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COMPLEMENTING EXTENSION OFFICERS IN TECHNOLOGY TRANSFER AND EXTENSION SERVICES: UNDERSTANDING THE INFLUENCE OF MEDIA AS CHANGE AGENTS IN MODERN AGRICULTURE

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Abstract

In conventional agriculture, extension officers are regarded as change agents. They intervene to bring about change through influencing innovation, technology transfer and decision-making process in order to help improve the lives of the farmers and their families. Farmers in 21st century have opportunity of receiving the majority of information about agriculture through mass media outlets as a result technology advancement.

A case study design was employed design utilizing mixed research approach focusing on Magu district as study area. The study used both primary and secondary data. The primary data were collected using purposive sampling from a sample of 148 farmers whereas the secondary data were collected from Magu District's agriculture, irrigation and cooperative office. The data collection tools included questionnaire, focused group discussion and semi-structured interview methods. The aim of this study was to investigate how mass media is serving both extension officers and farmers to enhance agriculture knowledge and technology adaptation in the wake of few extension officers.

We found extension officer to farmer ratio to be 1:1172 and 1:500 for crop and livestock farmer respectively. This ratio falls short from World Bank recommended standard ratio of 1:200-500 as well as below the Tanzania ministry of agriculture's standard of two extension officers per village. The rapid development of social media platforms gives the specialty crop industry the ability to speak directly to the public, informing consumers about food production and encouraging them to become agriculture advocates.

The impact of mass media among the farmers in enhancing productivity was moderate. This was easily analyzed by examining the theme content in mass media in the country and frequency of media usage by both farmers and extension officers. Amongst various mass media radio and television channels emerged as the most used, most dominant, relevant, low-cost medium and user friendly for farmer-to-farmer-extension and to expose rural communities to new agricultural technologies and ideas. Social media is the most recent form of digital communication and on a global scale and already this study reveal farmers particularly that farmer with high level of education and high-income level using social media for agriculture.

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Keywords: Mass Media; Technology Transfer and Adoption; Agriculture Productivity; Agriculture Profitability; Tanzania.

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1. Introduction

1.1. Background Information

Agriculture is undoubtedly the largest and most important sector of the Tanzanian economy, with country benefitting from a diverse production base that includes livestock, staple food crops and a variety of cash crops. A report by FAO (2015) shows that 73 percent of Tanzanian population lives in rural areas and the country has a total of 3.7m smallholder farms. The sector's contribution according to this FAO report has more than tripled in the last 10 years, supported by rising cash crop production, an emerging agro-processing segment and strong domestic demand for processed food. For instance, in 2015 it accounted to about 26 percent of the national income, whereby about 19 percent of the GDP was contributed by crops subsector, livestock subsector (4.70%) and fisheries subsector (2.25%) respectively (Chongela, 2015). The ministry of Finance and Planning reported that in the five-year development plan 2016/2017-2020/21 about 67 percent of the workforces are engaged in agriculture.

Agriculture sector in Tanzania is dominated by subsistence farmers who grow different types of crops for both domestic consumption and for cash. Food crops are commonly cultivated on relatively small surface areas averagely ranging from 0.9 up to 3 ha per household (MAFC, 2011a). Main food crops grown include maize, rice, sorghum, wheat, pulses, cassava, millet and sweet potatoes. The main cash crops grown include coffee, cashew nut, cotton and sisal (MAFC, 2012). Despite these indicators, Tanzania's agricultural performance in recent times remain inadequate and indeed far less than its potentials. Food demand exceeds the supply thus leading to large importations of food and national food insecurity is a major economic and health problem in Tanzania. In the 2018 global hunger index, Tanzania ranks 95th out of 119 qualifying countries. With a score of 29.5**,** which means Tanzania suffers from a level of hunger that is serious (https://www.globalhungerindex.org/tanzania.html).

1.2. Agricultural extension services in Tanzania

Agricultural extension includes the provision of farmers with knowledge, information, experiences and technologies needed to increase and sustain productivity and for improved wellbeing and livelihoods (NRI, 2011). Delivery of quality agricultural extension services in Tanzania has been a center of attention for a long time. Given the fact that the majority of Tanzanians (more than two thirds) live in rural areas and depend on small-scale agriculture for their livelihood and employment (URT, 2006), the Government's efforts have been geared towards improving production and productivity so as to attain food security and sufficiency at household and national

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level. These efforts are in line with the targets of the National Development Vision 2025 which envisages achieving a high quality livelihood through, among other things, food self-sufficiency and food security. The National Strategy for Growth and Reduction of Poverty (NSGRP) emphasizes the reduction of poverty levels among the majority of people who live in rural areas through enhancement of agricultural productivity (URT, 2005), so as to achieve Millennium Development Goal (MDGs) number one which targets on eradication of extreme poverty and hunger.

To ensure the performance of the agricultural sector, it is important that agricultural extension services in Tanzania are provided in the right frequency, efficiency and time (Rutatora and Matee, 2001). Currently, agricultural extension services in Tanzania have been vested in local government authorities to ensure effective participation of beneficiaries and motivate private sector involvement in service delivery (Kimaro *et al*., 2010). Various pluralistic demand-driven approaches have been used whereby farmers participate in planning and implementation. Approaches used include Farmers Field Schools, Farming Systems Approach, Training and Visit, Contract Farming, Participatory Extension and Farmer to farmer Extension (Kimaro *et al*., 2010).

The National Agriculture Policy of 2007, targets at developing and transforming the agricultural sector in Tanzania, making it more efficient, competitive and profitable. Some areas of attention include low productivity, inadequate support services, low quality produce, poor participation of private sector and dependence on rain-fed agriculture (NAP, 2012). Both National Agriculture Policy of 2007 and the old Agriculture and Livestock Policy of 1997 emphasize the need to deploy agricultural extension officers to work at village level. The target of the government is to employ 15,082 extension officers by the end of 2015 (MAFC, 2009).

