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Factors influencing the intensity of use of ICT tools by youth along agricultural value chains: Evidence from Busia County, Kenya

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Abstract:

Focus on youth has considerably increased in the developing countries, especially within Sub-Saharan Africa (SSA) in recent times. The Information and Communication Technology (ICT) sector is one of the rapidly developing sectors in the developing world, with the young generation being presently engaged in use of new technologies. The ICTs are beneficial in agriculture, but there is less evidence of their use for agricultural purposes particularly by the youth. The desire to change the face of agriculture for youth to find it appealing has seen the need to assess the relevance of youth participation in agriculture and integration of ICTs into the sector as a solution to youth migration and unemployment. This study analyzed the determinants of ICT usage in agricultural value chains among rural youth in Busia County, Kenya. A total of 213 young farmers were randomly selected and interviewed using semi-structured questionnaires. Descriptive statistics and Poisson regression model were applied in data analysis. Findings showed youth participation using ICTs was concentrated at the marketing level of the agricultural chain activities. Age, marital status, transport cost, distance to market, land size and extension services were significant in explaining the intensity of use of ICTs for agriculture. Key Words: Youth, ICTs, Agricultural value chains, Western Kenya

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1.0 Introduction

In Kenya, the youth account for about 78% of the total population (United Nations-HABITAT, 2016) with unemployment rate of about 35% (Republic of Kenya, 2017). Following Kenya's constitution (Republic of Kenya, 2010), we define the youth as all individuals in the age bracket from 18 to 35 years old. Agriculture remains their main source of livelihood with about 64% of the rural youth in Kenya depending on it (Kenya National Bureau of Statistics, 2010). Despite their significant contribution to the economies of most developing countries, youth are characterized by constrained ownership of and access to vital assets of production such as land, credit, and insurance among others (Naamwintome and Bagson, 2013). This often impedes youth participation in agriculture, they therefore flee to urban areas in search of better paying jobs. As a result, social problems such as theft and drug abuse arise (Sanginga et al., 2015).

The past decade has witnessed a lot of emphasis on relevance of the youth as the key drivers to agricultural prosperity more so in developing countries (Alliance for a Green Revolution in Africa, 2015). Various forms of strategies that targeted youth such as Agricultural Sector Development Strategy (ASDS) and Malabo declaration were implemented. In the year 2006, the Kenyan government developed the National Youth Policy as the main legal framework to address challenges that face youth. To achieve this objective, a number of programs have been put in place including; Youth Enterprise Development Fund (YEDF) and *UWEZO* fund to reduce unemployment among the youth and subsequently their incomes. However, the national youth policy framework did not address youth in agriculture issues. Furthermore, there is limited information on youth allocating funds received from the programs into farming (Kangai and Mburu, 2012).

Enhancement of agricultural productivity has therefore been a major focus of policy makers in Kenya due to the significant role of the agricultural sector in the country's economic development. Thus, the Kenya Youth in Agribusiness Strategy has been recently introduced as part of the strategies to prioritize employment creation through linkages in agricultural value chains for youth (Republic of Kenya, 2017). This aims at encouraging more youth to be part of agriculture. Nevertheless, non-participation in agriculture by most youth still prevails in Kenya. Past studies have observed that acceptance of youth towards agriculture is negative, as they see agriculture as unattractive form of drudgery, an occupation for failures and unprofitable (Bezu and Holden, 2014; Akpan et al., 2015).

Promoting effective use of ICTs in agriculture provides a viable solution to entice youth into agriculture by connecting them to new opportunities in inclusive agricultural value chains (AGRA, 2015). Okello et al. (2012) note that ICTs have the potential for improving production techniques, provision of updated agricultural information, extension services, money transfer, increasing sales and improving efficiency; which is beneficial to young farmers. In addition, ICT tools especially mobile phones, internet and social media can be used by youth to source for new information and marketing of high value commodities such as horticultural crops, which have more beneficial prospects for income generation and food supply both at the household and community level. The increased focus on use of modern ICTs by youth comes from the comprehension that youth can play a major role in dissemination of information and knowledge to rural farmers.

