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Use of Extension Services by Smallholder Farmers in Kitui County, Kenya: Challenges and Opportunities

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Abstract— Agriculture supports the livelihoods of rural people in developing countries, including Kenya. Agriculture is the mainstay and driver of the Kenyan rural economy. Despite the critical role of agriculture in Kenya, poor access to extension support services persists. The purpose of this study was to evaluate the utilization of agricultural extension services by smallholder farmers in Kitui County, Kenya. A total 99 farmers were sampled from Kitui County using a stratified random sampling approach. Secondary information sources such as national and county ministries reports and existing literature were reviewed to supplement the primary data. A Questionnaire was the main tool used for data collection in this study. Data obtained were analyzed through descriptive statistics. This study found that most farmers in Kitui County had access to extension service in their various crop and /or livestock enterprises. Majority of the farmers who had received extension services had applied all the recommendations made by the extension workers. The complexity of technology was stated as the most common reason for the non-application of some recommendations. Majority of the sampled farmers preferred extension information packaged in the form of print, the extension officer himself/face-to-face, radio, television, internet, Barazas, farm visit and self-explanation. Transports, both for the farmer to the service provider's office and for the service provider to the farm, was cited as a major expenses in livestock and crop agricultural extension. This study recommend that more funds should be allocated to an agricultural extension. For efficient delivery of extension service in Kitui County, extension officers should be well facilitated (especially through adequate transport facilities and access to technologies). Agricultural Extension work requires more funds to reach most of the farmers in vast Kitui County.

Key Words—Extension Services, Smallholder Farmers, Challenges, Opportunities.

1. INTRODUCTION

Agriculture supports the livelihoods of rural people in developing countries (World Bank, 2021). The contribution of agriculture to the Gross Domestic Product (GDP) in sub-Saharan Africa is approximately 30% (Jayne & Sanchez, 2021). In developing countries, more than 90% of the rural population depends on rain-fed agriculture for food security and income (Hlophe-Ginindza & Mpandeli, 2021). The contribution of the agriculture sector to the GDP in East Africa is about 40%, being a source of livelihood for approximately 80% of the region's residents (Amwata, 2020).

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In Kenya, agriculture (practiced by approximately 75% of the rural population) is mainly rain-fed and geared towards subsistence purposes (Kogo *et al*., 2021). The sector accounts for 33% of GDP and 80% of national rural employment (GOK, 2019). Agriculture, according to the Agriculture Sector Transformation and Growth Strategy, in Kenya can be a very good avenue for livelihood empowerment as well as a good tool for economic growth and development in Kenya (GOK, 2019).

The Kenya Vision 2030 recognizes the agriculture sector as an economic pillar focused on the promotion of food security and employment creation (Wanderi & Makandi, 2019). Consequently, it influences the country's poverty incidence levels, nutrition and health, as well as the overall quality of life (Ayieko *et al*., 2021). In order to achieve its goals, the agriculture sector should be supported with respect to productivity (MOALF & C, 2017). Following the promulgation of the Constitution of Kenya in the year 2010,

agriculture functions in Kenya were devolved until the year 2013.

It is generally agreed that the provision of agricultural extension services can enhance agricultural productivity in Kenya (Kogo *et al*., 2021). Agricultural extension can support and facilitate people who were engaged in agriculture through the provision of agro-advisories, bridging the skills and technology gaps for improved livelihoods and well-being (GOK, 2019). Extension services may involve both government agencies as well as private sector actors. In some cases, extension is also provided by Non-Governmental Organizations (NGOs), and producers/farmers organizations. Extension can extend research and technology knowledge to rural farmers, which by extension can improve their welfare. Modern extension services include technology transfer, facilitation, training/learning, linkages to markets and enhancement of partnerships for the benefit of farmers (Davis, 2008). According to the Strategy for Revitalizing Agriculture (SRA), agricultural extension is considered a useful tool in poverty alleviation (MOALF&C, 2017). Consequently, the declining effectiveness of the public extension service can be considered as a major factor that impedes agricultural growth and development. Strategy for Revitalizing Agriculture (SRA) 2004, proposed key reforms in the extension systems geared towards linkages between research and technology generation points, the extension system and farmers - the final beneficiaries. SRA proposed six policy areas that were to be given first-hand priority - public extension system being among them (Alex *et al.,* 2002). There is an ongoing debate that private extension service is more efficient than public extension in service delivery.

In most African countries, extension services were focused on increasing agricultural productivity, farmers' training, and technology transfers (Dhehibi *et al*., 2020). Some of the approaches that extension services adopted included the Integrated Rural Development Program, training and visit (T&V), and farmer field schools (FFS). In Africa, agricultural extension was reported to have had a significant and positive effect on farmer's knowledge/skills, adoption of superior technologies, and an increase in productivity (Danso-Abbeam *et al.,* 2018). In Ghana and Mali, use of extension approaches such as FFS was, however, argued to have been an elite driven activity that excluded the poor and less educated (Davis, 2008).

Agricultural extension history in Kenya dates back to the early 1900s (Cheruiyot, 2020). The first remarkable success of agricultural extension in Kenya was introduction of hybrid maize technology in the 1960s and 1970s through integrated approaches and projects (Nagarajan *et al.,* 2019). The integrated approach that Kenya adopted had shortcomings of ineffective management, inappropriate coordination, poor communication among project implementers and low engagement of the community (Ngigi & Busolo, 2019). According to Olayemi *et al*. (2021), use of the Training &Visit approach in agricultural extension helped in improving the quality of staff (officers) through training and establishment of enhanced linkages in Kenya. However, T&V approach was implemented among the more educated and productive farmers in better-off areas. Due to poor development of T&V approach, the system did not incorporate the voices of farmers, thereby resulting in a lack of accountability and unresponsiveness to the needs of farmers. Consequently, sustainable agricultural productivity impact was not recorded, let alone the existence of a positive return on the investment (Gautam & Anderson, 1999).

