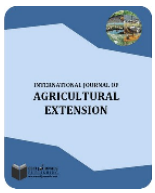

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DETERMINANTS OF CHOICE OF AGRICULTURAL INFORMATION SOURCES AND PATHWAYS AMONG SORGHUM FARMERS IN NDHIWA SUB-COUNTY, WESTERN KENYA

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A B S T R A C T

Extension In Kenya, the situation with regard to relaying of information and pathways used among farmers seems unsatisfactory. This is specifically the case in the production of 3rd ranked cereal crop "sorghum" (sorghum bicolor (L.) by farmers in Western Kenya. Sorghum farming in Ndhiwa Sub-County in the Western Kenya region is an important agricultural activity in the economy. Sorghum is not only drought resistant, but can also withstand long periods of water logging. Several technologies have been developed by research institutions with the aim of increasing its production. However, despite joint efforts by the research agencies and partners, its production has stagnated resulting in low crop yields. This study sought to assess determinants of agricultural information sources and pathways among sorghum farmers in Ndhiwa Sub-County. A quantitative research design was used to obtain information on the study. A multi-stage sampling technique was employed to collect cross sectional data from 379 sorghum farmers in Ndhiwa sub-county, Western Kenya. Data collected was analysed using Statistical Package for Social Sciences (SPSS) version 17 and adopted the multinomial logit model to find the determinants of choice of agricultural information sources/pathways. The most important sources of information were fellow farmers, Agricultural Extension Officers, researchers and Community-based Organizations (CBOs) and the pathways were farmer-to-farmer, radios, Barazas (local meetings), and trainings. . Gender, age, farming experience and education of household head, farm size, land ownership, employment/off-farm activities, access to credit facility and group membership significantly influenced access to agricultural information sources while age and education of household head, farm size, farming experience of household head, membership and access to credit facilities had a significant influence on the choice of pathways. These findings raise important insights as to whether agricultural information is being disseminated and communicated to sorghum farmers through the most appropriate, affordable sources and pathways The study recommended that, a focal farmer be selected using a set of criteria or a center be established as the focal point whereby other farmers can send or visit. After which the questions or issues raised be channelled to the appropriate source.

Keywords: Sorghum, agricultural information, communication, sources, pathways, dissemination.

INTRODUCTION

The access to and use of agricultural information is an important factor in improving agricultural production in any country (Nxumalo & Oladele, 2013). Its application plays an important role in increasing farmers' knowledge, crop production and yield. The research efforts in Kenya have been directed towards increasing economic growth, improving livelihoods and sorghum productivity. However, due to limited supply and limited use of quality seeds of improved varieties, fertilizers, inaccessibility to agricultural information, yields remain low. This has called for the intensification of information sharing, collection and dissemination through the available agricultural sources and pathways on sorghum production. Sorghum is the world's most versatile crop as it can successfully be grown in a wide range of regions and climatic conditions (Bateman *et al*., 2009). O'Neill & Kamau (1990) point out that 52% of sorghum in Kenya is grown in Nyanza and 23% in Western of the country. Sorghum is an important food

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crop in an area where maize does relatively poor or fails due to erratic rainfall, pests and diseases. It has been recognized as a drought resistant/tolerant crop indicating that sorghum will continue to do well in areas that are drought prone, under high temperatures and water logged. Sorghum consumption in Kenya is approximately 3.0kg per year per capita (FAO, 2004). Sorghum is utilized for food, feeds, and industrial uses. There are good prospects for the expansion of industrial market for sorghum since the East Africa Breweries Limited (EABL) is looking for farmers to produce sorghum in large quantities in Nyanza region. Despite having research done to improve the yield of sorghum, and with even more data being stored in various repositories, the production at the farmer level has remained low.