Kenya has recorded considerable growth in the ICT sector in recent years. The most recent statistics of the Communications Authority of Kenya (2017) show that, mobile subscriptions grew from 37.7 million in 2015 to 38.5 million in 2016 and reached 40.2 million by 2017. Consequently, internet subscriptions

grew from 23.9 million in 2015 to 26.8 million in 2016 to reach 29.6 million in 2017 (Communications Authority of Kenya, 2015; 2016; 2017). Mobile data subscriptions accounted for the majority of subscriptions standing at 29.4 million as at June 2017. Young people are identified as the majority users of ICTs (Samsuddin et al., 2016; International Telecommunication Union, 2017). Emergence of ICTs in general has been positively accepted by youth for communication, networking, entertainment and job searching. Despite its importance, there is slackness in use of ICTs for agriculture compared to its development in other sectors such as health, education, media and financial institutions. Regardless of the increased levels of internet and mobile subscriptions in Kenya, its use for agricultural purposes remains low among youth.

Adoption of ICTs in agriculture is an advantage for the youth since they have the interest and excitement to try new things, technical knowhow to operate ICTs and are always alert on any ICT updates. Youth participation in agriculture using ICTs is likely to stimulate development of the entire value chain, including; production, marketing, provision of extension, input supply, transport. The question, however, is where are the youth concentrated along the agricultural value chains and how has ICTs impacted on their incomes and adoption of new production skills? Knowing this is important for policy makers to discover how youth can navigate and transform agriculture by use of ICTs in the Kenyan context. This is also important for better designing, planning and implementation of agricultural sector-specific youth policies in agri-preneurship and information dissemination to rural farmers.

Empirical evidence shows that increased access to ICTs can possibly provide opportunities in the economy to eradicate poverty (Hassan et al., 2008). Related studies such as Ogotu et al., (2013) and Nyaga (2015) have centered their studies majorly on factors influencing general use of ICT in agriculture. Others like Issa et al. (2014) and Akpan et al. (2015) focused on youth participation in agriculture. However, there is a striking knowledge gap on what factors would influence youth to use ICT tools in agricultural related enterprises. This study therefore examined the factors that affect the use of ICT tools in agriculture by youth and the factors that condition the extent of use of ICTs on agricultural value chain stages. The study used data collected from young farmers aged between 18-35 years who participated in agricultural activities.

Subsequent sections of this paper are organized as follows; section 2 presents the empirical model and study area. Section 3 discusses the study results while section 4 offers conclusions and policy recommendations.

2.0 Methodology

2.1 Study area

This study was based on a household youth survey conducted in April and May 2017 in Busia County of Western Kenya. The choice of the county was purposive based on the high potential for agricultural production and its high youth population. According to the Busia County Integrated Development Plan (2013), the county has a total youth population of 194,000 who mostly engage in subsistence agriculture. The county is characterized with good climatic conditions, reliable rainfall and good quality soils that favor production of variety of crops including; maize, rice, horticultural crops, beans, cassava. The county was also selected due to previous implementation of ICT hubs. Furthermore, the county has a cross-border town where trade of agricultural products and most of the exports from neighboring counties to Uganda are channeled through Busia border hence has a very good market access for agricultural produce.

Tables and graphs were used to present the findings. Poisson regression model was used to examine the extent of use of ICTs.

2.4 Empirical model: Intensity of ICT use in agricultural value chains by youth

The intensity of use of ICTs in agricultural value chains in this study refers to the frequency of use of ICT tools in agricultural value chain stages (number of times a youth uses ICT tools per week). The number of times a youth uses ICT tools assumes integer value of discrete nature and is therefore a nonnegative count variable. The study therefore used a count data model to analyze the intensity of use of ICTs in agricultural value chains by youth. The key regression models to analyze count data models include the Poisson Regression Model (PRM), the Negative Binomial Regression Model (NBRM), the Zero Inflated Poisson (ZIP) and the Zero Inflated Negative Binomial (ZINB). The PRM and NBRM have become most common models used to analyze response variables with nonnegative integer (Winkelmann and Zimmermann, 1995; Greene, 2008). The negative binomial regression is used where poisson regression fails due under-dispersion or over-dispersion of variance. The remaining two models, zero inflated poisson and zero inflated negative binomial, are mainly used to account for the frequency of zero counts (that is, in cases where there are more zeros than expected in either the poisson or the negative binomial regressions). This is not the case in this study since the response variables were nonnegative integers with less zero counts. Poisson regression is used in this study because diagnostic tests revealed absence of over dispersion and under dispersion. Following Wooldridge (2002) and Greene (2003; 2008), the density function of the poisson regression model is given by:

