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Full Length Research Paper

Famers perceptions on effectiveness of extension delivery approaches to Mbororo female livestock farmers in North-West Region Cameroon

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The purpose of the study is to determine farmers' perception on agricultural extension delivery approaches on Mbororo female livestock farmers in North-West Cameroon. Primary data was collected using structured questionnaires established to Mbororo women. Interviews guides were used to get more information on the perception of Bororo female livestock farmer on effectiveness extension services delivery. Secondary data was collected from books, journals, research projects and articles and internet search. The study made use of simple random sampling method. 400 questionnaires were distributed randomly to Mbororo women in Mezam, Momo, Boyo, Donga-Mantung divisions of the North-West region of Cameroon. Data analysis was done using statistical package for social science (SPSS). Results revealed that farmers perception on participation in extension delivery services is 76.6% not effective, organisation of field days is 63.35% not effective, farm visit by extension agents is 53.3% not effective, holding field meetings with farmers is just 30.3% effective. Generally the Mbororo female livestock farmers have a negative perception on the quality of extension services delivered to them in livestock farming. They believe that the qualities of extension services are not effective at all level of implementations. Thus extension agents should strive well to develop strategies that can improve on service delivery to female livestock farmers of North-West region Cameroon.

Key words: Farmer's perception, extension, delivery approaches, livestock farming.

INTRODUCTION

Perception is the process by which individuals or a group of people receive information or stimuli from the environment and transform it into psychological awareness (van den Ban and Hwakins, 1996). Perception is also seen as awareness, comprehension or an understanding of something. For example, the way farmers perceive effectiveness of extension delivery

mechanism or, how effective extension personnel are in the accomplishment of extension activities (Nji, 2008). In this study perception is defined as the beliefs of farmers regarding extension training program, methods of dissemination, type of technology and field visit given to farmers. It constraints prevent them from reaching their full potential should be noted that positive perception

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will promote the adoption of technology while negative perception will hinder the adoption of modern technologies (Parminter and Wilson, 2003). This is a useful dimension to understand farmer's characteristics and look for ways to facilitating the adoption of new technologies by the farmers. Benjamin (2013) define effectiveness as a tool that is used to determine the level of awareness of extension services created among the farmers, number of visits paid by the village extension worker, percentage of scheduled meetings held between farmers and extension workers, number of field meetings held, regularity of meetings held by village extension worker, number of field days organized by village extension worker ,monthly or quarterly and number of demonstrations organized by the village extension worker within specified time frame (monthly, quarterly, annually). However, awareness of agricultural knowledge and information play a major role in agricultural development, particularly in food production (Amungwa and Nji, 2015). The main challenge in transferring agricultural knowledge and information to farmers is influenced by the environment in which farmers and the agricultural extension system operates. According to Ajala et al. (2013) there are numerous problems facing the transmission of agricultural extension services such as high illiteracy rate among farmers which sometimes make it difficult for them to understand all the ideas being communicated to them. Even after communicating the ideas, some of the farmers cannot subsequently translate the ideas to practice. In the same vein, most of the farmers are conservative and are not ready to accept any positive changes. The case of the Mbororo women is not so different. Generally, it is believed that Bororo women have high illiteracy level that prevents them from expanding in most domain of life and most especially in livestock activities (Aeisatu, 2012).

Livestock is seen as a key asset for rural households and it is a principal source of revenue for rural communities. It widens and sustains three major pathways out of poverty namely: (1) securing assets for the poor, (2) improving pastoral productivity and (3) increasing market participation by the poor. In most rural areas, livestock farming is greatly controlled by women. They make an average of 43% of the agricultural labour force in most developing countries (FAO, 2011). Rural women comprise two-thirds of low-income livestock keepers. They are engaged in activities related to small livestock production like poultry, sheep and goats (Thornton et al., 2003). Despite the high level of involvement in livestock activities, extension education which is intended to provide training to encourage large scale production among farmers is given mostly to men leaving the women with little or nothing to show (Ajaga, 2008). Women continue to face greater constraints than men in accessing natural resources, extension services, marketing opportunities and financial services. These within the agricultural sector (Ajaga, 2008). When rural

women have access and control over livestock or livestock products, positive impact is felt on overall well-being of the occupants particularly, in nutrition (FAO, 2012). Thus the quality of livestock is influenced by the perception of famers on extension delivery services. If extension agents devote more time in service delivery to women, the impact is seen on the quality of livestock produced by the female livestock farmers.

Many studies have been conducted on the impact of livestock farming on the livelihood of women but none has focus on the perception of female livestock farmers on the quality of extension services rendered to them. It is against this background that this study is undertaken to examine farmer's perception on extension delivery approaches. Therefore this study is intended to find out how Mbororo women feel about new technologies being implemented to improve on the livestock production and to lay a framework on which extension agents should focus on when delivery extension services to the women.

METHODOLOGY

Study area

The North-West region has seven administrative units namely: Boyo, Bui, Donga-Mantung, Menchum, Momo, Ngo Ketunjia and Mezam. The region is made up of 34 subdivisions and 35 councils. Mezam division is the head quarter of North-West region. The region is found between Latitudes 5°40' and 7° North of the prime Meridian. The population is estimated to be 1.8 million in 2010 National Institute of Statistics (NIS, 2010). The surface area is 17,300 km² and a population density of 60 km². Almost all the lands are located in altitudes above 900 m. Its hydrology is made up of plateaus that are big water catchments, various water sources, large rivers, waterfalls and artificial lakes with high potential to generate hydroelectricity and enhance economic activities. Abundant rainfall contributes to the development of agriculture and forest regeneration. Three kinds of vegetation are present in this region: lowland forest, mountain forest and afro-alpine vegetation. They are mostly made of wildlife, crop production, medicinal plants, fertile soils, and non-Timber Forest Product and fishing points (Manu, 2014) (Figure 1).

Sampling procedure

The random sampling method was used to select respondents in different communities which gave us the chance to interview every female that was seen in the Mbororo communities since it was not possible to identify women who are in livestock farming directly. To select the sample size, the (Yamane, 1967) formula which Assume $p=0.5$ (maximum variability) was used. The formula state that if a population is greater than one hundred thousand (>100,000) the sample size should be four hundred which will give a degree of confidence level which could be $\pm 5\%$ precision. In this case the formula for calculating the sample size of the study was:

$$n = \frac{N}{1 + N(e)2}$$

n= the sample size



Figure 1. North-West Region (Cameroon).
Source: [https://fr.wikipedia.org/wiki/RéionduNord-Ouest\(Cameroun\)](https://fr.wikipedia.org/wiki/RéionduNord-Ouest(Cameroun)).

N = the size of population

e = the margin of error (0.05) when the confidence level is 95%

Primary data was collected through structured questionnaires, interviews guides, observation guides while secondary data was collected through books, articles, journals.

Data collection

Data was collected with the use of structured questionnaires and interviews guides. Considering the fact that the women are not very educated, most of the data were collected using Pidgin English, a "lingua Franca" language commonly spoken in the North-West region. In some cases translations were made from English to "fulfulde" to those who were unable to understand the English language well. The questionnaires were filled by the researcher for purpose of efficiency. The questionnaires contain both open and close ended questions. The research design used for the study was both quantitative and qualitative method. A combination of these methods in this research was to achieve a deeper level of insight of the research in addition to statistical evidence to support facts. The statistical instrument used in analyses was the Statistical Package for Social Science (SPSS) version 20. The Spearman correlation coefficient test was used to test the hypothesis. Correlation is a bivariate analysis that measures the strengths of association between two variables.

RESULTS AND DISCUSSION

Results of the study are presented in the form of various charts. Farmer's perception on effective services delivery was tested using modalities like "effective" and "not effective". Indicators examined were; organization of field days, farmers participation in extension services, field visits, demonstration methods, creating awareness

(Figure 2).

Proper achievement of agricultural extension depends on good relationship with farmers. Women who participate (by take part in decision making, identify problems and propose solutions) in extension activities will have better access to knowledge and technology than those who do not take part in extension services. Taking part in extension work by female farmers will improve satisfaction and raise their level in livestock production. Figure 2 show that 76.6% of the respondent hold the believe that the livestock farmers themselves are not participate effectively in extension activities while only 23.4% feel that farmers contribute to effective extension services. These results are not different from that conducted in Ethiopia which realized only 42.2% perception of female farmers' participation in effective service delivery (Berhanu et al., 2014). Generally the results confirm that female livestock farmers in North-West region do not participate fully in extension services. In an interview with the sub-divisional delegate for livestock in Bamenda 1 up station who is also a Bororo woman herself confirm that Bororo women have a lot of limitations when it comes to taking part in extension services. They are more focused on child bearing and other social activities. According to this source of information, there is need to sensitize the Bororo women on the importance of taking full participation in extension services (Pelican 2012). To enhance participation of female farmers in extension and livestock services in the North-West region Bureau of Agriculture and Rural Development need to properly mainstream gender,

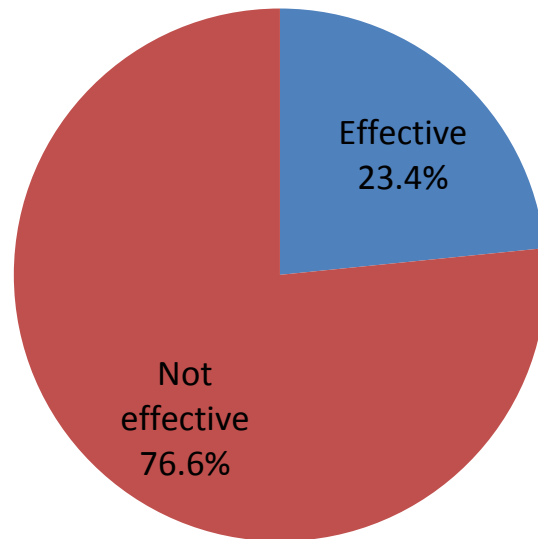


Figure 2. Farmer's perception on effective participation in extension services.

— effective — not effective

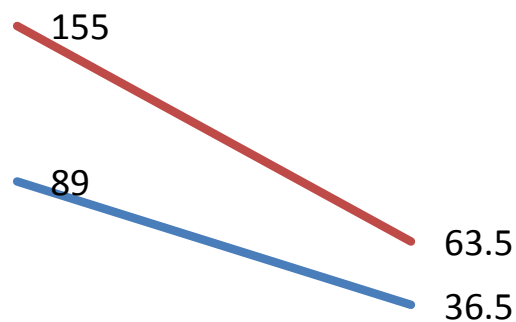


Figure 3. Farmers perception on the organization of field days by extension agents.

combine pro-poor development strategies and integrate literacy programmes into the routine extension activities (Figure 3).

An effective extension approach is based on close cooperation between farmers and extension staff (Birrerr et al., 2006). This close cooperation with farmers will encourage better supervision and understanding the need of the farmers in order to identify their problems. Better results could be achieved by organizing more field days by extension agents through effective planning, proper and frequency in organizing field visit by extension staff and training programs in close collaboration with

farmers. Results on Figure 3 show that 63.3% of the respondents believe that organization of filed days by extension agents is not effective. Yet 36.5% of the livestock farmers believe that the organization of field days by the extension agents is effective. However, the distance does not lead to the conclusion that extension work is effective, as extension agents are expected to spend more days with the livestock farmers so that they can become more acquainted to new technologies to improve on their livestock activities (Figure 4).

