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Indigenous Knowledge Use in Horticulture for Sustainable Agriculture Development in Tanzania: Evidence from Nyandira Village in Morogoro

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Abstract: ***This paper introduces indigenous knowledge (IK) use as resource which could contribute to the increased efficiency, effectiveness and sustainability of the development process. Specifically the study sought to identify sources of indigenous knowledge in the study area, types of indigenous knowledge which are being used in the study area and analyzing the combination use of indigenous knowledge and scientific knowledge use in the study area. The study adapted phenomenology research design, in-depth interview were conducted with 10 respondents and total 6 FGDs were conducted with farmers which were supplemented by observation method. Content analysis was used to analyze the collected. The study identifies the use of indigenous knowledge in the study area and the combination use of both scientific knowledge and indigenous knowledge. The study recommended stakeholders in horticulture and agriculture subsectors in general to promote both use of indigenous and scientific knowledge as they both promote sustainable horticulture and agriculture development.***

Keywords: Indigenous knowledge, Sustainable and horticulture

1. Introduction

Indigenous Knowledge is a generic term that consists of the actual knowledge, skills and practices or methods of doing things based on local material developed through various types of experimentation and practical experience overtime by the people of the place and adapted to the local situation (Aluma 2000 and Reid& Huq 2014). This knowledge can be in a range of sectors; agriculture (intercropping techniques, animal production, pest control, crop diversity, animal health care, and seed varieties), biology (botany, fish breeding techniques), human health care (traditional medicine and healing methods), the use and management of natural resources (soil conservation mechanisms, irrigation and other forms of management) education (oral traditions, local languages) and poverty alleviation in general. IK is a key element of the social capital of the poor and constitutes their main asset in their efforts to control their own lives (Gorjestani 2004). For these reasons, the potential contribution of IK to locally managed, sustainable and cost-effective survival strategies should be promoted in the development process. Indigenous knowledge has been a central feature for improving African agricultural productivity for centuries. The integration of indigenous knowledge systems has also allowed better results on farming activities in many developing countries. However, most farmers in developing countries are not only deprived from accessing global knowledge, but they also lack opportunities to share their own knowledge (Lwoga, 2011, Rankoana, 2016).

The horticulture sub-sector has grown significantly in the last decade, but by volume still represents a small part of the overall agricultural industry. Horticulture makes significant contribution to food security, nutrition improvements and economic growth (HODECT, 2010& Maroyi, 2012). The demand for vegetables produced with less agrichemical in Tanzania is increasing as the population increases, but production is low and post harvest losses are high. The government is seeking for ways to reduce post-harvest losses in an effort to achieve food security (Match Maker Associates 2017). Currently local communities are shifting from using local technical knowhow to modern technology in horticulture production as it is profitable through high production of agriculture products. The survival and well-being of communities in rural areas is predominantly dependent on utilizing local resources and knowledge for their livelihoods. Effective utilization of local knowledge and resources is influenced by technical knowhow. A study by Nawe and Hambati, (2014) noted that most of the modern technical solutions that have been implemented in agriculture to increase productivity in rural areas have not worked well because they did not take into account the local culture, particularly community preferences, skills and knowledge.

2. Methodology

2.1 Study Area and Justification

The study was carried out in Nyandira Village of Mgeta ward in Mvomero District in Morogoro Region. Nyandira village was chosen for two reasons. Firstly, a prior visit to the area indicated that 90 percent of residents depend on horticulture for their livelihoods. It was found therefore, very interesting to solicit information on the application of local knowledge on management of horticulture in this area. Secondly, local people use both local and scientific knowledge on management of horticulture. But, there is no study has been

done to show how the two types of knowledge complement each other in growing horticultural crops.

Nyandira village is located on the western slopes of the Uluguru Mountains and it is characterized by a mountainous and hilly terrain consisting of steep and deep valleys of slopes. The slopes range between 1100 and 1750 meters above sea level (Lie, 2011). The climate of the village is fairly cool, with temperatures ranging between 11 and 23°C (Lie, 2011). Dry seasons in Nyandira last for approximately four months, usually from June to September (Lie, 2011). More importantly, Uluguru Mountains in Nyandira village is the source of Mgeta River that flows towards Mgeta and further downstream joins the Ruvu which contributes to the water supply for Dar es Salaam originates.

Plate 1: Typical scenery in Nyandira village

The population of Nyandira village consists mainly of small holder farmers, and horticulture is the backbone of the economy. Due to favorable climate, production of vegetables goes on all year round. Vegetable produced are cabbage, arish potatoes, green peas, potatoes, beans, cauliflower and carrots. With the limited access to land and small plots, most farmers sustain a subsistence lifestyle complemented by small amounts of cash crops (Lie, 2011). Many farmers sell a small amount of surplus crop at the local market twice a week (Lie, 2011). Traders from outside the community from as far away as Dar Es Salaam comes to purchase produce after a market building managed by a market board was constructed in 2004 (Lie, 2011).