1.3. Good Agricultural Practices

Good Agricultural Practices is defined as farming that uses available technology optimally to promote agricultural productivity of safe and healthy food, to achieve economic viability and agricultural, environmental and social responsibility (FAO 2004). Good Agricultural Practices should be seen as a basket containing several good agricultural farming practices from where farmers can choose the most appropriate practices that suite their environment. Good Agricultural Practices include, but are not limited to, appropriate soil type, time of planting, plant spacing, improved cultivars, appropriate water management, appropriate weeding method, and appropriate nutrient management method, appropriate measures of pest control, proper harvesting and post-harvest practices.

According to FAO (2003) application of GAPs to both large and small-scale farmers has proved to have immense impact in increasing agricultural productivity, creating sustainable agriculture development, enhancing food security, increasing food safety and health, sustain rural livelihoods and conservation of the environment.

1.4. Rationale of Study

Agriculture still remain the vital tool for sustainable development and poverty alleviation even in the 21st century, and this is particularly true in developing countries like Tanzania(World Bank,

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2010; Ruane and Sonnino, 2011; Benjamin, 2013).The government of Tanzania for long time has tried to adopt different kinds of policy measures to modernize the extension system and advance agricultural service delivery to farmer's hence increasing agricultural productivity (Kimaro *et al*., 2010, MAFC, 2009). Amongst the measures taken has been to increase the number of agricultural extension personnel to work with farmers at village level. In some areas and districts the number extension staff has doubled while in some areas the number has remained the same or even decreased. Another intervention which can improve agricultural productivity is the adoption and used of good agricultural practices (GAP). By adopting GAP, farmers can increase productivity, improve food security and reduce poverty among them.

Despite the efforts of extension officers and agricultural officers in Tanzania in transferring agricultural technologies, information's and spreading the GAPs little is known on the extent and influence of mass media in transforming farmers from employing primitive and unproductive methods to using superior, tested and tried good agricultural practices for increasing agricultural productivity and improving their livelihoods. Appreciating of extension officers and farmers' usage of media in spreading information's and awareness of GAP and its adoption is imperative if increased agricultural productivity is to be achieved. This study is further justified, as it will help the research and extension agents to know the various medias which are used and specifically concentrate on those media in transferring agriculture technology, information's and knowledge to the farmers to ensure that their production potentials are realized by facilitating technology generation and diffusion thus reducing production inefficiencies. The farmers themselves will also benefit from this study as the revelation of their true situation could attract more favorable policies to them, which will help in improving their access to the modern technologies and thus increasing their productivity and efficiency.

1.5. Study Hypotheses

1) Mass media does not complement with agricultural extension officers in improving extension services and enhanced agriculture productivity
2) Adoption of good agricultural practices (GAPs) by farmers does not lead to enhanced agriculture productivity
3) There is no positive correlation between good agricultural extension services and farmers adoption of good agricultural practices.
4) There is negative impact of the use of mass media by the farmers in adoption of good agricultural practices

1.6. Study Objectives

1.6.1. General Objective

To investigate how mass media can complement extension officers and farmers to enhance agriculture knowledge and technology adaptation to increase crop productivity.

1.6.2. Specific Objectives

1) To assess farmers usage of mass media in gaining knowledge about agriculture

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2) Determine the ratio of extension officers to farmers in Magu district.
3) To determine usage of mass media by extension officer in transferring information and GAPs technologies to farmers.
4) To investigate and compares the effectiveness of the mass media in good agricultural practices (GAP) adoption in the district.
5) To determine the level of stakeholders' participation in the delivery of extension services in the district.

1.6.3. Research Questions

1) What if the extent of farmers usage of mass media?
2) What is the ratio of extension officers to farmers in Magu district?
3) What mass media extension officers employ in transferring information and GAPs technologies to farmers?
4) What if the effectiveness of mass media in GAPs adoption?
5) What is the level of stakeholder's participation in delivering extension services in Magu district?

2. Literature Review

2.1. Agriculture and Economic Development

The history of the world economic development over the years consistently shows few countries achieving sustained economic growth without first developing their agricultural sector (Lewis 1954, 1955; World Bank, 2008b; Christiansen and Demery, 2007).

Transforming the Tanzania agricultural sector from its current subsistence production orientation into market and industrial orientated production system forms the basis of the agricultural development priority of the government of Tanzania. Adoption of good agricultural practices (GAP) and intensive provision of extension services to farmers have consistently demonstrated high rates of return in various countries (Opara, 2008). They are one of the institutional support services that have a central role to play in the transformation process. The quality of agricultural extension services is an important issue in Tanzania where agriculture dominates the economy, accounting for 50%of the gross domestic product (GDP), providing 85% of exports, and employing about 80% of the work force (URT, 2012). Over 70 % of the country's 44.9 million people live in rural areas (FAO, 2010; URT, 2012).

According to the World Bank (2010) decline in production of crops happens mainly due to ineffective extension services i.e., untrained extension officials, lack of field demonstration, and neglecting the farmers' actual problems and the traditional farming. Lack of harmonized agricultural extension message to farmers can lead to confusion among farmers, who, in the process can be weakened and are unable to access the latest technologies. Thus, effective extension system needs to continuously be updated and fine-tuned by new information derived from research that is relevant to farmers' needs (Picciotto and Anderson, 1997). On the other hand, it has also been argued that GAPs can provide the catalyst for improvements to production techniques and supply chain infrastructure in developing countries (Jaffee, 2003a).

