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The Role of University in the Agricultural Advisory Framework in Tanzania

Esther A. Gabagambi Wu Jin
College of Humanities and Development Studies (COHD), China Agricultural University (CAU)
Corresponding author: Prof. Wu Jin

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Abstract
This Paper presents findings on the advisory role of universities in the agricultural extension system in Tanzania based on the literatures and household survey findings conducted in the Eastern Tanzania within 8 villages. The paper seeks to give highlights on the possible cause of disconnect based on the perceptions of farmers, extension workers and researchers in the country. The objective of the paper was to dissect the institutional framework of the agricultural advisory system in Tanzania and explain the interface of the key actors in the system by analyzing the extension services provision in Tanzania; Analyzing the role played by Sokoine university to the agricultural community; and assessing the impact of university extension services on community livelihood, and finally recommend on how to improve extension service delivery using the agricultural universities. The research used cross sectional design and participant observation technique. Data collected through household survey from a randomly selected sample of farmers in randomly selected villages which SUA and China Agriculture Universities were implementing dissemination of production technologies. Findings revealed that the extension system in Tanzania is to larger extent dominated by the public extension service providers than private providers, the role of university in extension services is vivid with significant impact to the agricultural communities' livelihood. SUA had played some important roles which impacted on the agricultural crop production, income and communities livelihood. Hence recommend for support of the universities as well as increasing the pubic private partnerships in extension service provision in order to make the extension system be effective and efficient for increased production, productivity, food security and improved community livelihood.
Keywords: Extension System; Advisory Role of University, Agricultural Advisory System.

1.0 Introduction

Extension can be defined as the entire set of organizations that support and facilitate people engaged in agricultural production to solve problems and to obtain information, skills, and technologies to improve their livelihoods and well-being (Birner, *et. al*. 2006). Typically, the operational framework of an extension system involves three pillars. On the one extreme there is a knowledge source comprised of researchers whereas on the other extreme there are users of the technology comprised of farming communities seeking knowledge to address numerous challenges on the farm such as pest control, improved seeds, irrigation facilities, access to market, innovations, etc. Between the two pillars is an agent who is supposed to transfer technology from the former to the latter. For countries that have transformed agriculture the synergy between the three pillars is strong. However, in Tanzania there seems to be a weak linkage between the three components. Apparently, each pillar is operating independently at the expense of agricultural performance. This paper seeks to give highlights on the possible cause of the disconnect based on the perceptions of farmers, extension workers and researchers in the country. Thus, the objective of this paper is to dissect the institutional framework of the agricultural advisory system in Tanzania and explain the interface of the key actors in the system. Specifically the paper intended: to analyze the extension services provision in Tanzania using the available literatures; to analyze the role played by Sokoine University to the agricultural community; to assess the impact of university extension services on community livelihood, and finally recommend on how to improve extension service delivery using the agricultural universities

2.0 Approach and Methodology

This is an anthropological study that dwelt on ethnographic principles. It provides a detailed, in-depth description of everyday life and practice of people being studied. Clifford Geertz in his writing on the idea of an interpretive theory of culture in 1973 refers to this kind of approach as "thick description" that attempts to explain how the issues represent "webs of meaning"; the cultural constructions, in which people live. Understanding was developed through close exploration of several sources of data. Using these data sources as a foundation, cultural frame of analysis was undertaken. The researcher had long-term engagement with participants and observed interactions among them. She became a participant in the life of the people while also maintaining the stance of an observer. This was undertaken from October 2017 to April 2018 through interaction with farmers in Morogoro region, extension workers in the same area and researchers at Sokoine University of Agriculture. Moreover desk research and household survey were conducted. A sample of 240 households was

randomly selected for an interview using semi structured questionnaire. Data collected was coded, entered and analysed using the SPSS computer program after which results were organized into means, and frequency distribution.

3.0 Results and Discussion

3.1 Extension services provision in Tanzania using the available literatures

3.1.1 Agricultural Extension in Context

The term extension was first used to describe adult education programs organized by Oxford and Cambridge universities in England starting in 1867; these educational programs helped extend the work of universities beyond the campus and into the neighboring communities. This term was later formally adopted in the United States in conjunction with the land grant universities that were originally established as teaching institutions during the 1860s. Research activities were added in 1887, and extension activities were started in the 1890s and then formally added in 1914 as part of each university's official mandate (Swanson and Rajalahti, 2010).

In most developing countries, the terminology used to establish public agricultural extension or advisory institutions was commonly recommended by the donor agency that helped create these public agricultural extension or advisory systems. For example, the U.S. Agency for International Development (USAID) played an active role in establishing agricultural universities as well as research and extension systems in many developing countries during the 1960s and 1970s; therefore, many of these public agricultural extension systems still carry the "extension" title. On the other hand, most ministries of agriculture, worldwide, administer their public extension systems; therefore, an increasing number of countries, especially in Sub-Saharan Africa, now use the term advisory service (Jones and Garforth, 1997). During the second half of the twentieth century, the primary agricultural development goal of most developing countries was national food security. Due in large part to the Green Revolution and public extension's focus on technology transfer, many nations actually achieved national food security by the end of the twentieth century. As a result, government support for both agricultural research and extension institutions began to decline, with a direct long-term impact on agricultural productivity growth. These trends have had a negative impact on many small-scale men and women farmers, especially in many Sub-Saharan African countries (Swanson and Rajalahti, 2010).

