The Economic and Phosphorus-Related Effects of Precision Feeding and Forage Management in North Cameroon

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Background Structural best management practices have been implemented throughout the north province of Cameroon in an effort to reduce phosphorus (P) losses to the reservoir .Yet long-term water quality control efforts within north Cameroon are hindered by continuous P build-up in the soils resulting from dairy farm P imports exceeding exports .Addressing the P imbalance problems and maintaining economic viability of the farms requires a system-level redesign of farm management .One possible innovative strategy , precision feed management (PFM) , reduces soil-P build-up by limiting feed and fertilizer purchases , and increasing high-quality homegrown forage production .

Methods This study applied the integrated farm system model (IFSM) to two dairy farms in north Cameroon to quantify the benefits of a PFM farm planning strategy in controlling P imbalance problems , and maintaining farm profitability and reducing off-farm P losses .

Results The IFSM accurately simulated the 2 farms based on farm data supplied by farm planners ; these scenarios were used as the baseline conditions .The IFSM simulations of more accurate feeding of P (based on P required in animal diets) integrated with increased productivity of grass-forage and increased proportion of forage in the diet reduced the P imbalance of one farm from 5 .3 to 0 .5 kg/ ha and from 9 .6 to 0 .0 kg/ha for the second farm .For both farms , soluble P lost to the environment was reduced by 18% .Feed supplement purchases declined by 7 .5 kg/cow per year for dietary mineral P , and by 1 .04 and 1 .29 t/cow per year for protein concentrates through adoption of the PFM system .Moreover , when a land management practice of converting corn to grass was coupled with the precision feeding of P and improved forage management , IFSM predicted reductions of 5 .8 and 9 .3 kg/ha of converted land sediment-bound P in erosion loss each year .

Conclusions The model predicted slight purchase increases in corn grain to offset reductions in corn silage production and feeding rates , but no appreciable change in the farm P balance due to land conversion .The model-based studies conducted on a farm-by-farm basis complement farm planning efforts in exploring innovative farming systems .Moreover , the results set a benchmark for potential benefits of PFM strategies , economically and environmentally .