In 1992, Kenya implemented liberalization and structural reforms, and the funding and delivery of extension services became a combination of public and private arrangements (Nissanke, 2019). This included contracting of public extension workers, Non-Governmental Organization (NGOs), farmers' organizations, and private sector. The privatization and commercialization of extension offer great potential, but in order to benefit resource-poor farmers, it requires testing strategies that are participatory, location-specific, and most importantly, flexible and dynamic to local stakeholder needs and resource limits (Davidson, 2007). In a bid to provide effective and efficient extension services to agrarian communities, governments are making concerted efforts to ensure agricultural extension is more demand-driven approach. This means tailoring the information, advice, and services to the expressed demands of the recipients (Rivera, 2004). Studies have shown that reforms in agricultural extension are required to ensure that farmer' priorities and conditions are given preference (Davidson, 2007).

According to Kingiri (2021), smallholder farmers have traditionally benefited from government extension systems (through the ministry of Agriculture) as well as commodity-based systems (through the government parastatals, out-grower companies, and cooperatives). The main targets of agricultural extension are both food crops and livestock. Some of the extension models and styles that the Kenyan government has tried include the progressive farmer model approach, integrated agricultural rural development approach, farm management, training and visit, attachment of officers to organizations, farming systems approaches, and Farmer Field Schools (Rivera *et al.,* 2001). The commodity-based extension model focuses mainly on commercial cash crops. The commodity-based extension model is profit-driven and only works well when all the stakeholders adequately benefit from the expenditures of the extension service. In the commodity-based extension model, all aspects of production and marketing are coordinated vertically (Siankwilimba *et al*., 2022).

The performance of the public agricultural extension service in Kenya has been a subject of discussion for years (Gautam & Anderson, 1999). The agricultural extension service has been perceived as a top-down approach, with extension officers designing extension programmes without their involvement. Quite often, these officers tend to apply these designs to different regions without considering the different agro-ecological zones. It is considered a major contributor to the poor performance of the agricultural sector (Republic of Kenya, 2005). Consequently, there has

been an effort to reform the public agricultural extension service in order to make it cost effective, broad-based, participatory, sustainable, accountable, and responsive to farmers' needs. Smallholder farmers do not only require advice necessary for increased productivity, but also linkages to markets, support in value addition, and diversification of incomes.

Due to the ineffectiveness of the public extension system, private agricultural extension systems have gained increasing popularity (Anderson, 2020). These extension systems comprise private companies, non-governmental (NGOs) and farmers' organizations (Nambiro *et al.,* 2005; Rees *et al.,* 2000). The privatization concept is aimed at increasing the participation of the private sector. With the emergence of private agricultural extension systems in agriculture, a number of concerns have emerged regarding their strengths and weaknesses. An additional concern relates to the role of the government in the private agricultural extension system. To respond to these concerns, the government has been forced to revise the national extension policy through the National Agricultural Sector Extension Policy (NASEP) and its implementation framework (GOK, 2011).
Prior to ushering in the devolved government on March 4th, 2013, following the enactment of the Kenyan Constitution in the year 2010, the agriculture sector comprised of ten (10) separate sub-sectors, namely: crops, livestock, fisheries, land, water, cooperatives and marketing, environment and natural resources, regional development, and development of arid and semi-arid land (ASAL).The devolution of extension service is aimed at taking the services closer to the people and ensures effective service delivery (GOK, 2011). The main setbacks of agricultural extension service in Kenya include inadequate funding, poor staffing and lack of involvement of farmer in planning (Rivera, 2004). In the devolved system, county governments have the mandate to provide extension services and authority to levy taxes on the services they provide (GOK, 2011).

The devolution of agricultural sector in Kenya presents an opportunity to increase farmer participation as well as ensure extension services are delivered in a way that benefit farmers to the maximum. Unfortunately, Agricultural sector faces challenges with the extension services being one of them. Extension officers are few, not adequately facilitated. They are unable to reach many farmers (GOK, 2011). The purpose of this study was to evaluate the use of extension services by smallholder farmers in Kitui County, Kenya (while unearthing the challenges and opportunities presented).

2. METHODOLOGY

The study used an *ex post facto* descriptive survey design. This study was undertaken in Kitui County in Kenya (located in eastern region - lower part, about 160 km east of the country's capital city). Kitui County lies between 0˚10′ and 3˚0′ south in terms of latitudes and 37˚50′ and 39˚0′east in terms of longitudes. The county is the sixth largest in Kenya in terms of land area (approximately 30,496.4 square kilometres) – however, about 6,369 Km^2 is part of Tsavo East National Park. The county is bordered by Taita Taveta (South), Makueni (West), Machakos (Northwest), Tana River (East), Embu and Tharaka Nithi (North). Administratively, Kitui County has eight sub-counties: Mwingi Central, Mwingi West Kitui Central, Kitui East, Kitui Rural, Kitui South, Kitui West and Mwingi North. The county has a total of 40 administrative wards and 247 local villages. The county has a population of 1,136,187 according to 2019 census comprising 262,942 households (Kitui County Government, 2021).

The target population was all farming households (262,942) and extension officers (219) in Kitui County. To come up with an appropriate sample size, the Nassiuma (2000) formula for Sample size determination was used.
$n = NC^2 \div C^2 + (N-1)\, e^2$
Note:
n=sample size;
N=population size;
C=Coefficient of variation which is ≤30%;
e=margin of error which is fixed between 2-5%).

The study sample was calculated at 20% coefficient of variation and 2% margin of error. Twenty percent coefficient of variation was used to ensure that the sample was wide enough to justify the results being generalised for the Kitui County. Higher coefficients of variation were not used to avoid very large samples due to limitation of research funds. Two percent margin of error was used because the study used an ex-post facto survey, whereby the independent variables could not be manipulated, and hence necessitating a relatively higher margin of error. Population size was 219 extension officers and 262,942 households in Kitui County. The final calculated sample size comprised a total of 69 extension officers and 100 farmers. A stratified random sampling approach was used to get the study sample. An additional two extension officers and nine farmers were also included in the final sample size in order to compensate for natural attrition.

A questionnaire was designed and used as the main instrument of data collection for both farmers and extension officers in Kitui County. Desk-review and Secondary data were collected from relevant national and county government offices complement the primary survey data. Peers at South Eastern Kenya University were requested to review the instrument to address aspects of validity, including content, construct, and face validity. The validation of the instrument was aimed at ensuring the instrument measured what it was intended to measure (Kathuri & Pals, 1993). The instrument was pre-tested for its reliability with a sample of 20 farmers and 20 agricultural extension officers in Machakos County.