There are many definitions, philosophies, and approaches to agricultural extension, and the views of what extension is all about have changed over time. Extension is conceived as a service to "extend" research-based knowledge to the rural sector to improve the lives of farmers. It thus include components of technology transfer, broader rural development goals, management skills, and non-formal education. The traditional view of extension particularly in Africa is very much focused on transferring technology for the purpose of increasing production and improving yields (Davis, 2008).

3.1.2 The Pillars of Agricultural Extension System

The agricultural extension system has three pillars namely research, extension and agricultural higher education referred to as the agricultural knowledge triangle (Eicher, 2001). He suggests that since the three pillars involve complementary investments they should be planned and sequenced as a system rather than as separate entities. Linking the triangle's institutions with their common clientele, namely the farmers, and with each other, also requires systematic planning (Figure 1).

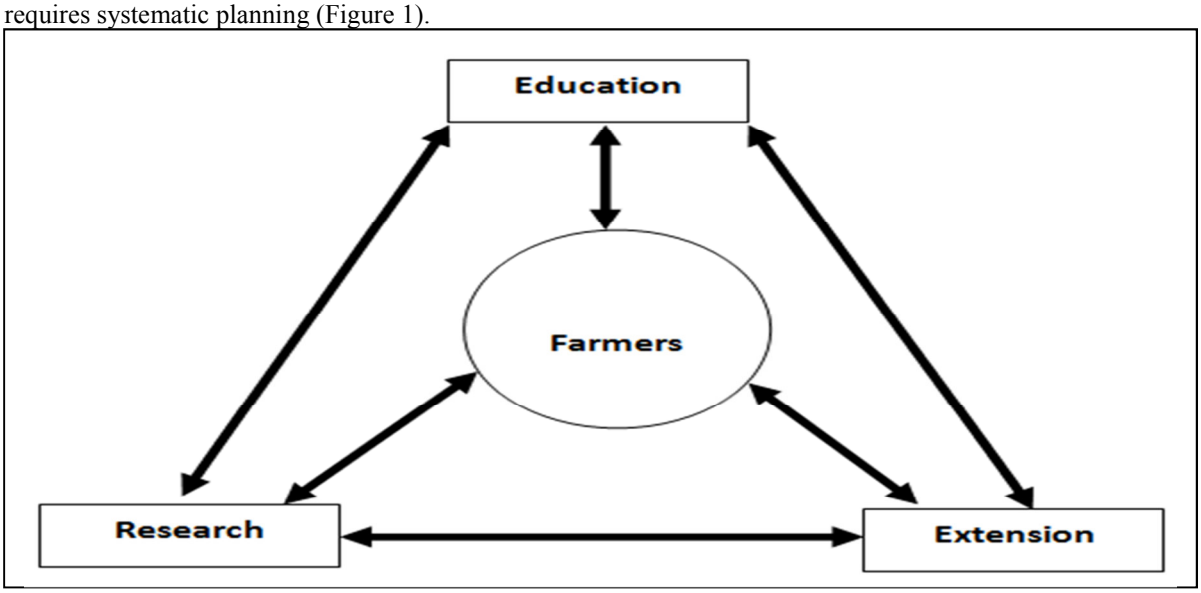

Figure 1: Agricultural extension as part of agricultural knowledge system
Source: Adopted from Eicher (2001)

It could be noted that optimally, agricultural information systems for rural development should link people and institutions to promote learning and to generate, shared and used agriculture - related technology, knowledge and information. According to FAO (2000) the system integrates farmers, agricultural educators, researchers and extensionists, enabling them to harness knowledge and information from various sources to improve farming and livelihoods. In principle, agricultural extension receives relevant information from the agricultural education system and feeds backfield observations to this system. Rivera *et al.* (2001) further state that extension is also professionally linked to the agricultural vocational and higher education systems in the sense that these systems also produce the agents who work in extension.

In addition, the relationship between agricultural extension and agricultural research is even closer, because the knowledge that agricultural extension transfers is usually generated by agricultural research through applied and adaptive agricultural research development. Whilst there could be a tendency within the agricultural sector to see the only purpose of agricultural extension as that of disseminating information to raise the production and profitability of the farmers (agricultural production performance), a broader interpretation sees its purpose as the advancement of the whole range of agricultural development tasks, such as credit, supplies, marketing and markets (agricultural process development). In the broadest interpretation, therefore, agricultural extension provides non-formal – agriculturally related continuing adult education - for multiple audiences: farmers, spouses, youth, community, urban horticulturalists (continuing agricultural education and community development) and for various purposes (including agricultural development, community resource development, group promotion and cooperative organizational development) (Rivera, Qamar and Crowder, 2001).

Terblanché (2008), citing Düvel (2002) and the Department of Agriculture (2005), writes that extension officials identifies and prioritizes the following principles underlying an effective extension approach: participation (empowerment, ownership, inclusivity); Needs based (balance between felt and unfelt needs); valuation/accountability; programmed (goal driven); institutional mobilization and organization; sustainability; behaviour change focus; priority approach; coordination/constructive involvement of all role player (forming of linkages); technical support; and equity.