$$f(y_i|x_i) = \frac{e^{-\lambda(x)} \lambda_i(x)^{y_i}}{\Gamma(1+y_i)} \quad (1)$$

Where; $\lambda_i = \exp(\alpha + X' \beta)$ and $y_i = 0, 1, \dots, i$ is the number of times a youth uses ICT tools per week, X = a vector of predictor variables and α and β are the parameters to be estimated.

Greene (2003; 2008) show that the expected number of events y_i (in this case, number of times of ICT use) is given as;

$$E(y_i|x_i) = \text{Var}[y_i|x_i] = \lambda_i = \text{Exp}(\alpha + X' \beta) \text{ for } i = 1, 2, \dots, n \quad (2)$$

Implicitly, the Poisson regression model is shown below:

$$\text{Number of times of ICT tools use} = f(\text{age, gender, marital, education, occupation, log of transport cost, log of distance to market, log of distance to electricity, income, number of agricultural value chains, group membership, land size, access to credit, extension}) + e \quad (3)$$

3.0 Results and Discussion

3.1 Demographic characteristics of Youth

Table 1 below presents basic overview of the youth sampled. The respondents consisted of more male youth (57%) than female youth. The mean age of the sampled youth was 28 years, indicating that they are an economically active group and are more exposed to modern technologies. Therefore, youth are significant in terms of faster uptake of agricultural innovations (Nyaga 2015). Results indicate that above 80% of the respondents had post-primary education with an average number of years of schooling as 10 years. This implies that education increases the skills to easily operate modern ICT tools such as internet, computers and social media. Therefore high level of education could encourage easy understanding and adoption of modern agricultural innovations. Majority (70%) of the youth surveyed were married, with the rest being single. More than three quarters of young farmers interviewed belonged to a development group, meaning social capital formation and desire for collective action among youth in the study area

was high. The average land size accessed by youth for farming is was found to be less than 2 acres. This is much lower than the Busia county average land holding which is 2.34 hectares (CIDP, 2013). On average, over 90% of youth owned at least one ICT tool with most having phones and radios. This could be explained by the fact that younger people are more exposed to ICTs.

Table 1: Demographic characteristics of youth

Variable	Statistic
Gender (% of male)	57.7
Marital status (% of married)	70.9
Group membership (% of farmers)	75.5
Average age (years)	28
Average education (number of years of formal schooling completed)	9.6
Level of education primary school and above (% of farmers)	84.8
Average land size (acres)	1.59
Ownership of ICT tools (% of farmers)	95.3

Source: *Field survey (2017).*

3.2 Nature of agricultural enterprises preferred by youth in the study area

Figure 2 below shows the types and nature of agricultural value chains engaged by youth. The results indicate that majority of the respondents were more concentrated in the cereal value chain, followed by horticulture and livestock value chains. This can be explained by the fact that cereal crops form the major staple food in the study area and most of the farmers produce for both subsistence and commercial purposes. Investment in production of cereals is linked to its increased demand. More than 70% were involved in the horticultural value chain as the young farmers are entrepreneurial and they prefer venturing in high-valued and short season agricultural enterprises that move fast to make profit. A study by Poulton and Kanyiga (2014) confirm that youth mainly dominate the horticulture value chain. Kangai and Mburu (2012) also found that youth favored horticulture more than other farm-level enterprises. Majority of youth who are in the livestock value chain are concentrated in poultry production because of ready market and short production periods.

