

Agricultural Interventions and Sustainability of Rural Livelihoods: A Case of Rural Women Potatoes Production Farmers Groups in Njoro Sub-county Kenya.

By

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Abstract

Women play indispensable role in agriculture and in improving the quality of life in rural areas. However, their contribution often remains concealed due to some social barriers and gender bias. This study assessed the adoption of Agricultural Innovations among rural women farmers in Njoro sub-county. To achieve this major objective, the study identified the socio-economic characteristics of the respondents as well as agricultural innovations introduced and their extent of use. Also the study determined the effects of technologies used on agricultural production. The study adopted cross-sectional study survey with concurrent mixed methods approach entailing equal preference to quantitative and qualitative methodologies to generate rich information that helped fully to explore each of the survey objectives. The respondents were sampled using different approaches for quantitative and qualitative aspects of the survey. For quantitative segment, simple random sampling was done to identify beneficiaries' households (HHs) for the household survey. The survey target 240 farmers who were organized into 2 clusters of 12 farmer groups (Each cluster 6 groups) comprising of 20 farmers each working as a production group in Mauche and Mau-Narok divisions in Njoro sub-county, Nakuru County, Kenya. The sample size representative of the farmers in this study was 148. Primary data collected using a combination of quantitative and qualitative methods including group discussion, structured interview, semi-structured interview, Key informant Interviews (KII) and some PRA tools such as Venn diagram, Gender Analysis Matrix, and Time Trends. Secondary sources comprised of relevant project documents and State and Non-state partner reports. The data collected was analyzed using qualitative and quantitative methods with the help of Statistical Package for Social Science (SPSS). The study findings revealed their was positive and significant relationship between the constraints

encountered and adoption level of Agricultural Innovation. It was also revealed that late adoption of innovations was due to irregular visits of extension agent. The major constraint revealed in the study was unstable market price, which has seriously affected the women's activities. Therefore the study recommends that the government should enforce price stabilization policies which will control market prices so as to reduce shortage and losses.

Key words: *Agricultural Interventions Sustainability & Rural Livelihoods*

1.0 Introduction

1.1 Background of the Study

Women being an integral part of farming household provide 60 and 80 percent of all agricultural labour (Action Aid International, 2011). According to Adi, (2013) women form the backbone of rural development and represent a major force that could boost rural economy, higher growth rate and increased food production. Over the years, reports across different societies of the world including those of Kenya clearly gave evidence to the productive capability of women in National development in relation to their men folks (Bogale, 2012). Women actually constitute the bulk of the world's food producers by pre-dominating the agricultural sector in terms of numbers and tasks performed. According to Adi (2013) is of the view that despite women's major responsibility in household, health and nutrition, their role in agriculture covers all facets of agro-business, including food production, livestock production, fishing as well as farm management. The importance of improved technology to agricultural development especially in less developed countries is widely recognized. This is predicated on the observed impact of these innovations and its potentials and actual contributions to the development of agriculture. In developing countries like Nigeria where a greater proportion of the population lives in rural areas, agricultural technologies could also provide a potential means of increasing production and subsequently raising incomes of farmers as well as their standard of living.

Consequently, there are some constraints facing the rural women's adoption of agricultural innovation which include failure of extension workers to reach them, lack of incentive for adoption of innovation, limited access to credit inputs and lack of access to membership in cooperatives and other rural organizations. Empirical study have shown that some women because of their habit and

apathy are resistant to change, that is, they cannot agree to accept any agricultural innovation which may definitely change or affect their agricultural system (Beyan, 2014). Introducing improved agricultural practices to rural women is not easy and adoption of innovation is very essential. It is based on this background that this study has investigated the constraints encountered by women in adoption of agricultural innovations in the study area. To achieve this main objective, the study identified the socio-economic characteristics of the women farmers. Examined the different agricultural innovations introduced to the area and their extent of use.