3.1.1 Cross-country Experience on Agricultural Extension Services

Agricultural extension which formerly referred exclusively to the public sector is now used to include all extension-type services provided by public, private and non-governmental programs. Agricultural extension lost momentum in the 1990s after the World Bank pulled back from the Training and Visit (T&V) Management System (Anderson, Feder and Ganguly, 2006). During the termination of T&V development, extension went adrift. With political pressures to withdraw or downsize services such as extension, several developed countries began to privatize their public sector extension systems, for instance, the Netherlands, New Zealand, The United Kingdom, and Denmark, along with several middle-income regions and countries – e.g., Brandenberg in Germany, Chile, Ecuador, Estonia, and South Africa (Rivera & Alex, 2005). It soon became apparent that agricultural extension was becoming a 'frontrunner' (Rivera, 1999) in government efforts at public sector service reform. In the developing countries of sub-Saharan Africa, reforms affecting extension have been initiated for various purposes: to decentralize government extension services (as in Ghana), to promote demand-led projects (as in Kenya), to institute cost recovery programs (as in Nigeria), and to privatize extension (as in Uganda) (Rivera, 2008).

Forms of agricultural extension services have operated in both Eastern and Western Europe since the middle of the 19th century. In the UK the term university extension was commonly used in the 1840s (Mosher, 1976) and Cambridge University formally adopted a system for the establishment of extension centers in 1873 (Van den Ban & Hawkins, 1988). In Bulgaria the first agricultural schools were founded in 1883 and the Croatian/Slavonian Agricultural Society established eight regional extension services in 1842/43 (Zimbrek, 1997, as cited in Brent, 1999).

Extension, according to Swanson (2006), needs to shift some of its focus from food security to increasing farm income and rural employment. He also maintains that for market-driven extension systems to be effective, decision-making must be decentralized. For a decentralized extension system to be effective there must be formal stakeholder involvement in decision-making to increase accountability (Swanson, 2006). Public extension systems all over the world are being challenged to improve their relevance and effectiveness in contributing to agricultural and rural livelihood sustainability in an environment of increasing economic, social and ecological risk (Beck, 1992; Funtowitz and Ravetz, 1993). Rwamigisa and Birner (2011) tie the challenges facing agricultural extension to lack of an efficient farmer-extension-research-linkage giving an example of Uganda. However, in some countries such linkage works properly. For example, the university-based National Agriculture, Livestock and Forestry Research Institute (INIFAP) in Mexico has been instrumental in the promoting research–extension linkages at national level (Agbamu, 2000) and (Ban, 2000).

China provides a unique case in which extension system has been successful. There are many studies in China that try to understand how effective its extension system has been. For example Stavis (1978), showed that by merging the extension system with research system, ensured that research focused on the practical problems

of the day by using science to diagnose and remedy the said problems. Stavis further added that this has created unique techniques for enhancing productivity. However, a solution for ineffective extension system according to Mei, is to improve farmers' decision making ability and participation in extension activities. Bao *et al*. (2012) using an econometric analysis, demonstrated that government extension services have minimal effect on the incomes from farming received by water-melon farming households in rural Nanjing. The study stresses that the agricultural cooperative system has contributed immensely in the improvement of these farmers' economic statuses in China. Hu *et al*. (2012) show that, the inclusive reform initiatives that China undertook in the 1990's, significantly improved farmers' access to extension services and technology usage.

There has also been discussion on which extension services is more efficient: public or private sector? David Hulme (1983), provided the Papua New Guinea case which showed that privatizing extension services can boost productivity, but may fail in achieving the wider goal of rural development. In the Indian case, Sulaiman *et al.* (2005) showed that private extension services have been able to develop a more sustainable and lucrative business in extension systems, which superseded production technology to include markets and linkages. This was possible because farmers were willing to pay for the delivery of quality inputs, credit, field based advice, technology, procurement services etc. This case study points to some policy implications. For example, private extension services can be a viable alternative for medium and large scale farmers, but such system can be discriminatory against the poorer farmers in such system. In the Kenyan case, Gilbert et al used a random sample of 110 small scale farmers through descriptive and inferential and descriptive statistics to show that both private and public extension services were insignificant in terms of improving helpfulness of out growers' credit system. The study went on further show that there was no significant difference between the commercial and state operated extension services.

Similarly, the Jordan case by Ali-Sharafat *et al*. (2012) showed the Jordanian experience with extension services and net profit. This simple random study showed that the net profit of those who received extension services were no different from those who did not receive extension services. The scholarship on the effectiveness of extension services also explores this from a gendered perspective. For example, in the Nigerian perspective, Ogundiran (2013), a simple random sample technique was used to show that agricultural extension services are not planned along gendered lines when packages are being given out. The study went to state that for extension services to be useful to women in this studied area, it needs to address women directly as an important clientele , it needs to have more female contact officers, more female friendly technology, and more training of existing extension officers with the requisite methodology to reach local female farmers.