Farm visits are the most common form of personal contact between the agent and the farmer and often

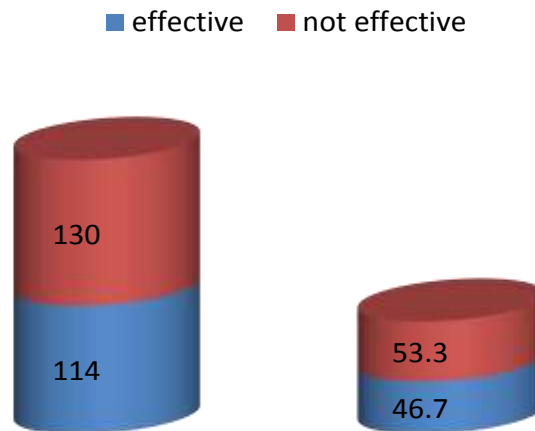


Figure 4. Farmers perception of farm visit.

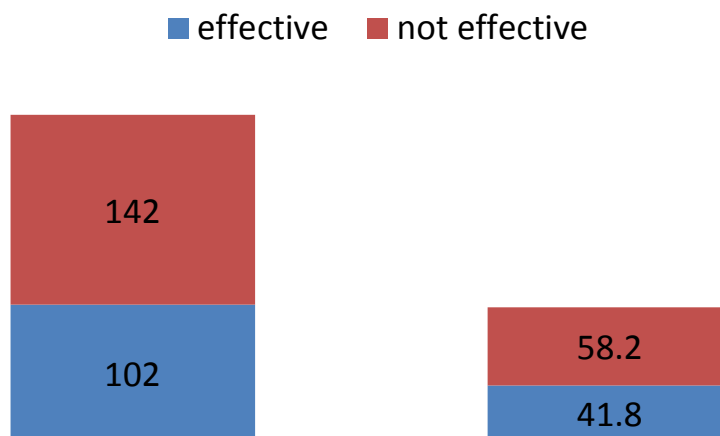


Figure 5. Perception on creating awareness of extension services.

constitute over 50% of the agent's extension activities as it takes much of the agent's time. It is important to be clear about the purpose of such visits in order to schedule them with care. Results from Figure 4 indicate slight different perceptions of farmers on farm visit by extension agents. From these results 46.7% of the respondents feel that farm visit by extension workers is effective while 53.3% of the respondents feel it is not effective. These results are contrary to the one obtained by (Maoba, 2016) in South Africa that realized only 24.36% effectiveness on extension workers in field visit. Also, in cross river state Nigeria, extension effectiveness on farmer's perception on farm visit was noted to be 65.55%. Agbarevo (2013) states that there are variations on effective farm visit in different countries depending on the availability of extension agents. These variations can be influence of hinder effective extension delivery services. For instance, if there are limited extensions agents in Cameroon than in Nigeria, farmers in Nigeria may have more access to extension agents than in

Cameroon. However, lacks of effective farm visits can lead to farmers complain about invisibility of agricultural advisors and that could impact negatively on extension activities. (Singh et al., 2013). It is important for agricultural advisors to visit farmers often. Visits should be meaningful and have a purpose in order to have a positive impact to the farming community. More attention is needed to reduce the current percentages of 53.3% of not effective visits to increase the percentage of farm visits by extension agents in Cameroon in general and North-West region in particular (Figure 5).

Extension agents provide advice and information to assist farmers in making decisions and generally enable them to take action. This can be information about prices and markets, for example, or about the availability of credit and inputs. (Amungwa and Nji 2015) Creating awareness to the farmers about these services by extension agent is an important factor for effectiveness. Respondents were asked to express their views by indicating effective or not effective on the level of

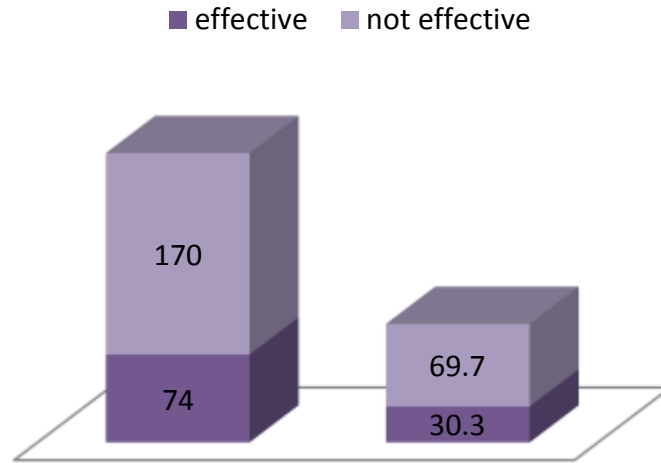


Figure 6. Perception on holding field meeting with farmers.

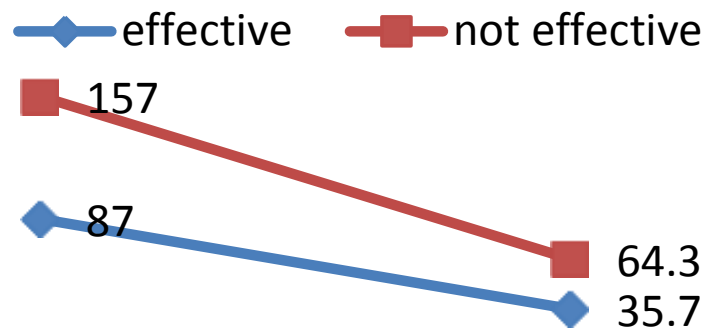


Figure 7. Farmer's perception on organization of demonstration methods.

awareness created by extension agents in their respective communities. From results in Figure 5 it is clear that extension agent still have a lot to do to create more awareness on extension activities to the livestock farmers. According to the result, 41.8% of respondents holds that awareness is effective while 58.2% believe that extension agent are not doing well to create awareness. According to UN (2005) lack of awareness of information related to livestock farming to farmers in remote villages is restricted due to the lack of infrastructure. However, most Bororo women live in remote areas that are often difficult to access by extension agents. In addition, Kaushik and Singh (2004) noted that if there is efficiency of farm information and the entrepreneurial innovation among farmers, economic and social change will be improved. It is mandatory for extension agents to improve on creating awareness among female livestock farmers as it will equally help the farmers to improve on productivity and quality of livestock produce by the women (Figure 6).

Extension effectiveness is determined by percentage of

meetings held between farmers and extension workers, number of field meetings held, regularity of meetings held by community extension worker. Farmers were allowed to determine their Perception about meeting schedule by extension workers by showing if the meetings are effective or not effective. Figure 5 reveal that the meetings schedule by extension workers to the livestock farmers is not effective as 69.7% hold to this believe while 30.3% of the farmers feel that the meeting schedules are effective. This result is contrary to that carried out by Agbarevo and Machiadikwe (2013). In cross river state in Nigeria which revealed that farmer's perception on meetings scheduled by extension workers to farmers was 87.93% effective. However, we noticed on Figure 5 that extension agents do not create awareness of their activities to the farmers. There is need for extension agents to improve on the meetings schedules to farmers especially with female livestock farmers in North-West region of Cameroon (Figure 7).

According to the results above farmer's perception on the organization of demonstration methods by extension

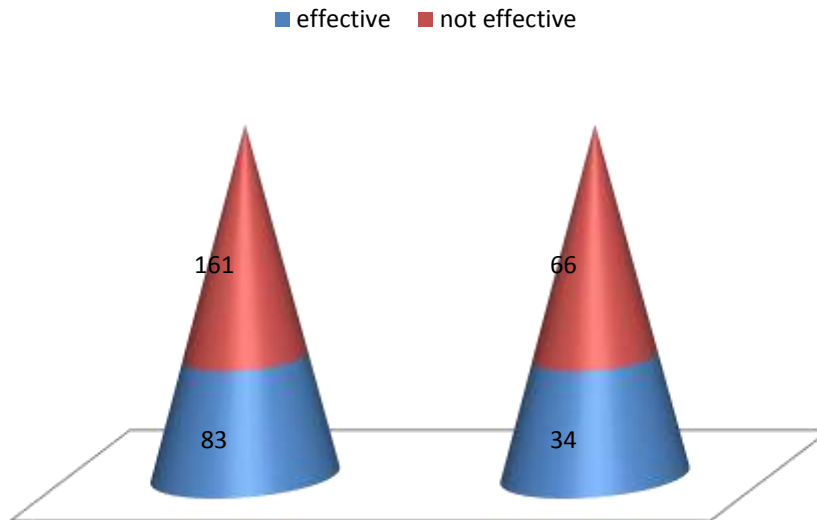


Figure 8. Farmers perception in the organization of farmers training groups.

workers are 35.7% effective and 64.3% not effective. In comparison with the study of (Machiadikwe, 2013) in cross river perception rate of farmers on demonstration methods by extension agents is (77.58%). It will be crucial to ensure that methods regarded to be effective are mainly used to deliver extension messages. Officials should be encouraged to do away or minimize the application of extension methods perceived not effective. Persistence with such methods may result in non-participation of farmers to extension activities since it has been considered to be non-effective. According to Aphunu and Otoikhian (2008) there is the need for regular training for extension agents so that reasonable knowledge and experience in adult learning principles could be acquired to enhance their effectiveness (Figure 8).

Rapid changes are taking place in farming worldwide as a result of globalization and speedy urbanization. Farmers are intensifying existing patterns of production and diversifying their farm enterprises in an attempt to improve their livelihoods. Technical know-how seems not to be enough. Farmers need some form of organization both to represent their interests and as a means for taking collective action. Extension, therefore, should be concerned with helping to set up, structure and develop organizations of local farmers. Based on the results on Figure 7, farmer perception on organization of farmers training groups is not effective as 66% of the farmers have the perception that organization of training groups are not effective and 34% feel that the organization of training groups is effective. These results are not so different from that of Benjamin (2013) which registers (39.65%) effectiveness on training groups organized by extension agent in Nigeria. Therefore, in order to be competitive and take advantage of the new opportunities

farmers have to strive to increase to adapt their farm business to market changes and improve efficiency, profitability and income. Farmers' skills and capacity can only be built through a process of learning and practice. The Farm Business School (FBS) has been developed by the Food and Agriculture Organization of the United Nations to help farmers learn how to make their farming enterprises and overall farm operations profitable and able to respond to market demands. The learning takes place at the village level and farmers' capacity in entrepreneurial and management skills is built through a "learning by doing" method. Through this, extension officers and pilot farmers are trained as facilitators and then organize seasonal training courses, where farmers work in small groups at their own rate using materials that have been specially designed for the schools. (Amungwa and Nji 2015) If extension agents in Cameroon are able to adopt these techniques then female livestock farmers will be able to improve their profitability in both quantitatively and qualitatively.

