Rice Farmers Perception on Soil Quality Indicators and Fertility Management in the Volta Region of Ghana: Reconciliation with Scientific Evidence

Emmanuel Kofi Zinsu
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Soil conservation and fertility management in smallholder farms have been considered to be a very complex activity by some researchers and experts in the field. This according to them calls for active participation of farmers and stakeholders for collaborative efforts towards the designing of a sustained soil improvement strategy for enhanced agricultural productivity. However, it has been argued that both scientist and farmers have differing viewpoints when it comes to soil conservation and management practices. These dissimilarities in thoughts are often underpinned by a difference in viewpoint between those developing soil management technologies and those being asked to use them. A lot of researchers have come to the realization that different actors in the context of agricultural management will have different standpoints which is fashioned in their interest and experiences, and as well entrenched in their own particular worldviews and practices. These differences in viewpoint have called for a more participatory approach towards the designing of effective communication tools regarding the sustainable management of landscapes through the exploitation of both knowledge systems.

The Volta Region of Ghana is the third largest producer of rice in the country, producing about 83,936MT per annum which is about 17% of total national production. The government of Ghana has also identified rice as a priority crop in the region for poverty reduction and ensuring food security, thus has formulated policies to boost production. However intense rice production needs careful soil fertility management strategies. The farmers' perceptions and their ability to evaluate soil quality are key competences and their local soil knowledge often forms a much better starting point for communication than scientific soil classifications. However little is known about farmers' perception on soil fertility and its management and thus the need for the development of extension contents. To address these needs the study explored and identified the most important soil attributes/indicators known and used by farmers in the classifications of their soils. Farmers' relations and concepts towards the identified indicators were also assessed. Finally the research investigated how farmers' perception about soil quality indicators matches with scientific measurements.

The mixed method approach was the main study design employed in conducting this study. The study used two different research approaches in two different stages for data collection and analysis. These were the exploratory and descriptive research approaches respectively. Participatory rural appraisal (PRA) tools such as focused group discussion, individual interviews, transect walks and rankings were the main methods used to collect data from 124 rice farmers in three rice growing districts (Biakoye, Kadjebi and Jasikan) of the Volta Region of Ghana. Two separate expert interviews of soil scientists plus a thorough scientific literature review were also conducted to understand and buttress research topic and findings. Finally, soil samples from selected rice fields were collected at plough depth of 0-20cm for laboratory analysis. Qualitative content analysis was the main method used for data analysis of all transcribed interviews from where the categorization of major or minor themes, subtopics, relevant phrases, metaphors, story lines and identification of common trends that explained the concepts and knowledge of soil indicators and fertility management were obtained. Finally, the most important farmer soil quality indicators were obtained by the use of Kendall's coefficient of concordance and soil samples were quantitatively analyzed using standardized laboratory procedures.

Research findings revealed that in all farmers were able to name and identify 20 major soil quality indicators out of which five (vegetation cover, soil color, earthworms, soil structure and texture) turned out to be the most important ones used by the farmers to evaluate and classify their soils. Based on these indicators five major local soil types (*tordor*, *ntaariɛɛ, ojeka, apibour* and *montro*) were also named and classified by the farmers but these were heavily influenced by topographical /environmental factors down to socio-economic significance. Farmers were also seen to have locally generated terms for fertility management and strategies which matches well with scientific terms. However despite the wide range of locally adopted fertility strategies known by farmers they do not really practice them but instead rely heavily on the application of subsidized inorganic fertilizers. With respect to soil physico-chemical analysis, it was revealed that on the whole farmers' assessment merges well with the measured soil chemical parameters but the farmers missed the fact that the main limiting nutrients of the soils was nitrogen (N) and Phosphorous(P).

The study concludes that indeed farmers have a relatively good and 'holistic' knowledge of soil fertility and its management and their classification of soils is more utilitarian focusing on top soil features rather than sub soil characteristics as compared

to scientists. Also, despite the deep knowledge of farmers about their soils, they do not really trust in what they know therefore they rely heavily on subsidized mineral fertilizer as their main methods of fertility improvement. The study therefore recommends the development of **extension contents** to train farmers on innovative ways of maintaining soil fertility e.g. use of rice straw on fields. The focus of the extension content should be more of motivation and reinforcement of farmer knowledge as it is evident farmers already possess a considerable amount of soil knowledge.

Betreut von Dr. Maria Gerster-Bentaya
Geprüft durch Jun.-Prof. Dr. Andrea Knierim