The decline in sorghum production in Ndhiwa sub-county of Western Kenya has contributed to food insufficiency, food insecurity and poor income for the population. Nevertheless, its production could arguably be improved by strengthening access to and use of relevant, reliable and useful information and knowledge. For agricultural information to reach the intended target there ought to be appropriate information sources and pathways. The information sources are institutions or individuals which provide content or expertise of interest to the recipients, for example fellow farmers, extension services, neighbours, family friends, markets, researchers and Community Based Organizations (CBOs), and agricultural companies. Pathways (channels) are methods or vehicles through which information is transferred or received. According to Murage *et al.* (2012), information pathways include agricultural extensionists, farmer teachers (FT), farmer-to-farmer (FF) approaches; farmer field schools (FFS), Training and Visit (T&V) approaches, radio, television, mobile and newspaper and magazines. Other channels include journal papers, posters, books, banners, pamphlets, reports, brochures, billboards and ICT-based (internet, mobile phones, documentary on DVD/CD players) applications, (Amudavi *et al.,* 2009).

The findings from the study showed that farmer-to-farmer is a more popular method despite inadequate reliability of information and experience shared among farmers. Sharing of information is made easy through meetings/barazas, market places, and communication is enhanced by information delivery through the fellow farmers and radios. The use of other sources and pathways like researcher/CBOs and radios, televisions and mobile phones have not been fully utilized as a result of high cost, low literacy level, low income and limited service providers. Even though there are agricultural information in different forms and repositories, by different sources, the target farmers have not managed to access agricultural information to enable proper decision making. This study, therefore, sought to determine the choice of agricultural information sources and pathways on sorghum production in order to increase sorghum productivity. It is against the background that the yields of sorghum under farmers' conditions have, however, remained low in spite of the research innovations.

MATERIALS AND METHODS

Description of the Study Area: The study was conducted in seven wards of Ndhiwa Sub-County in Homa Bay County, Western Kenya (Figure 1). Ndhiwa is located between 34o12′ and 34o 40′ east and latitudes 0o 28′ and 0o 40′ south in the southwestern part of Kenya along Lake Victoria. There is a bimodal rainfall pattern: March – June for the long rains and August – November for the short rains. The Sub-County lies in lower midland agro-ecological zone, at an altitude of 1200 – 1400m above sea level. It is the third largest Sub-County with 7 County Assembly Wards. Ndhiwa's population is 172,212, while the density is 244 persons per square kilometer (Kenya National Bureau of Statistics, 2013). It was selected because of its fertile land and good annual rainfall which could make it the food granary for most parts of Western Kenya.

Sample Size and Sampling Procedure: During the survey to identify the sources and pathways of agricultural information on sorghum production, a total of 379 farmers were interviewed from the entire population of 396. The reasons for not covering the entire sample were lack of financial resources, non-responsiveness by some farmers and poor road conditions. The sample size of 399 was determined according to Yamane (1973) formula used:

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

Where n is the sample size, N is the population size, and e is the level of precision. Using a population of 172,212 farmers and with 0.05 level of precision, the sample size was;

$$n = \frac{172212}{1 + 172212(0.05^{2)}}$$

n= 399 farmers

The proportional sub-sample for each ward was calculated as below:

$$n = \frac{400}{172212}$$

then;

n= 0.0023

The respondents were selected by using proportionate stratified random sampling technique because the population sample is divided into wards. Stratified sampling ensures unbiased representation and inclusion of all the farmers as well as the cost per observation may be reduced by stratification.

Table 1. Farmers Proportionate Distribution in Ndhiwa Constituency.

Wards	Farmers Population	Proportion	Sub-samples
Kwabwai	31,596	31,596 × .0023	73
Kanyadoto	16,331	16,331 × .0023	38
Kanyikela	6,283	6,283 × .0023	14
Kabuoch North	35,270	35,270 × .0023	81
Kabuoch South/Pala	26,332	26,332 × .0023	61
Kanyamwa Kologi	23,442	23,442 × .0023	54
Kanyamwa Kosewe	32,958	32,958 × .0023	76
Total	172212		396

Data Collection: Questionnaires, observations and interviews were used to collect information from the farmers involved in the descriptive study. The tool was pre-tested to check its validity and reliability with a sample of 20 respondents similar to the study area. This was done in Koibatek which has similar characteristics to the study area. Some adjustments were done after the pilot-test results to improve on the reliability. The questionnaires were then administered to the farmers by the researcher with the help of 7 enumerators to collect the required data accordingly. It focused on household heads (male, female) for interview.

