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Presenter Information

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Nitrogen , phosphorus and potassium utilization and their nutrient cycling in a beef-forage production system

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Key words : Beef production system , Cycling index , Nutrient balance , Nutrient cycling , Utilization efficiency

Introduction Quantification of nutrient flow is the first step for nutrient management in the livestock production system . The objective of this study was to quantify the cycling for nitrogen (N) , phosphorus (P) and potassium (K) in a beef-forage production system in Japan .

Materials and methods Survey was conducted in the Experimental Farm of Kyoto University in Kyoto Prefecture , Japan . There were 9.5ha grassland and about 160 head of beef cattle in the farm . The herd consisted of breeding cows , calves , heifers and fattening cows and steers . Forage cultivated on the grassland was ensiled and offered to breeding cows . The whole farm system was divided into three components : animal , manure and soil/crop . The nutrient inflow , outflow and cycling of N , P and K in the soil-plant-animal pathway were quantified from April 2005 to March 2007 . Nutrient utilizations in each compartment and the whole farm were evaluated by nutrient balances (nutrient inflow minus nutrient export) and nutrient utilization efficiencies (nutrient export divided by nutrient inflow) . Nutrient balance and nutrient utilization efficiency indicate the apparent nutrient losses and the utilization of nutrient in a whole farm or a compartment . Nutrient cycling was represented using Finn's cycling index (Finn , 1980) .

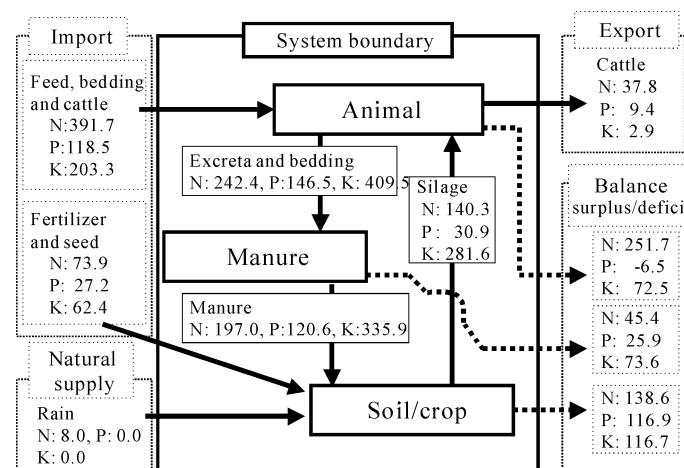


Figure 1 .N , P and K flow in a beef-forage production system (kg year⁻¹ ha⁻¹) ;average 2005-2006 , April through March .

Results The annual average N , P and K flows (kg year⁻¹ ha⁻¹) are shown in Figure 1 . The major nutrient inflow was imported to animal component from outside the system for all nutrients . The average nutrient balances of N , P and K in the whole farm (kg year⁻¹ ha⁻¹) were 435.7 , 136.3 and 262.8 , and the average nutrient utilization efficiencies were 0.08 , 0.06 and 0.01 , respectively . The nutrient balances were the largest in animal component for N and in soil/crop component for P and K . The average cycling indices of N , P and K were 0.19 , 0.17 and 0.49 , indicating that K was the most cycled in the system .

Conclusions The results of each nutrient flow indicated there were differences in the characteristics of nutrients . The quantitative data from this study would give insight to improve nutrient utilization and reduce nutrient losses in the system .

Reference

Finn , J.T . , (1980) . Flow analysis of models of the Hubbard Brook ecosystem . *Ecology* 61 , 562-571 .