CONCLUSION AND RECOMMENDATIONS

When farmers view extension delivery approaches to be effective, the impact is felt on the quality of products produce by the farmers as they will be able to apply learned technology on their farms. Results of the study indicated that the applications of the extension methods are perceived by the female livestock farmers not to be effective at all categories of extension services tested. It should be noted that effective agricultural extension delivery approaches can contribute drastically towards an improved livestock production leading to sustainable

agriculture thus reduce food security and mitigate poverty. Weak agricultural extension can result in low or poor yield, leading to susceptibility that can cause economic depression (Amungwa and Nji 2015). Women suffer the consequences of inadequate extension delivery approaches because they are not given proper attention when it comes to policy formation. The results have shown clearly that the female livestock farmers have poor perception about the quality of extension services rendered to them. Most of the farmers hold the believe that, the extension services are not effective at the level of creating awareness, demonstration, organizing filed visit to name a few. The reason for none effectiveness can be seen both at the levels of livestock farmers on the one hand as seen on Figure 2 where about 72.3% of the farmers do not participate in extension activities and on the other hand the extension agents because there is limited awareness on extension services rendered by the agents in the communities. Therefore extension agents should foster to improve on developing more effective principles to ensure effectiveness in services delivery to the Bororo female livestock farmers especially the Bororo female livestock farmers in North-West region.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

Determinants of agriculture participation among tertiary institution youths in Ghana

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The study was conducted to examine the determinants of agriculture participation among tertiary institutions youth in Ghana. The study first, examined what factors influences youth decision to participate in agriculture activities and second, the intensity of participation of those youths who are participating in agriculture. A multi-stage sampling procedure was used to select respondents for the study. Data collected were analyzed with the aid of descriptive and double hurdle model (DHM). Though farming comes with a lot of benefits to a nation but the result of this study reveals that majority of the youth, 315 compared to their counterparts 135, decided not to engage in farming. The findings of this research also discovered that, youth perception of farm input price, youth level of education, access to credit, access land and youth course of study at the tertiary institution, gender composition of the youth, and youth perception of farm income significantly affect decision and the intensity to engage in farming. Furthermore, insufficient capital, high cost of farm input, poor storage facility, farmers are not respected, poor income generating and inadequate credit facility are some of the constraints of youth participation in farming.

Key words: Ghana, youth, farming, double-hurdle model, participation.

INTRODUCTION

Agriculture is important to the development of any nation, Ghana being no exception (Department for Environment, 2015; Food and Agriculture Organization (FAO), 2006). The international development community has recognized that agriculture is an engine of growth and poverty reduction in countries where it is the main occupation of the poor (The World Bank, 2008). Furthermore, young people are very important resource required for every nation's development especially for sustainability in agricultural production (Ahaibwe et al., 2013). However,

with low participation of youth in agricultural production, the future of the agricultural industry is questionable. Agricultural sector in many developing countries is underperforming. This is because youth, who represent a crucial resource in agriculture and the rural economy through their roles as farmers, labourers and entrepreneurs, almost everywhere, has developed a sort of perception to agriculture (White, 2012; Leavy and Hossain, 2014). There is recognition that for Africa to achieve food security, special attention must be given to

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the youth because the youths are regarded as critical agricultural players (Brooks et al., 2013).

The agricultural sector is believed by many analysts that it is naturally endowed with multiple potentials to engross unemployed and excess or idle labour which consists of youths especially, graduates, from other sectors of the economy (Akpan, 2010). In a developing country like Ghana, the Ministry of Food and Agriculture (MOFA) in order to encourage youth participation in the agricultural sector (MoFA, 2014) has established a program, Youth in Agriculture Programme (YIAP) to change the negative perception the youth have on participation in agriculture, that is, farmers are uneducated, unskilled, physical labourers with extremely low economic return. The introduction of the program is necessary and vital to facilitate food and nutrition security for the future and also highlights the essential benefits attached to agriculture (MoFA, 2014). In Ghana, youths are distancing themselves away from agriculture in the face of government making efforts to attract them into the sector, creating employment while producing food for ever growing populations (Naamwintome and Bagson, 2013).

The researchers try to justify why increase participation of the youth in agriculture activity in Ghana is an important tool for economic growth by the following facts. The Ghanaian economy is broadly categorised into three sectors, namely, Agriculture (including Forestry and Fishing), Industry and Service. Agriculture's contribution to total employment is estimated to be 40.6%, with the Service and Industry sectors accounting for 45.2 and 14.1%, respectively as at the year 2017 (The World Factbook, 2017). This means, agriculture has lost its position as the largest employer, after dropping second to the Service's Sector. From Figures 1 and 2, the reduction in the agriculture employment rate also affects its contribution to Ghana gross domestic product (GDP). Agriculture contribution to GDP is estimated as 18.30% with the service and industrial sectors recording for 24.50 and 57.2%, respectively in the year 2017 (The World Factbook, 2017). This simply reconfirms that agriculture production and its contribution to GDP will boost should the employment rate of agriculture increase (Speth et al., 2015). Therefore, in order to halt the reduction in the agriculture employment rate, increase investment in agriculture by encouraging these young ones to participate in agriculture activities is needed. Furthermore, the current level of youth unemployment in Ghana is alarming. Youth unemployment incurred huge costs to the economy, society and their families (Maguire et al., 2013; ILO, 2013; Ajaegbu, 2012). Ghana's real GDP growth reached about 15.2% when the country began its commercial oil production in 2011 (Baah-Boateng, 2013; Ackah-Baidoo, 2016). In spite of this strong growth performance, employment generation remains a challenge (Peprah et al., 2015).

According to WDI, Ghana recorded a decline in youth unemployment rate from 11.40% in 2010 to 4.90% in

2017. In spite of this reduction in youth unemployment rate, the country continues to battle with high incidence of joblessness and job-seeking youths particularly in recent times. Ghana's unemployment in the urban areas is also found to be more prevalent than in rural areas (Baah-Boateng, 2013; Owusu-Ansah and Poku, 2012). The regular migration of people, particularly the youth, from rural area to the urban centers in search of better economic prospects which are not easy to come by, largely explains the phenomenon of the high urban unemployment rate in Ghana (Owusu-Ansah and Poku, 2012; Adaawen and Owusu, 2013). Therefore in order to curb this unemployment menace among the youth, they are encouraged seeing agriculture activity as an opportunity to generate income and create wealth because of the presence of vibrant and expanding markets for agricultural commodities (both primary and secondary commodities) in Ghana. Again, considering the current average age of farmers in Ghana, 55-60 years according to the Food and Agriculture Organization (2014) report, it calls for the need to encourage the upcoming young ones to participate in agriculture so that in some few years to come as population increases, food will be in abundance.

There are bountiful of factors contributing to youth's participation in farming. Among others factors leading to inadequate youth participating in agriculture activities may include lack of access to farm credit, limited government support, and lack of information and communication technologies (Mathivha, 2012; Dlamini, 1997). Moreover, Nnadi and Akwivu (2008) examined determinants of youths participation in agricultural production in Imo State, Nigeria. Data were generated from the three agricultural zones in the state. The empirical result revealed that age, education, marital status, parent income, parent occupation, household size and youth dependent ratio were significant factors influencing youth participation in agricultural activities. Again, Ohene (2013) research work on determinants of farmers' participation in the youth-in-agriculture programme in the eastern region of Ghana, also showed that age of respondent, education, household size, farm size, access to credit facilities and farm income of respondents were found to be significant and hence influenced participation in the youth in agriculture programme. In addition, difficulties in accessing loans, absence of the land policy, low levels of knowledge and skills in agriculture, lack of agricultural insurance and lack of extension contact have been identified as youth challenges causing less participation in agriculture (Ohene, 2013; Douglas et al., 2017; Akpan et al., 2015).

Ghana being a developing country could sufficiently absorb the surplus or idle labour in her economy because of its vast natural resource potentials in the agricultural sector (Food and Agriculture Organization, 2014). Considering the evergreen rainforest and the rich savanna soil in the south and north, respectively, not

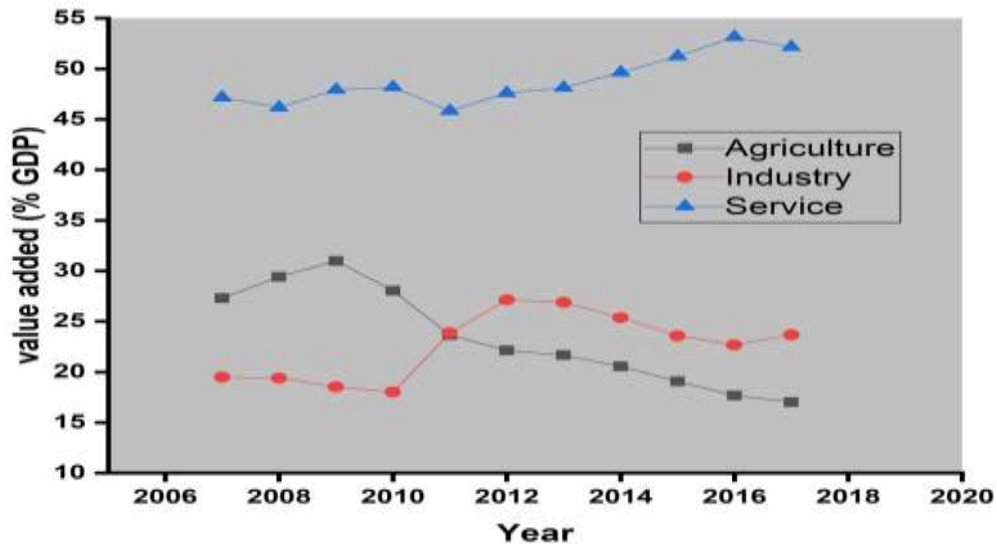


Figure 1. Value added (%GDP) of the three sectors (Service, Industry and Agriculture). Source: World Development Indicators (WDI).

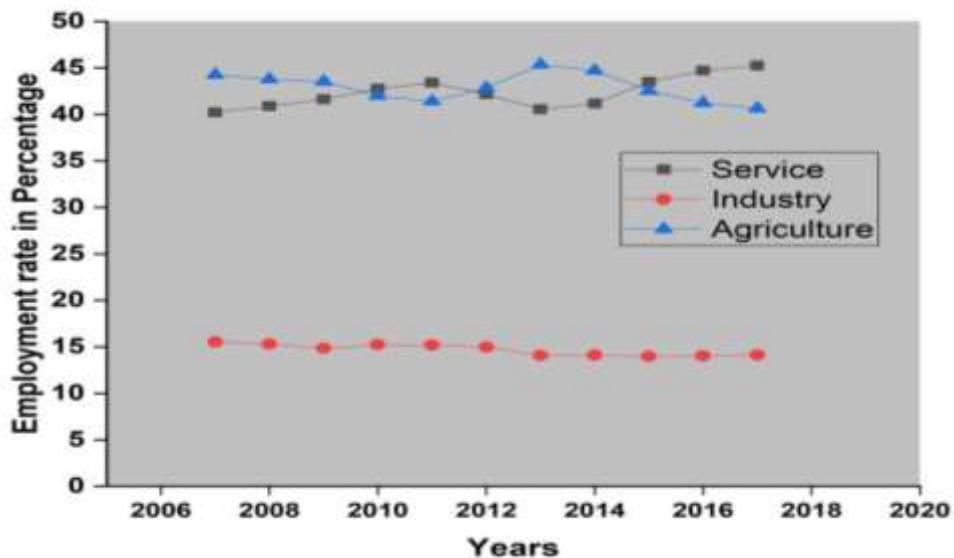


Figure 2. Employment rate of the three sectors (Service, Industry, and Agriculture). Source: World Development Indicators (WDI).

overlooking the rich water bodies that aligned the coastal states are capable of providing everlasting job opportunities for the idle and unemployed youth if these youths are ready to engage themselves in agricultural production.