Data Analysis: After data collection, the questionnaires were cleaned for errors, coded, and then entered into the computer after which analysis of quantitative data was done using Statistical Package for Social Sciences (SPSS). Descriptive statistics namely percentages, frequency, means, standard deviations and Multinomial Logit (MNL) were used to determine the factors that influence the choice of agricultural information sources and pathways (Table 2). The choices made from the alternatives depended on a number of factors such as socio-economic factors and institutional factors. A typical MNL model uses this form:

$$Pij = \beta o + \beta iXi + \varepsilon i$$

where Pij is the probability of choice of a given AIC pathway/source; Xi factors affecting the choice of AIC pathway/source; β is set of parameters to be estimated, j is alternative choices of AIC pathways/source; ε represent randomized errors; i is individual respondent.

The Multinomial Logit (MNL) model was used to analyse the factors influencing choice of agriculture information source and pathways. MNL is a multi-equation model used because it predicts a nominal dependent variable given one or more independent variables. It is also simple to compute than its counterpart, the multinomial probit model.

RESULTS AND DISCUSSION

Socio-economic Characteristics of the Respondents: Data depicted in Table 2 indicated that greater than one fourth (28.5%) of respondents were more than 50 years old followed by almost one fifth (20.8%) young aged respondents. Furthermore, half of the respondents appeared with age bracket of 31-50 years. Furthermore, half of the respondents appeared with age bracket of 31-50 years. Age is an important factor that influences the adoption of new technologies because it is said to be a primary latent characteristic in adoption decisions (Akudugu *et al.,* 2012). Relatively few youths were involved in farming activities probably because they did not want to soil themselves. In addition, many young farmers do not have adequate resources. A lot of studies have found that age had a positive influence on adoption of agricultural technologies (Deressa *et al*., 2008; Akudugu *et al*., 2012). Age is correlated with farming experience and it is possible that as one advances in age, experience with farming technology also increases, hence decrease in choice of sources used, given that information has already been acquired through experience. Female headed-households (52.0%) were

more than male-headed households (48.0%). This can be attributed to the fact that the women remain at home to farm while the men migrate from rural to urban areas in search for employment and income generation.

Approximately 87% respondents appeared literate to varied level of education followed by almost 13% illiterate respondents. Among literates proportion of primary passed respondents (62.5%) appeared prominent. High literacy level suggests that adoption of new technology will be high as knowledge about available opportunities may influence the choice of sources and pathways to use. The level of education plays a critical role in the transformation process to transfer technology, assist farmers in problem-solving and enables them to be more embedded in the agricultural knowledge sharing (Balangaliza, 2014). The results corroborate with the findings of Rehman *et al.* (2011) that more educated farmers had more access to agricultural information. The household size is often linked to supply of farm labour and its largeness exerts a positive effect on adoption of technologies. The results indicate that family size ranged from one to fifteen persons with an average of about 6 – 10 members (55.7%). Large families are sometimes presumed to assist in farms' labour requirements (Ayuya, 2010). Higher number of family members leads to decision to take risk for participation in technology packages thus leading to accessing information. Conversely, large households imply that a lot of resources and technologies are needed to manage their farms.

Table 2. Socio-economic characteristics of the respondents (n = 379).

Demographic characteristics	Frequency	Percentage
Age distribution		
Below 30 years	79	20.8
31 - 40	92	24.3
41 - 50	100	26.4
Above 50 years	108	28.5
Gender		
Male	182	48.0
Female	197	52.0
Marital Status		
Married	293	77.3
Unmarried	86	22.7
Education Level		
No formal Education	49	12.9
Primary	237	62.5
Secondary	69	18.2
Tertiary	14	3.7
Adult Literacy	8	2.1
University	2	0.5
Household size		
1 - 5	130	34.3
6 - 10	211	55.7
11 - 15	35	9.2
16 - 20	1	0.3
Farm Size (Ha)		
1.00	241	63.6
2.00	115	30.3
3.00	20	5.3
4.00	1	0.3
5.00	1	0.3
6.00	1	0.3

About 62.5% of farmers did not own title deeds. Land ownership with title deeds enables a farmer to have the right of usage which allows them to access new technologies and invest into the farm. Title deeds allow farmers to use land as collateral for loans. Ownership of land influences adoption of technology and hence agricultural productivity. About 64% of the farmers owned 1.0 hectare while the rest owned more than 2.0 hectares. The size of land determines the ability to acquire credit and act as collateral (Achieng', 2014). Farmers with small farms place less interest on new and advanced technologies compared to commercialized farms (Akudugu *et al*., 2012; Abdullah & Samah, 2013).