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2.2. Mass media in Agriculture

Information provided by different mass media is critical in agricultural development because it is a tool for communication between research, extension officers, farmers and all stakeholders in agriculture sector. It serves as a channel for assessing trends, issues and shaping agricultural decisions (Opara, 2008 For example, Kipkurgat et al., (2016) argues that social media is becoming a very important because it has the ability to connect with farmers and agribusiness people from around the world over large geographical distances. Farming requires information and technical expertise hence the need for extension services however, due to various factors extension services are not readily available to all farmers. In convention agricultural extension services, extension officers are the agents of change and transformation to the farmers. They provide a variety of agricultural services to farmers which comprises technology transfers, advisory services and human resource development (Aker, 2011). Agricultural extension messages, according to Nisha (2006) and Lawal (2015) covers a broad range of information including improved varieties of crops, soil information, and agricultural calendar for specific location, livestock control, water management and control of pests, weeds or plant diseases. Agricultural extension messages should be compatible with the existing practices, societal norms, beliefs and culture of the society before it can be accepted or adopted. A consensus exists that extension services, if functioning effectively, improve agricultural productivity by providing farmers with information that helps them to optimize their use of limited resources (Muyanga & Jayne, 2006).

The agricultural sector globally is embracing mass media in particular social media which it is utilizing it to promote agriculture knowledge and transfer of technology within the sector as well as creating networks with other agriculture stakeholders. The speedy development of mass media particularly social media platforms has given researchers, extension officers and farmers opportunities to speak directly to the public, informing consumers about food production and encouraging them to become agriculture advocates. They might be using Line, Facebook, Instagram, YouTube or Twitter, but it is clear that researchers, extension or individual farmers can publish information or own stories without going through the prior bureaucracy and editing from owners of media. Sharing success stories and interesting facts about agricultural production and their technologies can encourage consumers, food companies and other farmers to get involved in agricultural issues. The unleashing of social media's full potential can lead to greater efficiency in agriculture knowledge and technology transfer for agricultural productivity (FAO 2001; Singh *et al*., 2015; Maru, 2018).

3. Methodology

3.1. Study Area

Magu District is one of the seven districts of the Mwanza Region of Tanzania, East Africa. Its administrative centre is the town of Magu on the Simiyu River. It is bordered to the north by Lake Victoria and Busega district, to the east by Bariadi district, to the south by Itilima district, Maswa district, Kwimba district and Misungwi district, and to the west by the city of Mwanza, which consists of Nyamagana district and Ilemela district.

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The people of Magu district are mainly involved in agriculture and fishing. The low productivity in agricultural crops is thought to be associated with inadequacy of extension service and less employment of good agricultural practices. This study aims at determining means of enhancing agricultural productivity through combating inadequacy of extension services and adoption of good agricultural practices.

3.2. Research Design

Data for this study were collected by using a descriptive design. In cross sectional design data are collected at single point in time from a sample selected to represent some large population (Creswell, 1994). The design is suitable for purpose of description as well as for determination of relations between variables (Babbie, 2010).

This descriptive research was divided into three phases. The first phase involved document analysis of secondary data that were available at the office (Ministry of Agriculture, Livestock and Fisheries). This phase was performed to get in-depth perspective of the current status at the districts with regards to extension services, usage of mass media on dissemination of agricultural technology and knowledge and good agricultural practices.

The second phase was done to get detailed information through interviews using a topic list as a guide and focused group discussion of Ministry of Agriculture, Livestock and fisheries officials of Magu district and research experts. The officials included were District Agriculture, Irrigation and Cooperative Officer (DAICO), District Planning Officer, District Livestock and Fisheries Officer(DLFO), District Agriculture Extension Officer(DAEO), District Cooperatives Officer, District subjects Matter Specialist (SMS)-Crops, District Subject's Matter Specialist (SMS) – Rangeland and four farmers groups (kichawama, mbuni farmers, chamingo and mkombozi).

The third phase of the study included 10 Ward and Village extension officers. In this phase, interviewed were done to determine various extension methods the extension officers employ in their areas and challenges they face along the way.

3.3. Sampling Design

This study used purposive sampling strategy. The purposive sampling involves identifying and selecting individuals or groups of individuals that are especially knowledgeable about or experienced with a phenomenon of interest (Cresswell and Plano, 2011). In this study the researcher selected representative sample based on their knowledge about the agricultural extension services, good agricultural practices and mass media usage among farmers and extension officers.

3.4. Sample Size

The study's sample involved 148 people of whom 80 were farmers, 4 farmers groups, 12 were extension officers and 6 were officers at district levels from Ministry of Agricultural, Livestock and Fisheries.

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3.5. Primary Data Collection

In order to get primary data for this study, 80 questionnaires were administered to farmers, 12 interviews were done to 12 village and ward extension officers and focus group discussion was done to 4 farmer groups kichawama (10 farmers), mbuni farmers (8 farmers), chamingo (26 farmers) and mkombozi (6 farmers) and 6 officers at Magu district levels from Ministry of Agricultural, Livestock and Fisheries (MALF).

3.6. Secondary Data Collection

Analysis of available documents from the Ministry of Agriculture, Livestock and Fisheries (MALF) and documents from the District agriculture office at Magu district were done to obtain information pertaining to agricultural extension services, good agricultural practices and mass media usage among farmers and extension officers.

3.7. Data Analysis

Information obtained was edited, coded and analyzed using Statistical Package for Social Sciences (SPSS) statistics 23; IBM Inc. New York, USA) whereby descriptive statistics (frequencies and graphs) were used in the analysis to determine the extent by which extension system is delivering and adoption of farming practices by farmers.

4. Results and Discussion

4.1. Demographic Characteristics farmers in Magu district

4.1.1. Age

Age is one of vital factor in performance and adoption rate of technologies such as the new technologies employed in good agricultural practices. Younger people tend to faster and well to the newest technologies that elderly people who tend to remain conservative and prefer more traditional stuffs. The age of the respondents ranged from 15- 29 age group to >75 age group. Age group of 30-34 and 45-59 had the highest frequency with 27 respondents each (33.8%) while the >75 age group had few respondents (only five) equivalent to 6.3%, Other age group included 15-29 which had 8.8% and 60-74 which had 17.5% (Table 1).

