



Soil Organic Carbon and Food Security : Technical and Socio-economical Potentials of Selected Soil Management TIMPs in Kenya

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- **Guiding questions for that panel are:**
- What are the technical and socio-economical potentials of different soil management approaches on the given cropland (ISFM, conservation agriculture, organic agriculture, ...) for a) achieving food security and b) carbon sequestration?
- What are the tradeoffs associated to each of those approaches (currently and in a situation of advanced global warming)?
- Is there a corridor within which those approaches can meet and achieve good results for crop production and eventually food security on one side and carbon sequestration on the other side under different ecological and socio-economical conditions in tropical countries, in particular Sub-Saharan Africa?

Introduction

- Soil fertility decline continues to be a major challenge limiting agricultural productivity Kenya.
- Despite the novelty of organic-based technologies in enhancing agricultural production in Kenya's central highlands, adoption is low.
- Despite governmental and non-governmental agencies' efforts to tackle the constraints by promoting organic-based technologies, these efforts do not match the adoption levels
- KALRO researchers have recommended Soil and water management Technologies, Innovations, and Management Practices (**TIMPs**) which broadly include organic inputs or integrating the organics with inorganic inputs (organic-based technologies) to enhance agricultural productivity

A Look at KALRO KCSAP SLM TIMPs



- Improved crop climate smart varieties (e.g. Green gram Variety KAT N26)
- Inorganic fertilizer at recommended rate of 100kg/ha
- Farm yard manure at recommended rates of 1ton/ha
- Combination of inorganic Fertilizer and FYM at half recommended rates (50:50)
- Minimum tillage
- Tied ridges
- Integration of:
 - Cover Crops, agroforestry
- Current studies compare combination of the above with Conventional tillage (cost of in terms of labour for land preparation, weeding etc.)

Levels of Adoption Central Highlands of Kenya



- 80% of the CHK households used animal manure and attributed its use to cattle ownership and financial constraints that hinder the accessibility of inorganic fertilizer.
- Manure and combination of manure +fertilizer were the most adopted technologies
 - Cattle ownership among households enhances the adoption of manure and manure + fertilizer
- The proportion of land dedicated to agroforestry relatively small (Agroforestry is a long term investment that may take time for the farmers to benefit)
- Compost was the least adopted technology of the selected organic-based technologies (the high labor and capital requirement and the intensive process in preparing the compost).
- The low allocation of land under cover crops (cover cropping is still unpopular among farmers)

Socioeconomic Factors with Positive Influencing Adoption Intensity of Selected Organic-Based Technologies (1)



- The gender of the household
- Years of farming experience (**significant**)
- Household size (a proxy for labor availability in the household) (**significant**).
- Access to external labor (farmers' willingness to invest in long -term strategies that replenish the soil) (**significant**)
- The household head's education level (Awareness and to apply new technologies in an efficient way) (**significant**)
- Agricultural group membership (pooled access to TIMPs)

Socioeconomic Factors with Positive Influencing Adoption Intensity of Selected Organic-Based Technologies (2)



- Size of land under cultivation (proxy of production factor, capacity to carry risk, size of wealth, and collateral in access to credit) (**significant**)
- Land title deed ownership (proxy of security and land rights identified as a key component that encourages long term investments on the soil) (**significant**)
- Access to credit (adoption of TIMPS expensive, a line of credit necessary)
- Households purchasing power (e.g. availability of off farm income)
- TLU numbers (Availability of manure) (**significant**).

Socioeconomic Factors with Negative Influencing Adoption Intensity of Selected Organic-Based Technologies



- The household head's age had a negative effect on the adoption of organic-based technologies, especially of compost and crop rotation.
 - As household heads advance in age, their risk aversion abilities increase, unlike younger farmers with low-risk aversion
 - Proxy for capacity to work implying that as the age of the farmer advances,
 - participate in strenuous farming activities such as composting, and this reduces the possibility of adopting labor-intensive technologies
- However, other studies reported that elderly household heads adopted new agricultural technologies compared to younger household heads.
 - Attributed to ability older households likely accumulation more capital over time.
 - Credit institution may prefer the elderly than the young households head.

Conclusions

- Benefits of increasing soil carbon apparent but validation with Cost Benefit analysis necessary
- Limited long term studies on technical, social and economic studies
- Challenge of limited funding to NRM
- Long term nature of Soil carbon initiatives