Farming is the most important source of livelihood for majority (90.5%) of the farmers in Ndhiwa. Thus a meagre 9.5% obtained income from off-farm activities. The influence of off-farm income in the adoption of new technologies is derived from the fact that income earned can be used to finance the accessing agricultural information from other sources. Household with off-farm income might be motivated to invest in the uptake of new innovation (Ayuya, 2010).

Agricultural Information Sources: According to the findings documented in Table 3 revealed that 40.88% of the respondents indicated that Fellow farmers were perceived most preferred agricultural information source by 40.88% respondents while Agricultural Extension Officers, researchers and CBOs were perceived information sources by 25.1 and 18.52% respondents respectively. Fellow farmers are popular sources of information because they foster solidarity, similar background and build morale by relying on each other (Kipkurgat, 2015). Farmers meet their peers and exchange ideas, information and knowledge among themselves. Opara (2008) also noted that fellow farmers were a very useful source of information in their findings. Agricultural extension services were rated second probably because the farmers could not reach the staff and the training activities such as field days, seminars, workshops were rare. While farmers consider agricultural information disseminated by extensionists to be accurate and reliable, farmer's accessibility to new technologies is lacking due to problems associated with the extension system in Kenya (Kipkurgat, 2015). The change in extension models to demand driven coupled with devolution of agricultural activities from the central government may have served to weaken it. Previously, farmers would contact agricultural extension service providers for clarification on technical issues before making decisions (Etwire *et al*., 2013).

Researchers and Community Based Organizations (CBOs) were the least ranked by 18.52% of the respondents, probably because information disseminated is too technical for farmers. Researchers also often pass information to extension staff who disseminate to farmers albeit inaccurately at times. Jaetzold *et al.* (2006) in their study found that information flow from research to the farmer and vice versa is hampered by the lack of a common source of reference.

Table 3. Sources of agricultural information used.

Sources	Percent
Fellow farmers	40.88
Agriculture Extension Officers	25.31
Researchers/CBOs	18.52
Agrovets, markets	15.29

Agricultural Information Pathways: The main agricultural information pathways mentioned by the respondents were personal media (67.6%), electronic media (17.2%), print media (8.0%) and those who did not access (6.3%) of the respondents (Table 4).

Farmer-to-farmer contact enables farmers to exchange news and adopt new technology, especially from experienced fellow farmers. Farmers get information from fellow farmers because of the proximity and perceived less risk. Agricultural information available to farmers is abundant but the main problem is getting what is relevant and quickly (Kipkurgat, 2015).

Extension workers, fellow farmers, consultants/specialists disseminate agricultural information through seminars, workshops, trainings, meetings and demonstrations. Some farmers hinted that they were too old to attend the barazas so they relied on fellow farmers (neighbours) for advice whenever they countered problems. Farmers attended barazas because the knowledge providers had more accurate and reliable information on sorghum production (Kitetu & Chai, 2009).

Radio as mentioned by 17.2% of the respondents was the most popular mass medium of communication in the study area. Agricultural information can be transmitted to large numbers of rural poor farmers through radio. Communicating on vital subjects, educating people on new practices in their local language could enhance sorghum production. The coverage by radio is wide and has the ability to pass information that can reach all

farmers (Irfan *et al*., 2006). Rural radio is an excellent communication tool and pathway that enhances and improves sharing of agricultural information in Ndhiwa though the time of delivery is not appropriate.