Table 1: Age group category of farmer respondents in Magu district

Age group	Frequency	Percent	Cumulative Percent
15-29	7	8.8	8.8
30-44	27	33.8	42.5
45-59	27	33.8	76.3
60-74	14	17.5	93.8
<75	5	6.3	100.0
Total	80	100.0	

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4.1.2. Gender

The data from the findings of this study shows among of all the farmers interviewed in this study, 67.5 percent were men and 32.5 percent women (Table 2). There significant difference in education and income at 0.05 significant level. The level of education and level of income in this district favors men than women. This can imply an element of blockage or imbalance in access of GAPs information or less interaction of women farmers with extension officers.

Table 2: Gender of farmer respondents in Magu district

Gender	Frequency	Percent	Level of education		Level of Income	
			Mean Square	F	Mean Square	F
Male	54	67.5	4.981	0.040*	1.212	0.3*
Female	26	32.5	1.141		0.632	
Total	80	100.0				

*denotes for significant different at the 0.05 level

4.1.3. Household Size

Household size is defined as the number of people who living in the respondent's household. Large family size is assumed as an indicator of labour availability in the family (Tadesse, 2008).

In this study the household size on the survey area ranged between less than 4 and 16 people per household. 56.3 percent of the respondent had household size of 5-8 people per household. Respondents with less than 4 household sizes had 2.5% percent while respondents with household size of 4, 9-12 and 13-16 had 15 percent, 20 percent and 6.3 percent respectively (Fig 1). The average house hold size of 5-8people per house is consistent with Tanzania 2012 census (NBS, 2012). This indicates the population growth rate have not changed especially in rural areas.

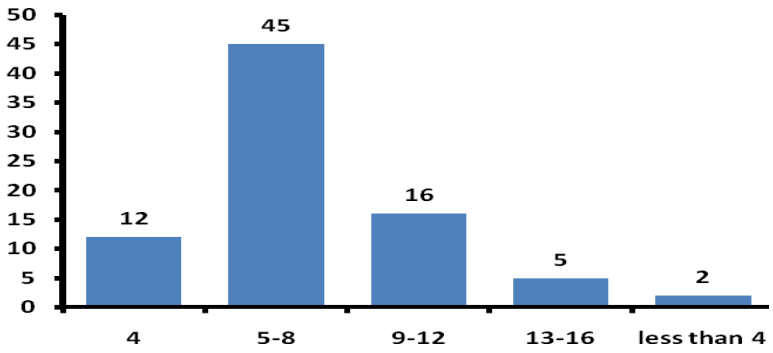

Figure 1: Household size of respondents in Magu district

4.1.4. Level of Education

Education has ability to strengthen farmer knowledge base hence influencing adoption rate of recommended agricultural practices (Bezuayehu *et al.*, 2002). The better educated farmers usually are more likely to adopt new agricultural practices than less educated farmers (Cary *et al.*, 2002 and Nina, 1993). The more the level of education the more likely farmers tend to accept new

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agricultural technologies. In these study farmers with higher level of education had access and higher usage of social media than lower level of education or no formal education (Table 4.2). This implies increase of level of education in the district will result in surge of the use of social media in future. In the present study it was found that majority respondents (49 percent) had attained primary school education while respondents with secondary education, college education informal education had 17.5 percent, 12.5 percent and 21.3 percent respectively (Figure 2).

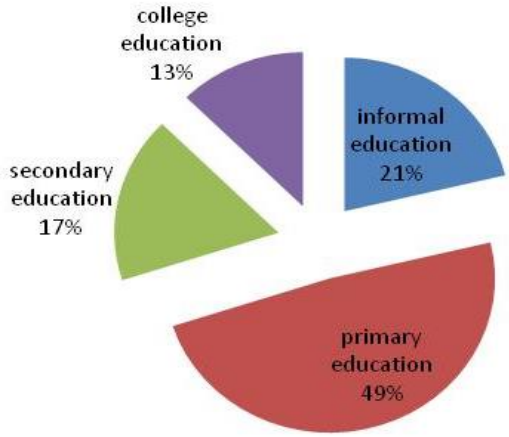

Figure 2: Education background of farmer respondents in Magu district

4.1.5. Marital Status

Marital status is critical variable in determining the level and magnitude of conflict arising from inheritance of land hence affecting land accessibility and good agricultural practices by the farmers. Women especially widow and single are disadvantaged in accessing land. In this study nearly all the respondents (76.3.5 percent) were married, 2.6 percent were single, 6.3 percent were divorced and 6.4 percent were widowed. Married respondents had far more access to land than the widow and divorced (Table 3). This implies disparity in the access of to wealth and opportunity with married especially married men having advantage while divorced, widowed and single are vulnerable and disadvantaged. This has been observed and hinders development in many developing countries particularly sub- Saharan Africa.

Table 3: Marital statuses of farmer respondents in Magu district

			farm size (acres)				
Gender of the farmers			4 or less	5-8	9-12	>12	Total
male	Marital status of respondents	married	5	15	11	16	47
		single	0	1	0	0	1
		divorced	1	0	1	0	2
		widow	1	2	1	0	4
	Total		7	18	13	16	54
female	Marital status of respondents	married	4	2	7	1	14
		single	0	1	0	0	1
		divorced	1	1	1	0	3
		widow	3	4	0	1	8
	Total		8	8	8	2	26
Total	Marital status of respondents	married	9	17	18	17	61
		single	0	2	0	0	2
		divorced	2	1	2	0	5
		widow	4	6	1	1	12
	Total		15	26	21	18	80

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4.2. Income Status of Farmers of the Farmers