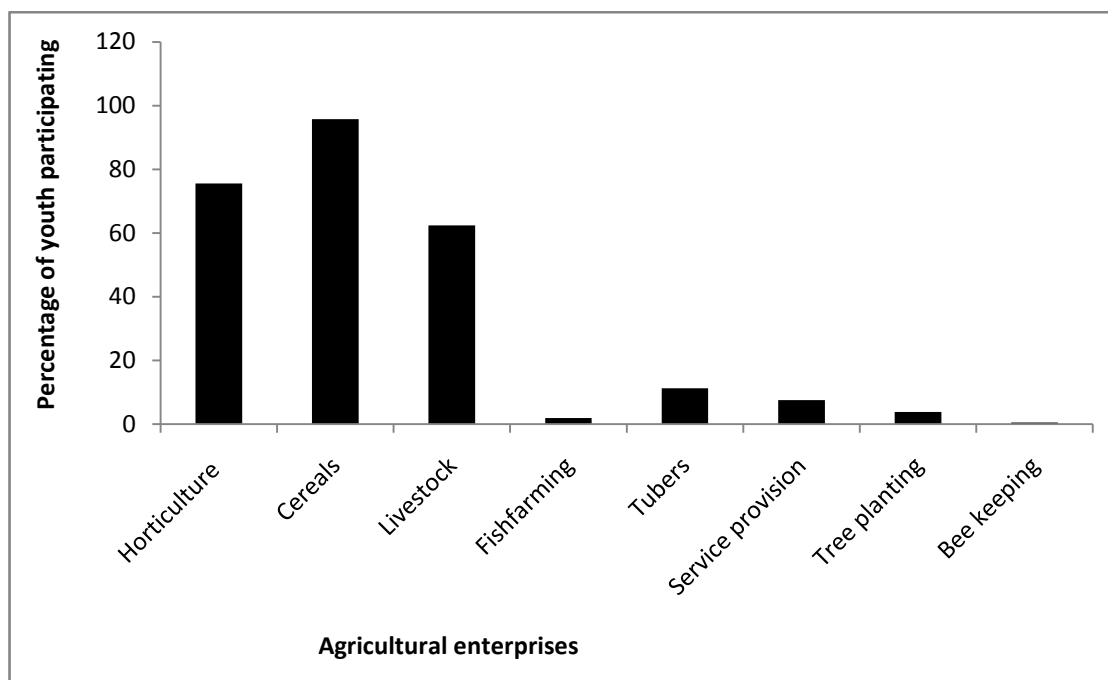


Figure 2: Youth participation in agricultural enterprises

Source: *Field Survey (2017).*

Furthermore, Figure 3 shows that across all enterprises respondents participated more in production, marketing and input supply stages of agricultural value chains; with an exception of service provision where a large number participated in the provision of extension services. This means that their main way of participation was through providing labor. Kimaro et al. (2015) study conforms to this finding that youth are involved in agriculture by supply of labor at local and family farms.