However, while previous studies focus on the youth as a whole especially youths in the rural areas, their perception on farming and determinant of their involvement in agriculture activity, no known study to the best of the authors' knowledge investigated determinant

of youth in the tertiary institution decision and the intensity of participation in agriculture activities which this study does. This study objectives are therefore in twofold; first to examine the determinants of tertiary institution youth participation in agriculture activities and second to determine the intensity of tertiary institution youth participation in agriculture activities. Findings of this study will lead to better understanding of major reasons why youths are discarding or not putting in much effort in agriculture activities.

Theoretical framework of the study

Youth involvement in agriculture cannot explain without elaborating on migration studies. Many researchers have included migration as part and parcel of development studies for decades. The migration pull and push model had been employed to explain various issues relating to youth involvement in farming by few researchers like Noorani (2015) and Akpan et al. (2015). Some of the factors 'pulling' young people away from agriculture and more specifically farming, may include increased educational opportunities and higher paying jobs in the cities as well as sound economic environment. The push factors on the other hand also include: lack of access or restricted access to land, inadequate social amenities, poor transportation network and lack of opportunity for personal development. This research study examines the determinant of youth decision to engage and participate in farming and therefore employed the push and pull factor model as a guide to understand this study. There are numerous theories of migration but this study considered the dual labour market theory based on the objective of the study.

The dual labour market theory developed by Michael Piore in 1979, links migration to structural changes in the economy but explains migration dynamics with the demand side (Massey, 1999). This theory posits a bifurcated occupational structure and a dual pattern of economic organization in advanced economies. Two types of organization in the economy is expatiated by duality, namely capital-intensive where both skilled and unskilled labour are utilized, and labour intensive where unskilled labor prevails. The theory argues that migration is driven by conditions of labour demand rather than supply. This implies that the atmosphere of the economy creating a demand for both skilled and unskilled in the urban areas as compared to the rural areas causes migration. Therefore, as immigration becomes desirable and necessary to fill the jobs, policy choices in the form of active recruitment efforts follow the needs of the market. This theory places much emphasis on the pull factors of migration. Many youths are leaving the rural areas, that is, neglecting farming to the urban area based on economic, social and personal factors (Lee, 1966; Massey, 1999; Kurekova, 2011). Hence, this study rest on the fact that, youth migration (from the rural area/farming) is a function of several factors such as pull factors, push factors and economic factors as well.

METHODOLOGY

Data source and sampling procedure

The targeted population for this research was the youth in Ghana. The study was narrowed to the students at the tertiary institution. A pre-test structured questionnaire was prepared for collecting data from the respondents at the university level. Based on the experiences of pre-testing of the interview questionnaire, it was

modified and amended. The questionnaires were then finalized for the collection of data. Data on respondents' decision and the intensity of participation in agriculture activities were collected through interview schedule. Information was obtained on tertiary institution youth socio-economic characteristics, agriculture participants farm enterprise characteristics such as reason for farming, type of farming these participants have engaged themselves and their annual income earnings. Also their participation constraints information was solicited. Data was edited and coded to ensure accuracy, validity, uniformity, consistency and completeness. A double-hurdle model as previously used by Simtowe and Zeller (2007), Akpan et al. (2013), and Kuwornu et al. (2017) was employed to determine factors which influence the youth decision and the intensity of participation in agriculture activities. Data collected was analysed using descriptive and inferential statistical tools.

The multi-stage sampling technique was employed in selecting respondents for the study and again, ensure each respondent had equal chance of being selected in the sample (Stafford et al., 2006; Ascione et al., 2016). The first stage involved purposive sampling, where three universities were selected namely, University of Cape Coast (UCC), Kwame Nkrumah University of Science and Technology (KNUST) and University of Ghana (UG). These universities were purposively selected because they among the few universities in Ghana which offer agriculture as a course, that is, there exist college of agriculture in these school. The second stage employed the simple random sampling to select three halls each within these universities and in each hall. In the third and final stage, 50 students per hall were randomly selected making a total of 450 students. Among these 50 students selected includes both agriculture and non-agriculture students. A total of 135 students decided to engage and participate in farming and 315 decided not to engage and participate in farming.

Data was edited and coded to ensure accuracy, validity, uniformity, consistency and completeness. A double-hurdle model as previously used by Simtowe and Zeller (2007), Akpan et al. (2013), and Kuwornu et al. (2017) was employed to determine factors which influence the youth decision and the intensity of participation in agriculture activities.

Empirical method

The study employed the independent double-hurdle model (DHM) originally formulated by Cragg (1971), with the assumption that youth decision and intensity of participation in agriculture activity are two distinct or independent decisions. In addition, different sets of variables are believed to influence the decisions of a youth decision to participate in agriculture and extent or effort put in the participation. The model is equivalent to a combination of a probit or logit and truncated regression model (Worku and Mekonnen, 2012). This work employed logit instead of probit since both econometric regression models are almost the same. A different latent variable is used to model each decision process, with a logit model to determine decision of engagement level one and a Tobit model to determine the intensity of participation (Blundell and Meghir, 1987). The first hurdle, a binary Logit model was used to identify significant factors that influence youth decision to engage in agriculture. This method was chosen because it is a standard method of analysis when the outcome variable is dichotomous (Hosmer et al., 2013), measured as having a value of 1 or 0, where 1 implies decision to something and 0 implies otherwise. Implicitly, the specified model is shown in Equations 1 and 2. The Logit model which captures youth decision to engage in farming is shown in Equations 4 and 5.

Tertiary youths are partitioned into two categories, participants in agriculture ($S_n > 0$) and non-participants ($S_n = 0$). Where S_n is the intensity of participation (amount of capitals invested in the

Table 1. Independent variables measurements, description and expected sign.

Code	Variable	Description	Expected sign
PPFI	Perceived price of farm input	1, if respondent perceives price to be high; 0, otherwise	-
INCPE	Income perception	1, if respondent perceives farming income to be high; 0, otherwise	+
AC	Access to credit	1, if respondent has access to credit; 0, otherwise	+
AL	Access to land	1, if respondent has access to land; 0, otherwise	+
EDU	Education (years)	Respondent number of years of schooling	-
AGE	Age (years)	Respondent age	+/-
GEN	Gender	1, if respondent is a male; 0, female	+
YOCOS	Youth Course of study	1, if respondent is an agriculture student; 0, otherwise	+
PO	Parent occupation	1, if respondent parents job is farming; 0, otherwise	+

agriculture activities carried out by participant). Let Y_1 represent the category to which the youth belongs, since the participant and non-participant partitions give an ordered response. Let the ordered response Y_1 be such that:

$$Y_{1i} = 0 \text{ if } S_{ni} = 0 \quad (1)$$

$$Y_{1i} = 1 \text{ if } S_{ni} > 0 \quad (2)$$

where the index equation is written as:

$$Y_1^* = \beta_{1i} Z_{1i} + \varepsilon_{1i} \quad (3)$$

where Y_1^* is a latent discrete accessibility choice variable that denotes binary censoring, which is the utility the youth gets from participating in the agriculture. Z_{1i} is a vector of explanatory variables hypothesized to influence farming choice, β_{1i} is a vector of parameters and ε_{1i} is the standard error term.

$$\text{Prob}(\text{Access} = 1) = \log\left(\frac{p}{1-p}\right) \quad (4)$$

$$Y_i = \beta_0 + \beta_1 \text{PPFI}_i + \beta_2 \text{AC}_i + \beta_3 \text{PO}_i + \beta_4 \text{AL}_i + \beta_5 \text{EDU}_i + \beta_6 \text{YOCOS}_i + \beta_7 \text{AGE}_i + \beta_8 \text{GEN}_i + \beta_9 \text{INCP}_i + \varepsilon_i \quad (5)$$

Finding the determinants of the intensity of participation was achieved by estimating the equation of the second hurdle. The second hurdle involves an outcome equation, which employs a truncated regression (tobit) model to determine factors affecting the actual amount of capital used for agriculture by a youth who decided to participate in farming. This stage uses observations only from respondents who reported positive or greater than zero amount of capital. The truncated model is expressed as shown in Equation 6.

$$S_i^* = Z'_{2i} \beta_2 + v_i, v_i \sim N(0, \delta^2) \quad (6)$$

S_i is the observed size of money (capital) by the sampled

respondent. For a youth who does not engage in farming, S_i cannot be measured and was set to be equal to zero (0). This indicates that the observed amount of capital is zero either when

there is censoring at zero $S^* \leq 0$ or if there is faulty reporting, or due to some random circumstance. The empirical model used to estimate the truncated regression model of the intensity of participation among the youths' is as follows:

$$S_i^* = \beta_0 + \beta_1 \text{PPFI}_i + \beta_2 \text{AC}_i + \beta_3 \text{PO}_i + \beta_4 \text{AL}_i + \beta_5 \text{EDU}_i + \beta_6 \text{YOCOS}_i + \beta_7 \text{AGE}_i + \beta_8 \text{GEN}_i + \beta_9 \text{INCP}_i + \varepsilon_i \quad (7)$$

where the dependent variable, S_i = intensity of participation (Amount of capital invested in agriculture activity by a youth measured in Ghana Cedis (GH¢)) and Y_i = farming participation (1, if participated; 0, otherwise) $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8$ represent parameters of the model to be estimated and ε_i represents the stochastic error term.

RESULTS AND DISCUSSION

Descriptive statistics of socio-economic characteristics of respondents

The descriptive statistics of respondents is shown in Table 1. The result revealed an average age of about 26 ± 5.86 years for youth in the study area. This is because the targeted populations were students in the university. The result also showed that, about 65, 39, 40, 39 and 48% of the respondents had access to credit, perceived that farm inputs (fertilizer, seed, etc.) price were high, parents engage in farming as their occupation, had basic farming knowledge and perceived that, one can generate high income in farming, respectively. An average amount of GH¢1246.67±708.88 was revealed to be the amount of capital spent on the farm by the respondents. This is an indication that tertiary institution youth intensity of participation in agriculture activities are not encouraging. Also, about 65% of the respondents

Table 2. Socio-economic characteristics of respondents.

Variable	Mean	SD
PPFI	0.39	0.49
INCPE	0.48	0.50
AC	0.65	0.48
AL	0.38	0.48
EDU	15.10	2.02
AGE	25.71	5.86
GEN	0.65	0.48
YOCOS	0.30	0.46
PO	0.40	0.49
Farming capital (Ghana Cedi)	1246.67	708.88

Source: Survey Results, February - May (2018).

Table 3. Reasons for farming.

Reason	Frequency	Percentage
Parental influence	19	14.1
Income generating (Profit)	127	94.1
Self-employment	61	45.2
Access to land	29	21.5

Source: Survey Results, February - May (2018).

were male youth. The result also showed that 25% of youth interviewed were married. Only 38% of the respondents sampled had accessed to land for farming.

Participants farm enterprise characteristics descriptive statistics

From the study, it was revealed that out of the 135 participants, 58 (43%) of the respondents were non agriculture students and the remaining 77 (57%) respondents were agriculture students. These participants were asked the following questions: the reason why they choose farming, the kind of farming activities they involved themselves in and their average income per year.