Quantitative data was analysed using STATA program version 16.0. Before the actual analysis, the data was cleaned of any outliers and entry errors. In this study, descriptive and inferential statistics through econometric models were used to analyze data. The inferential statistics modeling used was Stochastic Frontier Analysis (SFA).

3. RESULTS AND DISCUSSIONS

3.1 Demographic and Socio-economic Characteristics of the Farmers

The characteristics of the farmers were identified. These characteristics are believed to be crucial in understanding the nature of farming in the area as well as the extension services available to farmers.

3.1.1 Age of the sampled farmers

The results in Table 1 shows that 12.2% of the respondents were aged 40 years and below and 87.8% were more than 41 years. The youngest sampled farmers were 30 years old while the oldest was 70 years. An average farmer in this study was aged 49.43 years.

Table 1: Age of farmer sampled

Age bracket (Years)	Frequency	Percent
21-30	3	3.1
31-40	9	9.2
41-50	43	43.9
Above 51	43	43.9
Total	**98**	**100.0**

Note: Minimum = 30 years; Maximum = 70 years; Mean = 49.43; Standard deviation = 9.043.

These results show that the respondents were within the active and productive age group and thus can participate in agricultural production. Age of a farmer may influence productivity and incomes from their farming enterprises. Young farmers may realize higher productivity and incomes due to their ability to adopt new technologies and innovations (although sometimes they may have lower farming experience). Age is said to be a primary latent characteristics in the adoption decision provided by the extension workers. Age is also a major factor in agricultural productivity. Age was found to positively influence the adoption of sorghum in Burkina Faso (Adesina & Baidu-Forson, 1995). It is also believed that the age of a household head is crucial for his or her decision making in determining what and how to produce on a given piece of land and season.

3.1.2 Level of Education of the farmers

Evidence from most literature has proved that education and new technology use is directly correlated. The results from this study indicated that the farmers had varying level of formal education as depicted in Figure 1

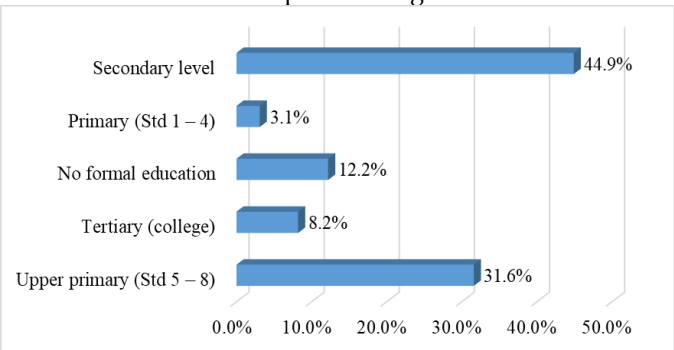


Figure 1: Level of Education of the farmers

Most of the respondents had less than tertiary level of education. Majority (44.9%) of the respondents had secondary level of education. About 31.6% of the respondents had upper primary (Standard 5 – 8) level of education. About 12.2% of the respondents had no formal education. A few respondents had tertiary (8.2%) and lower primary (3.1%) level of education.

These results imply that majority of the farmers may lack adequate technical education which is a prerequisite to better modern farming. In addition to this, the level of education of the household head can influence the kind of decision that may be made on behalf of the entire household with regard to both crop and livestock farming. More educated farmers are likely to make better decisions as well as quickly adopt new technologies in farming as compared to their less educated counterparts.

3.1.3 Gender of the Respondent

On the issue of gender, the results of the study showed that majority of the farmers were female as shown in Figure 2.

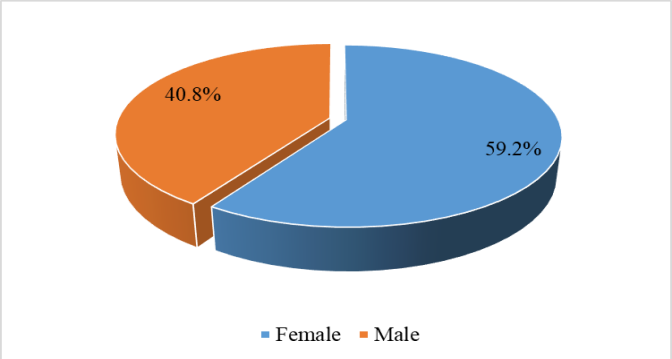


Figure 2: Gender of the Respondents

About 59.2% of the respondents were female while 40.8% were male. Gender of household is an important factor in the household decision making. Past studies have indicated that male farmers tend to focus on income generation, while female farmers focus on food crops. This may imply that farming related decisions such as application of new technologies, how to seek and use financing, type of breeds/varieties to be kept or planted and crops/animal husbandry practices to be implemented may be dominated by female gender.

Most of the farmers had monthly incomes of 10,000-19,999 brackets as represented by 44.9%of the total responses. This was closely followed by farmers whose monthly incomes were Kshs. 0 – 9,999 as represented by 39.1% of the total responses. There were very few farmers whose monthly income was in the range of Kshs.20, 000-29,999 (6.5%), Kshs. 30,000-39,999 (7.6%), Kshs. 40,000-49,999 (3.3%) and Kshs. 60,000-70,000 (2.2%). This implies that majority of the farmers have limited income which may affect their farming enterprises.

3.1.4 Income of the farmers

The distribution of farmers' incomes is summarized in Table 2.

Table 2: Monthly incomes of farmers

Income brackets	Frequency	Percentage
0-9,999	36	36.7%
10,000-19,999	44	44.9%
20,000-29,999	6	6.1%
30,000-39,999	7	7.1%
40,000-49,999	3	3.1%
60,000-70,000	2	2.0%
Total	98	100.0%

Note: mean = 13,206.52; Standard Deviation = 1,277.84; Minimum = 1,000; Maximum = 70,000

Income availability enhances adoption of new farming technologies (Wongnaa, 2016). Any new technology requires some income. Likewise, the frequency of access of extension services and productivity may be affected positively by the income of the respondents.

3.1.5 Farm size

The results of the study indicated that 48.0% of the respondents were smallholder farmers with 0 - 5 acres of land. About 36.7% of the respondents had 5 – 10 acres of land. There were very few farmers with more than 10 acres of land. Majority of the respondents in this study were smallholder farmers as shown in Table 3.