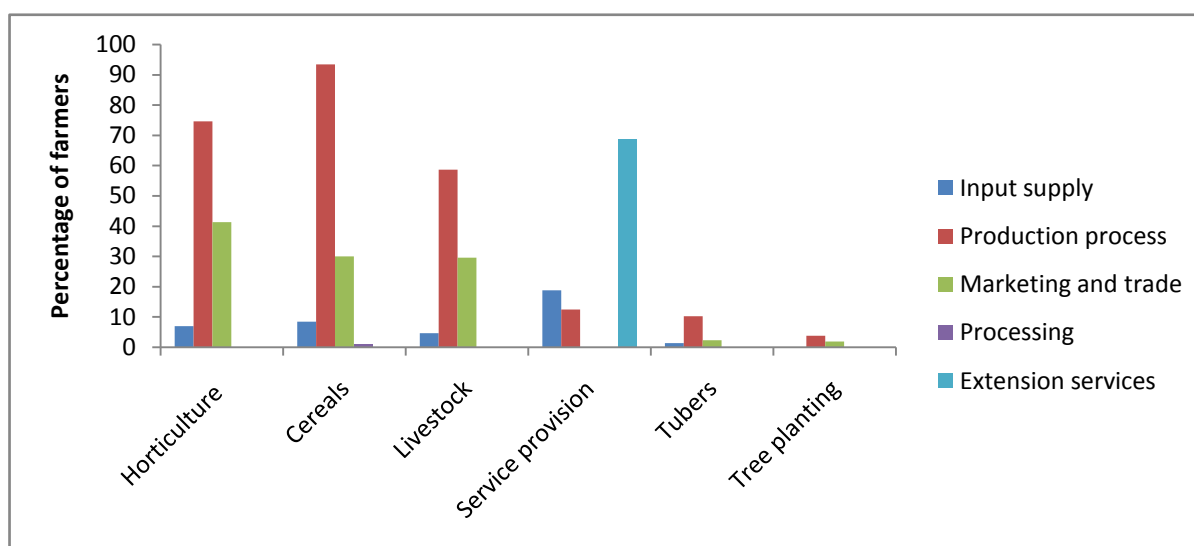


Figure 3: Stages of agricultural value chains activities

Source: *Field Survey (2017).*

3.3 ICT use in agricultural chain activities

Results in Figure 4 indicate that, the main differences in the use of ICTs for other purposes compared to the use for agricultural purposes. This finding suggests that generally use of ICT for non-agricultural purposes is higher while there is slackness in use for agricultural purposes by youth. This supports findings by Chavula (2014) that indicate low usage of ICTs for agricultural purposes.

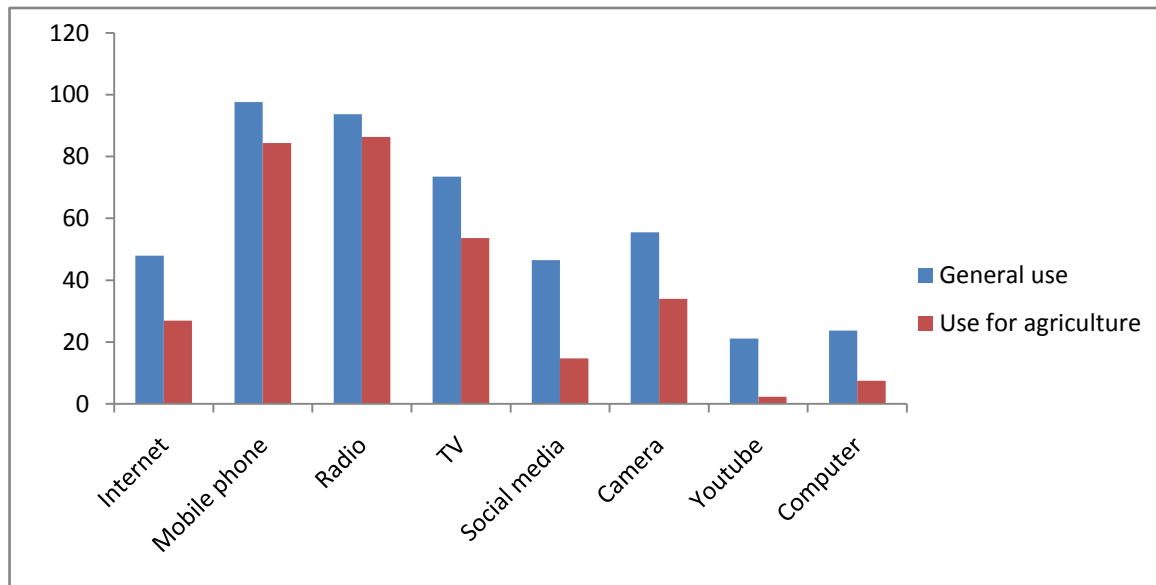


Figure 4: Use of ICT tools

Source: *Field Survey (2017).*

Of the total sample, more than 90% preferred using ICTs mostly for marketing as shown in Figure 5. This is because youth are entrepreneurial and are more focused on higher returns thus would want innovations that reduce transaction costs, are convenient and enable them to get accurate information. The drudgery nature of agriculture is minimized at the marketing stage using ICTs. Chalwe (2011) also stated that younger people engaged more than older people in marketing of beans in Zambia.

