

# Nutrient fluxes from soil to market in African indigenous vegetable production systems

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## Introduction

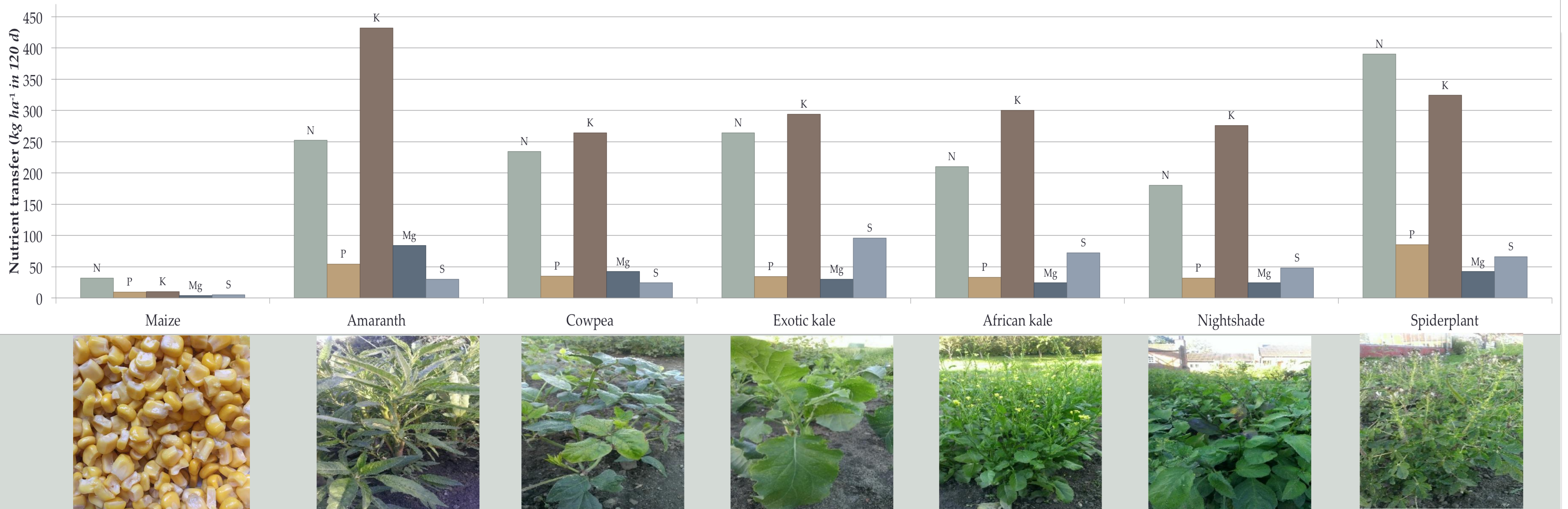
Farmers in sub-Saharan Africa (SSA) are facing two ongoing problems. First, nutrient export from soil (e.g. by harvest products) is often larger than the nutrient input into soil, leading to soil mining and decreasing soil fertility in the long-term. Second, human intake of microelements like zinc and iron is often suboptimal (hidden hunger), causing

major health risks. For fighting hidden hunger, the cultivation and consumption of African indigenous leafy vegetables (AIV) is increasingly promoted due to their high microelement concentrations compared to staple crops such as maize. However, for AIV production systems data are lacking on nutrient export from soil, and thus, fertilizer demand to avoid soil mining.

## Materials and Methods

Five AIV species (Spider plant *Cleome gynandra*, African nightshade *Solanum scabrum*, Amaranthus *Amaranthus cruentus*, Cowpea *Vigna unguiculata*, African kale *Brassica carinata*) and Exotic kale (*Brassica oleracea*), commonly grown in SSA, were cultivated in a field experiment for four to six weeks. At harvest, the biomass and nutrient concentrations of edible (leaves) and non-edible plant organs (leaf litter, stubbles, coarse roots, fine roots) were quantified.