Income level and economic power of farmers has an influence to whether farmer can used good agriculture practices recommended as the use of GAP require spend significant amount of money (Roger, 2003). Farmers who are well off can afford the prices of new improved technology such as hybrid seeds, irrigation, pesticides etc than low income farmers. Farm income is the main source of capital to purchase farm inputs and other household consumable goods. Thus, those households with a relatively higher level of farm income are likely to purchase improved seeds or other essential agricultural inputs

The results indicated in Fig.3 show very low percentage (3.8 percent of the respondents had income between TZS 6,000,000 - 10,000,000 millions while the majority of the respondents (41.3 percent) had average income of TZS 100,000 - 1,000,000. About 33.8 percent of the respondent had income between TZS 3,100,000-6,000,000 millions. Other respondents (5 percent) had income of greater than TZS 10,000,000. This suggest that majority of farmers have the income below the poverty line hence they are poor and practices subsistence farming and agriculture is the source of their income and livelihoods. The agriculture sector is characterized with risky, rainfall unpredictability and price fluctuation of agricultural products hence the use of media should focuses in giving information like weather, market prices and new technologies which can make the agricultural sector less risky and increase agricultural productivity.

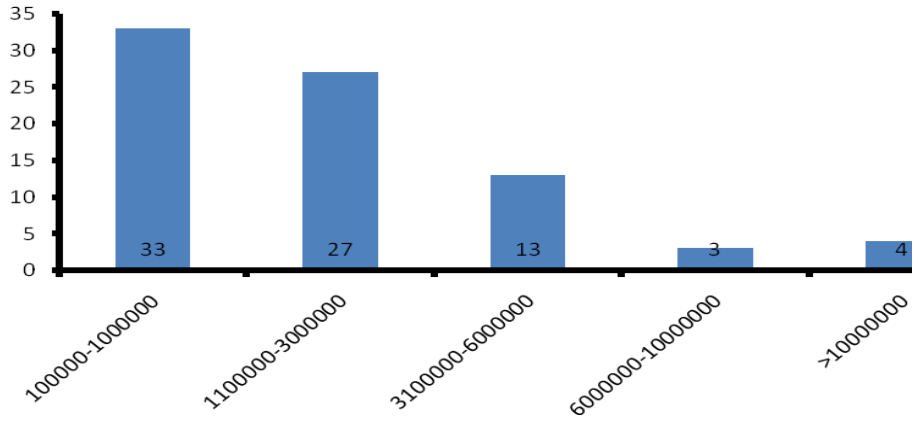

Figure 3: Income level of farmer respondents in Magu district

4.3. Farm Size

According to CIMMYT, (1993) farm size is a vital factor in influencing farmer rate of usage of good agricultural practices and other innovations. It is well noted that, small- scale and large- scale farmers differ in the speed of adoption of various innovations (Polson and Spencer, 1991). Rogers (2003) asserted that those farmers who own large farms enjoy a high socio-economic status. They also have immense mass communication opportunities, and are more innovative in adopting new agricultural technologies (Okwell *et al.,* 1991).

The findings of this study revealed that majority of farmers in Magu district had farm size ranging from 4- 8 hectares (67%), while 15% of respondents had farm size ranging from 9-12 hectares and

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only15% had farm size area more than 12 hectares (Table 3). This result indicates that the majority of farmers own small land and often this land are dispersed. Farmers of this nature are less likely to be innovative or less likely use social media /expensive technologies (Okwell *et al.*, 1991). Efforts should be made to enhance the access to land to famers so that they can increase efficiency and productivity.

Table 3: Farm size (hectares) among farmer respondents in Magu district

Farm size category	Frequency	Percent
4 or less	15	18.8
5-8	26	32.5
9-12	21	26.3
>12	18	22.5
Total	80	100.0

4.4. Proportions of Extension Officers to the Farmers in Magu District

According to the World Bank (2006b) the recommended farmer - extension officer ratio ranges from 500 farmers to one extension officers and, this depends on farm sizes and distance these extension officers have travel to the farmer's farm. However, in a community-based paid extension model of Bangladesh 200:1 ratio of livestock farmers to livestock extension officer has been proved successful (Uddin *et al*., 206).

In our study in Magu district we found there is 25 ward extension officer (WEO) and 20 village extension officers (VEO) which make up the total of 45 extension officers in the district. According to Tanzania Census (2012) Magu district had a population of 299,759. The rural poor is more than 60% of the population and among this 44% are children under the age of 15. The estimation of farmers actively involved in agriculture are around 53 people. The ratio of farmer to extension officer was 400:1. According to directives and policy from Ministry of Agriculture, Livestock and Fisheries (MALF). Every village in Tanzania is supposed to have 2 extension officers. The Magu District has 80 villages and 20 village extension officers which implies there shortage 140 extension officers. The available 20 extension faces unprecedented pressure in covering this gap with little incentives such as frequent training, Promotion, good house, communication allowance and means of transportation to reach the farmers.

4.5. Methods of Teachings Gaps to Farmers in Magu District

There are many methods as well as ways that extension officers often use in teaching farmers about GAPS (Oladele, 1999). This includes individual field visits, farmer group methods Olubandwa *et al*., (2011). Others methods includes field tours, leaflets, newsletters, posters, field demonstrations, signboards, visual aids and radio/television programmes (Mirani, 2013). In this study we found that the main methods used by extension officers to be field demonstrations, using lead farmers, mass media and task forces methodologies (Fig .4). Looking at the preferred methods of teaching GAPs to farmers it becomes contradicting as to whether the available workforce (WEOs and VEOs) is enough and set to meet farmers knowledge needs on GAPs. Findings show that demonstration plots, mass media, lead farmers and task forces are the most preferred methods of

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delivering GAPs knowledge to farmers. With the ratio of 4 villages to 1 extension offices it would become difficult for deployed methods to enable smooth delivery of GAPs knowledge to farmers. The results show that mass media is the least method used by the extension officers (Fig 4) this implies that the extension officers have poor facilities as well as incentives that can empower them to use the media in sharing and transferring agricultural information. In order the extension officers to use the media especially social media like youtube and Whatsapp it needs farmers as well to be able to have the gadgets and facilities as information is forward and backward. Therefore media facilities and facilities are of paramount importance to both extension officers and farmers in order to empower them to communicate easily.