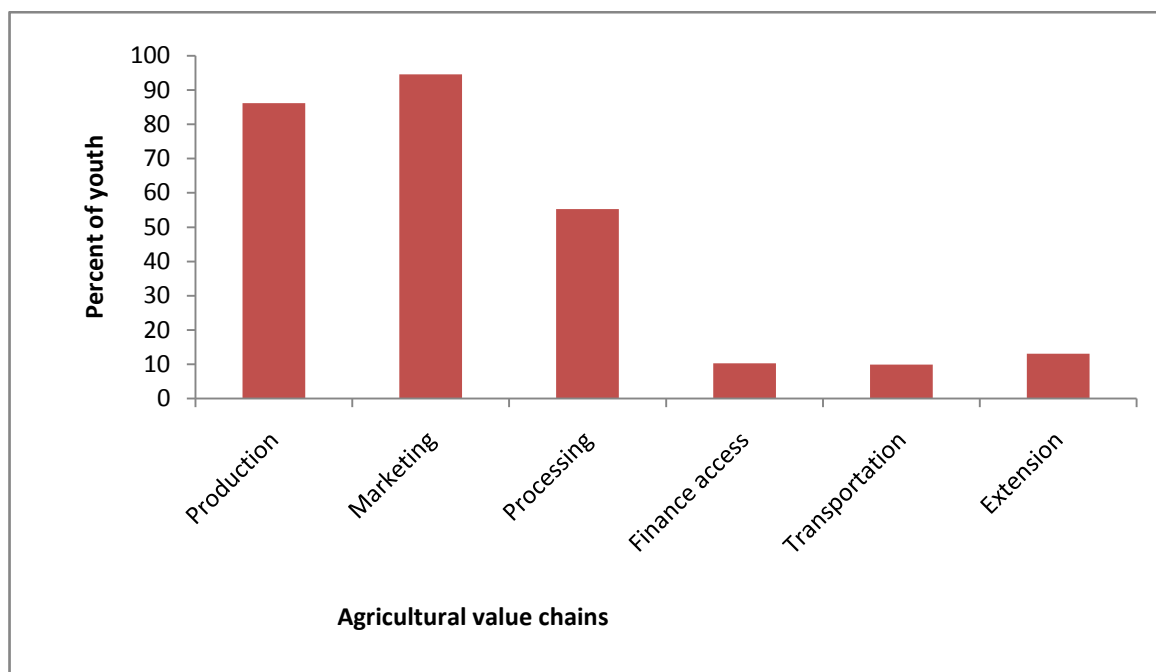


Figure 5: Use of ICTs in agricultural value chain stages

Source: Field survey (2017).

