

ID: 577

Nutrient Balance and Efficiency in Agricultural Activities and Greenhouse Gas Emissions from Nutrients and Crops

Can Mavruk^{1*}, Aziz Cumhuri Kocalar²

¹Marketing Department, Vocational School of Social Sciences, Nigde Omer Halisdemir University, Nigde, Türkiye.

*can.mavruk@ohu.edu.tr

²Urban and Regional Planning Department, Faculty of Architecture, Nigde Omer Halisdemir University, Nigde, Türkiye

Abstract

Agricultural activities play a crucial role in food production; however, excessive use of synthetic fertilizers has raised serious concerns regarding soil, water, and environmental pollution. Nutrient deficiency, how well crops use available nutrients and how effectively agricultural inputs (synthetic fertilizers, manure applied to soils, nitrogen deposition, biological fixation and seed) are applied have gained importance. Therefore, the study analyzes cropland nutrient balance, nutrient use efficiency and greenhouse gas emissions from synthetic fertilizers and crops in Türkiye. Data is retrieved from FAOSTAT (Food and Agricultural Organization of the United Nations) for the 1961-2022 period. This article also proposes sustainable alternatives to mitigate adverse effects, emphasizing the need for balanced agricultural practices to ensure agricultural and environmental sustainability. An increasing N surplus and increasing K deficit was found, which can be explained by higher increase in crop removal than mineral fertilizers. Nitrogen use signaled for possible deficiency due to efficiency falling below the threshold. Quantity of cereal production explained 93% of the variability in total N₂O GHG emissions. N₂O emissions from cereals were not significantly different from CH₄ emissions from rice cultivation in 2022. Although nutritious dioxide emission intensity had a logarithmic trajectory, variations were high in the last decade. Overall, greenhouse gas emissions from fertilizers and cereals are in desired levels despite some risks for nitrogen and potassium deficiencies. N interventions and altering compositions of fertilizers should be promoted to balance crop removal and mineral fertilizers. Future studies should consider greenhouse gas emissions from pesticide use in relation to environmental effects. Farmers in Türkiye should adopt sustainable agricultural practices such as use of organic fertilizers; precision agriculture techniques to optimize fertilizer application; and crop rotation and cover crops to maintain soil health and prevent nutrient depletion. Policymakers and farmers must collaborate to promote these practices through education, incentives, and regulatory frameworks.

Key Words: Nutrient balance, Nutrient efficiency, Greenhouse gas emissions, Türkiye