Table 3: Size of farm

Farm size (acres)	Frequency	Percentage
0-5	47	48.0%
5-10	36	36.7%
10-15	9	9.2%
20-25	2	2.0%
25-30	2	2.0%
45-50	2	2.0%
Total	98	100.0%

Land as a major factor in agricultural production has been used in several studies. Farmers with large farms adopt more advanced farm practices than smallholder farmers. World Bank (2000) defined smallholder farmers as those farmers that operate less than two hectares of land (4.942 acres) and have low resource base. In addition, Narayan and Gulati (2002), defined smallholder farmer as "a farmer, practicing a mix of commercial and subsistence farming or either, where the family provides the majority of labour and the farm provides the principal source of income."

3.1.6 Main Occupation of the Farmers

The most popular occupation practiced was agriculture (crop and livestock farming) as depicted in Figure 3.

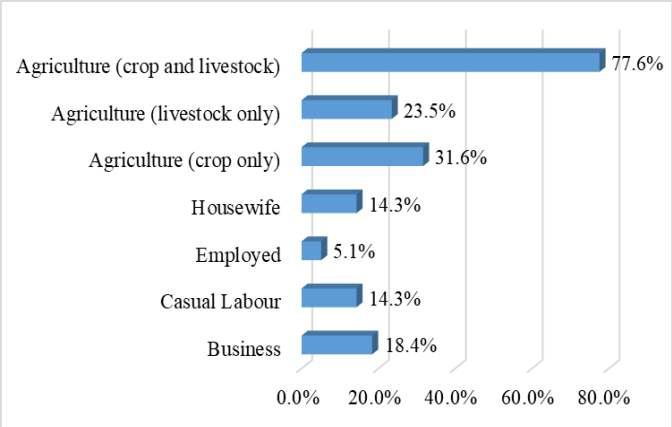


Figure 3: The main occupation of the farmers

Majority of the farmers (77.6%) were engaged in both crop and livestock agriculture as their main occupation. About 31.6% were engaged in crop production while livestock was practiced by only 23.5%. About 18.4% of the farmers were engaged in businesses while others were engaged in casual labour (14.3%) and paid employment (5.1%) as their major occupation. Some farmers (14.3%) were mainly housewives.

3.1.7 Crops grown by farmers

The most popular crop that was grown in the study area was maize (90.8%), green grams (88.8%), cow peas (80.6%) and pigeon peas (55.1%). Other crops that were grown by the sampled farmers included mangoes, vegetables, cassava, beans, sorghum, millet, dollicos, onions, oranges, pawpaw, banana, pearl millet, spinach, tomato, guavas, pumpkins, sweet potatoes, avocado and tobacco.

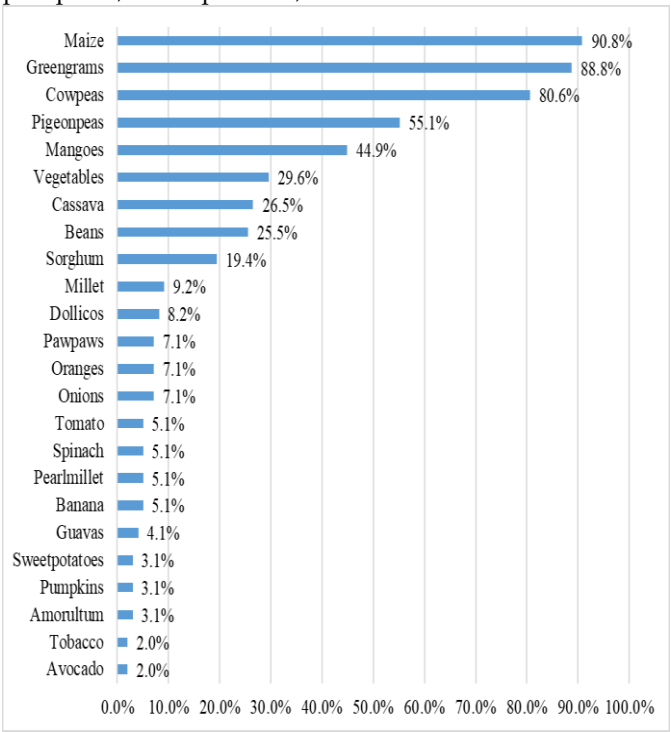


Figure 4: Crops grown by farmers

This implies that the major staple crop in the study area is maize, green grams and cow peas. Good extension services interventions towards these major crops could therefore have a great impact in the households' incomes and wellbeing.

3.2 Smallholder Farmers' Use of Extension Services

3.2.1 Source of information on devolution of agricultural extension services

Respondents were asked to indicate where they got information on the devolution of agricultural extension services to counties. The results are shown in Figure 5. Majority of the farmers said that they learned about the devolution of agricultural extension services from farmers' groups and meetings. Radio, political rallies, television, and neighbors or fellow farmers were some of the sources of respondents' information.

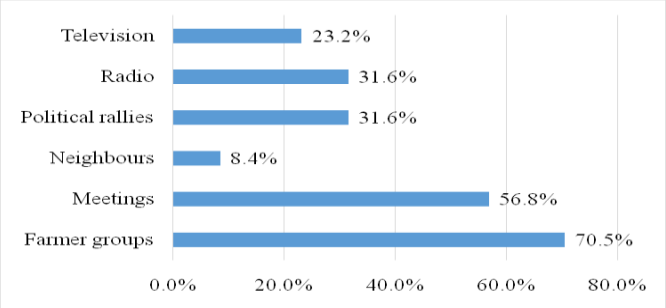


Figure 5: Respondents sources of information on devolution of agricultural extension services

3.2.2 Farmers use of extension education on crop and livestock enterprises

From the current study, more farmers have access to extension service in their various crop and /or livestock enterprises as shown in Figure 6.