3.1.2 Agricultural Extension Services in Tanzania

Like in other countries, agricultural extension services in Tanzania have mostly been provided and financed by the public sector, however, the landscape is changing with regard to the provision of extension services in the country. Observations reveal that several non-governmental organizations (NGOs) and farmer-led initiatives have, over time, supplemented extension service delivery of the public extension services with cost-sharing, but these experiences have not been formally integrated into the extension system nor has their potential to reduce public expenditure and improve quality of extension service been considered. As the government continues to face financial difficulties, it has started to reconsider the issue of public extension service and is currently entertaining the possibilities of gradually divesting the public sector of extension, leaving the private sector and users to take an increasing responsibility (Rutatora and Mattee, 2001). In this framework universities are involved tangentially in the extension services provision in the country.

3.2 The Role Played by Sokoine University to the Agricultural Community

3.2.1Various studies on roles of agricultural university in Tanzania extension System

The role of an agricultural university was clearly explained by Julius Nyerere, the first President of the United Republic of Tanzania in 1984 when he was inaugurating Sokoine University of Agriculture. He pointed out that major purpose of an agricultural university is the development and transmission of skills and practical expertise at highest level. The skills and expertise required are all those necessary and useful for the transformation of rural areas in terms of agricultural development and increased production.

3.3.2.Role of SUA in the Extension System in Tanzania

Agriculture sector involves number of players like the universities into education and research, State and Central Government in extension, with core work of research and delivering of agricultural innovation technology knowledge at field in collaboration with the NGOs in implementing programs for farmers (Raj and Bhattacharjee, 2017). Agricultural Extension System no longer means delivery of new technology to farmers, but it has much more responsibility by talking about climate change, conservation of resources, protection of environment, new technologies for better yields, value addition and others which could make sustainable crop production (Raj and Bhattacharjee, 2017). Thus information on technologies for soil and water management, farm credit, crop markets are of vital importance to the farmers in order to improve farm productivity. This is due to the fact that, good management of water and soil resources will help farmers to cut costs while maintaining or improving the

productivity of the land (SAI, 2010; Raj and Bhattacharjee, 2017). Hence lack the motivation to adopt other productivity enhancing inputs such as fertilizers, high yielding varieties, and herbicides cannot guarantee the sustainable food security and poverty reduction among the households (Namara *et al.*, 2007).

For sustainable farm productivity and better living, SUA and other organizations do work for farmers including private players and public institutions who work with synergy in effective innovation systems; because innovation requires knowledge from multiple sources, including users of that knowledge; and that, it involves these different sources of knowledge interacting with each other in order to share and combine ideas (Hall, 2007; Raj and Bhattacharjee, 2017). Among the public institutions known as the agricultural universities is the Sokoine University of Agriculture (SUA). Being the leading agricultural university in Tanzania, SUA has recorded several achievements in training, research and outreach. Key strengths with respect to outreach include availability of content, innovations and technologies generated by the university, presence of competent and experienced personnel, presence of basic conference facilities and services, existence of broadcast media, and strategic geographical location of the University which provides easy access to most regions (SUA, 2017). Other strengths include availability of transport services, existence of campuses and outreach centers in different regions, presence of formal and informal collaborators and partners country-wide, and availability of institutional frameworks that support outreach activities (SUA, 2017).

Available opportunities include great demand of SUA's innovations and technologies by wide range of stakeholders' country-wide, increasing demand for up-scaling and out-scaling research findings and proven technologies as well as opportunities provided by technological advancements such as ICTs and electrification in repackaging and sharing information. Most research outputs available at the University are stored in shelves and computers (SUA, 2017), Thus from shelves and computers various technologies developed by the university are disseminated to the farming communities so that they can be made available to farmers to become aware of the innovation technologies. Despite of this effort SUA (2017) reported that majority of the stakeholders are unaware of their existence. That is to say, although abundant knowledge, innovations and technologies have been produced at SUA, very little of these have reached relevant stakeholders outside the University. Consequently, and SUA has not been able to fully contribute to the country-wide gap that exists between research and practice which results to low productivity (SUA, 2017). This lead to a need for institutional change through formulation of Outreach Policy in order to enhance implementation of outreach activities and contribute to the attainment of the National Five Year Development Plan (FYDP II) (2016/17- 2020/21) and other policies and strategies including the National Agriculture Policy (2013) and the National Agricultural Sector Development Strategy II (ASDS II) (2015/16- 2024/25). Thus, this is paramount to improving productivity, incomes and living standards among the farming communities adopting the same technological innovations disseminated by the university through its outreach program in collaboration with other stakeholders like China agricultural university and government extension agents and other NGOs working with farmers in agricultural communities.

In order more about the role of an agricultural university in research and innovation system within the country, this study analyzed farmers' awareness of the agricultural innovation technologies disseminated by SUA, sources for agricultural innovation technologies disseminated and their adoption rates among the farmers across farmer categories as described in subsequent subsections.

3.1.2.1 Awareness of the various agricultural innovation technologies among farmers

This subsection describes various technologies identified be used in the study area following their dissemination. Thus through assessing the awareness/knowledge possession by the farmer for particular crop production technology from both formal and informal sources, The formal sources of learned technologies include government extension staff, NGOs, researchers, University staff, and others whereas; informal sources include relatives, parents, friends and the like.