2.0 Literature Review

2.1 Diffusion of Agricultural Innovations in History

Agricultural development is essentially about the study of changes or improvements in agriculture. These changes date back to the hunter/gatherer society when people lived in balance with nature. In good years harvest was plentiful; however, in bad years, they starved. People in hunter/gatherer society also lacked the tools to exploit the land. However, the agricultural revolution changed all that. With the invention of the plough sedentary agriculture was begun and farmers in Western societies no longer depended on the vagaries of the weather. According to Greve (2011) *The Study of Man*, showed that progress in agriculture, the world over, was made possible by the adoption of innovations, across nations.

In modern times, Diffusion of Innovation research was rendered more popular by Rogers with the first edition of his book, *Diffusion of Innovations*(1962), which has gone through several editions because of its success (Boushey, 2010). Rogers (2003) defined diffusion as a process of communication through which an innovation is spread via communication channels to members of a community over time. The main elements of diffusion process are: a) an innovation, b) communicated through channels, c) over time, and d) to members of a given community or system. Although the diffusion of innovation theory was founded in the communication of agricultural innovations, it has since been applied in other disciplines, such as, pharmacy and marketing.

2.2 The S-M-C-R-E Model in adoption of innovations

Berwick (2003) may have developed the S-M-C-R-E communication model; however, it is Rogers (2003) who gained fame for promoting it. Rogers is generally credited with the S-M-C-R-E or “Source-Message-Channel-Receiver- Effect” model of communication for spreading new

innovations. In their book, *Communication of Innovations: A Cross Cultural Approach* Buchanan, Cole and Keohane (2011) adapted the model as a communication process for extension practice in developing countries. In that context, a sender (S) or “Source” can be the Ministry of Agriculture and Food Cooperatives of Tanzania, with a message (M), such as use of fertilizer, which is sent through a channel C, such as radio or an extension agent, to a receiver R, which can be farmers, for the purpose of adoption or rejection (E) or effect. Although rejection is possible, it is always hoped that farmers will adopt the innovations promoted.

2.3 Elements of Diffusion of Innovations

Again, the four main elements of diffusion process are: the innovation, communication channels, time, and the social system (Rogers, 2003).

a. An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption (Rogers, 2003). An innovation may take the form of ideas, objects, practices (Rogers, 2003), creation, learning, events, trajectories, processes, or contexts (Bhatti , Olsen , & Pederson, 2011). The perceived newness of the idea for the individual determines his or her reaction to it. If the idea is new to the individual, it is an innovation. The newness of an innovation does not only involve new knowledge; someone may have known about an innovation for some time but not yet developed a favorable or unfavorable attitude towards it, nor have adopted or rejected it.

b. Next is the channel that can be either a mass medium or an interpersonal channel.

A communication channel is the means through which messages get from one individual to another (Rogers, 2003). The nature of the information-exchange relationship between a pair of individuals determines the conditions under which a source will or will not transmit the innovation to the receiver, and the effect of the transfer. For example, mass media channels are often the most rapid means to inform an audience of potential adopters about the existence of an innovation, that is, to create awareness-knowledge (Rogers, 2003).

Mass media channels are all means of transmitting messages that involve a mass medium, such as radio, television, newspapers, etc., which enable a source of one or a few individuals to reach an audience of many. On the other hand, interpersonal channels are more effective in persuading an individual to adopt a new idea, especially if the interpersonal channel links two or more individuals who are near peers (Rogers, 2003). For example, through farm visit an extension worker is likely

to convince a farmer to adopt a new farming method rather than a farmer having got the news via the radio or television. Interpersonal channels involve a face-to-face exchange between two or more individuals such as when an extension agent visits a farmer or farmer to farmer communication is a form of interpersonal communication.

c. Time is the third element in the diffusion process. According to Rogers (2003), the time variable is involved in diffusion in the innovation-decision process; innovativeness; and an innovation's rate of adoption. The innovation-decision process is the process through which an individual passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision (Rogers, 2003). Based on time, there are five main steps in the diffusion process: knowledge, persuasion, decision, implementation, and confirmation.