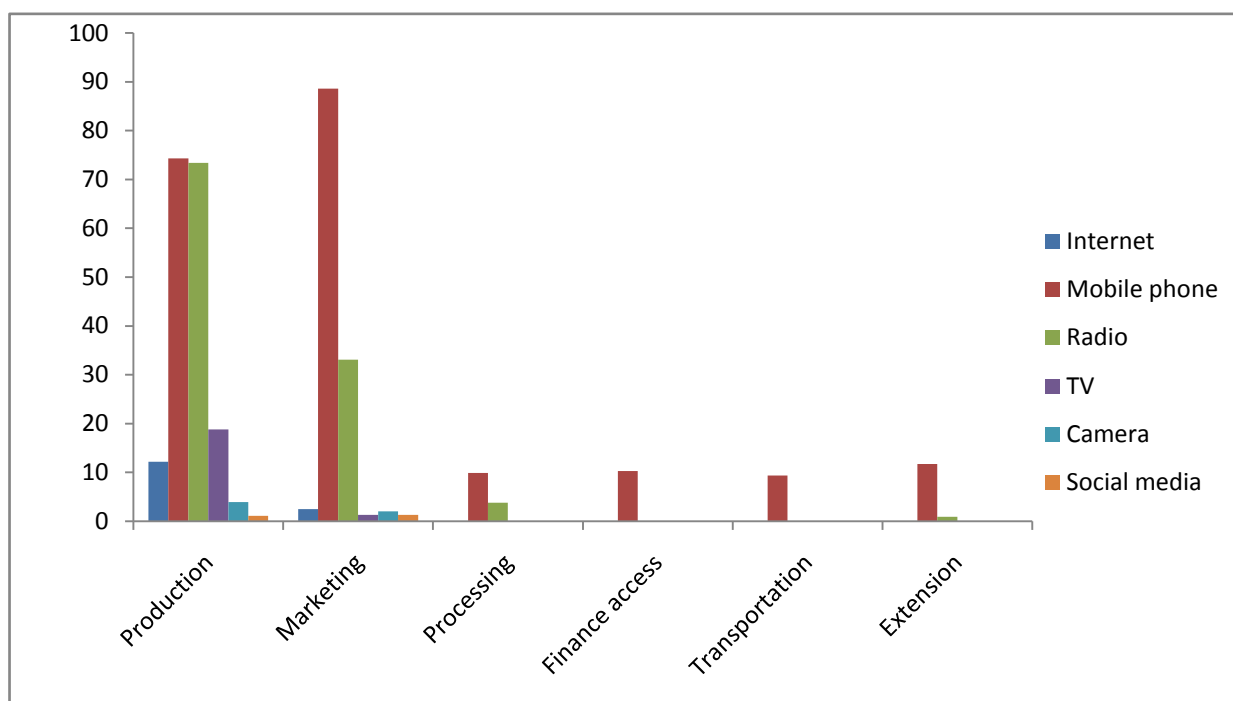


Figure 6: Tools used in agricultural value chain stages

Source: Field survey (2017).

Results from the figure 6 above illustrate that mobile phone, radio and TV are the most commonly used ICT tools in agriculture. The most used ICT tool across all the value chain stages was mobile phone this is mainly because young people are the largest group using phones. This is because of the ease and convenience in getting information on new production technologies, money transfer and communication. The finding concurs with that of Syiem and Raj (2015), who found mobile phones were highly accessed and most frequent used by rural farmers in India.

3.4 Determinants of intensity of use of ICT tools in agricultural value chains

The Poisson regression model was estimated to examine the factors determining the extent to which young farmers use ICTs in agricultural value chains. Table 2 below shows the results.

Table 2: Poisson regression of the intensity of use of ICT tools by youth

Independent variables	Poisson Regression			Marginal Effects		
	Co-efficient	Std. Error	P-value	Co-efficient	Std. Error	P-value
Constant	-0.2982	0.6904	0.666			
Age	-0.0203*	0.0117	0.082	-0.0541*	0.0312	0.083
Gender	-0.0926	0.1210	0.444	-0.2463	0.3220	0.444
Marital status	-0.3346**	0.1340	0.013	-0.8900**	0.3593	0.013
Occupation	0.7994	0.1415	0.572	0.2126	0.3766	0.572
Education (no. of years)	0.0264	0.0206	0.201	0.0701	0.0549	0.202
Log transport cost	0.3070***	0.1071	0.004	0.8165***	0.2879	0.005
Log distance to market	0.1787**	0.0810	0.027	0.4754**	0.2169	0.028
Log distance to electricity	0.0069	0.0456	0.879	0.0184	0.1214	0.879
Income	0.0000	0.0000	0.145	0.0000	0.0000	0.146
Agricultural value chains (number of AVCs participates in)	0.1414***	0.0452	0.002	0.3761***	0.1218	0.002
Group membership	-0.1124	0.1447	0.437	-0.2990	0.3851	0.437
Land size	0.0895*	0.0485	0.065	0.2380*	0.1295	0.066
Credit	0.0157	0.1290	0.903	0.0418	0.3433	0.903
Extension	0.4415**	0.2011	0.028	1.1742**	0.5383	0.029
Pseudo R ² = 0.0773, LR Chi ² = 49.40, Prob > Chi ² = 0.0000, Log likelihood = -294.9919						

Note: ***, **, * significant at 1%, 5% and 10% respectively

Source: Field survey (2017).

From the results, age, marital status, transport cost, distance to the market, land size, number of agricultural value chain stages (a youth participates in) and access to extension services significantly influence the intensity of ICT use in agricultural value chains. Age has an inverse relationship to the extent of use of ICT tools, implying that younger farmers are more receptive to new ideas and innovations compared to older ones. They are more likely to use ICT tools to seek information on production, marketing, access to extension and transportation services. This finding corroborates with past studies (see, Wawire et al., 2017; Okello et al., 2012).

