# Scaling-up nutrient balances from plot to village level under small-holder settlement schemes in sub-humid Zimbabwe

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## 1. Introduction

- Nutrient balances are useful tools as indicator of ecosystem quality and for optimizing nutrient use.
- Does the scale of assessment affect the conclusions obtained?

## 2. Objective

- To compare partial (and full) nutrient balances of three representative Zimbabwean villages from contrasting settlement periods (50s, 80s and early 2000) at different spatial scales.

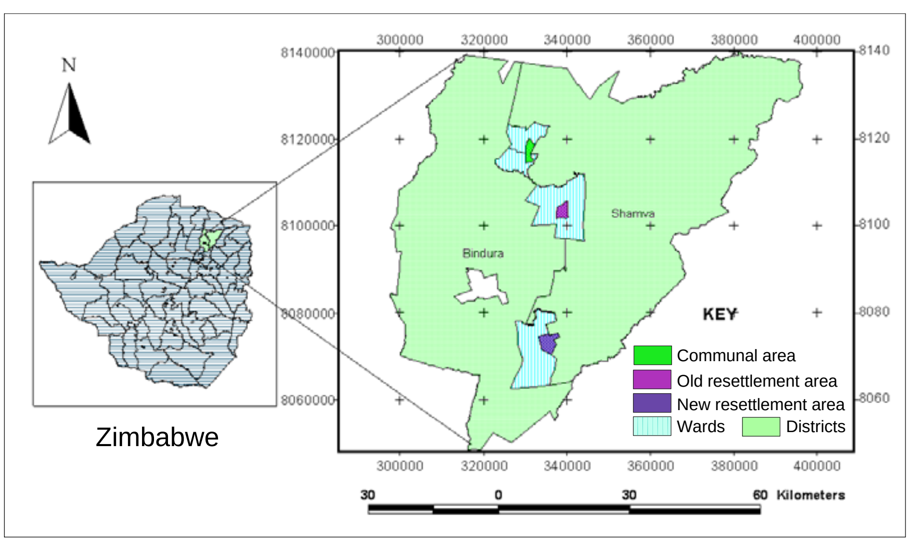


Figure 1. Location of study sites in Zimbabwe

## 3. Methodology

- During the 2006-7 cropping season, 27 stratified farmers on the 3 villages were randomly selected

Table 1. Main characteristics of the study sites

| Characteristic | Village: Kanyera | Chomutomora | Hereford Farm |
|---|---|---|---|
| Settlement type | Communal area | Old resettlement | New resettlement |
| Settlement time | 1948 | 1987 | 2002 |
| Main soil type | Loamy sand | Sandy Loam | Clay |
| Main crops | Maize, groundnuts | Maize, cotton | Maize, cotton |
| No. of households | 90 | 38 | 72 |
| Village area (ha) | 730 | 780 | 1350 |

- Nutrient resource flow maps were carried out with each farmer, linking all land cover types
- Organic inputs and crops were sampled and analyzed
- A survey about NRM was applied to selected farmers and to 40% of inhabitants per village
- N and P balances were calculated at different scales and expressed in kg $ha^{-1}$ $yr^{-1}$.

Table 2. Different spatial scales at which nutrient balances were calculated

| Scale | Description | Method of aggregation |
|---|---|---|
| Plot | Different plots of same crop | None |
| Crop | Different crops of same farmer | Sum of all plots per crop per farm |
| Farm | Different farms in a village | Sum of all crops per farm + household |
| Land cover* | Different land covers in a village | Extrapolation of stratified farms & survey[&] |
| Village | The three villages as a unit | Recalculation of flows from farm level[&] |

*Three land cover types were defined: Cropping fields, Woodlands and Pastures [&]Excluding internal flows at these levels