Trainings, seminars and demonstrations were pathways used mainly by researchers, CBOs and extension staff to disseminate information to farmers. This concurs with findings by Balangaliza, (2014) where the use of trainings was found as an important means of information dissemination on the uptake of technology on legume production. Agricultural workshops are organized at local sub-county levels at regular intervals during which participants are exposed to new farming technologies.

About 8.0% of the respondents indicated print media as represented by brochures and newspapers. Brochures were the most commonly accessed form of print media. This is so because it has been proved to be an effective means for disseminating information, especially in introducing new technologies to target users (Irfan *et al*., 2006). Information in the brochures if well processed and packaged could be relevant to farmers' need or interest. Presently in Kenya, a lot of printed materials are being published regularly by public and private organizations for the dissemination of agricultural information, for example Seeds of Gold by the Daily Nation, The Organic Farmer (TOF) by the International Centre of Insect and Physiology and Ecology (icipe) and Biovision Africa Trust (BvAT), and Smart Farming by the daily, The standard.

Table 4. Channels used to disseminate information from the source to farmers.

Agricultural Information Channels	Percentage
Print Media	8.0
Personal Media	67.6
Electronic Media	17.2
Did not access	6.3

Factors influencing the Type of Agricultural Information Sources: The empirical findings in Table 4 show that gender, age, experience and education of household head, farm size, land ownership, employment/off-farm activities, access to credit facility and group membership significantly influenced agricultural information sources.

Gender of household head positively influenced researchers/CBOs (7.3%) but negatively influenced fellow farmer (10.1%) as agricultural information sources. A male headed household had a higher probability of accessing researchers but a lower probability of choosing fellow farmer. This is probably because male headed households are endowed with resources to attend trainings facilitated by researchers mostly in research centres. Female headed households are known to control assets particularly important for household food security and for child outcomes and rarely for trainings. Women invest substantially in nutrition, education and healthcare for their children (Shroff *et al*., 2009) and therefore they would seek for information from nearer sources like fellow farmers.

Table 5. Marginal effect results of Multinomial logit on factors influencing the choice of agricultural information Pathways.

Variable	Training		Brochures		Farmer-to-farmer		Radio	
	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z
Gender	0.034	0.268	0.006	0.592	-0.068	0.232	-0.020	0.671
Age	-0.049	0.000	-0.011	0.234	0.100***	0.000	-0.012	0.458
Experience	0.000	0.907	-0.003	0.152	0.001	0.683	0.008	0.426
Education	0.040	0.012	0.039**	0.003	-0.031	0.371	0.005	0.854
Farm Size	0.005	0.616	0.029	0.012	-0.53**	0.003	-0.010	0.494
Land Ownership	-0.022	0.435	-0.025	0.681	0.117	0.035	-0.032	0.480
Off farm income	0.051	0.348	0.048	0.297	-0.020	0.849	0.012	0.887
Group Membership	0.129**	0.050	0.097**	0.003	-0.252***	0.000	0.090	0.271

n = 379; Wald chi2(36) = 160.38; Log likelihood = -491.746; Prob > chi2 = 0.0;

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

Age of the household head had a positive influence on agricultural extension officers (96%) and fellow farmers (67%) while negatively influencing researchers/CBOs (6%) as sources of information. This is probably because the agricultural extension officers were willing to train and visit farmers in the baraza. It could also be as

farmers become older they become immobile to go for trainings facilitated by researchers therefore opting for nearer source like fellow farmers. Usually older farmers are less likely to explore new sources of information and thus less likely to depend on new information sources. Older farmers are more experienced and could have accumulated more knowledge and capital through the years hence seeking information from fellow farmers. Murage *et al.* (2010) also noted that experienced farmers are more likely to adopt new farming methods without consulting external information sources.

Farming experience had a significant but negative influence on the choice of agricultural extension as a source of information. When one advances in age, the number of extension contacts decrease by 0.5% due to the years of farming experience acquired. This implies that as farmers gain more farming experience, the number of demand driven extension contacts reduced. More experienced farmers are able to evaluate the usefulness of the extension information received in the past, thus guiding their future demand for extension services (Gido, 2014). This concurs with findings by Murage *et al.* (2012) that farmers who are experienced are more likely to adopt new farming methods from fellow farmers.