2.2 The Design of the Study

For the purpose of the study which sought to understand local knowledge used by smallholder farmers in management of horticultural crops. The study adapted phenomenology research design for achieve the intended goal. Phenomelogical studies are undertaken to obtain the overall picture of a phenomenon (i.e. local knowledge on horticulture). In the human sphere it normally translates into gathering 'deep' information and perceptions through inductive, qualitative methods such as interviews, discussions and participant observation, and representing it from the perspective of the research participant(s). In this study only qualitative data were gathered using qualitative methods and tools. Hence this study is built on qualitative approach.

2.3 Sampling size and sampling procedure

10 participants were selected purposively to be included in the study. Teddlie and Yu (2007) define purposive sampling as the process of selecting units such as individuals, institutions or groups of individuals to answer the research question. The selection of participants based on criterion that only those farmers were found engaging in vegetable farming for 5 years consecutively.

2.4 Methods of Data Collection

Primary data were collected in the field through in-depth interview, FGD and field observation. The methods solicited information on types of local knowledge on horticulture, applications of local knowledge on horticulture, sources of local knowledge on horticulture and ways/methods of obtaining it, the complementarity of scientific knowledge on local knowledge on horticultural crop management, and methods used to choose appropriate knowledge for horticultural crops production.

Plate 2: An interview with a farmer in Nyandira village

FGDs used to collect information on the application of local knowledge on management of horticultural farming. FGD is among the common methods of data collection used in qualitative research. There is no common agreement on the number of FGDs that are ideal for a study. The number of discussion groups ranged from 6 to over 50 groups depending on the study aims and available resources. In most cases, the majority of studies involve a few FGDs while others combine them with other methods (Kitzinger, 1995). In this study, six (6) FGDs comprising both male and female who engage in vegetable farming were formed. The discussion was recorded by the permission of participants.

Participants for FGDs were recruited with the assistance of village and ten cell leaders. For each group discussion, a maximum of 10 participants were recruited considering various socio-economic and demographic backgrounds. After the recruitment, the FGDs participants were contacted regarding the date, time and the venue of the discussion. Participants of the same age group for instance 18 - 35 formed one discussion group. Having participants of the same age group in one discussion group ensures homogeneity and encourages participants to talk freely (Krauss, 2005).

Plate 3: Participants in FGD in Nyandira village

The study further used direct observation method to collect data from the field. Direct observation enriched the information collected by the other research instruments. A checklist of elements to be observed was prepared. It consisted of aspects such as types of horticultural crops growing in the areas, local and scientific methods of growing horticultural crops in the fields, types of trees used for controlling and killing insects and weevils of horticultural crops and the likes. Any other issues relevant to the study that emerged which were not in the checklist were recorded. All observations were recorded in field notes instantly to avoid forgetting the information which was then followed by a detailed description.

2.5 Data Analysis

Data collected through in-depth interview and FGDs were analyzed using content analysis method. The process started by preparing and organizing the collected information before the initiation of actual data analysis process. A large part of this process involved transcribing the interviews from non-textual into textual formats. This process was performed in tandem with the: (i) translation of the information that was collected in *Kiswahili* into English; and, (ii) removal of all the identifiers from the data for the purpose of conserving the participants' anonymity. After the coding process was completed, researcher started to uncover the main themes. While building themes, the focus was mainly on searching for commonalities and frequencies of occurrence of various codes within the data set so that grouping and linking the related codes together could occur. With regard to the analysis of

information about application of local knowledge on horticulture, the process finally involved the interpretation of any emerged themes. The analyses provided the interpretations on the themes basing on the objective of the study. Then further the comparison of the study findings with information gleaned from the literature.

3. Results and Discussions

3.1 Types and applications of local knowledge on horticulture

We found limited current type of local knowledge in practice. Most of the local knowledge reported to have been replaced by scientific knowledge. The few reported type of local knowledge still in practice was:

(i) Manuring (manure from cattle, goats, sheep and chicken) for retaining soil fertility.
(ii) Burning grasses and the ashes are applied as fertilizers.
(iii) Composite manure and agricultural crop residues,
(iv) Planting legumes to retain soil fertility.
(v) Traditionally-constructed ridges crossing slopes. That is making mounds by collecting and heaping trash for planting horticultural crops.

