Leaching of soil nutrients from tropical cropping systems at different levels of agricultural intensity in Bengaluru, Southern India

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Introduction

- Urbanization increases demands for food and pressure on available arable land (Figure 1).
- Intensified multiple cropping systems play a major role in balancing these two drivers.
- Frequent application of high inputs on weathered tropical soils affects resource use efficiency and productivity of agricultural systems.
- On weathered tropical soils, nutrient leaching leads to major nutrient losses in the system.

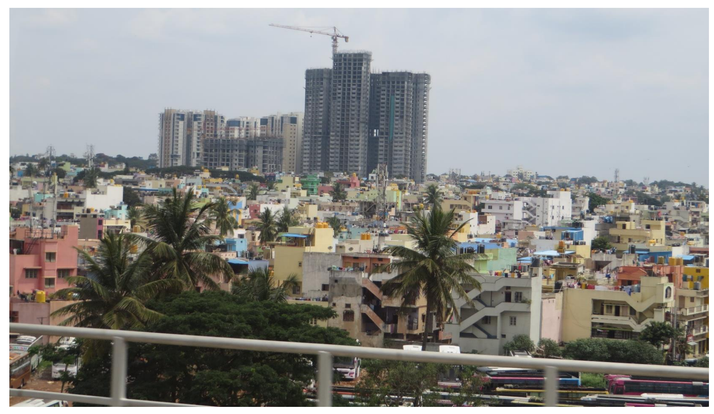

Figure. 1. Bangalore city view from the metro line

Methodology

- An on-station field experiment, started in 2016 at GKVK campus of the University of Agricultural Science, Bangalore, India, mimics a typical cereal-vegetable cropping system at three levels of N (intensification stages) under (drip-)irrigation.
- Cabbage, eggplant, tomato in the dry season *Rabi* (February – June) are followed by millet, lablab and maize in the Monsoon season *Kharif* (July – November).
- Leaching data were recorded using *in-situ* monolithic free drainage lysimeters which were installed in the plots with low (control) and high N during Rabi and Kharif seasons 2017 (Figure 2).
- Lysimeters were emptied weekly and the nutrient concentration in the leachates was determined by ion-chromatography.

Figure. 2. (a) Lysimeter setup, (b) and (c) view of factorial experiment layouts and lysimeters during the cropping seasons: (b) aerial view in *Kharif*, and (c) ground view in *Rabi*

Results and Discussion

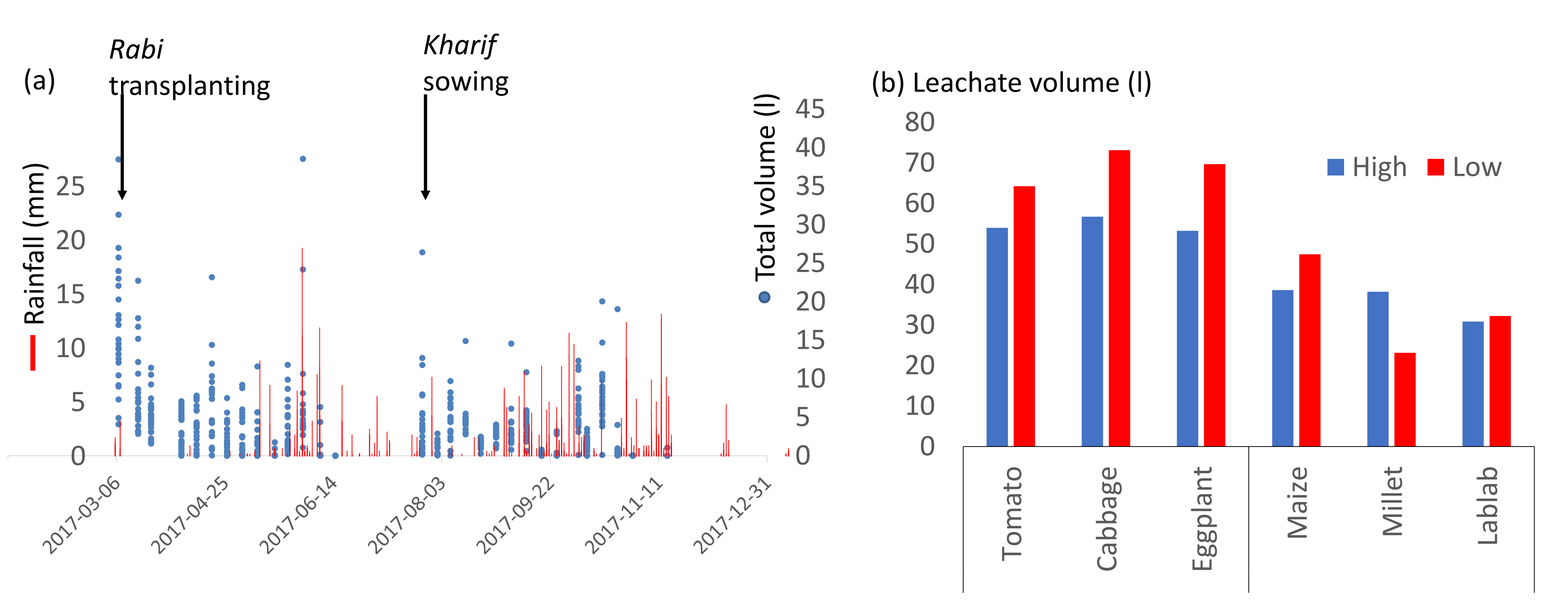

Figure 3. (a) Lysimeter sampling events and rainfall with the starting points of two seasons, and (b) the total volume of the leachate for the 2017 cropping seasons