The education level of the household head had a positive and significant influence on the choice of agricultural extension officers as sources of information. More educated and experienced farmers are in a better position to assess the relevance of new technologies. Extension staff is educated and are more likely to communicate and be trusted by the educated farmers. As farmers gain higher education, they are able to interpret and decipher new information faster hence making better decisions on adoption. Furthermore, one focuses on getting training, building skills on new technology.

Farm size significantly influenced the choice of agricultural extension, researcher/CBO and fellow farmers as sources of information. An increase in farm size by one hectare increased the probability of choosing agricultural extension (2.2%) but reduced the probability of choosing fellow farmer (3.8%). Farmers with large size are more likely to adopt technologies than farmers cultivating small land sizes since they can afford to devote part of their fields to try the improved technology. Mariano *et al.* (2012) and Kansiime *et al*. (2014) noted that access to extension has been linked to improved technologies. Moreover, farm size is often taken as indicator of better resource base. The decrease in choosing fellow farmer as a source of information is attributed to farmer's belief that fellow farmer's indigenous knowledge is not accurate, credible and reliable (Davis *et al*., 2012).

Access to credit facilities significantly influenced the choice of agricultural extension and fellow farmer as a source of information. Agricultural extension was positively influenced because farmers who accessed credit facilities could seek for extension services like trainings, technologies and information materials. Credit facilities could also be used to purchase farm inputs and produce surplus for markets (Kansiime, *et al.,* 2014). Momanyi *et al.* (2015) also cite access to credit as a vital role in the process of small holder commercialization. On the other hand, access to credit negatively influenced the choice of fellow farmer as a source of information. Credit loaned to farmers enables them to source for more credible, authentic, and reliable information from agricultural extensionist and not fellow farmers.

Group membership had a positive influence on the use of agricultural extension, researchers/CBOs and fellow farmer by 22.1%, 11.1% and 30.1% respectively. Farmers who belonged to a group may influence one another to choose latest technologies. In addition, farmers who belonged to farmers' organization were able to access inputs at slightly lower rates and encourage members to work very hard. Farmer related groups and organizations increase the chances with which extension agents contact members, thus reducing cost of service delivery and service providers. In addition, agricultural extension service and researchers/CBOs enhance knowledge base of farmers through various ways, such as demonstrations, specific training and group meetings. According to Ofuoku & Agbamu (2012), farmers join farmer associations with the objective of accessing extension services, credit facilities, information and capacity building.

Factors Influencing Choice of Agricultural Information Pathways: The variables age of household head, education of household head, farm size, farming experience of household head, membership and access to credit facilities had a significant influence on the choice of pathways (Table 6).

Age of the household head was significant and negatively influenced training but positively influenced farmer-to-

farmer as a pathway of information. The negative influence of age on training could be because older farmers were less mobile to attend the trainings. Younger farmers are more receptive to new ideas, active, adventurous and mobile and thus they preferred training. In regards to farmer-to-farmer approach, older farmers have less mobility and would prefer nearer sources like farmer-to-farmer. This result is consistent with what Daudu *et al.* (2009) found out that older farmers interacted with those nearer to them. Education level of the household head had a positive and significant influence on the choice of brochures as information pathway. This could be attributed to the household heads with higher levels of education engaging in off-farm activities which limit the time available to learn agricultural technologies. Higher level of formal education equips farmers with knowledge and skills thus facilitating awareness of the innovation and making informed decision concerning a particular technology. It further equips them with ability to read and write, hence using print as a source of information like brochures. Brochures provide them with the necessary information they can comprehend at their convenient time. The results are consistent with Faturoti *et al.* (2006) who found higher level of formal education facilitating awareness of innovation in agriculture. Education is expected to positively influence a farmer's ability to source and decipher information. Rehman *et al.* (2011) found a highly positive significant relationship between the respondents' education and level of awareness.

Table 6. Marginal effect results of Multinomial logit on factors influencing the choice of agricultural information Pathways.