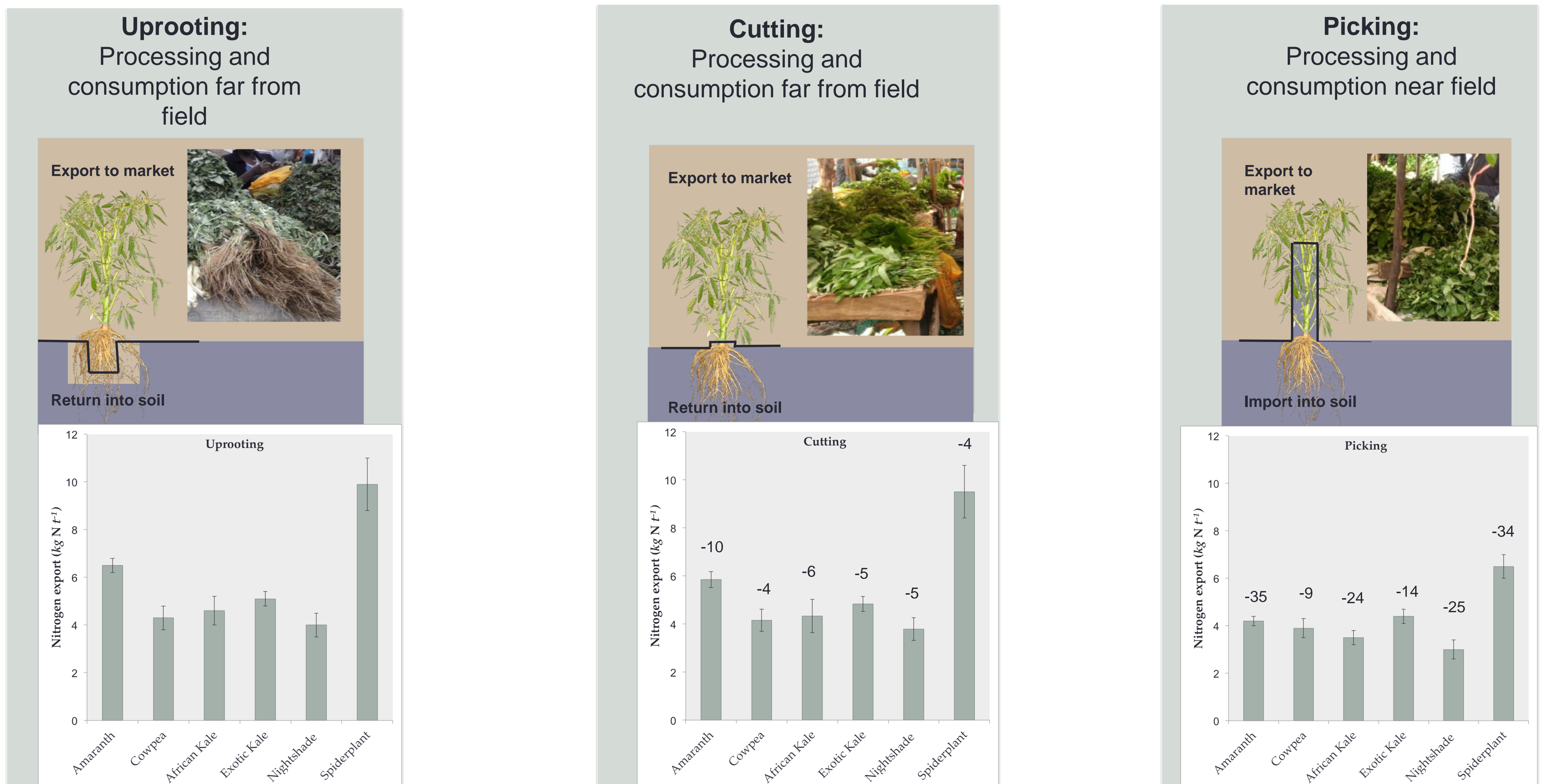
## 1. How many nutrients are transferred from soil to market with average yields\* in SSA?



- Farmers can produce high edible fresh mass in a duration of 120 days by cultivation of AIVs.
- But production of AIV is associated with an extremely high nutrient transfer from soil to market compared with maize grain production.  
→ Production of AIVs has a high risk of soil mining unless the nutrient loss through harvest is compensated by adequate fertilizer supply.

\*Average yield in SSA: per ha 2t maize grains in 120d (1 harvest), 3 x 20t edible yield (leaves and laterals) in 120d (3 harvests).

## 2. What is the potential for decreasing fertilizer demand by appropriate harvest technique?



Numbers above columns indicate the species-specific reduction of N-loss in percentage.

- For reducing nutrient losses from soil, plants should be harvested by cutting and picking and not by uprooting.
- Returning harvest residues to the sites of primary production has large potential for improving soil fertility in smallholder AIV production.