- Leaching volumes were higher during the *Rabi* season with continuous drip irrigation than in *Kharif* with life-saving irrigation (Fig 3b).
- N leaching occurred in both *Kharif* and *Rabi* seasons, and was highest for tomato.
- *Rabi* had higher K leaching compared to *Kharif* season.
- S leaching was high in low fertilized plots of cabbage (in *Rabi*) and millet (in *Kharif*).

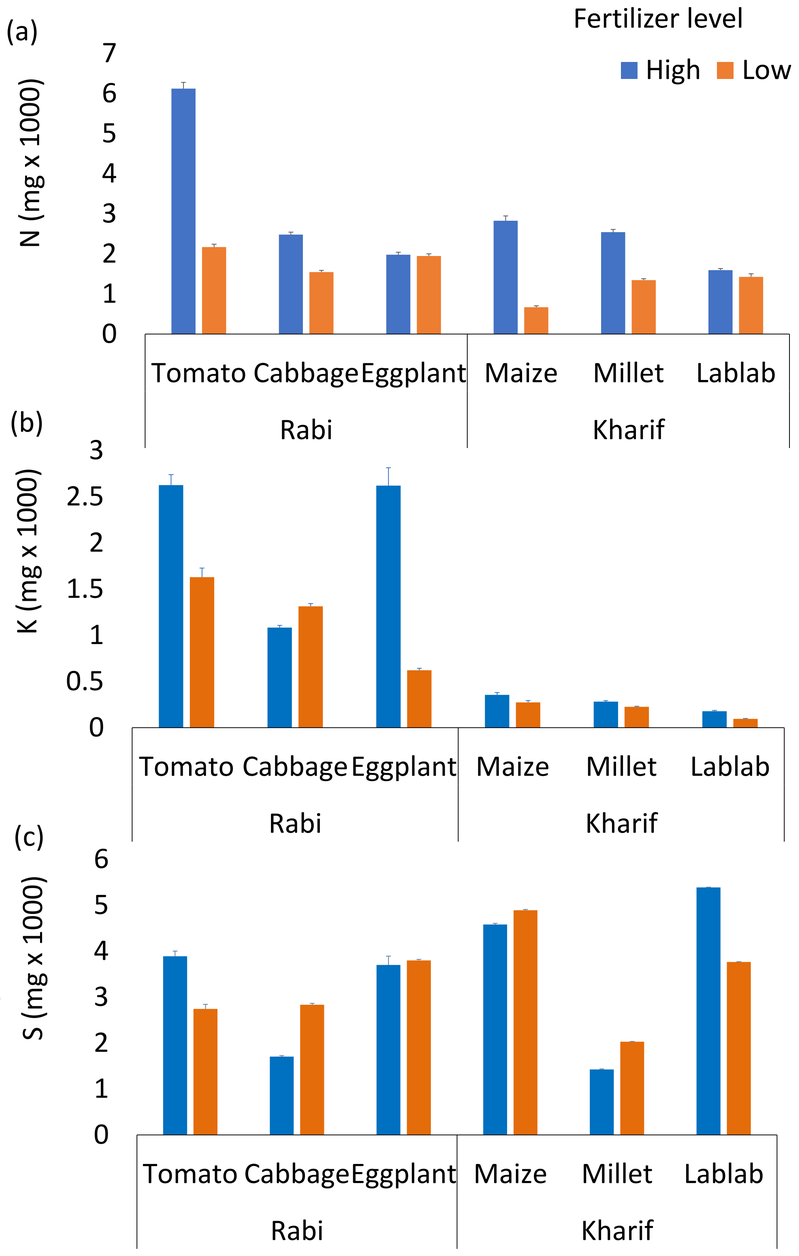

Figure. 4. Leaching losses. Total amount of (a) nitrogen (as NO_3^- and NH_4^+), (b) potassium (as K^+), and (c) sulfur (as SO_4^{2-}) in the leachate during both cropping seasons in 2017

Conclusions

- High leaching losses during the *Rabi* seasons give evidence that inputs were not used efficiently in any of the simulated agricultural management scenarios.
- Low leaching of S from the millet plots may be a carry-over effect caused by strong S uptake in cabbage grown in the previous *Rabi* season.
- Cabbage plots without N showed high leaching losses of S, probably due to low S uptake by the crop.

Acknowledgements

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