

Evaluation of a farm-level decision support tool for trade-off and scenario analysis for addressing food security, income generation and natural resource management

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Resource-poor farmers face difficult decisions over the use of scarce nutrient sources in crop-livestock production systems. A better understanding of the comparative values and trade-offs in the use of land, labour, manures and other locally available resources is required in order to increase the production and efficiency of mixed crop-livestock systems. While efforts are required to expand our knowledge of the biophysical aspects of alternative uses of organic nutrient sources, similar efforts are also required on the socio-economic driving forces behind farmers' decision making. The approach uses trade-off analysis, partial budgeting and multiple goal linear programming to identify management options to address farmers production criteria and overcome their constraints. This evaluation includes both the short and longer-term economic and environmental benefits. From the social and economic viewpoint, organic resources can be identified that could substitute for mineral fertilizers in areas where fertilizers are not affordable. From an environmental aspect, management practices could be identified that results in fewer nutrient losses and could rebuild or maintain the soil resource base.

A multi-stakeholder coalition has been working in Ethiopia, Tanzania, Zimbabwe and Uganda and has successfully developed a decision support tool (DST) to explore these different trade-offs and scenarios based on smallholder farmers existing practices and opportunities. This paper uses case studies from AHI benchmark sites in Lushoto, Tanzania and Areka, Ethiopia to discuss the potential of the DST for improving farmers and development partners decision making to achieve food security, increase farm income, increase returns to land and labour and maintaining sustainable production. Examples to be presented will investigate scenarios and trade-offs for three different wealth categories per site and for different areas of the farm with varying soil fertility levels, for example:

- Land allocation – which crops to which land
- Efficiency of fertilizer use – when to apply, where to apply it in the rotation, how much
- Labour constraints – when to weed, when to apply manures
- Investment options: capital allocation - livestock versus crop enterprises, labour allocation - farm and non-farm
- Appropriate use of crop residues in mixed systems
- Integration of legumes into the system