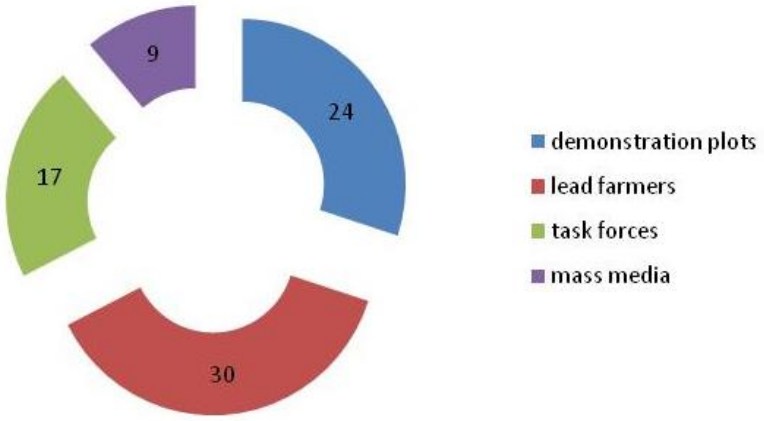

Figure 4: Methods used by agricultural extension officers in teaching GAPS to farmers in Magu district.

4.6. Mass Media Usage by Farmers in Agriculture Knowledge and Technology Transfer

The data shows that most of the respondents uses radios 31(39%) followed televisions 17 (22%), other mass medias used included social media 14(17.5%), newspapers 5(6%), books and brochures 3 (4%) and others 10 (12.5%). This study confirm that radio and television is the main method, this resonate to other studies in Tanzania on mostly used method on transferring (Mtega and Ngoepe, 2018). Transfer of agriculture knowledge and technology to farmers in very important in Tanzania. Undoubtedly, there has been a rapid quantitative diffusion of mass media in the country. Moreover, the benefits from development and efficient usage of communication programmes in Magu district and Tanzania at large will bring a paradigm shift in agriculture but this can only successful if the mass media like the TV and radio programmes are professionally designed, packaged and executed by the media experts and communication specialists. This study shows that among all the mass media, radio and television are still influential, accessible and dominant forces of agricultural knowledge and technology transfer to farmer in rural areas. Education level of farmers, poor communication infrastructure, user friendly of radio and televisions might have been the reasons of high preference of radio and televisions in the rural areas.

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Table 4.1: Usage and effectiveness of mass media in agriculture knowledge and technology transfer

Mass mdeia type	Very effective	Effective	Moderately effective	Not effective	Total
Televisions	0	3	13	1	17
Newspapers	0	3	1	1	5
Radio	3	7	16	5	31
books and brochures	0	0	2	1	3
Social media	0	5	8	1	14
others	0	2	8	0	10
Total	3	20	48	9	80

Table 4.2: Education effects on usage of mass media in agriculture knowledge and technology transfer

Mass media type	Education level of respondents				Total
	informal education	primary education	secondary education	college education	
Televisions	4	13	0	0	17
Newspapers	1	1	2	1	5
Radio	9	19	3	0	31
books and brochures	0	0	1	2	3
Social media	0	1	6	7	14
others	3	5	2	0	10
Total	17	39	14	10	80

4.7. Usage, Parameters and Impact of Social Media by Farmers in Agriculture Knowledge and Technology Transfer

There were few farmers (only 14) using social media (Table 4.2). Farmers who were using social media had higher level of education (secondary and college education) while farmers who are not using social media had much lower level of education. The data shows that most of the respondents are using Whatsapp and facebook while others using you tube, twitter, jamiiforums, blogs, instagram and linkeln (Fig 5). They use social media for learning new technologies, gaining news skills, and knowledge, checking market prices of agricultural products, branding agricultural products and checking weather forecast (Table 5).

Some farmers are seeking information on YouTube videos, because they want to visualize things in the internet. Weather is of paramount important in determining agricultural production. It has greater influence on the growth, development and yields of a crop, incidence of pests and diseases, moisture needs and fertilizer requirements in terms of differences in nutrient requirements due to water stresses. The farmers, especially the resource poor peasants, are especially defenseless to the negative effects of extreme weather and natural disasters. Yet, precise forecasting and timely warning can reduce the effects of natural disasters such as floods, and improved weather

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forecasting can improve crop yields through cultivating drought tolerant varieties or crops which minimize the effects of severe weather or drought. In this study the farmer's thinks the weather information provides were mostly inaccurate and they cannot entirely rely on it. Therefore, efforts should be made by Tanzania Meteorological Agency (TMA) to provide more accurate information to farmers as inaccurate information it hurts more the farmers than no information. The success of social media depends on commitment level of extension officers, Farmers and all agricultural stakeholders in using and managing the content of social media for agricultural extension (Saravanan et al., 2015). Despite to newness of social media to both farmers and extension officers in the rural areas this study shows social media are becoming popular among rural people.