Table 2 shows the reason why these 135 respondents decided and participate in farming. From the table, farming being an income generating job records the highest, that is, 127 (94.1%) respondents see farming as a source of income, farming serving as self-employment is the next reason, that is, 61 (45.2%) respondents consider farming as a substitute for being jobless. Access to land and parental influence is also identified as the reasons why these respondents chose farming. About 29 (21.5%) of the respondents had access to land through inheritance, lease and rent whiles 19 (14.1%) participate in farming because their parents are farmers and due to

that, influenced their young ones.

Participants' reasons for farming

Type of farming system engaged in by participants

The kind of farming activities carried on by these participants is also shown in Table 3. Majority of the respondents, 126 (93.3%) are into crop farming such as maize, cassavas, beans, yams and plantains. The reason why most of these students chose crop farming is because, accessing a market for these crop products was relatively easy (Table 4). Again, these crops are traditional staple products that one is more than likely to be exposed in Ghana. Livestock farming took the second position. A total number of 11 (8.1%) respondents raise animals such as cows, goats, pigs and sheep. They also decided to raise these animals because one can easily access market for these products. Respondents engaged in mixed farming, that is, raising animal and growing crops at the same time are 10 (7.4%). Despite of the divided attention and resources over several activities associated with mixed farming, thus leading to reduced economies of scale, these farmers chose to practice it because of the possibility of reducing risk and re-utilizing resources. Fish farming and poultry recorded 5 (3.7%) and 3 (2.2%) respondents, respectively. The less

Table 4. Types of farming activities.

Types of farming	Frequency	Percentage
Fish farming	5	3.7
Livestock	11	8.1
poultry	3	2.2
crops	126	93.3
Mixed farming	10	7.4

Source: Survey Results, February - May (2018).

Table 5. Annual income earnings from farming.

Farming income/annual (in Ghana cedis, GH¢)	Frequency	Percentage
100-1000	24	42.1
1100-2000	15	26.3
2100-3000	11	19.3
Above 3000	7	12.3

Source: Survey Results, February - May (2018).

participation of these kinds of farming can be attributed to the following: first, a lot of money is needed to sustain the birds and fishes. Second, most people do not know the technicalities in raising these kinds of animals; therefore, in order not to risk their resources, they prefer other options to these ones.

Annual income earnings from farming

Monthly income earnings from farming are shown in Table 5. Out of the 135 participants, only 57 (42.2%) reported their monthly income. From the table, 24 (42.1%) participants earn 100 to 1000 GHC per month. Again, 15 (26.3%) and 11 (19.3%) participants reported monthly income earnings of GH¢1100-2000 and GH¢2100-3000 per month, respectively. Only a few of the participants, 7 (12.3%), concluded that they earn above GH¢3000 per month. All those who earn above GH¢3000 in addition to 10 participants revealed that, they have market to sell their goods.

Differences between means of the independent variables for participants and nonparticipant in farming

From the Table 2, perceived price of farm inputs, access to credit, basic farming knowledge, access to land, and perception on income were all significant at 1%. Education was also significant at 5%. This implies that there are significant differences between the means for participants and nonparticipants in terms of perceived

price of farm inputs, access to credit, basic farming knowledge, access to land, education and perception on income. There are, however, no significant differences between means for participants and non-participants for the rest of the variables (Table 6).

Determinant of youth decision and intensity of participation in agriculture activities

Results of the determinants youth decision and intensity to engage in agriculture activity are shown in Table 7. The first hurdle reveals that the Log Likelihood and chi square value are -196.43532 and 101.82, respectively, while the Log Likelihood for the second hurdle was -1277.1122. The entire models were significant at 1% levels of probability. The results showed that the coefficients of perceived price of farm input, access to credit, access to land, education, youth courses of study, gender of the youth and youth perception on income were found to be significant at the various levels of significance ($p < 0.05$, $p < 0.01$). The results in the table further revealed that while perceived price of farm input reduces participation and intensity of farming, access to credit, access to land, youth courses of study increased participation and intensity of farming. The more youth perceive farm input prices to be high by Gh¢1 would reduce the odd of increase in participation by 0.46 times and intensity by 93.20 cedis. This is as a result that, most of these youths are not working and do not have enough money to purchase high or expensive inputs. This result is in consistent with the findings of Goldsmith et al. (2010) who indicated that, high price of products leads

Table 6. Differences between means of the independent variables for participants and nonparticipant in farming.

Variable	Participants (n=135)	Non Participants(n=315)
Price of farm input perception	0.2815(0.3885)***	0.4349(0.0279)
Access to credit	0.8519(0.0307)***	0.5587(0.0280)
Basic farming knowledge	0.5407(0.0431)***	0.3143(0.0262)
Access to land	0.5852(0.0426)***	0.2857(0.0255)
Education (years)	14.7629(0.1722)**	15.2476(0.1174)
Marital status	0.2667(0.0382)	0.2381(0.0240)
Age (years)	25.2222(0.4871)	25.9175(0.3349)
Gender	0.6222(0.419)	0.6635(0.0267)
Parent occupation	0.5481(0.0429)	0.3302(0.0265)
Income perception	0.7333(0.0382)***	0.3683(0.0272)

*** represent significant levels at 1%.

Source: Survey Results, February - May (2018).

Table 7. Model estimate of determinant of youth decision and intensity to engage in agriculture activities.

Variable	First hurdle (decision to engage in agriculture activities)			Second hurdle (intensity of participation)		
	Odd ratio	Std. Err	z	Coefficient	Robust Std. Err	Marginal effect
PPFI	0.4620429***	0.1244281	-2.87	-388.1203**	188.5471	-93.2069
AC	5.481302***	1.720702	5.42	875.7002***	219.5019	210.299
PO	1.487312	0.4236066	1.39	247.4977	189.186	59.43645
AL	3.290897***	1.019529	3.84	844.1424***	214.7454	202.7204
EDU	0.8160579**	0.0653256	-2.54	-69.42743	58.76	-16.67296
YOCOS	5.988001***	1.582618	6.77	1321.989***	206.8289	317.4749
AGE	1.009215	0.0326003	0.28	25.82828	20.16603	6.202648
GEN	1.516646	0.4431459	1.43	-520.3403***	187.6828	-124.9595
INCP	1.197661	0.4264476	0.51	947.5468***	189.5838	227.5529
constant	0.5629017	0.6655144	-0.49	-1902.197**	914.0864	-
Log likelihood = -196.43532,			Log likelihood = -1277.1122,			
Pseudo R ² = 0.2854			F(9, 441)= 23.35,			
Prob > chi ² = 0.0000			Prob > F = 0.0000			
Wald chi ² (9) = 101.82			Pseudo R ² = 0.0599			

** and *** represent significant levels at 5 and 1% respectively.

Source: Survey Results, February - May (2018).

to low patronage holding all other things constant. An increase in access to credit by Gh¢1 and land by 1acre would increase participation by 5.48 and 3.29 times, respectively and intensity by 210.299 and 202.72 cedis, respectively too. This result confirms Yuan and Gao (2012) and Chandio et al. (2017) that access to credit relaxes the financial constraint and this helps farmers to diversify their portfolio. Again, it supports Cotula et al. (2004) who explains that access to land brings hope to the youth because securing a land will have implications for the distribution of wealth, rates of economic growth and the incidence of poverty if used properly.

However, while an increase in education by a year

reduces the odd of increase in participation by 0.82 times, the intensity of participation fall by 124.96 cedis among male youth farmers. The result suggests that, as youth acquired more years of formal education, there is an increase tendency of agricultural diversification. The result suggested that most youth perceived agricultural production is not profitable enough or yield fast income as compared to non-agro based businesses. Therefore, seek for greener pastures (white collar job) in the urban area, neglecting farming. This result is also in agreement with the research findings of Akpan et al. (2013) who reported that educated people give less priority to farming because they have higher chance to find less tedious job in the cities that can earn them huge sum of income.

Table 8. Constraints to youth engagement in farming in Ghana.

Constraint	Percentage	Ranking
Insufficient capital	72.40	1
High cost of farm input	62.70	2
Poor storage facility	61.80	3
Farmers are not respected	61.40	4
Inadequate land availability	57.70	5
Poor income generating	55.30	6
Inadequate credit facility	44.70	7
Energy demanding	43.20	8
No agriculture insurance	40.60	9
No basic farming experience	35.80	10

Source: Survey Results, February - May (2018).

Similarly, a number increase in agriculture students increases participation by 5.98 times and intensity by 317.47 cedis. Meanwhile, a 227.55 cedis increment in the intensity occurs as youths perceive Gh¢1 increase in income, thus, perceives a higher income. This result explains that, if agriculture becomes more remunerative and rewarding in terms of incomes and profitability, it will attract the youths to participate in it, therefore, increasing the amount of capital spent so as to increase production and income. These findings agree with the research study of Chikezie et al. (2012) and Ahaibwe et al. (2013). They reported that high income from agriculture activities encourages individuals to participate in agriculture activities.

Constraints to youth involvement in farming

The results on the constraints to participation in agriculture activities in Ghana are shown in Table 8. Qualitative tools such as percentages and ranking were employed to identify the most important constraints. Results revealed that, insufficient capital (72.40%) is the most important constraint faced by tertiary institution youth in Ghana. High cost of farm input (62.70%) and poor storage facilities (61.80%) also serves as hindrances to youth involvement in agriculture in the country. Farmers are not respected (61.40), inadequate land availability for farming (57.70%) and poor income generating (55.30%) as well inadequate credit facility (44.70%) are other significant deterrent to tertiary institution youth involvement in farming. In addition, the study identified farming as energy demanding (43.20%) and no agriculture insurance (40.60%) as mild constraints to youth involvement in farming. However, the study asserted that, the opinion those youths having no farming experience (35.80) is not upheld by majority of tertiary institution youth in the country.

CONCLUSION AND RECOMMENDATION

In conclusion, youth participation is a key way to alleviate unemployment, food insecurity, immoral social behaviour like crimes and drug abuse and extreme poverty in developing countries of which Ghana is not excluded. Though farming comes with a lot of benefits to a nation but the result of this study reveals that majority of the tertiary institution youths, 315 (70%) compared to their counterparts 135 (30%), decided not to engage in farming. The findings of this research has also discovered that, youth perception of farm input price, youth level of education, access to credit, access land and youth course of study at the tertiary institutions, gender composition of the youth, and youth perception of farm income significantly affect decision and the intensity to engage in farming. Furthermore, insufficient capital, high cost of farm input, poor storage facility, farmers are not respected, poor income generating and inadequate credit facility are some of the constraints of tertiary institution youth participation in farming.

Based on the findings of this study, it is recommended that in order to push the youth into farming, communities and the government have a role to play. The following factors should be addressed and dealt with. They include:

- (1) Motivating successful youth farmer through merit awards during every farmer's day celebration.
- (2) Provision of subsidies on major farm inputs prices such as fertilizers, seeds and other farming equipment.
- (3) Putting on measures to curtail credit and land constraints so that, sufficient capital and access to land could be acquired by the youths to participate in farming.
- (4) Provision of small farm in all primary and junior high schools in addition to the agriculture subjects studied in schools for practical purposes. This will give the students basic farming experience and increase their love for agriculture.