Findings presented in Table 13 revealed that farmers were aware of the technologies which were disseminated within study area through various stakeholders. The most technology by many of the farmers (47.5%) to have been aware of is intercropping technology while the least (5.8%) reported was technology use of green/compost manure or incorporating crop residues. The second most reported by many (43.3%) was soil and water conservation technology, followed by improved plant planting technology which was reported by 32.9% that they were aware of it. Other technologies with percentages of awareness by the farmers are as shown in Table 13. Since awareness among farmers of the agricultural innovation technologies is lower than 50.0%, it signifies the need for mass campaign on the importance and use of respective technologies for taping the benefits associated with use of the technologies on the crop farms.

Table 1: Awareness of various agricultural innovation technologies among farmers

Technology	Frequency	Percent (%)
Crop rotation	60	25.0
Intercropping	114	47.5
Intercropping with N-fixing crops	41	17.1
Fallowing	52	22.7
Improved fallowing	19	7.9
Animal manure	20	8.3
Zero/minimum tillage	16	6.7
Green manure or compost manure	14	5.8
Chemical fertilizers	25	10.4
Soil and water conservation	104	43.3
Improved plant planting	79	32.9
irrigation	11	4.6

3.1.2.2 Learning sources for agricultural innovation technologies disseminated to farmers

Various agricultural innovation technologies identified are those technologies which aimed at improving soil fertility, and crop production. These included crop rotation, intercropping, intercropping with nitrogen fixing crops, fallowing, improved fallowing, animal manure, zero/minimum tillage, green/compost manure, chemical fertilizers, soil and water conservation, improved planting and irrigation. Findings (Table 14) revealed that, farmers learning sources for the technologies were not limited to informal sources such as friends, family members and neighbors, but also involved local and international formal sources. Local formal sources included government extension agent, Agricultural University (e.g. SUA), input suppliers, and media such as televisions, radio and newspapers; whereas international formal learning sources was provided by China lead project and NGO like Care international (Table 14). The importance of Agricultural universities and NGO in technology development and dissemination was also explained in Raj and Bhattacharjee (2017) that they are among the agricultural sector development key players through research and technology development and extension of the technologies to the farmer fields while collaborating with implementing agents such as the NGOs.

Table 2: Sources of the knowledge learning for the technology to the farmer

Technology	Informal sources		Formal sources					
	PFM	FRN	GEX	UNV	CHP	NGC	TRN	ISU
Crop rotation	6.7	2.1	11.2	1.2	0.0	3.3	0.4	0.0
Intercropping	12.5	6.2	16.7	4.6	0.0	0.0	0.0	1.0
Intercropping with N-fixing crops	2.1	0.0	9.2	2.1	0.8	2.9	0.0	0.0
Fallowing	4.6	1.7	8.8	0.0	0.0	6.2	0.0	0.0
Improved fallowing	1.2	0.0	1.2	0.8	0.0	4.6	0.0	0.0
Animal manure	5.8	0.4	0.0	0.0	0.0	2.1	0.0	0.0
Zero/minimum tillage	2.1	0.0	0.8	0.0	0.0	2.9	0.0	0.0
Green manure or compost manure	1.7	1.2	0.0	0.0	0.0	2.9	0.0	0.0
Chemical fertilizers	1.2	5.0	0.0	0.0	0.0	0.8	0.0	0.0
Soil water and soil conservation	11.7	4.6	17.1	2.5	0.0	7.5	0.0	0.0
Improved plant planting	1.7	1.7	17.9	2.9	0.8	7.1	0.8	0.0
irrigation	0.4	2.1	1.2	0.0	0.0	0.0	0.0	0.8

Key: PFM= Parents/family members; FRN= Friends /neighbours; GEX= Government extension agent; UNV= University; CHP= China project; NGC= NGO e.g. Care; TRN= TV, radio &newspaper; ISU= Input suppliers

Findings presented in figure 5 revealed that there were differences in the sources of technology learning depending on particular technology. For example majority (29.5%) of the respondents reported that, improved plant planting emanated from formal sources of learning against very few (3.4%) of them whole reported that the same technology was provided to farmers through informal learning sources. Formal learning sources have also been found to be higher than informal learning sources in the dissemination of soil and water conservation, intercropping, crop rotation, intercropping with Nitrogen fixing crops, and fallowing.

Findings (Fig. 5) revealed that 27.1%, 22.3%, 16.1%, 15.0% and 15.0% of the farmers depended on the formal sources for soil and water conservation, intercropping, intercropping with N-fixing crops and fallowing respectively against 16.3%, 18.7%, 8.8%, 2.1% and 6.3% for the same technologies whose learning sources were from informal sources. Though the formal learning sources for various technologies had been far ahead of informal sources in majority of the technologies disseminated, findings revealed that very few (0.8%) of the farmers in the study area had reported to have received training on chemical fertilizer from the formal sources of learning. This implies that use of chemical fertilizers in the rural agricultural communities is very minimal may be due to reluctance of farmers to change or due to less information or education on the importance of chemical fertilizers or due to lack of enough financial capacities among smallholder farmers to afford their purchase

following increasing industrial input prices.

