HOW THE TYPE OF DAIRY PRODUCTION SYSTEM AFFECTS THE NUTRIENT BALANCE FROM AN ENVIRONMENTAL AND ECONOMIC PERSPECTIVE

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The knowledge of nutrient flow in dairy farms has to be explored to find optimized strategies for efficient nutrient conversion to milk. This study aims to improve the understanding of variances in nitrogen and phosphorus balance and efficiency indicators between dairy farm systems. This is the first study applying nutrient balance approach at a farm level to a tropical region in a developing country and considering three different production systems. This study analyzed 67 dairy cattle farms located in the watershed Lajeado Tacongava in the Northeast region of Rio Grande do Sul State, Southern Brazil. Selected dairy farms represented three production systems: confined (3 farms); semi-confined (7 farms); pasture-based (57 farms). Input–output nutrient balances were calculated at the farm gate level for nitrogen and phosphorus over a year. Inputs are feed and fertilizer and outputs are milk and animals. Inputs and outputs differ among different farm systems, and they are the main factors affecting nutrient budgets. The main nitrogen and phosphorus input on the all farms resulted from the feed. The average total N and P surplus on pasture-based farms were 4,899.7 and 693 kg year-1, respectively. In semi-confined systems were 9,276.2 and 1,178.1 kg year-1 and in confined systems were 22,806.1 and 2,239 kg year-1. When considering the monetary value of the total N surplus, the averages were US$ 2.615, 4.950.7, and 12.171.7 for pasture-based, semi-confined and confined systems respectively. Monetary values of P surplus were US$ 346.4, 588.8, and 1,119 for pasture-based, semi-confined and confined. The productive aspects that most determined the values of N and P surplus to 67 farms were the total number of lactating cows and the farm area. Results indicate that surplus can partially replace chemical nitrogen fertilizer, except in the confined system, and fully replace phosphorus fertilizer. Confined farms presented values to use surplus as fertilizer greater than the crop demand. For the other production systems, it happens only for phosphorus. Large variability between dairy farms of the same production system and between different production systems was observed. It reflects the inherent productive, economic, and environmental conditions of each farm and system.