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CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

An overview of agricultural extension in Botswana and needed reforms

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Crops and livestock sectors constitute agriculture in Botswana. The sectors are dominated by small-scale farmers engaged in traditional production systems. National Agriculture Policy calls for an effective extension service to ensure continued farmer capacity building, increased efficiency and production by the sectors. Several extension approaches adopted over 79 years have been replaced one after the other since 1926 to find the extension service that best addressed production needs of farmers. However, it has proven over the years that the national extension system is not responsive to the needs: hence the decreasing contribution of agriculture to the wellbeing of Botswana. The paper adopts an historical approach to discuss the evolution of agricultural extension in Botswana: the challenges, interventions, policy and other initiatives implemented to make extension effective. Document analysis provided data on past and present extension programs, and rationale for new reforms. Institutional pluralism, cost-recovery, and decentralization are recommended to strengthen the extension service.

Key words: Agricultural extension, extension approach, extension reform.

INTRODUCTION

Agricultural extension remains a powerful strategy for rural development throughout the world; no nation expects to achieve growth in agriculture without an effective extension service (Anaeto et al., 2012). Presently, agricultural extension cannot only focus on increasing production, but should also recognize the presence of other institutions that support farmers. The institutions, together with extension must facilitate the farmers' efforts to solve problems; link them to markets and other players in the agriculture value chain. They

should provide services to farmers; help them obtain information, skills, and technologies to improve their livelihoods.

The transfer of technology (ToT) model, a dominant extension approach for developing and disseminating innovations in most African countries, has limited success with promoting sustainable agricultural development (Van den Ban, 1999) because the role of agricultural extension has changed (Karbasioun, 2007; Allahyari, 2007). Agricultural extension certainly needs re-focusing and re-

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positioning to better address the problems of the poor as dictated by the new global context (Toness, 2001).

In rural areas, many farmers do not have the most up to date information on how to grow food efficiently and economically. Therefore, improving their knowledge and providing physical resources necessary for implementation can dramatically increase the level of productivity. Increased farmer knowledge means more improved agricultural practices and therefore more food and income (Rosegrant and Cline, 2003; Mission 2014: Feeding the World). This increase in agricultural production can be attributed to acceptance of technological changes at the rural farm level (Anaeto et al., 2012), and can be achieved through an extension service that goes beyond technology transfer to include facilitation, training to ensure learning, appropriate skill development by farmers, promoting farm groups and dealing with marketing issues.

The focus of agricultural extension should primarily be changing attitudes and behavior of farmers through training. Secondly, the economical focus is to increase farmer income, crop yield, improved financial management and food preservation skills. The third focus of agricultural extension is social; this includes improved health of farmers, leadership skill development and increased desire to participate in own development (Asiabaka, 2002; Anaeto et al., 2012). The over-arching focus should be on the fit between an extension system and the national agricultural policy context as this determines the effectiveness of the system and its operations. In addition, current extension services should be ready and willing to partner with diverse groups of service providers and agencies. This is to support farmers with the skills required in making informed decisions and choosing the best options (Davis, 2009).

More than 60% of the populations of most developing countries is poor, lives in rural areas and depends on agriculture for their livelihoods (World Bank, 2007). These are the people who lack the functional knowledge essential for increasing agricultural production and income generation, to further alleviate poverty. Agricultural extension therefore, plays a critical role in facilitating agricultural productivity and achieving the desired development outcomes such as poverty alleviation (Vercillo, 2011).

LITERATURE REVIEW

Botswana's agricultural system comprises two sectors, crops and livestock, dominated by small-scale farmers engaged in traditional production systems. The relative performance of agriculture dropped from 42% of Botswana's gross domestic product (GDP) in 1966 to 2.37 in 2014 (World Bank Indicators, 2012). A number of factors such as access to roads, electricity,

telecommunication, grain storage, and sanitation are associated with the decrease in the sector's contribution to the economy (Republic of Botswana, 2009).

Botswana National Development Plan 10 (Republic of Botswana, 2009 to 2016) recommends several goals to enable attainment of desired results in the agricultural sectors and increase agricultural productivity. These are; facilitating the growth and competitiveness of the agricultural sector, enhancing farmers' willingness and sustainable resource management skills, and availing essential resources to the agricultural and related sector and improving management skills. In addition, commercialization, private sector engagement, and effective extension services are recommended for improving performance of agriculture.

Extension approaches in Botswana have evolved over time since 1926 as the search for a service that best addressed the problems constraining agricultural development continued. An extension approach is a structural framework to the delivery of services and therefore, defines the organizational and leadership structures. An Approach determines the purpose, objectives of extension, clients, needs, programs, methods and resource requirements (Axinn, 1988). Through extension service, government availed programmes, appropriate resources to improve crops and livestock sectors; these are the reason why after 79 years, current policy acknowledge the relevance of extension and regard the service as integral to innovative technology required to increase agricultural productivity (Republic of Botswana, 2012a).

The purpose of this paper was to discuss agricultural extension in Botswana, past and present approaches, programs, and initiatives to support extension services, and agricultural production in order to promote food security. The specific objective of the paper was to discuss the challenges of agricultural extension and recommend appropriate reforms. The paper starts with a narrative of the evolution of extension since 1926, to describe past and present extension services and reveal recurring challenges. The paper then discusses appropriate extension reforms and identifies those that can best address challenges of agricultural extension in Botswana.

METHODOLOGY

The study adopted a qualitative research approach, and an historical method based argument that "the past is causally related to the present": the present can be understood with reference to the past. Therefore, a process-series, sequence-pattern and cycles exist to reveal a basis for any social activity. The argument of historical methods is that past knowledge is a prerequisite for present knowledge (Ghosh, 2003). According to Creswell (2003), identifying patterns is critical to qualitative study. Therefore, this study relied on content analysis of published and unpublished documents to provide the data. Sources of data comprised of

Botswana government documents, conference proceedings, journal articles, and informal interviews, discussions with Ministry of Agriculture officials, extension workers, extension experts, and farmers.

DISCUSSION

Evolution of agricultural extension

The first agricultural extension activities reported in 1926 targeted dairy production. The responsibility of the first extension agent, the dairy inspector, was finding best management practices for dairy production and persuading farmers to adopt the practices (Hobb, 1985).

In 1935, the Department of Agriculture was established with a mandate to conduct research on crop and pasture agronomy, and to promote pig, poultry and forestry production. Other livestock production services were provided through the Department of Veterinary Services (DVS), which had been established much earlier to advise farmers. The extension approach adopted then by the DVS was the "Foremen Farmers" also referred to as "Cattle Guards". The foremen farmers were the innovators, engaged in more advanced production systems (Lever, 1970).

The emphasis of extension in the 1940s shifted to small scale, traditional sector agricultural production, leading to the establishment of two small scale irrigation schemes in 1947. The Cooperative Demonstration Pilot Scheme (CDPS) became an established extension approach, and marked the birth of a full-fledged National Agricultural Extension Service (Lever, 1970). The CDPS extension approach required extension agents to conduct demonstrations on the farmers' fields to disseminate new technologies to a wider population of farmers. Despite the high yields attained on demonstration plots, many farmers failed to continue once they did not have access to subsidies provided through the CDPS. Thus, there was no sustainable technology adoption induced by the program.

The Pupil Farmer Scheme (PFS), an approach based on a concept borrowed from Zimbabwe, replaced the CDPS in 1962 (Lever, 1970). In the PFS extension approach, one extension agent worked with and targeted 15 to 25 farmers. To qualify as a Pupil Farmer, an individual or a household had to own a plough and draught oxen, and should have cleared the bush and destumped his or her field. As the pupil farmer progressed and production methods improved, he or she was promoted to progressive, improved, and then master farmer (Baker, 1988). Five years into implementation, PFS had registered a total of 4,150 farmers, which then accounted for 16% of the farmer population in Botswana. The scheme had 1,700 pupil farmers, 1400 improved farmers, 750 pupil livestock men (engaged in livestock farming only), 200 progressive farmers, and 100 master

farmers. No extension programs specifically targeted unregistered farmers (Mrema, 1995).

During implementation, the PFS approach faced numerous challenges such as lack of coordination, inadequate supervision of staff, lack of equipment, poor transportation, poor housing, and selective and limited coverage (Baker, 1988). Therefore, the Ford Foundation supported consultancy was commissioned by the Botswana government in 1972/73 to review the existing national rural development program. The consultancy recommended a shift in focus from subsistence to commercial farming, and the replacement of the PFS by a more 'modern' approach, Integrated Rural Development Program (IRDP) that could reach more farmers (Chambers and Feldmann, 1973).

The IRDP combined rural and agricultural extension service delivery and as such covered many aspects of rural development such as rural infrastructure, water supply, health, rural industries and agriculture. More funding for research, agricultural credit schemes, and subsidies for agricultural inputs were also recommended (Mrema, 1995). Through this approach, agricultural extension emphasized group methods and worked through farmers associations, and individual farm visits. Farmer associations are regarded as important to the success of agriculture in Botswana; especially for priority areas of production such as piggery (Republic of Botswana, 2011).

In addition, Botswana farmers are by nature used to working in groups to maximize their production (Willet, 1981). To promote group formation, the Ministry of Agriculture (MoA) established the Agricultural Management Association (AMAs) Act Number 18, Chapter 35:08 in 1986 which it provided the guidelines for registering farmer associations or clusters and the structures to monitor and support groups; for example, to qualify for registration, and venture into a collective project a group is required have five members or more and a constitution (Republic of Botswana, 2011).

The Accelerated Rural Development Programme (ARDP) replaced the PFS in 1973 to 1976. The program turned to be a success only as a rural extension system, and in providing services and building rural infrastructure (Chambers, 1977). It did not improve agricultural productivity and production (Odell, 1978). In addition, the implementation capacity of the ARDP was reportedly low as only 30% of the allocated budget had been used by the end of the three years. This poor performance was attributed to a lack of trained workforce. After the review of the program, the Ministry of Agriculture (MoA) commissioned several human resource development projects, including the expansion of the Botswana College of Agriculture in 1979 to 1984, then the only College in the country offering tertiary level education in agriculture. This offered personnel of the Ministry of Agriculture opportunities for higher training at Bachelors

and Master's Degree levels.

The search for better extension approaches and better programmes continued: prior to the formal adoption of the Farming Systems Research and Extension (FSR/E) approach, various research activities affecting farmer practices such as the British funded Dryland Farming Research Scheme (DLFRS, 1971 to 1983), Evaluation of Farming Systems and Implements Project (EFSAIP, 1985), and the Integrated Farming Pilot Project (IFPP, 1975 to 1985) were set up. The objectives of the DLFRS were to investigate constraints of arable agriculture and develop solutions for making crop production more reliable; hence the development of a minimum tillage cropping system, 'Makgonatsotlhe', a locally designed two-wheeled tool bar plough. Minimum tillage cropping system had several packages recommended for on-station experimentation.

The DLFRS, EFSAIP, and IFPP actually introduced the work of the FSR/E in Botswana (Frankenberger and Mitawa, 1988). The EFSAIP and IFPP projects were established to test the recommendation of the DLFRS; the EFSAIP was responsible for both on-station and on-farm implement development and testing, while the IFPP worked with technologies developed by the DLFRS. After screening by EFSAIP, the IFPP tested the technologies under farm conditions and farmer managed trials (Baker, 1988). The trials by the DLFRS and EFSAIP revealed that the Makgonatsotlhe system was not that effective when used on-farm. Yield increases were marginal as compared to those attained from the traditional seed broadcast method, and equipment was expensive. This was yet another technology that failed and was abandoned in the 1970s.