## 4. Results

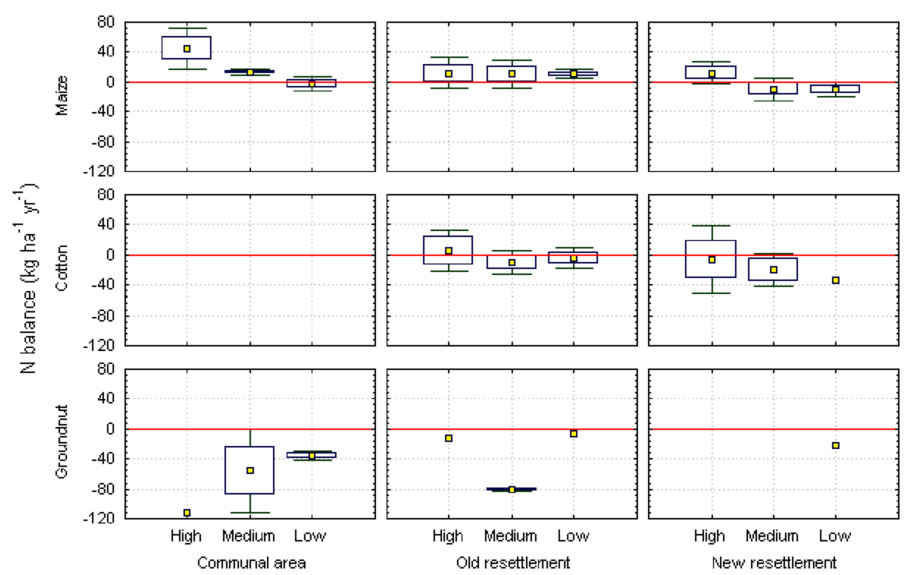


Figure 2. Partial N balances for different crops by farmers wealth class show differences due to resource endowment and crop type. Negative partial N balances in groundnut are artificial, as it is a N-fixing plant.

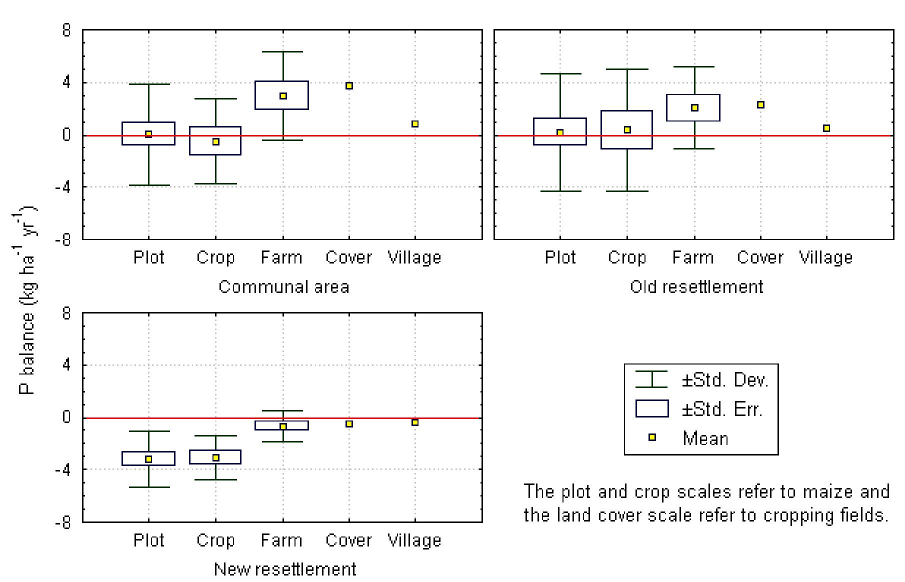


Figure 3. Partial P balances at different scales show differences according to the scale and the village under study.

Table 3. Partial N and P balances (kg $ha^{-1}$ $yr^{-1}$) for different land cover types suggest cropping fields being favored at expense of other lands.

| Village | Cropping Fields N | Cropping Fields P | Woodlands N | Woodlands P | Pastures N | Pastures P |
|---|---|---|---|---|---|---|
| Communal area | 36 | 4 | -9 | -1 | -10 | -2 |
| Old resettlement | 12 | 2 | -3 | -1 | -13 | -3 |
| New resettlement | 5 | -1 | -6 | -1 | -27 | -5 |

## 5. Conclusions

- Results from nutrient balances are scale-dependent
- The way of aggregation of nutrient flows, during the scaling-up process, have a strong effect on the results

## 6. Practical implications of findings

- Results suggest that farmers in the new resettlement area are more reliant on soil nutrient stocks
- Fertilizer distribution systems must be improved to stop the continuing degradation of resettled areas.

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