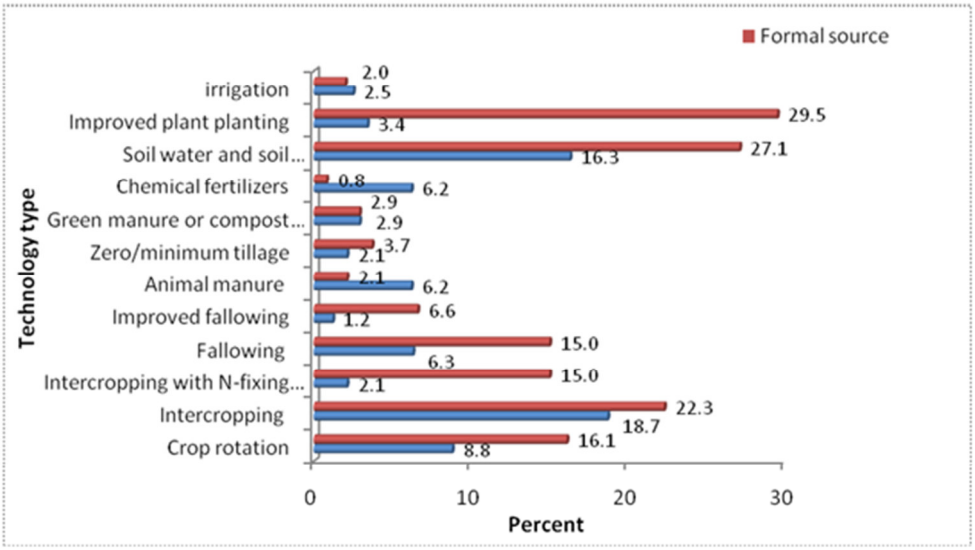

Fig. Formal and informal learning sources of the agricultural innovation technologies

3.2 The Impact of University Extension Services on Community Livelihood,

Relevance of the technological package to the farmers was conceptualized to have been the result of its impact from on knowledge gained, applicability, and its impact on crop production and productivity. Hence it was imperative to analyse the knowledge gap, practicing and production level differences between two farmer categories (beneficiaries ie demo farmer versus non beneficiaries ie the non-demo farmers) using the primary data from the household interviews.

3.2.1 Observed differences between farmer categories

University interventions in the rural farming communities had some impacts on the level of production, extension access and household food security among farmers who were engaged in the project run by the agricultural university. Findings presented in Table 1 revealed that many (53.7%) farmers who were participants of the demo activities were more food secured than those who were not project beneficiaries and the differences were significant at $\alpha = 0.05$. This implies that participation in the project demonstrations imparted some knowledge on better technologies for food crops production which increased the levels of production above those who were not beneficiary of the project.

Table 3: food shortage by farmer category

Is food shortage a chronic problem to your household		Category of Farmer		Total
		Demo farmer	None-Demo farmer	
Yes	Count	7	11	18
	% within household food shortages	38.9%	61.1%	100.0%
	% of Total	4.5%	7.1%	11.7%
No	Count	73	63	136
	% within household food shortages	53.7%	46.3%	100.0%
	% of Total	47.4%	40.9%	88.3%
Total	Count	80	74	154
	% within household food shortages	51.9%	48.1%	100.0%
	% of Total	51.9%	48.1%	100.0%

Chi square=1.393; p=0.238

Food shortage is among the problems facing majority of the households especially during of season some months after harvesting as it was reported by the key informants and the focused group discussion participants. The analysis results presented in Table 2 indicate that there were significant differences ($p<0.05$) between the demo and non-demo farmers in food shortage coping mechanisms. For example many (55.7%) of the demo farmer category were able to purchase food stuffs during food shortage, while 62.5% of the on demo farmer relied upon the Support from relatives. Further findings revealed that majority (75%) of those non demo farmers relied on selling own labour by working for food in other people's farm. This implies that with access to extension services provided by agricultural universities in the study area improved production, increased farmers access to various technologies and entrepreneurial skills which added to their household income and thus reduced working for food on other people's farms.

Table 4: Household food coping strategies by farmer category

How did your household cope with food shortage?		Farmer category		Total
		Demo farmer	None-Demo farmer	
Bought	Count	59	47	106
	% within Copping strategy	55.7%	44.3%	100.0%
Support from relatives	Count	6	10	16
	% within Copping strategy	37.5%	62.5%	100.0%
worked for food	Count	3	9	12
	% within Copping strategy	25.0%	75.0%	100.0%

Chi square= 10.740; p=0.030

3.2.1.1 Production of cash crops, quantity produced and production technology use by farmer category

University outreach in dissemination of extension services to farmers were thought to have contributed to production of important cash crops to the farming households through application of innovative technologies which could increase the level of production upon farmers having the knowledge and practice the same on their farms. Findings presented in Table 3 show that majority (73.8%) of the demo farmers acquired the technologies related to production of sunflower and grow the cash crop, while only 26.2% of the non demo farmers grow the same cash crop, and the difference was statistically significant ($p<0.05$). This implies that with project implementation farmers who participated in the project adopted the commodity crops extended to them.

