

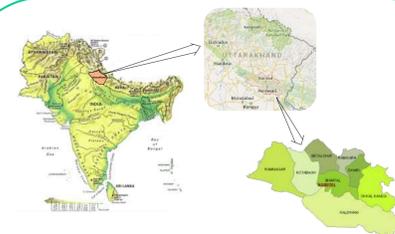
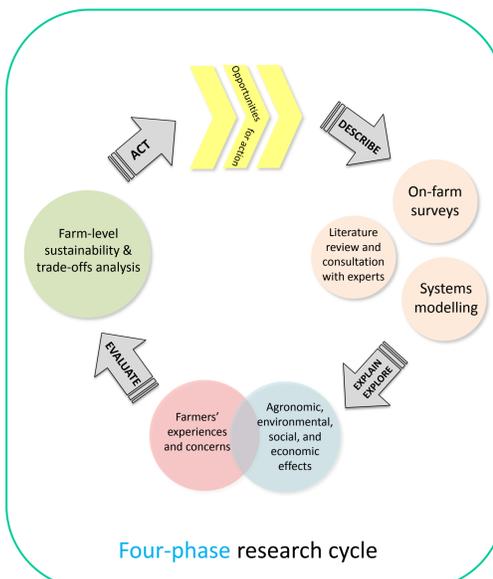
# Managing manure for sustainable organic Basmati rice production

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## Research Objectives

- Describe **actual manure management practices** and **manure nutrient availability** on farms producing organic Basmati rice in the Nainital District, Uttarakhand, India
- Assess **farm-level sustainability of three manure processing methods**: farmyard manure (FYM), vermicompost (VC), and biogas slurry (BGS)
- Compare farmers' manure management practices with best practice recommendations **to identify potential points of nutrient loss**
- Systematically **identify locally relevant and feasible interventions** that could increase nutrient supply and recycling at the farm level

## Materials & Methods



58 farmers surveyed in Kotabagh, Patkote, and Betalghat in the Nainital District of Uttarakhand, India, February – April 2016

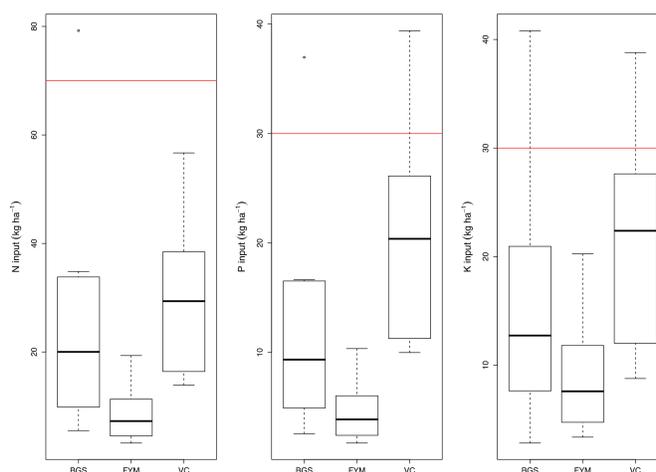


## Results

### Describe

- Average 9683 kg total fresh manure available for *kharif* season per farm
- 98% manure allocated to fertilizer product(s)
- 71 – 75% of manure fertilizers allocated to Basmati
- 88% of FYM and 100% of BGS farmers stored manure on bare soil
- 47% of FYM and 100% of BGS farmers stored manure with no form of cover

### Explain & Explore

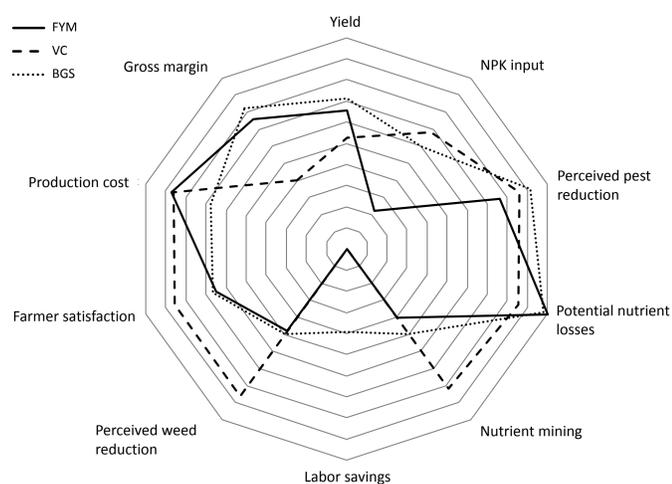


Distribution of N, P, and K input rates (kg ha<sup>-1</sup>) for farmers using primarily BGS, FYM, and VC. Red lines are the recommended input rates for Basmati.

- No significant differences between manure management groups for farm size, yield, or stocking rate
- Lowest overall NPK inputs for farmers in the FYM group
- Significantly higher NPK inputs in VC group than FYM
- Farmers' manure inputs were on average only 36% of the N, 50% of the P, and 61% of the K doses recommended for Basmati

### Act

### Evaluate



Comparison of the agronomic, ecological, social, and economic performance of three manure management practices. Scores for each sustainability indicator were calculated as relative to a local baseline and scaled from 0–1, where 1 (the outer edge of the web) is 'optimal'.

- Losses as a result of application method and crop and/or soil properties
- Fertigation
- Split application coordinated with crop demand



4. Soil & crop



1. Livestock



2. Manure collection & handling



3. Manure storage & composting

- Losses during storage and decomposition
- Cover FYM piles
- Make VC if possible
- Collect BGS in an enclosed pit

- Losses between feeding and excretion
- Survey did not address feeding practices; no recommendations can be made

- Losses due to infrequent collection, off-farm grazing, and poor animal housing
- Little room for improvement in collection frequency
- Use animal bedding to absorb urine

## Discussion & Conclusions

- Maintaining profitable yields is central to achieving other sustainability goals
- Increasing bulk manure fertilizer inputs is not feasible for most farmers, so system improvements should not hinge on increased manure availability
- Improving the plant-nutritive quality of available manure fertilizers is a logical point of focus for translating sustainability analyses into practical advisory efforts

- Both VC and BGS are improved technologies compared to FYM
- VC should continue to be promoted, especially to smaller, resource-limited farmers
- Livestock should be provided with bedding in all seasons to absorb urine
- Farmers should receive support for options to cover FYM piles, since all farmers will make at least some FYM
- Further research should address the storage of BGS

### Acknowledgments

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