In 1975, the Botswana Government through the influence of the farming systems movement and the Farming Systems Development (FSD) approach by the FAO, introduced the Farming Systems Research and Extension (FSR/E). This subsequently led to the establishment of four FSR/E projects as an alternative to the Accelerated Rural Development Program (ARDP) (Chambers, 1977). The projects included the Farming Systems in the Southern Region (FSSR), Agricultural Development Ngamiland Project (ADNP), Molapo Development Project (MDP), and the Agricultural Technology Improvement Project (ATIP). The projects tested farmers' reactions to technical packages recommended through on-station research and collected information about farmer practices and constraints (Republic of Botswana, 1987). The testing of research recommendations on farmers' fields by the IFPP, ADNP and MDP projects however, found the packages inappropriate and unworkable (Frankenberger and Mitawa, 1988).

More programs of the ATIP were implemented in 1982 by the Department of Agricultural Research (DAR) to ensure generation of relevant technologies, a function

critical in agricultural productivity (Acquah, 2003). All four projects, FSSR, MDP, ADNP and ATIP proved successful in developing and testing technologies for resource-poor farmers (Republic of Botswana, 1987). The MDP aimed to improve farming skills of Molapo farmers through improved water and crop management. Farmers also needed better understanding of the floods such as frequencies in order to develop appropriate crop management plans.

Weak linkages between administration team and Regional Agricultural Office (RAO) as well as lack of trained counterparts proved to be a major problem of the MDP. The main problem of the ADNP was lack of clarity regarding execution of project objectives and development of research priorities. This was further complicated by lack of linkages between the Department of Agricultural Research and other government programs such as the Accelerated Rainfed Arable Production and Drought Relief (ARAP&DRP) (Republic of Botswana, 1987).

According to Frankenberger and Mitawa (1988), ATIP excelled the most in strengthening research-extension linkages and enhancing extension effectiveness in technology transfer. The ATIP paved way for establishment of research-extension linkages with programs of other government departments and organizations; thus, promoting effective technology transfer (World Bank, 1985). The relevant organizations at that time were the Department of Agricultural Field Service (DAFS), Division of Planning and Statistics (DPS), Arable Lands Development Programme (ALDEP), Rural Industry Innovation Center (RIIC), Farm Machinery Development Unit (FMDU), and Botswana College of Agriculture (BCA). The linkages also supported cost-effective institutionalization of Farming Systems Research Extension (FSR/E) work (Frankenberger and Mitawa, 1988). The FSR/E had limited impact on agricultural productivity. It also failed in:

- (1) Testing and developing of relevant technologies for small farmers with limited resources
- (2) Improving linkages between research, extension and other development institutions
- (3) Improving farmer confidence in research and extension
- (4) Skill development and improved institutional capabilities, and
- (5) Developing research infrastructure in the agricultural regions.

Other constraints of the FSR/E approach were:

- (1) Lack of trained personnel
- (2) Unwillingness of personnel to work in remote areas
- (3) Lack of coordination of project activities by different

departments of MoA and other government ministries, and

(4) Lack of funds to support the FSR/E (Frankenberger and Mitawa, 1988).

National initiatives supporting agricultural extension

Institutional support

Extension services become powerful when they do not stand alone but have programs that provide for inputs, subsidies, and credit (Contado, 1997). In 1995, programs such as the Financial Assistance Policy (FAP) were implemented. The FAP had subsidies to speed up farmer transition to new forms of production such as piggery, dairy, horticulture, and smallstock. Arable Land Development Project (ALDEP) (1981/82 to 2007/2008), Accelerated Rainfed Arable Project (ARAP) (1985/86 to 1995/96), and the Integrated Support Programme for Arable Agriculture Development (ISPAAD) (2008 to date) were the 5 programs specific to arable farming. Livestock Management and Infrastructure Development (LIMID) of 2007, the Fencing Component, 1991 and the National Master Plan for Dairy Development (NAMPAADD), 2002 targeted livestock improvement (Agenda 21-Botswana; Republic of Botswana, 2009).

In 2008 ISPAAD replaced ALDEP, the aim of ISPAAD and ALDEP was to improve arable farming and increase production through fencing of fields. This was to protect crops from damage by roaming livestock and game as well as assisting farmers to obtain requisite inputs. Packages offered by ISPAAD were:

- (1) Provision of drought power
- (2) Potable water
- (3) Seeds
- (5) Fertilizer and herbicides and facilitation of access to credit and fencing
- (6) Establishment of agricultural service centers (Republic of Botswana, 2013).

To further improve adoption, ISPAAD targeted three farmer categories according to area of production and level of operation; assistance was customer-packaged according to subsistence, emerging, and commercial farmers. Specific objectives of two phases of the Livestock Management and Infrastructure Development (LIMID) 2007 up until 2010 were:

- (1) Promotion of food security through improved productivity of livestock, cattle, goats, sheep, and Tswana (indigenous breed) chickens
- (2) Improving the management of livestock
- (3) Improving range resource management, utilization and conservation

(4) Provide infrastructure for safe and hygienic processing of poultry (meat)

(5) Eradicate poverty.

The programme offered seven packages: small stock, guinea fowl, and Tswana chickens targeting resource-poor households; others specific to infrastructure development comprised animal husbandry and fodder support, borehole and well equipping, borehole drilling and reticulation and borehole/well purchase, and cooperative poultry abattoir construction.

An evaluation study of LIMID phase I, showed the scheme excelling: the programme increased population of small stock, Tswana chickens, and clients found it useful as it improved lives. The study revealed low access to programmes by youth and infrastructure development component with the least access by all beneficiary groups. This was attributed to failure to raise required client contribution (Republic of Botswana, 2010a).

The National Master Plan for Arable Agriculture and Dairy Development (NAMPAADD), a 10 year program focusing on dairy, horticulture, and arable farming was established in 2002. Its main aim was to improve the performance of agriculture and ensure economical and sustainable use of natural resources. The specific objective was to promote competitiveness by agriculture and reduce reliance on imports that can be viably produced locally. The NAMPAADD aimed at transforming traditional or subsistence farmer operations to commercial level as well as upgrading the management skills and technology application of commercial farmers (Republic of Botswana, 2009). The core mandate of NAMPAADD was to coordinate and lead the implementation of the Master Plan in conjunction with the relevant departments of the MoA and other stakeholders. The program, unlike others, had no financial assistance component but assisted farmers with the preparation of business plans for loan applications to financial institutions.

The NAMPAADD focused on dairy farming with dairy herd of minimum 50 cows, rain-fed of land size (150 ha) and irrigated (1 to 2 ha) agriculture as such operations can give farmers reasonable returns and continuation in production. The program worked with 78 pilot farmers, 59, 10, and 9 for rain-fed, irrigated, and dairy farming respectively and used selected Production and Training Farms (PTFS) to train farmers and extension workers. Four PTFS were established: Ramatlabama (610 ha, rain-fed), Dikabeya (7 ha, irrigated), Glen Valley (7 ha, irrigated), and in Sunnyside (170 cows, dairy). The PTFS served as demonstration farms for new technologies, training facilities, and production units for commercial farming. Even though with little impact, production on PTFS and regular farmer training continued. Minimum technology adoption was linked to costly technology and

target output recommended by the production schemes (Republic of Botswana, 2009-2016).

Policy support

A review of the agricultural sector undertaken in 1989 in Botswana led to the development of a new agricultural policy in 1991. The policy adopted household and national food security to replace national food self-sufficiency as one of its objectives, and identified several challenges for agricultural extension including the need for:

- (1) An extension system design that gave maximum economic benefit and promoted national production plans emphasizing agriculture as well as non-farm.
- (2) Economically sound advice on farm techniques that are relevant to farmer situations,
- (3) Targeted policy packages and subsidies for specific farmers,
- (4) Adoption of commercial rather than subsistence production approaches by farmers, and
- (5) Private-sector service provision.

Some initiatives supporting policy objectives include the development of Small, Medium, and Micro Enterprises (SMME) in agriculture instrumental to improved agricultural production, rural household food security and poverty eradication (Republic of Botswana, 2009-2016). The Local Enterprise Authority (LEA), launched in 2004, supports local business development especially small, medium, and micro enterprises (SMMEs) projects. The authority provides several services, business skills training, mentoring, facilitation of market access, credit access, business plan development, and technology adaptation and adoption to SMMEs (Republic of Botswana, 2011).

The Citizen Entrepreneurial Development Agency (CEDA), was another scheme launched in 2001 to offer loans at lower interest rates (than market interest rates), to encourage citizens to invest in enterprise development. The Young Farmer Fund (YFF), a CEDA component introduced in 2006, promotes youth participation in agriculture and business. The program provides loans to young entrepreneurs at lower interest rates and longer repayment periods than those given to other CEDA clients. The Agency also provides enterprise-specific training and mentoring to young farmers.

The National Strategy for Poverty Reduction (NSPR) 2003 was another attempt by government to have an overarching policy framework for poverty reduction; a policy that harmonizes all existing national anti-poverty policies and programmes in order to promote sustainable livelihood and rural development (Republic of Botswana, 2010b). This led to the Poverty Eradication Program of

2012. The programme provides agricultural and non-farm packages such as kiosks, home based laundry, upholstery, tent hire, and pottery. Apart from inputs and materials, beneficiaries undergo training specific to enterprise projects and regular monitoring by the District and Village Extension Teams (Republic of Botswana, 2012a).

The Revised Policy on Rural Development (2003) was yet another framework emphasizing rural livelihood improvement through better public services, developed livestock and crop sectors, infrastructure, employment and income generation (Republic of Botswana, 2001). Other strategies include the Strategic Framework for Community Development (2010), Community Based Strategy for Rural Development (1997), and the Community Based Natural Resource Management Policy (2007).

Structural support

To implement some of the recommendations from the First National Conference on Agricultural Extension held in 1995, the MoA underwent a major re-structuring conducted through the Organizational and Methods (O&M) study of the government departments. This was to improve coordination and cost effectiveness of services in the related departments of the Ministry (Mrema, 1995). The re-organization led to the split of the former Department of Agricultural Field Services into two parallel agricultural extension systems, one for livestock production and health and the other for crop production and forestry. Another re-structuring of the MoA by the O&M approved by the Cabinet in 2005 was implemented in 2006. As a result, the Department of Animal Health and Production split to become the Department of Veterinary Services and the Department of Animal Production. Extension services merged into one unified service under six Regional Agricultural Coordinators reporting directly to the Deputy Permanent Secretary (Support Services) within the MoA. The Division of Agricultural Planning and Statistics was renamed Division of Research and Statistics, and the Department of Crop Production and Forestry became the Department of Crop Production. A new department of Agricultural Business Promotions was created, while the Department of Agricultural Research was retained.

Constraints and challenges of agricultural extension

One of the goals of the National Policy on Agricultural Development (1991) was that farmers needed to adopt non-traditional production systems such as horticulture, bee-keeping, harvesting and processing veld products in order to diversify agriculture and enhance food security.

Table 1. Factors constraining agricultural extension.