Table 5: Sunflower production by farmer category

Did you grow Sunflower		Category of Farmer		Total
		Demo farmer	None-Demo farmer	
Yes	Count	31	11	42
	% within sunflower growing	73.8%	26.2%	100.0%
No	Count	84	114	198
	% within sunflower growing	42.4%	57.6%	100.0%

Chi square= 13.676; p=0.000

The Chi-square test results (Table 4) revealed there were significant differences between the quantity of sunflower produced across farmer category at $p<0.05$. Farmers who were project beneficiaries produced more of the crop output than otherwise. For example about 92.3% of the project beneficiaries were able to produce demo above 232 kg of sunflower compared to only 7.7% of the non-beneficiaries who reached the same quantity of sunflower output. This implies that the technologies which the university promoted in the farming community were more effective than those which farmers used to grow the same crops on their farm fields.

Table 6: Quantity of sunflower produced across farmer category

Quantity of sunflower produced		Category of Farmer		Total
		Demo farmer	None-Demo farmer	
below 101 kg	Count	4	3	7
	% within Quantity of sunflower produced	57.1%	42.9%	100.0%
101-166 kg	Count	0	6	6
	% within Quantity of sunflower produced	0.0%	100.0%	100.0%
167-232 kg	Count	3	0	3
	% within Quantity of sunflower produced	100.0%	0.0%	100.0%
above 232 kg	Count	24	2	26
	% within Quantity of sunflower produced	92.3%	7.7%	100.0%

Chi square= 23.582; p=0.000

Production of the crops increased because of various reasons one of which was the knowledge and practicing of the innovative technological innovations disseminated on the farmer fields. Findings presented in Table 5 indicate that there were significant knowledge and practical gap between the farmers the two farmer categories. About 60.0% of the non-demo reported not having knowledge and not even been able to practice crop rotation. However, about 71.7% of the demo farmer reported to have had the knowledge on crop rotation and also had been practicing the same technology on their farms. This implies that University technologies empowered farmers to practical performance of the production technologies promoted.

Table 7: Knowledge and capacity to practice technologies

Do you have knowledge and practice crop rotation		Category of Farmer		Total
		Demo farmer	None-Demo farmer	
No	Count	72	108	180
	% within knowledge and practicing	40.0%	60.0%	100.0%
Yes	Count	43	17	60
	% within knowledge and practicing	71.7%	28.3%	100.0%

Chi square=18.081; p=0.000

Similar findings on knowledge gap were also observed in the issue of use of intercropping. Findings revealed that many (62.3%) of the demo farmers understood and practiced intercropping on their farms compared to 65.1% of the non-demo farmers who did not understood and practice the same technology. Findings revealed that the differences were statistically significant at $p<0.05$ level of significant (Table 6).

Table 8: Intercropping knowledge and practising

Do you have enough knowledge and practice Intercropping		Category of Farmer		Total
		Demo farmer	None-Demo farmer	
Yes	Count	71	43	114
	% within knowledge and practice of Intercropping	62.3%	37.7%	100.0%
No	Count	44	82	126
	% within knowledge and practice of Intercropping	34.9%	65.1%	100.0%

Chi square= 17.952; p= 0.000

Practicing and knowledge base on particular technology was conceptualized to be emanating from extension services access by the farmer through extension staff visit. Thus, findings presented by Table 7, indicated that there were significant differences in the access to extension services between the two farmer categories at $p<0.05$ level of significance. About 78.1% of the demo farmers reported to have received the extension services in comparison to 86.6% of non-demo farmers who reported that they did not have access to extension services. This implies that there were crop production differences between the two groups. Thus shows the important role played by agricultural universities in extension services.

Table 9: Extension services access

Did you get service from extension agents/officers?		Category of Farmer		Total
		Demo farmer	None-Demo farmer	
Yes	Count	100	28	128
	% within receiving extension services	78.1%	21.9%	100.0%
No	Count	15	97	112
	% within receiving extension services	13.4%	86.6%	100.0%

Chi square= 100.3; p= 0.000

3.2.1.2 Asset owned, electricity use and quality of the house owned by farmer category

Study findings (Table 7) revealed that asset ownership and quality of house owned by farmers in agricultural communities within study area were significantly related to farmer categories (project beneficiaries versus non project beneficiaries). For example among 115 demo farmer category, 70.4% of them reported to have owned bicycles versus 46.4% of 125 non demo farmer category who reported to have owned the same asset. The Chi square test results indicated that the difference was significant (Chi Square =14.196; p=0.000). similar findings were also observed with mobile phone ownership where it was found that majority (85.2%) of 115 demo farmers owned the asset while only 71.2% of the 125 non demo farmer owned the same asset and the difference was statistically significant at $p<0.05$ level of significance. Though mobile phone and bicycle ownership among farmer categories was significant, yet sofa coach and radio ownerships were not statistically different (Table 7).