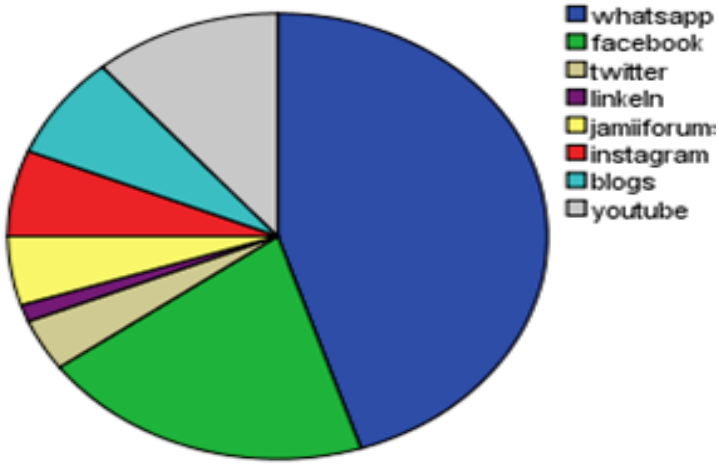

Figure 5: Usage of social media in agriculture knowledge and technology transfer

Table 5: Parameters that farmers seeks in social media

Parameter in the social media	Percent	Rank
check markert and prices of agric products	21.3	3
new technoligies ie.seeds.pesticides	30.0	1
branding of agricultural producs	5.0	5
weather forecast	16.3	4
to get news skills and knowledge	27.5	2
Total	100.0	

4.8. Other Stakeholders Providing Extension Services in Magu Districts

Public controlled agricultural extension systems in various developing countries have stagnated over the last few decades due to shortage of political and monetary support. Public investments in agricultural extension services have gradually deteoriated over past years, alongside the low priority attributed to agriculture in the development agenda by governments and donors (Hani *et al*., 2007).

Pluralistic approach on provision of extension services involving public private partnership is inevitable. Consistent support to the stakeholder process is critical for its effective implementation and for reorienting the existing extension system towards a pluralistic, demand led and market

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oriented advisory system. This study explored whether other agricultural stakeholders are assisting the public extension system in providing extension systems or there are platforms for public-private partnership in extension system.

The results revealed there are number of private institutions and NGOs which provide extension services in Magu district. Some of these private institutions and NGOs includes Alliance ginners (T) ltd, Gatsby Africa, One acre fund, Tanzania Horticultural Association (TAHA), Cassava Value Addition (CAVA) and Seed companies such as SeedCo, Tanseed, Syngeta and so on. However, there is no clear platform on which public extension officer and private extension officer can meet and evaluate their approach in teaching GAPs.

In additional majority of farmers 64 (82.1%) thinks that extension services and information about GAPs given by public extension officers are consistent with extension services and information given by the private extension officers or other stakeholders. Despite inadequate of the ratio of extension officers to farmers, still the perception of farmers on the efficiency of agriculture extension officers on their work seem to be good. As indicated in the findings, 66% of farmers indicated that the efficiency of extension officers was either good or very good. This is in support with those of (Bareth, 2011; Baneke, 2006, and Agumagu, 2003) who suggested that with regular training programs, mass media exposures and organizational climate chances are high that famers will be satisfied with services provided by extension officers.

4.9. Efficiency of Agricultural Extension Officers on Their Works

Dissemination of the right GAPs information at an appropriate time among farmers is key to enhancing agriculture productivity. The village and ward extension officers, play an important role in influencing farmer to shift to better GAPs and other innovations therefore the success or failure of any agriculture programmes with which they are associated. The efficiency of extension officers depends on many factors including regular training programmes, r extent on the cooperation of contact farmers and fellow farmers, Job attitude, job satisfaction, mass media exposure and organizational climate (Bareth and. Rathore 2011, Banmeke and Ajayi 2006, Adesope and Agumagu 2003). In this study we surveyed the farmer's opinions on the efficiency of extension officers' services and the findings shows varied opinions with 14 farmers(17.9%) thinks the extension officers giving very good services to farmers while 38 farmers(48.7%) thinks the services are good, 22 farmers (28.3%) undecided, 4 farmers(5.1%) thinks the services are not good enough (Table 4).

Table 6: Farmers perceptions towards Extension officer's services

Farmers perceptions towards Extension officers services	Frequency	Percent
Very good	15	18
Excellent	38	48.7
undecided	22	28.3
Not good	5	5.0
Total	80	100.0

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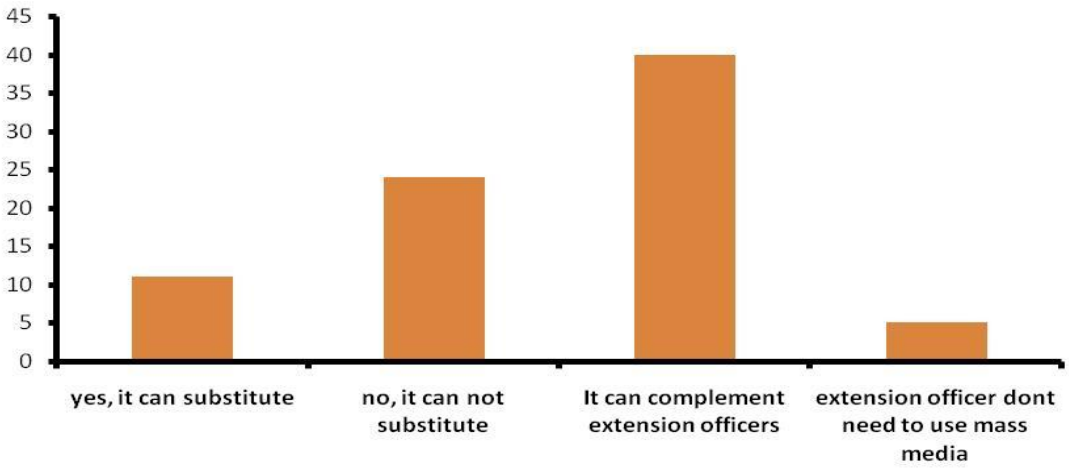

Figure 6: Complementary between extension officers and mass media

4.10. Farmers Adoption of Good Agricultural Practices

The use of GAPs by small scale farmers can contribute to dramatic improvement of agriculture productivity (FAO). The findings of this study suggest that many farmers in Magu district don't use good agricultural practices. The farmers yield per hectares for the three major crops in the district (Maize, Rice and Cotton) is below the average yield of the crops reported in Tanzania. This study suggests farmer who uses GAPs has potentially capability to produce four to six times more than farmers who don't use GAPs. However, only farmer who are higher level of income (42%) and education (30%) were motivated in adopting and implementing GAPs as suggested to them by extension officers and mass media. This suggests that the desire to earn profit through higher productivity and the quest for knowledge and information could be one of the reasons to apply GAPs in their farming practices.