The results further indicate that marital status also had a negative effect on the extent of use of ICTs. This implies that the married respondents are less likely to use ICTs for agricultural purposes. This can be attributed to the fact that single youths' are risk takers and are not afraid to invest their funds in modern agricultural technologies whereas their married counterparts prioritize food security and are therefore risk averse. This finding is in line with findings by Akpan (2015) that decision making in a family does not exclusively rely on one party. Contrary to findings by Nyamba and Mlozi (2012), that show married people engaged in agricultural activities using mobile phones more compared to their single counterparts. Transport costs had a positive and significant effect on use of ICTs for agriculture. This implies that the higher the transport cost the more likely a youth uses ICTs to make phone calls to trading partners or market produce online to reduce transaction costs. This finding further explains the positive relationship between distance to the produce market and use of ICT tools in agricultural value chains. Indicating that young farmers' who reside away from output markets, have a higher likelihood of using ICT tools to cut on large transport and transaction costs. Findings from past studies (Okello et al., 2014) also suggested that increase in transport cost to output markets increases use of ICT-based market information services.

Holding other factors constant, an increase in the number of agricultural value chain stages a youth participates in was found to increase the intensity of use of ICT tools. Results show that youth are involved in different levels of agricultural value chains including; input delivery, production, transportation and trading. Hence, young farmers participating in more than one agricultural value chain stage are likely to use ICT tools more frequently.

Land size had a positive and significant effect on use of ICTs for agricultural purposes. Availability of larger pieces of land is likely to entice youth to participate in agriculture majorly because they are interested in higher outputs and more profits. Therefore youth that have access to larger pieces of land are likely to invest in agriculture using new agricultural related technologies and innovations. Similarly, Agwu et al. (2014) found out that the likelihood for youth to participate in multiple agricultural enterprises is amplified by increase in land size.

As hypothesized, access to extension services had a positive significant effect to the use of ICTs. This is mainly because increase in extension services through use of ICTs is likely to improve flow of information dissemination by youth. This could be attributed to the fact that youth are the main users of ICTs especially mobile phones to source for information. This is supported by findings from the descriptive (Figure 5).

4.0 Conclusion and Recommendations

Global economic development in terms of rising ICT importance has provided rural youth in developing countries immense opportunity to participate in agricultural value chains. This study examined the factors influencing ICT usage by youth in agricultural value chains in Kenya. It used descriptive statistics to characterize youth participation in agricultural value chains and a Poisson regression model to assess the factors that determine the intensity of use of ICTs. Results show that youth had a higher preference for cereals, horticultural crops and livestock (particularly poultry). Further, youth were more concentrated in marketing and production chain levels using ICTs. Generally all ICT tools were highly used for non-agricultural purposes as compared to agricultural activities. Use of mobile phones was the highest indicating that young people use mobiles for multiple purposes including surfing the internet. The study also finds that age, marital status, transport cost, distance to the produce market, number of agricultural value chain, land size and access to extension influence intensity of ICT use. The empirical analysis results demonstrate that, ICTs can be effectively used in agriculture related enterprises thus providing a viable employment opportunity to the youth.

There is need to develop county-specific agricultural strategies that are based on ICT development in the agriculture sector targeting youth. On this basis, targeted value chain research and development, information sharing and training on youth would enhance development of the specific value chain activities such as production, marketing, processing and transportation. This would ensure use of ICTs for proper value chain monitoring, development and management. Thus the policy makers in Kenya should prioritize involving youth in designing, planning and implementing youth-in-agric policies.

Considering there is low usage of ICTs for agricultural purposes by youth especially the internet, there is need for Kenyan government to continue promoting use of internet for agricultural purposes. There is also need for stakeholders to incorporate technologies and ICT services that are youth friendly and are specialized in conducting specific value chain activities. Future work could enrich this by analyzing participation of youth on a specific agricultural enterprise. This will enhance easy and better development of the value chains.

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