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Farm size had a negative influence on the choice of farmer-to-farmer (5.3%) approach while positively influencing the choice of brochures (2.9%) as information pathways. Increasing the farm size by 1 hectare meant that farmers had a higher likelihood to source agricultural information from brochures as they are perceived to be credible, reliable and accurate. The negative influence of farm size on farmer-to-farmer approach of information dissemination is probably due to smaller farms having lower levels of diversification and competition of land for other uses and probably doing the same things as their neighbours or fellow farmers. Farmers with larger farms are likely to uptake a technology than those with small farms (Balangaliza, 2014). Farm size is also an indication of resource endowment in Western Kenya (Sanginga and Woomer, 2009).

There was significant influence of land ownership rights on choice of farmer-to-farmer dissemination approach as an information pathway. Farmer-to-farmer interaction provides information that helps in making the right decision on investment. In addition, the local language is understandable hence influencing the decision to share with a fellow farmer. Land rights are essential in motivating farmers to make short and long-term fixed investments that will increase agricultural productivity and rural household incomes (Akudugu *et al*., 2012). Land ownership indicates that land enhances chances of diversification into a variety of enterprises, impacting on farm profitability and poverty reduction.

Group membership positively and significantly influenced trainings and brochures while negatively influenced farmer-to-farmer dissemination model as information pathway. Organizations normally train farmers in groups which help in cutting down on costs. Further, farmers in groups are capable to request to be

trained mostly by extension service providers in their area of interest. During trainings, brochures are distributed to members for further references. The findings agrees with Troung (2008) who cites farmers in associations could be trained easily without considering the geographical locations of the farmers thus making it cheaper on the cost of transporting farmers. According to Okuthe *et al*. (2013), social participation is important because it indicates the extent of contact farmers have with organized groups. However, group members decreased the likelihood of sourcing for information from farmer-to-farmer dissemination because they perceived them as not being authentic and credible. Bukenya *et al*. (2008) also noted that more educated farmers were often more reluctant to learn with other farmers or in groups. Sanginga & Woomer (2009) also found that technological packages are best distributed through existing community-based and farmer organizations that provide peer support to participating farm households. An individual small scale farmer is a weak player in the market hence belonging to a group would increase their bargaining power.

CONCLUSION AND RECOMMENDATION

Agricultural information plays a central role in building a strong, self-sufficient and sustainable agricultural economy. It impacts on agricultural production, marketing and thus improves livelihoods. Agricultural information contributes to solving food security, hunger and poverty problems while impacting on agricultural production and marketing in Ndhiwa Sub-County. It is therefore vital for farmers to possess such information to meet their needs. It can be concluded that the appropriate sources and pathways be combined to bring the force in adopting the new technologies. Fellow farmers, agricultural extension services, and the researchers/CBOs were the major sources of information on sorghum production. The main pathways however were farmer-to-farmer, barazas, radios, trainings/workshops i.e. personal and print were the main media of information and electronic pathway was rarely used. The main reason for this may be that the alternative channels are expensive and not easily accessible. Extension service was not as effective probably because of the poor infrastructure.

The following factors: gender, age, farming experience and level of education of the household head, farm size, land ownership, employment/off-farm activities, and access to credit facility and group membership positively and significantly influenced the choice of agricultural information sources.

A focal farmer be selected using a set of criteria and a centre established so as to link the sources and farmers for ease and quick accessibility of information.

The organization of farmers into associations by government and NGOs, provision of agricultural information and communication, training and education to farmers may increase farmers' access to the use of agricultural information.

Therefore, for sorghum production to be increased in Ndhiwa Sub-County, effective dissemination of agricultural information from the source and/by the pathways, ought to be timely, cost effective and accurate. NGOs organizing women into groups for capacity building can empower and make them have "voice" in agricultural development.

The sorghum farmers from Ndhiwa Sub-County and Kenya at large should liaise with researchers from agricultural institutions, service providers and develop local contents for farmers' needs to be fed to tele-centres and later communicated to farmers in rural areas.

Further Recommendation: Need for supply and marketing system to be put in place and promotion done on the sorghum and the improved varieties.

The research and extension agents should embark on campaigns of the importance of sorghum since it is gluten free and good for health.

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