

Abstract

A Mass Balance of Nitrogen, Phosphorus and Potassium On Farms in a Dairy Watershed in Northeast Wisconsin.

Kevin A. Erb

Growth in the dairy industry over the past ten years in the Lower Fox River Basin has led to creation of a number of large dairy farms milking more than 300 cows. This trend has generated public and agency concern over the potential surface water impact of these larger operations as compared to the smaller, traditional 50-70 cow dairy farms.

A mass balance of 13 dairy farms, ranging in herd size from 50 to 500 head and 4 cash grain operations was conducted in the Lower Fox River Basin over a two year period to determine the per-hectare rate of nitrogen, phosphorus and potassium loading on farms in the basin. Incoming sources of these nutrients were quantified from feed, fertilizer and livestock purchases, as well as natural sources of nitrogen. Economic nutrient export was calculated, as well as an estimate of environmental phosphorus losses.

The mass balance showed an average of 98 kg/ha nitrogen accumulation, 17 kg/ha phosphorus accumulation and 90 kg/ha potassium accumulation on dairy farms. Cash grain accumulation rates were -10, 3, and 26 kg/ha, respectively. The mass balance showed differences in cow populations between dairy farms did not change per hectare phosphorus accumulations. Potassium accumulations increased as herd size and acreage increased.

The mass balance identified feed as the source for 55% of the imported phosphorus, with fertilizer accounting for 43%. Eleven of the thirteen farms were under nitrogen based nutrient management plans during the study period. Of this feed phosphorus, 51% was in the form of protein supplements and 17% was mineral supplementation. Milk sales were the dominant route of economic nutrient export for all three nutrients studied..

Phosphorus accumulations could be reduced by more than 80% by implementing a number of management practices, including switching to lower phosphorus protein supplements, growing rather than purchasing protein sources, reducing the amount of phosphorus in the dairy ration and reallocating manure across the farm to fields with the greatest phosphorus need.