

## Farm-gate nutrient balance assessment of organic dairy farms at different intensity levels in Germany

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Key words: nutrient budget; dairy farm; farm gate; nitrogen; organic farming; phosphorus; potassium

### ABSTRACT

Organic farms are characterized as low external input agro-ecosystems. Currently, some organic dairy farmers feed higher amounts of concentrates and succulent feed, some of which is purchased, to increase the dairy performance of their cows. To assess the environmental impact of this practice, nutrient balances at the farm-gate level of 26 organic dairy farms located in two different regions in Germany were compiled and analysed. The farms are characterised by different production features and feeding intensity levels (0 - 2.72 t DM of concentrates per cow and year, which was 0 - 378 g kg<sup>-1</sup> milk) yielding 5,150 - 8,790 kg milk on average per cow and year.

The area- and product- (milk) related farm-gate nutrient budgets for P and K are almost balanced (mean -3 kg P ha<sup>-1</sup>, range (R): -14 to 4 kg P ha<sup>-1</sup>; -0.5 g P kg<sup>-1</sup> milk, R: -2.8 to 0.9 g P kg<sup>-1</sup> milk and 1 kg K ha<sup>-1</sup>, R: -13 to 15 kg K ha<sup>-1</sup>; 0.1 g K kg<sup>-1</sup> milk, R: -2.4 to 3.9 g K kg<sup>-1</sup> milk). The N surplus averages only 43 kg ha<sup>-1</sup> (R: 8 to 85 kg N ha<sup>-1</sup>) and 8.2 g kg<sup>-1</sup> milk (R: 2.1 to 17.1 g kg<sup>-1</sup> milk), but the correlation between the amount of feed purchased on a net basis and N surplus is significant ( $r = 0.56$ ,  $p = 0.003$ ). Average area-related nutrient use efficiency for all farms calculated as the proportion of input to output is high for N (45%), P (164%) and K (91%). The share of nutrient input and output components and correlations between parameters are presented.

To classify the results, investigations comparing organic and conventional dairy farming in Europe are listed, indicating an N surplus for organic farms, which is often only half or a third of the surplus of conventional farms. However, intensification in organic dairy farming has, in some cases, significant impacts that need to be assessed to determine its environmental performance and profile.

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