meat, milk, or eggs. In contrast to nitrogen, phosphorus (P) is not lost to the atmosphere and therefore, what isn't exported from the farm remains within the farmstead or possibly lost due to leaching.

Phosphorus utilization by species varies from approximately 20% to 50%. The 50-80% not utilized remains in the initial manure excretion. A dairy cow uses approximately 27% of dietary P for milk production and thus approximately 73% of dietary P is not exported from the farm.

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Dairy farms typically import P in several different products such as feed (grains, byproduct feeds, and forage), bedding such as straw or shavings, and fertilizer (see figure 1). Most dairies in the Northwest are met importers of nutrients since their land base for forage or grain production is not enough to meet the total dietary needs of the herd. In order to achieve balance, more emphasis will need to be placed on P export in manure.

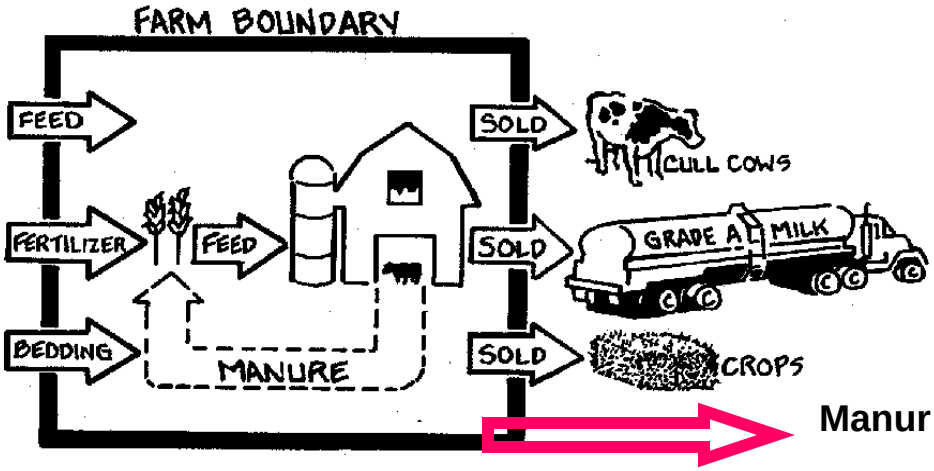

Figure 1. Whole Farm Nutrient Balance (source: Whatcom County BMP manual).

A quick way to get an estimate of farm balance for P in a dairy operation is to compare milk export of P to farm import of P in feeds. If feed import of P = milk export of P, the farm theoretically is in balance. Milk export can be calculated by multiplying the % P in milk (0.09%). An example would be 500 cows x 85 pounds of milk/day x 0.09% P in milk = 38.25 pounds/day. For the farm to be in balance, the import of P would need to approximate 38 pounds per day.

Economics

Phosphorus is one of the more expensive nutrients to supplement. Feeding P at 100% of NRC recommendations vs 120% can result in substantial savings in feed costs. This can amount to $1400 to $1800 per 100 cows per year in some situations.

Factors affecting Farm Balance of Phosphorus

A number of factors are associated with import of P in feeds. Since P can vary amongst feedstuffs and vary from load to load, often times the target P level is raised so as not to limit P in the formulated diet. The P availability in feedstuffs also varies with forages having a lower availability compared to grains. If the facilities and management are capable of grouping cows by age and stage of lactation, there is more of an opportunity to reduce import of P in feeds. In addition, home-grown forages have different abilities to remove P from the soil. Grass will remove almost twice as much P when compared to corn silage. An example of forage uptake is shown in Table 1. Some producers choose to have their heifers raised off-farm and this can help with farm balance.

Table 1. Crop Removal of P in Forages*

Forage	% P	Pounds P/acre
Alfalfa Hay	0.31	43
Alfalfa Silage	0.37	52
Grass Silage	0.45	63
Corn Silage	0.23	32

*based on 7 ton DM yield

Summary

Achieving on-farm balance of P will require the evaluation of all imports and exports of P to determine where opportunities exist for reductions. Key points to evaluate are: imported feedstuffs, home grown feeds, fertilizer, and export of manure. Each farm will have their own unique opportunities to develop a plan to achieve balance.

References:

Nutrient Requirements of Dairy Cattle. 7th revised edition, 2001. National Research Council. National Academy Press.

Grusenmeyer, D, and B Peterson. 1995. Mnauer management guidelines for Western Washington. Whatcom County Extension Office.

Hart, J, M Gangwer, M Graham, and E Marx. 1996. Nutrient management for dairy production: Dairy manure as a fertilizer source. Oregon State University Extension Service, EM # 8586.

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