The quality attribute of the household was also observed in terms of whether they used electricity and household house quality (nature of material the door and window. From the table results in Table 7, findings revealed that use of electricity by the households was significantly related to farmer category (X^2 =11.754; p=0.001). When comparing the two categories demo farmer and non-demo, findings show that many (52.2%) of 115 demo farmer category were using electricity vis-à-vis the 30.4% of 125 non demo farmer categories. This implies that farmers who participated in agricultural innovation interventions which were extended by the University and other stakeholders were better off than their counterparts in terms of access and use of the electricity at their household levels. This could be due to improved levels of agricultural production among themselves as the result of adopting various agricultural production technologies promoted within their areas.

Similar differences were observed in the quality of houses between the demo and non-demo farmer categories especially nature of door and window materials, and nature of the house floor in which findings revealed that, the difference was statistically significant at $p<0.05$ (Table 7). While in the two above house qualities differences were significant, house qualities such as roofing material used and wall materials the differences were not significant at $p<0.05$ (Table 7).

Table 10: Asset ownership and quality of the house owned across farmer category

Asset type owned by farmer, electricity use and house quality	Farmer category by assets owned	
	Demo farmer (%)	Non demo farmer (%)
Bicycle (Chi Square (X^2)=14.196; p=0.000)	n=115	n=125
Yes	70.40	46.40
No	29.60	53.60
Mobile phone (X^2 =6.840; p=0.009)	n=115	n=125
Yes	85.20	71.20
No	14.80	28.80
Radio (X^2 =1.386; p=0.239)	n=115	n=115
Yes	75.70	68.70
No	24.30	31.30
Sofa coach (X^2 =0.647; p=0.421)	n=30	n=19
Yes	96.7	100.0
No	3.3	0.0
Household electricity use (11.754; p=0.001)	n=115	n=125
Have electricity and do use it	52.20	30.40
Do not have and do not use	47.80	69.60
Household's house qualities		
i. Door and window material (X^2 =3.856; p=0.041)	n=115	n=125
Wood	95.70	88.80
Iron sheet	4.30	11.20
ii. Floor material (X^2 =6.951; p=0.031)	n=115	n=125
Soil	40.90	52.80
Cement	59.10	44.80
Cement and soil	0.00	2.40
iii. Roofing material (X^2 =2.01; p=0.307)	n=115	n=125
Iron-sheet	96.50	92.00
Grass	3.50	8.00
iv. Wall material		
Brick wall	93.90	94.40
Grass wall	1.70	0.00
Mud	4.30	5.60

4.0 Conclusion and Recommendations

This paper conclusions and recommendations are based on the study on the Role of University in the Agricultural Advisory Framework in Tanzania whose objectives included analysis of the extension services provision in Tanzania, analysis of the role played by Sokoine university of Agriculture to the agricultural community; assessment of the impact of university extension services on community livelihood, and finally recommendations on how to improve extension service delivery using the agricultural universities.

This paper found that the Agricultural Extension Services in Tanzania is mostly financed and provided by the public sector, with less participation of the private sector. Though there had been changes in the landscape with regard to the provision of extension services in the country, and that there had been in coming of several non-governmental organizations (NGOs) and farmer-led initiatives over time to supplemented extension service delivery of the public extension services with cost-sharing. The only problem has been lack of formal integration of the private sector into the extension system. Because of this then, public expenditure on extension services and quality of extension services offered had remained below standard. Thus we recommend for more reformation in the extension service provision in order to make sure that extension services delivered are farmer oriented and demanded whereby the private sector will get fully involved to reduce the work load to the public sector in order to improve quality and timely delivery while utilizing universities in provision of similar services to the farming community.

This paper concludes that Universities specifically agricultural universities have many roles to play in the extension system of the country. However universities work in collaboration with other stakeholders such as

NGOs, the government, extension staff and the farming communities. Apart from teaching students universities play part in technology development, promotion and extension to the farming community where technologies are adopted based on their performance under the farmer fields relative to economic importance of the technologies in question after meeting farmers demand. Thus universities are expected to develop educational programs which help in the extension their work beyond the campus and into the neighboring communities for knowledge transfer and sharing for increased productivity, income, food security and improved household livelihood. Hence, this paper recommends that, universities should be empowered to execute their duties and play their important roles through provision of funds for training, research, technology development and dissemination for wider community adoption.

This paper also found that SUA plays great role in technology development, and dissemination of the technologies using students and its staff in collaboration with other local and international universities like China Agricultural University. The work of SUA to the community showed that, knowledge, awareness and use of various technical innovations developed had made beneficiaries, increase their crop production levels , as well as growing of important cash crops tantamount to increased household income and food security. The work which have led to asset ownership and quality housing among the beneficiaries and therefore recommend for increased support to the institution from all stakeholders. Farmers on the other hands should cooperate with the university by participating in the projects and adopting technologies disseminated; while the government and NGOs should support the university by providing funds to enable it carry on its duties. Since there are many farmers in the country and many use informal sources of technologies available, there is a need to the university and the country to expand enrolment of students to study agricultural related disciplines to cater for the community need for extension services.

The paper also found that extension services provided by university to the community have significant impact on productivity, income and food security among the farming households. Thus recommend for wider dissemination and follow ups in order to reach the wider community and increase the benefits accrued from using the same innovative technologies.

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