Constraints			
Physical	Administrative	Extension agent	Farmers
Unreliable rainfall	Lack of coordination	Few specialized personnel	Lack of credit facilities
Limited market	Programmes not complimentary	Inadequate in-service training	Absentee farming
Inadequate transport and communication	Programmes not targeted to farmers	Lack of training plans	Poor adoption rate due to negative attitudes
-	-	Low morale	Shortage of drought power
-	-	Shortage of residential and office accommodation	Shortage of farm labour
-	-	Agents spending less time on extension and more on administrative emergencies	Inadequate farmer's organizations
-	-	Lack of support from supervisors	Lack of knowledge and skills on improved farming practices
-	-	No promotion and clear career advancement paths	-

In addition, the policy objectives for commercializing agriculture emphasized entrepreneurial skills. The lack of entrepreneurial skills continues to retard agricultural production in Botswana. Expensive technologies such as seed, hybrid cultivars, chemicals, and machinery challenge adoption by farmers and thus, stress the need for improved extension services (Republic of Botswana, 2000). The National Development Plan-10 (2009-2016) outlines constraints of agricultural production and productivity as:

- (1) Farm fragmentation making provision of essential infrastructure expensive
- (2) Inadequate resources
- (3) Recurring drought
- (4) Pests and diseases
- (5) Non-affordability of critical farm inputs, and
- (6) Technology adoption.

Effective delivery of agricultural extension services is constrained by four groups of factors: physical, administrative, extension worker related and farmer related. Farmers' constraints included lack of credit facility, absentee farmers, poor adoption rate because of negative attitudes, lack of knowledge on improved farming practices, and strong farmer organizations (Sebina et al., 2011). Table 1 shows constraints of agricultural extension by specific category. Problems associated with extension agents and farmers make a longer list. This is a result worth noting as extension agents link the system to the farmers; if the link is disabled, the whole system becomes ineffective (Morse et al., 2006). Tables 2 and 3 outline agricultural extension approaches, projects, and challenges that can be categorized as: administrative, including selective

programmes targeting particular group of farmers and production systems; project and administration team linkages and coordination; farmer related challenges comprising of selective coverage, expensive equipment, lack of subsidies and inputs, lack of trained extension workers and poor implementation capacity; and, extension worker related problems such as poor housing and transportation, and poor training.

Reforms for improving extension service delivery

Two types of institutional reforms, market and non-market are recommended to refocus agricultural extension systems in developing countries. The adoption of one or the other depends on the purpose and focus of an extension system (Rivera et al., 2001). Market reforms are used to privatize the management of agricultural and rural extension. This is either by contracting extension service delivery, cost-recovery by charging fees for services, or creating partnerships with farmers' associations. Rivera et al. (2001) classified market reforms into four main strategies:

- (1) Revision of public-sector extension systems
- (2) Pluralism
- (3) Cost-recovery, and
- (4) Total privatization.

Market reform strategies can assist with commercialization of agriculture in Botswana with the Department of Agribusiness Promotion (DABP) of the Ministry of Agriculture (MoA) leading the public sector role in promoting business skill transfer, market access and agricultural cooperatives and associations (Republic of Botswana, 2012c).

Table 2. Agricultural extension approaches and challenges.

Year	Extension approach	Challenges
1926	Commodity-specific (focus on dairy only)	Selective services targeting dairy small farmers only
1935	Foremen farmer	Minimal effect on technology adoption and farmer development
1947	Cooperative demonstration plot scheme (CDPS)	No sustainability when project ends Failure to continue because of no access to subsidies and inputs Minimal adoption by farmers
1962	Pupil Farmer Scheme (PFS)	Lack of coordination and Supervision of extension workers Lack of equipment, poor housing and transportation for extension workers Selective services for registered farmers only with little coverage
1972	Integrated Rural Development Programme (IRDP)	Minimal improvement on the PFS Focus only on rural extension and not on agricultural projects
1973	Accelerated Rural Development Programme (ARDP)	Poor implementation capacity due to lack of trained workforce Minimal impact on agricultural production

Table 3. Agricultural approaches and challenges.

Farming systems development approach and farming research extension (FSR/E) projects		
1971 – 83	Dryland Farming Research Scheme (DLFRS)	Failure of minimum tillage technology in the farmers' fields after success in the on-station trials
	Agricultural Technology Improvement Projects (ATIP)	-
1975	Farming Systems In the Southern Region (FSSR)	Developing and testing technology for resource-poor farmers was successful; but, later found inappropriate and unworkable
	Agricultural Development Programme (ADNP)	No clarity of how to implement project objectives and develop research priorities
	Molapo Development Project (MDP)	Weak linkages between administration team of the MDP and Regional Agricultural Office Lack of trained extension staff
1975 – 85	Integrated Farming Pilot Project (IFPP)	Minimal yield increases using Makgonatsotlhe as compared to traditional tillage methods
1985	Evaluation of Farming Systems And Implement Project (EFSAIP)	Expensive equipment that farmers could not afford
2005	Unified Extension System With Regional Agricultural Coordination	No continuity of programmes due to slow staff recruitment in the new department Delayed extension operations due to staff movements in the MoA Lack of a unifying strategy for extension departments of the MoA

The MoA can also finance services but contract delivery of services to commercial farms, agri-shops, NGOs, and parastatals such as Botswana Meat Commission (BMC),

Botswana College of Agriculture (BCA), Botswana Vaccine Institute (BVI), Citizen Entrepreneurial Development Agency (CEDA), The Local Enterprise

Authority (LEA), and Botswana Marketing Board (BMB) for specialized technology and information needs (horticulture, seed multiplication, fodder, poultry, inputs) for all types of farmers subsistence, emerging, and commercial as already targeted by programs such as ISPAAD. Engagement of the private sector in sourcing and transportation of seeds and fertilizer from storage facilities is a partnership possibility for availing inputs to farmers (Republic of Botswana, 2012a).

Non-market reforms aim to relieve government ministries of the responsibility for both funding and management of public sector extension service delivery. Most commonly used non-market reform strategies are decentralization, transfer of responsibility of extension delivery to lower tiers of government, delegation to non-government organization, or removal of the entire government responsibility. Three decentralization strategies dominate reform for improving agricultural extension:

- (1) Decentralizing the burden of costs for extension through re-designing the fiscal system.
- (2) Decentralize national government responsibility for extension through structural reform, and
- (3) Decentralize extension program management through farmer participation in decision-making and transfer of responsibility for programs.

According to Rivera and Qamar (2003), a review of institutional constraints helps reveal reform needs. Therefore, three reform strategies, institutional pluralism, cost-recovery and decentralization are best suited to refocusing and improving agricultural extension service delivery in Botswana.

Institutional pluralism

This is widely promoted in developing countries and it involves contracting out the delivery of public-sector extension services to non-governmental organizations (NGOs), private companies, consultancy firms and farmer cooperatives or associations to enhance capacity building of the private sector. Pluralism allows close cooperation between public and private sectors where government continues funding extension services while the delivery is delegated to the private-sector (Rivera and Qamar, 2003). The success with different models of institutional pluralism and privatization of agricultural extension is reported in Ecuador, Chile, Costa Rica, Sri Lanka, Ethiopia, Kenya, Uganda, Mozambique, and Zimbabwe (Kidd et al., 2000). Pluralism therefore can promote partnership of the MoA as a public extension provider with support institutions, private companies, agri-shops, NGOs such as Veld Products or 'Thusanyo Lefatshing', parastatals, Botswana Meat Commission (BMC),

Botswana University of Agriculture and Natural Resources (BUAN), Botswana Vaccine Institute (BVI), CEDA, LEA, and Botswana Marketing Board (BMB) in order to improve relationships and promote private sector capacity building

Cost-recovery

This involves fee-charging: farmers pay for extension services. These are farmers who can afford fees for extension advice. This enables better targeting of specialized groups such as subsistence or small scale and commercial farmers, women and youth, and farmers association to meet different client needs. The MoA can charge fees for extension services and delivery using any criteria, type of farmer, technology, and information. This is a bit radical as most production systems are small scale; however, there are few emerging commercial farmers who are able to pay for extension advisory services. A number of farmers are already paying to enroll themselves and/or their employees for training related to specific production techniques at the Centre for In-service and Continuing Education (CICE) at the Botswana College of Agriculture, presently upgraded to a university (BUAN) instead of attending the same training free of charge at the Denman Rural Training Centre. The MoA, for instance, can give free extension services to subsistence farmers, subsidized services to small scale farmers, and 100 percent payment by commercial farmers such as what prevailed for the Integrated Support Program for Arable Agriculture Development (ISPAAD, 2008).

Decentralization

This enables the MoA to transfer authority and responsibility for agricultural extension to the regions, districts, and villages for more accountability and speedy response to clients. One viable decentralization option is of transfer of responsibility and authority for extension to related organizations already with a mandate for extension advisory, government ministries and departments for better design of specialized programs for agricultural as well as rural extension. This is to enhance relevance, responsiveness, and increase effectiveness (Rivera, 2008). Government may strengthen farmer clusters and associations at different levels in the priority sectors such as piggery, horticulture, small-stock, dairy, grant subsidies, and transfer responsibility for extension to the associations (Republic of Botswana, 2011). In the MoA, institutions such as the Department of Agricultural Research (DAR), BUAN, BMC, BAMB, CEDA, and Botswana Cooperatives Movement (BCM) could deliver commodity-based extension services according to own

area of expertise. Another option that would enhance coordination of the many service providers is that of shifting authority and responsibility for all national extension service delivery to the Rural Extension Coordination Council (RECC) where different stakeholder management levels are represented. This is on condition that a decentralization-specific policy to ensure total transfer of responsibility, powers and finances to the Council, recruitment of own extension personnel, and farmer participation in decision-making is developed. Another decentralization option to improve coordination among many service providers is to give authority and responsibility for all national extension service delivery to the Rural Extension Coordination Council (RECC). This is on condition that a decentralization-specific policy is developed to ensure total transfer of control and finances to the Council and to also provide a structure to the operations.

CONCLUSION AND RECOMMENDATIONS

The purpose of this paper was to discuss agricultural extension in Botswana, past and present approaches, programs, and initiatives to support extension services, and agricultural production. This was to demonstrate the recurring nature of the factors constraining the extension system and recommend reforms for improving the services. The review reveals a remedial pattern to address problems as several extension approaches, programmes, initiatives, and schemes were implemented one after the other since 1926, often concurrently.

Policy initiatives such as FAP, ALDEP, ARAP and presently ISPAAD, NAMPAAD, and others were an attempt to address the problems of agricultural extension. The schemes targeted coordination, access to subsidies, inputs and entrepreneurial skills training; while structural support tackled more the administrative challenges. Unfortunately, this skewed extension agent work to inputs distribution, registering farmers and helping them complete forms for subsidies and credit, Farmers complain generally about no farm visits by local area extension agents; an activity they valued the most (Tladi, 2004).

Factors constraining main extension comprised low adoption of improved technologies by farmers, attitudes of farmers, lack of resources, drought power, lack of highly specialized extension workers, compounded by physical factors such as low and unreliable rainfall and droughts, and lack of a vision and therefore, no extension policy, poor coordination and collaboration by departments and lack of support and training for extension workers. Based on the constraints, challenges of administrative, farmer, and agent or employee welfare nature were identified. Institutional pluralism, cost-recovery and decentralization were recommended to refocus and improve agricultural extension in Botswana.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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