Table 7: Comparisons of yield per hectare (tons) with or without GAPs for three major crops in Magu district.

Crop name	With GAPs In literature	Without GAPs In literature	Without GAPs Observed in this study
Maize	8-10 t/ha	1.2 -1.6 t/ha (Mrutu et al., 2014; Magehema et al., 2014)	0.7-1.5t/ha
Rice	6-10t /ha	1.6-2.4t/ha (Ngailo *et al*., 2016)	0.8-1.5 t/ha
Cotton	3-4 t/ha	0.75-8t/ha (Mwangulumba and Buluma 2012)	0.5-0.7 t/ha

4.11. Theme Content in Print Mass Media

Farmers have an inevitable need for various types of information to be effective in farming. In this study we found different mass media that farmers uses to get information namely radio, televisions, newspapers, social media, books, magazines and others (Table 4).However, we found that the content in print mass media is dominated with political news (28%),sports news(22%),economic news (9%) and entertainment news(8%) while agricultural news had only (5%). We found also there is no agricultural newspaper available, only few features, column and reports. This implies

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that in order for print mass media to contribute more in agriculture they should do more either by adding more agricultural news and information or establishing agricultural newspaper or magazine altogether which will provide latest agricultural knowledge and technologies especially at beginning of cropping seasons.

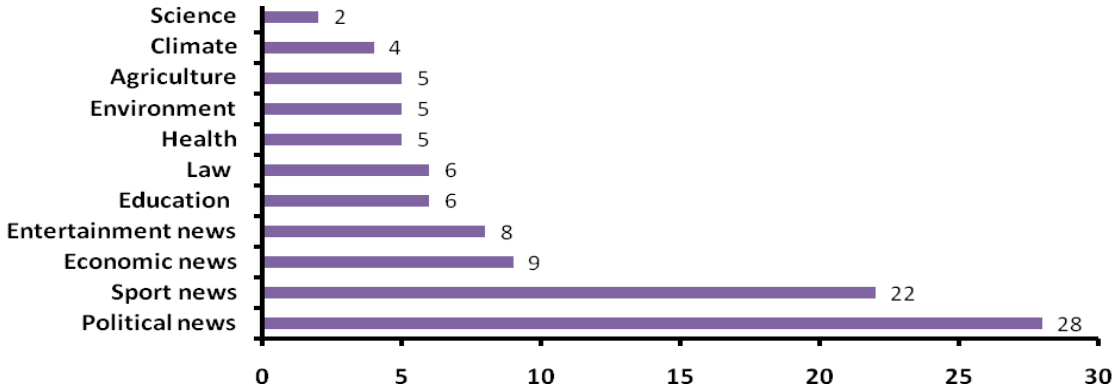

Figure 7: The percentage of theme content of print mass media

5. Conclusion

From the study context of this research study, it can be deduced that few farmers in the study area uses good agricultural practices. The transfer of agricultural knowledge and technologies is highly necessary to farmers in the study area. The Magu district has few number extension officers as required; this is affecting immensely the extension and deliverance of Good Agricultural Practices information to farmers. In order to bridge the gap of agricultural knowledge and shortages of extension officers in the district the use of variety of mass media firstly by extension officers for dissemination of agricultural knowledge and technologies to farmers without necessary for physical contact and secondly by farmers themselves should use mass media to seek and receive variety of agricultural information, mostly scientific, educational and technology based, including training information, agrochemicals and technological information. The importance of extension officers to agricultural transformation in this era cannot be overemphasized but mass media strengths can complement the conventional role of extension officer in disseminating agricultural information and transforming the agricultural sector.

The collaboration between district council and private extension service providers in the form of public private partnership is still weak. Both public and private stakeholders are targeting to help the same farmer but a lack of stakeholders' joint decision has led to the dilution of each other efforts and sometimes brings confusion to farmers. Also Farmers in Magu district mostly constrained in adopting recommended technologies by a number of factors. These factors include level of their education, small land sizes, high cost of technology, lack of capital to buy technologies, poor agricultural infrastructures, lack of access to both credit facilities and input-output markets and lack of adequate information support (and practical demonstrations of how to utilize technologies to potentially improve production). Furthermore, plant pests and diseases, poor seeds, drought, fake/expired pesticides and low market prices were the main constraints and highly impacted on crop productivity in the study area. The Majority of smallholder farmers they don't use Good Agricultural Practices (GAPs) and this is reflected on the below average productivity of their crops.

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6. Recommendations

Firstly, Magu district council should increase participation of all agricultural stakeholders in the process of designing, implementing and evaluation of the policy and programmes within the district. Effort should be made to create a strong platform for all agriculture service providers to discuss, examine and implement together projects which will have sustainable and lifelong impacts to the farmers.

Secondly, given the low level of subsistence farmers' literacy and passive or limited participation of stakeholders at institutional level, governments and other service providers need to strengthen capacities for proper integration of social media in agricultural extension service delivery. This will go a long way to facilitate further and effective use of social media in agricultural extension service delivery.

Thirdly, Availability of infrastructure and access to internet facilities should be enhanced by governments and other service providers so as to enable proper utilization of social media for agricultural extension service delivery, especially by the extension workers and farmers.

Furthermore, the ministry of agriculture should focus on improving the work environment of extension agents including provision of transport, training and other motivations so as to increase performance of extension. The farmers should be supported by the government by assuring good market for their produce and timely provision of inputs and lastly with regards to concerns of fake or expired seeds and pesticides, the Magu district council with the help form TPRI should conduct routine checking and certifying the suppliers of seeds and pesticides.

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