

Key Concepts of Nutrient Balance on a Dairy Farm

An assessment of nutrient balance on a dairy farm allows you to determine management options that increase nutrient recycling from cropland to the cattle and back to crops again (Klausner 1993). A more detailed discussion of whole farm nutrient balance can be found in Lesson 2, Whole Farm Nutrient Planning.

Nutrient management decisions must relate to the movement of nutrients onto the farm, movement of nutrients within the farm system (including all cropland owned and leased by the dairy), and movement of nutrients out of the farm system. Figure 12-1 illustrates a simplified flow of nutrients on a typical dairy farm. Usually, N, P, K, and other nutrients are brought into the farm system via purchased feeds and fertilizer, although N also enters the farm via N fixation by legumes and rainfall. These same nutrients leave the farm in products sold such as milk, meat, and crops. *The magnitude of any resulting losses is driven by the difference in inputs and outputs.*

Nutrients normally become concentrated on dairy farms because more are brought into the farm system than leave in the products sold. Table 12-1 illustrates the mass N and P balances for several dairy farms in New York as summarized by Klausner (1993).

Although the actual values for N and P inputs and outputs will vary, depending on the farm's location in the United States and the resources available, Table 12-1 does provide a good overview of the typical capture of nutrients on a dairy farm. For instance, notice that the percentage of N remaining on these farms ranged from 64% to 76% and was not related to the dairy's size. But, with greater herd size, more N (or P) must be managed and therefore more acres of cropland will be needed to effectively use the nutrients from the dairy. The mass balance for P is similar to N; in each case, a large percentage of the P that is brought onto the farm each year remains on the farm and accumulates over years. Although data are lacking, it is possible that microminerals (such as sodium and chloride) also accumulate.

Since nutrient accumulation is common on dairy operations, you need to develop a nutrient management plan that ensures efficient nutrient use by and minimal environmental impact from the cattle and crops. Keep in mind that these mass balances are only estimates of the actual nutrient status of a dairy. To develop a specific mass balance for your dairy, use the tools found in Lesson 2, Whole Farm Nutrient Planning.

Follow the steps below to minimize the flow of N, P, K, and other nutrient inputs onto your farm:

1. Determine the actual nutrient requirements of the cattle and crops before making feed and fertilizer purchases.
2. Sample and analyze feeds during ration formulation; do not rely on "book values."
3. Use soil testing to determine crop requirements.

To reduce the amount of feed purchased on most dairies, maximize the harvest of high-quality forages. When more nutrients come from homegrown forages, then fewer nutrients must be purchased and brought onto the farm.

Remember that purchased feeds and fertilizers are a major route for nutrients to enter the farm. Each purchase must be scrutinized carefully to avoid unnecessary accumulation of nutrients on the dairy.

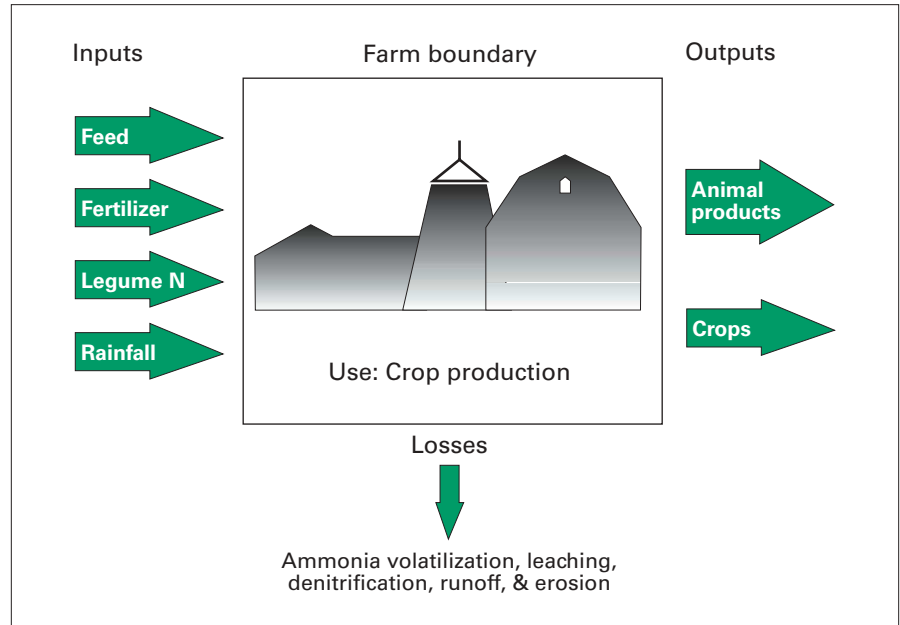


Figure 12-1. A simplified diagram of nutrient flow on a typical dairy operation.
Source: Klausner 1993.

Table 12-1. Mass N and P balances for New York dairy farms.

	Size of Dairy, Number of Cows		
	45	320	500
Input			
	----- (tons of N per year) -----		
Purchased fertilizer	1.0	13.5	26.1
Purchased feed	3.8	43.8	78.5
N fixation by legumes	1.3	14.6	13.9
Purchased cattle	0	0.1	0
<i>Total inputs</i>	<i>6.1</i>	<i>72.0</i>	<i>118.5</i>
Output			
Milk	2.0	18.6	26.4
Cattle sold	0.1	1.9	1.9
Crops sold	0.1	0	0
<i>Total outputs</i>	<i>2.2</i>	<i>20.5</i>	<i>28.3</i>
Remainder	3.9 (6.1-2.2)	51.5 (72-20.5)	90.2 (29.2-28.3)
% Remaining on farm	64%	71%	76%
Input			
	----- (tons of P per year) -----		
Purchased fertilizer	1.2	2.0	5.5
Purchased feed	1.0	8.4	14.2
Purchased cattle	0	0.03	0
<i>Total inputs</i>	<i>2.2</i>	<i>10.4</i>	<i>24.2</i>
Output			
Milk	0.36	3.8	5.5
Cattle sold	0.05	0.5	0.5
Crops sold	0.01	0	0
<i>Total outputs</i>	<i>0.43</i>	<i>4.3</i>	<i>6.0</i>
Remainder	1.8 (2.2-.43)	6.2 (10.4-4.3)	18.2 (24.2-6)
% Remaining on farm	81%	59%	75%

Adapted from Klausner 1993.