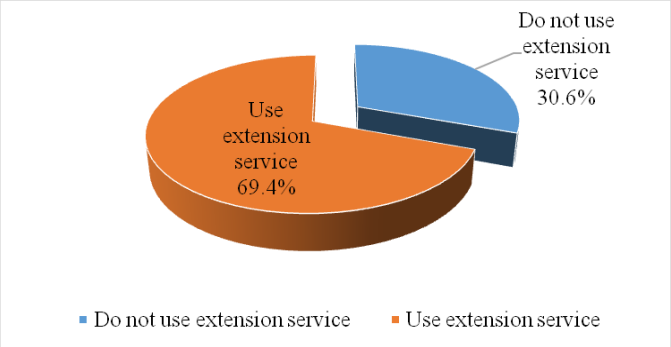


Figure 6: Farmers' use of extension services in their crop and or livestock enterprises.

3.2.3 Source of agricultural extension information

The respondents who had accessed and used extension services within the last 12 months indicated that they had received the service from various sources as shown in Figure 7.

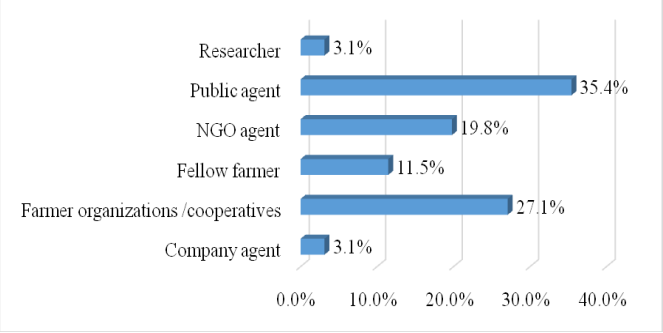


Figure 7: Respondents source of agricultural extension information.

According to the results, the respondents got extension services from government representatives (government extension officers), farmers' groups or cooperatives, NGO agents, fellow farmers, researchers, and firm representatives.

3.2.4 Farmers' ways of accessing agricultural extension services

Respondents who had received extension services received the information from sources shown in Figure 8.

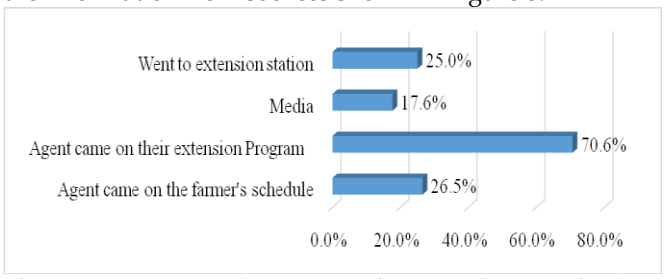


Figure 8: Farmers' ways of accessing agricultural extension services

The survey shows that most of the sampled farmers received extension education through agents who were in their extension program, media, extension station, and extension programmes.

3.2.5 Channels used to deliver extension services

The channels used to deliver extension services to the farmers are shown in Figure 9. Field days/demonstrations being the most common while ASK shows was the least used.

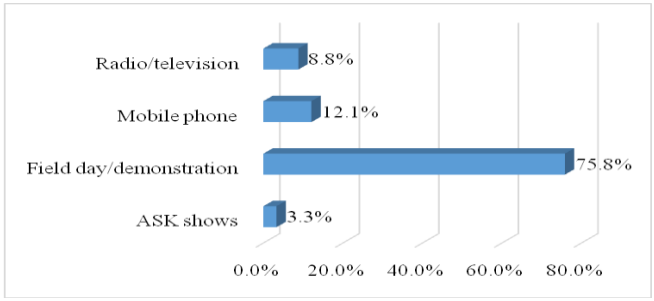


Figure 9: Channels used to deliver extension services

3.2.6 Farmers reasons for the choice of the different extension service providers

The respondents who had accessed agricultural extension services within the last one year were asked to indicate the reasons that made them select the particular agricultural service. The results are shown in Figure 10. The reasons farmers favoured their preferred service providers included proximity, provision of relevant information, cost, and accessibility.

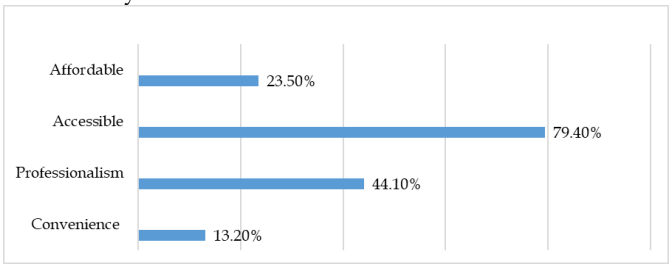


Figure 10: Respondents reasons for the choice of different extension service providers

3.2.7 Farmers level of satisfaction with the performance of agricultural extension service

The current study sought to determine the level of satisfaction that respondents were getting with the work of extension service is shown in Table 4. The timeliness of information, adequacy of information, professionalism of the agent, and relevancy of the information received on agricultural extension services were all rated as satisfactory by the respondents.

3.2.8 Farmers' application of recommendations received from the extension officers

This study found that majority of the sampled respondents who received extension services had applied all the recommendations made by the extension workers as shown in Figure 11.

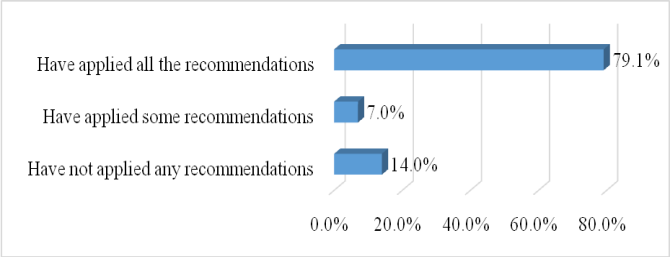


Figure 11: Farmers' application of recommendations received from the extension officers

There were few farmers had not applied any recommendation from the extension agent.

Table 4: Farmers' level of satisfaction with the performance of agricultural extension service

Satisfaction levels	Not Satisfied	Somehow Satisfied	Satisfied	Very Satisfied	Total
Timeliness of information	9(13.2)	3(4.4)***	40(58.8)	16(23.5)	68(100.0)
Information is adequate/enough	3(4.4)	6(8.8)	41(60.3)	18(26.5)	68(100.0)
Agent knowledgeable (professionalism)	6(8.8)	16(23.5)	38(55.9)	8(11.8)	68(100.0)
Relevancy of information	3(4.4)	12(17.6)	44(64.7)	9(13.2)	68(100.0)

*** Figures in brackets represent percentages

3.2.10 Extension recommendations applied by farmers

Some of the recommendations that were reported to have been applied by farmers are summarized in Figure 12.

