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# Nutrient Fluxes from Soil to Market in African Indigenous Vegetables Production System

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## Abstract

In many smallholder farming systems in sub-Saharan Africa, nutrient supply is either too low leading to soil fertility decline due to soil mining or too high leading to environmental pollution. The aim of our study was the quantification of mineral nutrient transfer from soil to market in African indigenous vegetable (AIV) production systems as guide for development of fertiliser recommendations. In a field experiment under optimal nutrient supply, we measured biomass and mineral nutrient concentrations (nitrogen, phosphorus, sulfur, potassium, magnesium, calcium) of edible (leaves, tender laterals) and non-edible (stems, coarse roots, fine roots) plant organs of six leafy vegetable species (amaranthus *Amaranthus cruentus*, cowpea *Vigna unguiculata*, African kale *Brassica carinata*, African nightshade *Solanum scabrum*, spider plant *Cleome gynandra*, common kale *Brassica oleracea acephala*). In a "batch system", plants were completely harvested five weeks after transplanting. In a "continuous system", plants stayed in the field for 15 weeks whereby sprouts were harvested every five weeks. Plants were harvested by pulling out or cutting five cm above soil surface or cutting edible organs only.

The nutrient transfer from soil to market was very high when plants were harvested by pulling out and largely varied among species. For example, the potassium transfer associated with the sale of 103 kg edible plant fresh mass varied between 6.3 kg for common kale and 34 kg for amaranth, the nitrogen transfer varied between 5 kg for African kale and 13.5 kg for cowpea, and the sulfur transfer varied between 1.1 kg for African nightshade and 2.3 kg for spider plant. Harvesting edible organs only, reduced the potassium transfer from soil to market between 22 % for common kale and 79 % for amaranth, the nitrogen transfer between 20 % for African kale and 69 % for cowpea, and the sulfur transfer between 13 % for common kale and 80 % for cowpea.

We conclude that due to the large differences among AIV species in biomass partitioning and nutrient concentrations in different organs, the fertiliser recommendations for replacement of nutrient transfer from soil to market need to be species-specific and must consider also the production system.

**Keywords:** Fertiliser need, harvesting technique, leafy vegetables

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