

Nutrient Cycling in Organic Field Crops in Canada and the United States

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Core Ideas:

- Soil, climate, fertility sources, and land use impact organic nutrient management strategies.
- Cover/green manure crops and animal manures are used to maintain soil fertility on organic farms.
- Conventional soil testing may not be ideally suited to organic systems.
- Tracking soil nutrient temporal changes can improve comprehensive nutrient management plans.
- More research of how weeds and soil microbial community structure/function impact nutrient cycling and crop production is needed.

Abstract

Organic farmers have identified soil fertility and weed management as the two highest research priority areas. No review exists of research on soil nutrient management in organic field crop systems. We conducted a comprehensive review to identify the principles and factors governing nutrient management, knowledge gaps, and future research needs in organic grain and other field crop systems in Canada and the United States. We compared results from research conducted in different climates, soils, and crop rotational sequences. Results indicate that (i) dual-use cover/green manure crops and/or animal manure are the most common sources of plant available N and other nutrients in organic field crop systems; (ii) soil nutrient deficiencies can develop through sole reliance on cover/green manure crops; (iii) dependence on animal manure can lead to N and P excesses; (iv) conventional soil testing procedures may not accurately predict crop nutrient needs; (v) greater knowledge of microbial processes governing nutrient cycling is needed; and (vi) better understanding of the impact of weeds on soil fertility may create weed and nutrient management synergies. Knowledge gaps include a lack in understanding of how the

soil and plant biomes influence nutrient-use efficiency and how crop diversity and rotations impact soil fertility, sustainability, and resilience in organic field crop systems. Likewise, interactions between weeds, crops, soil fertility, and weed management strategies are poorly understood.

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