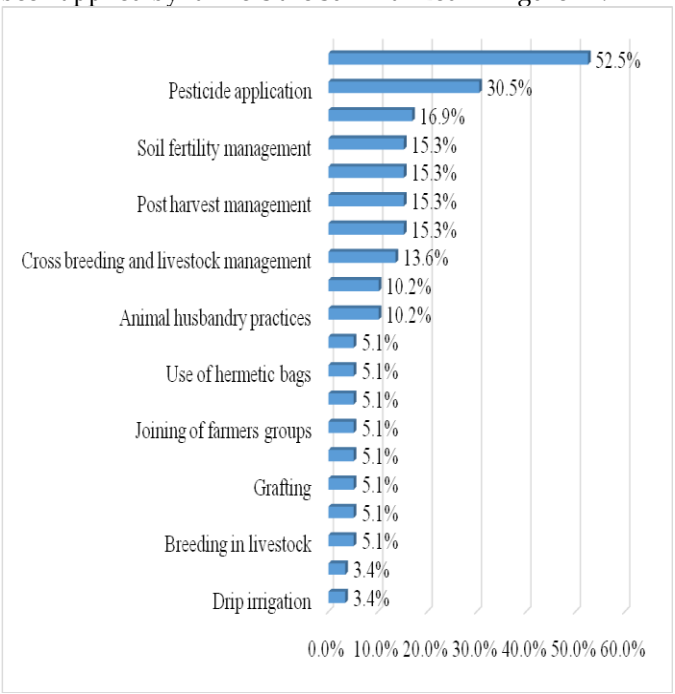


Figure 12: Extension recommendations applied by farmers

Agronomic practices, pesticide application, soil and water conservation, agrochemical handling, post-harvest management, poultry keeping, soil fertility management, cross-breeding and livestock management, animal husbandry practices, and the use of certified seeds are among the agricultural extension recommendations implemented by the farmers.

3.2.11 Farmers' reasons for non-application of extension recommendations

Some of the reasons why some extension recommendations were not applied by farmers are summarized in Figure 13.

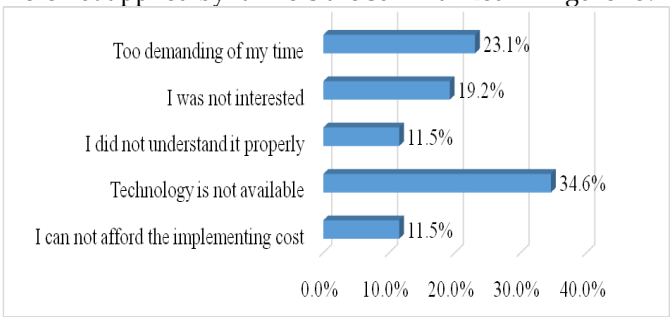


Figure 13: Farmers' reasons for non-application of extension recommendations

The complexity of technology was stated as the most common reason for the non-application of some recommendations: it was burdensome and uninteresting.

3.2.12 Farmer's preference on packaging of the agricultural extension information

Respondents were requested to indicate how they preferred extension and other technical information packaged so that it was more useful to them and their farm decision-making. The results are shown in Table 5. Majority of the sampled farmers preferred extension information packaged in the form of print, the extension officer himself/face-to-face, radio, television, internet, Barazas, farm visit and self-explanation.

Table 5: Farmer's preference on packaging of the agricultural extension information

Preferred extension information package	Frequency	Percent
Call *Barazas*	3	3.1
Farm visit	3	3.1
Extension Officer Himself (Face-To-Face)	26	26.5
Internet	6	6.1
Print (Brochures, Pamphlets, and leaflets)	52	53.1
Radio	25	25.5
Self-explanation	3	3.1
Television	9	9.2

3.2.13 Farmers preferred language in extension information

Respondents preferred if extension information could be packaged in a variety of languages as depicted in Figure 14.

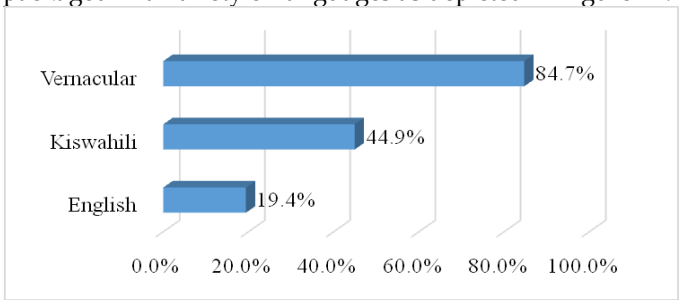


Figure 14: Farmers preferred language in extension information

Extension information was favored by some respondents in Kiswahili, the vernacular language, while a few preferred English as shown in Figure 15.

3.2.14 Respondents' average expenditure on livestock and crop extension services

Respondents who had used extension services indicated that they had spent it, as summarized in Table 6. Transports, both for the farmer to the service provider's office and for the service provider to the farm, are major expenses in livestock and crop agricultural extension.

Table 6: Respondents' average expenditure (Kshs.) on livestock and crop extension services

Variable	Mean	Std. Dev.	Minimum	Maximum
Livestock	7,307.69	659.43	500	20,000
Crop	8,492.31	705.97	1,000	25,000

4. CONCLUSION AND RECOMMENDATIONS

Most farmers in Kitui County have access to extension service in their various crop and /or livestock enterprises. Farmers get extension services from government representatives (government extension officers), farmers' groups or cooperatives, NGO agents, fellow farmers, researchers, and company agents. Field days/demonstrations were the most common methods used in delivering extension services while ASK shows was the least used. The main reasons why farmers favoured their preferred service providers included proximity, provision of relevant information, cost, and accessibility.

The timeliness of information, adequacy of information, professionalism of the agent, and relevancy of the information received on agricultural extension services were all rated as satisfactory by most of the farmers. Majority of the farmers who had received extension services had applied all the recommendations made by the extension workers. Agronomic practices, pesticide application, soil and water conservation, agrochemical handling, post-harvest management, poultry keeping, soil fertility management, cross-breeding and livestock management, animal husbandry practices, and the use of certified seeds are among the agricultural extension recommendations implemented by the farmers.