Plate 4: Traditionally Prepared Ridges and planted Onion and Potatoes

(vi) The local farmers also have unique knowledge on techniques and skills for use and management of seeds vegetables. Traditionally, they used and still continue to develop local varieties of crops to suit their needs. For example, farmers use the mass selection to sort seeds for next season. Generally speaking, this is the knowledge that has been developed over time and handed down through many generations.

(vii) The use of traditional pesticides to control pest in the field. Farmers reported to use cast, 'kibebeni (local name)' and 'kidugutusungu (local name)' leaves to control pests in the field (See plate 3 below). Each type of tree is used independently, but they are applied to the same problems. The leaves of these trees are shattered and then they are put in bucket of water for two day (24 hours) or three days (36 hours). The solution resulted from this process is sprayed on leaves of cabbage to kill the pests known as 'buluba' (local name name). Also the solution can be applied to *Red Ant* which attacks the roots and stem of cabbage, cornflower, peas and beans.

Plate 5: Medicinal plants

(viii) For preservation of horticultural crops, for example, tomatoes from rotting. Farmers use traditional or local made fridge to protect tomatoes from being rotten.

Plate 5: Vegetable preservation fridge made locally

3.2 Sources of local knowledge on horticulture

We found that farmers create new knowledge through socialization processes such as face-to face interactions, group interactions, and cultural roles such as apprenticeships, initiation rites during adolescent age, and age-set systems. Lwoga (undated) reported that tacit knowledge regarding farming activities is largely preserved in human minds (i.e. people's minds) and local practices. Largely, it is preserved in the memories of elders (such as, parents), who are consulted whenever farmers have a problem. It is also preserved in songs, written formats, carvings and still pictures. More generally speaking, we found that the farming local knowledge is mainly acquired through local sources such as family or parents, neighbours, friends, personal experience, social group gatherings, demonstration and observation, and farmer groups.

3.3 Complement of scientific knowledge on local knowledge on horticultural crop management

Recently, scientific storage systems have been considered as major tools that complementing local knowledge in horticultural farming. For many years, farmers have been using their local knowledge to maintain soil fertility, for example, Planting legumes, agricultural crop residues, and manuring (manure from cattle, goats, sheep and chicken), and traditional constructed ridges. Recently, scientific knowledge has emerged to complementing these methods of soil fertility maintenance. Farmers are now applying inorganic fertilizers as the new methods of maintain soil fertility. Many horticultural farmers are now applying inorganic fertilizers, for example, phosphoric fertilizers to maintain soil fertility and increase productivity.

Similarly, farmers have been applying their own local knowledge in controlling pest and disease. These include spraying solutions made from 'utupa', 'kibebeni' and 'kidugutusungu' trees to control pests. But because of globalization which is shrinking the world, many of these farmers have started to apply scientific knowledge, for example, the application of pesticides to control diseases and kill pests. Therefore, pesticides are now complementing the local knowledge in controlling and pests and diseases. There have also new seeds of vegetables which are replacing the local seeds.

3.4 Effectiveness of local knowledge on managing horticultural crops compared to scientific knowledge

Application of agriculture pesticides as mentioned to have caused the increase of pests in the area. One participant during FGD was quoted saying:

In the past, pests were few, but after starting applying agrichemical pesticides, there has been an increase in pests in such a way that we are linking agrichemical pesticides as are major sources of these pests. We think pesticides attract pests. Farmer in Nyandira village

Local solutions from tree leaves of 'cast ', 'kibebeni' and 'kidugutusungu' (both two in local names) were reported to be effective in controlling and killing pests compared to pesticides. However, availability of these trees is now limited. Population increase which increasing the demand of food has necessitated to expand the areas for cultivation. Expansion of land for cultivation has resulted into deforestation, hence scarcity of these trees. On other hand framers due to limited availability of local knowledge they are switching to the use of scientific knowledge which on their case is much harmful compare to their indigenous knowledge. Local knowledge is now disappearing due limited storage and increased invention of science and technology together with the impact of globalization in rural areas.

4. Conclusion and Recommendation

4.1 Conclusion

The study conclusion was that local community are still using local knowledge in horticulture production in making ridges, treatment and killing pests and preserving their post harvest crops. The source of indigenous were through socialization processes such as face-to face interactions, group interactions, and cultural roles such as apprenticeships, initiation rites during adolescent age, and age-set systems and new knowledge are being complement by indigenous for sustainable agriculture development in the study area.

4.2 Recommendation

The study findings see the importance of combining both scientific knowledge and indigenous knowledge as it supplements each other in horticulture production. The Agriculture stakeholders should not ignore the indigenous knowledge as it as to do with local community culture and knowledge hence by ignoring it may lead to poor production and reduce innovation in horticulture production

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