The complexity of technology was stated as the most common reason for the non-application of some recommendations: it was burdensome and uninteresting. Majority of the sampled farmers preferred extension information packaged in the form of print, the extension officer himself/face-to-face, radio, television, internet, Barazas, farm visit and self-explanation. Extension information was favored by some respondents in Kiswahili, the vernacular language, while a few preferred English. Transports, both for the farmer to the service provider's office and for the service provider to the farm, are major expenses in livestock and crop agricultural extension.

More funds should be allocated to an agricultural extension. For efficient delivery of extension service in Kitui County, extension officers should be well facilitated (especially through adequate transport facilities and access to technologies). Agricultural Extension work requires more funds to reach most of the farmers in vast Kitui County.

5. REFERENCES

Adesina, A.A., & Baidu-Forson, J. (1995). Farmers' perceptions and adoption of new agricultural technology: evidence from analysis in Burkina Faso and Guinea, West Africa. *Journal of Agricultural economics*, *13*(1):1-9.

Alex, G., Zijp, W., & Byerlee, D. (2002). Rural Extension and Advisory System: New Directions. Rural Development Strategy. *Background Paper*, *9*.

Amaza, P. S., Bila, Y., & Iheanacho, A. C. (2006). Identification of factors that influence technical efficiency of food crop production in West Africa: Empirical evidence from Borno State, Nigeria. *Journal of Agriculture and Rural Development in the Tropics and Subtropics (JARTS)*, *107*(2):139-147.

Amaza, P., Kwacha, A., & Kamara, A. (2007). Farmers' perceptions, profitability, and factors influencing the adoption of improved maize varieties in the Guinea Savannas of Nigeria. *IITA: Research to nourish Africa*.

Amwata, D.A. (2020). Situational analysis of the agriculture sector in Kenya. Ministry of agriculture, Livestock and Fisheries. Nairobi, Kenya.

Anderson, J. R. (2020). Agricultural Extension Policy: A 2020 Re-Vision. *Rutgers University Feed the Future Policy Consortium*.

Appleton, H., & Scott, A. (1994). Gender issues in agricultural technology development. *12th Panel of Experts on Agricultural Engineering, Food and Agriculture Organization (FAO), Rome.*

Ayieko, M., Odame, H., & Olwande, J. (2021). Strengthening Seed Systems and Market Development in Kenya: Perspectives on Political Economy and Policy Processes. *Tegemeo Institute of Agricultural Policy and Development Working Paper. Nairobi: Tegemeo Institute of Agricultural Policy and Development, Egerton University, Kenya.*

Birch, I. (2018). Agriculturaal productivity in Kenya: barriers and opportunities. K4D Helpdesk Report: *Institute of Development Studies, Brighton, United Kingdom*.

Bozoğlu, M., & Ceyhan, V. (2007). Measuring the technical efficiency and exploring the inefficiency determinants of vegetable farms in Samsun province, Turkey. *Agricultural systems*, *94*(3):649-656.

Cheruiyot, J. K. (2020). Participatory livelihood analysis as an alternative method for agricultural extension needs assessment: case of a rural community in Kenya, http://ir-library.kabianga.ac.ke/handle/123456789/297.

Danso-Abbeam, G., Ehiakpor, D. S., & Aidoo, R. (2018). Agricultural extension and its effects on farm productivity and income: insight from Northern Ghana. *journal of Agriculture & Food Security*, *7*(1): 1-10.https://doi.org/10.1186/s40066-018-0225-x.

Davidson, A. P. (2007). Participation, education, and pluralism: towards a new extension ethic. *Development in Practice*, *17*(1): 39-50.

Davis, K. E. (2008). Extension in Sub-Saharan Africa: Overview and assessment of past and current models, and future prospects, *Journal of International Agricultural and Extension Education, 15*(3): 34-46.

Dhehibi, B., Rudiger, U., Moyo, H. P., & Dhraief, M. Z. (2020). Agricultural technology transfer preferences of smallholder farmers in Tunisia's arid regions. *Sustainability*, *12*(1): 421.

Elias, A., Nohmi, M., Yasunobu, K., & Ishida, A. (2013). Effect of agricultural extension program on smallholders' farm productivity: Evidence from three peasant associations in the highlands of Ethiopia. *Journal of Agricultural Science*, *5*(8):163.

Faguet, J.P. (2014). Decentralization and governance. *World Development*, *53*:2-13.

Gautam, M., & Anderson, J.R. (1999). Reconsidering the evidence on returns to T&V extension in Kenya. Policy Research Working Paper 1098, the World Bank, Washington D.C. *Global Environmental Change, 19*:248-255.

Government of Kenya, GOK (2011). 'Interim report of the task force on devolved government: A report on the implementation of devolved government in Kenya', Task force on devolved government (TFDG) consultation document, Nairobi, Kenya.

Government of Kenya, GOK (2019). Economic surveys. Kenya National Bureau of Statistics (KNBS). 2019 Kenya Population and Housing Census: Volume II. Nairobi, Kenya.

Goyal, A., & Nash, J. (2017). Reaping richer returns: public spending priorities for African agriculture productivity growth. Africa Development Forum series. Washington, DC: World Bank. doi:10.1596/978-1-4648-0937-8.

Gunderson, L.H., Allen, C.R., Angeler, D.G., Garmestani, A.S., & Holling, C.S. (2014). Panarchy: theory and application. *Ecosystems*, *17*(4): 578-589.

Hlophe-Ginindza, S. N., & Mpandeli, N. (2021). The Role of Small-Scale Farmers in Ensuring Food Security in Africa. *Food Security Africa*.

Jayne, T. S., & Sanchez, P. A. (2021). Agricultural productivity must improve in sub-Saharan Africa. *Science, 372*(6546): 1045-1047.

Kathuri, N.J., & Pal, D.A. (1993). Introduction to educational research. Egerton University, Njoro, Educational Media, Kenya.

Kingiri, A. (2021). Agricultural advisory and extension service approaches and inclusion in reaching out to Kenyan rural farmers. *African Journal of Science, Technology, Innovation and Development*, *13*(7): 797-806.

Kitui County Government, (2021). Overview of Kitui County Sub-Counties, Wards and Villages. Retrieved from https://kitui.go.ke/countygovt/about-kitui.

Kogo, B. K., Kumar, L., & Koech, R. (2021). Climate change and variability in Kenya: a review of impacts on agriculture and food security. *Environment, Development and Sustainability, 23*(1): 23-43.

Kudaligama, V. P., & Yanagida, J. F. (2000). A comparison of intercountry agricultural production functions: A frontier function approach. *Journal of Economic Development*, *25*(1): 57-74.

Langyintuo, A., & Mekuria, M. (2008). Assessing the influence of neighborhood effects on the adoption of improved agricultural technologies in developing agriculture. *African Journal of Agricultural and Resource Economics*, *2*(2):151-169.

Mango, N., Makate, C., Hanyani-Mlambo, B., Siziba, S., & Lundy, M. (2015). A stochastic frontier analysis of technical efficiency in smallholder maize production in Zimbabwe: The post-fast-track land reform outlook. *Cogent Economics & Finance*, *3*(1): 1117189.

MOALF&C, (2017). Agricultural Sector Development Support Programme Implementation Framework II. Ministry of Agriculture, Livestock and Fisheries and the Council of Governors Secretariat, Nairobi, Kenya.

Mpawenimana, J. (2005). Analysis of Socio-Economic Factors Affecting the Production of Bananas in Rwanda: A Case Study of Kanama District. *University of Nairobi.* Nairobi, Kenya.

Muhumed, I. J., & Minja, D. (2019). The Effect of Devolution of Agricultural Sector on the Citizens' Livelihoods in Wajir County. *International Journal of Current Aspects*, *3*(3), 187-198.

Mutuga, M.K. (2018). Effect of devolution of governance powers from state to county government on fish farming enterprise in Laikipia country, Kenya. Nations University Fisheries Training Programme, Iceland [final project]. http://www.unuftp.is/static/fellows/document/martin16prf.pdf.

Mwajombe, K. K., & Mlozi, M. R. (2015). Measuring farm-level technical efficiency of urban agriculture in Tanzanian towns: the policy implications.

Nagarajan, L., Naseem, A., & Pray, C. (2019). Contribution of policy change on maize varietal development and yields in Kenya. *Journal of Agribusiness in Developing and Emerging Economies*.

Nambiro, E., Omiti, T., & Mugunieri, L. (2005). Decentralization and access to agricultural extension services in Kenya. *SAGA Working Paper.* October 2005, Ministry of Agriculture, Livestock., Fishries and Coperatice, Kilimo House , Kenya.

Nassiuma, D.K. (2000). Survey sampling: Theory and methods. Njoro, Kenya: Egerton University Press, Kenya.

Ngigi, S., & Busolo, D. N. (2019). Devolution in Kenya: the good, the bad and the ugly. *Public Policy and Administration Research, 9*(6): 9-21.

Nguyen, H.Q. (2014). Crop Diversification, Economic Performance and Household's Behaviours: Evidence from Vietnam. Household, Behaviours and Evidence. Vietnam July 2, 2014.

Nissanke, M. (2019). Exploring macroeconomic frameworks conducive to structural transformation of sub-Saharan African economies. *Structural Change and Economic Dynamics*, *48*: 103-116.

Olayemi, S. S., Alo Adeola Ope-Oluwa, A. A. O. O., & Angba, C. W. (2021). Evolution of agricultural extension models in Sub-Saharan Africa: A critical review. *International Journal of Agricultural Extension and Rural Development Studies*, *8*(1):29-51.

Rees, D., Momanyi, M., Wekundah, J., Ndungu, F., Odondi, J., Oyure, A. O., & Joldersma, R. (2000). *Agricultural knowledge and information systems in Kenya: implications for technology dissemination and development*. London: Agricultural Research and Extension Network.

Republic of Kenya, (2005). Kenya Education Sector Support Programme 2005 – 2010, Government printers, Nairobi, Kenya.

Rivera, W.M. (2004). Demand-Driven Approaches to Agriculture Extension, Case Studies of International Initiatives, *Agriculture and Rural Development Discussion Paper 10*.

Rivera, W.M., Quamar, M.K., & Crowder, L. (2001). Agricultural and rural extension worldwide: options for institutional reform in the developing countries. Extension, Education and Communication Service, Research, Extension and Training Division, Sustainable Development Department, FAO, Rome, Italy.

Rogers, E. M. (2003). Diffusion of Innovations. 5th ed. New York: The Free Press.

Siankwilimba, E., Hiddlestone-Mumford, J., Hang'ombe Mudenda, B. M., Mumba, C., & Hoque, M. E. (2022). COVID-19 and the Sustainability of Agricultural Extension Models. *International Journal of Applied Chemical and Biological Sciences*, *3*(1): 1-20.

Tabi, A.J., Vabi, M.B., & Malaa, D.K. (2010). Adoption of Maize and Cassava Technologies in the Forest-Savannah Zone of Cameroon: Implications for Poverty Reduction. *World Applied Sciences Journal, 11*(2): 196-209.

Tura, M.D., Aredo, R., Rovere, G., Tesfahun, W., Mwangi, J., & Mwabu G. (2010) Adoption and continued use of improved maize seeds: Case study of Central Ethiopia, *African Journal of Agricultural Research*, *5(17):* 2350-2358.

UBoS, (2010). Uganda National Household Survey: Socio-economic Module. Abridged Report. Uganda Bureau of Statistics (UBoS).Kampala, Uganda.

Wanderi, M. P., & Makandi, L. (2019). Kenyan Universities Contribution Towards the President's "Big Four" Agenda: The Case of Mount Kenya University's Graduate Enterprise Academy, Kenya

Wongnaa, C.A. (2016). *Economic efficiency and productivity of maize farmers in Ghana* (Doctoral dissertation, Kwame Nkrumah University of Science and Technology).

World Bank, (2000). Decentralizing Agricultural Extension: Lessons and Good Practice. Washington, D.C.: The World Bank, USA.

World Bank, (2021). Drivers of agricultural foreign divestment. *Studies in Agricultural Economics*, *123*(1): 43-51.