Innovativeness is "the degree to which an individual is relatively earlier in adopting new ideas than the other members of his social system" (Boushey, 2016). Based on innovativeness, adopters are grouped into five categories: innovators, early adopters, early majority, late majority and laggards Rogers, (2003) that consecutively adopted an innovation.

Innovators are active information seekers about new ideas. The adoption process begins with a small number of visionary, imaginative innovators. They often spend a great time, energy and creativity on developing new ideas. And they love to talk about them.

Early adopters are the socially respectable members of a social system. They are always on the lookout for a strategic leap forward in their lives or businesses. Early adopters tend to be more economically successful, well connected and well informed. They are an easy audience. They don't need much persuading because they are on the lookout for anything that could give them a social or economic edge. The early majority is individuals, comfortable with moderately progressive ideas, but won't act without solid proof of benefits. The late majority are conservative individuals who hate risk and are uncomfortable with new idea. Lastly, laggards are persons who perceive a high risk in adopting a particular product or behavior.

d. The names of the adopter categories reflect the rate of adoption, which is the relative speed of adopting an innovation by individuals in a social system. A social system is defined as a set of interrelated units that are engaged in joint problem solving to accomplish a common goal. The members or units of a social system may be individuals, informal groups, organizations, and/or

subsystems. The adopter categories begin with the most progressive, followed by the least progressive ones when adopting the innovation. The most rapid adopter group is known as an innovator (as much as 2.5% of the community). The next adopter category is the early adopters (13.5%), early majority (13.5%), and late majority (34%). Laggard (16%) is the last group to receive the innovation (Rogers, 2003). It can be seen from the percentages that initially there are only a small number of individuals who adopt the innovation. Over time, this number increases up to a certain point in time, and then decreases, forming a normal bell curve. There are five basic attributes of an innovation which affect its diffusion and adoption in society. These are relative advantage, compatibility, complexity, tri-ability and observability of the innovation.

Relative advantage is the degree to which an innovation is perceived as being better than the existing idea measured in economic terms, social prestige, convenience, and satisfaction. The study sought to establish that although a number of modern agricultural information sources exist, do the respondents have knowledge of the sources to meet their agricultural information need; implying that there is much benefit derived due to utilization.

Compatibility refers to the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters. An idea that is incompatible with the culture of a social system will not be immediately adopted. It is necessary to establish if the available information sources are relevant to the needs of the respondents against competition from indigenous practices and cultural beliefs.

Complexity implies the degree to which an innovation is perceived as difficult to understand and use. Simple ideas are adopted more rapidly than innovations that require the adopter to develop new skills and understandings. A major challenge of information sources especially written materials is the assumption that the consumer has an ability to read. These skills lack among the farmers in most parts of the developing world including Tanzania. This makes access, application and adoption of some sources a challenge. Triability is the degree to which an innovation may be experimented with. An innovation that is testable represents less uncertainty to the individual who is considering it for adoption. It is easier to learn by doing because it gives opportunity to test the new innovation which influences decisions for adoption.

Observability relates to the degree to which the adopter has had the opportunity to see the results of the implemented innovation. The researcher will find out whether farmers who receive training in agriculture are often role models for those who do not and are often consulted based on their

observable successes. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it because such visibility stimulates peer discussion of the advantages and disadvantages hence informed decision making.

3.0 Methodology

3.1 Research Design

This study adopted cross-sectional study survey with concurrent mixed methods approach entailing equal preference to quantitative and qualitative methodologies to generate rich information that helped fully to explore each of the survey objectives. This design was appropriate as it provided a better opportunity for participation of the beneficiaries as well as key partners and stakeholders in potato production project in Mauche and Mau-Narok division Njoro sub-county. It also ensured dependence on more than one source of information so that data was carefully triangulated through integrated analysis approach. Qualitative data was collected to triangulate individual quantitative household survey data for the purpose of validating the results. This, together with secondary data enhanced the process by assuring internal and external validity of the results.

3.2 Study Population and Sampling procedure

The study population was farmers who were registered in groups to produce potatoes in Mauche and Mau-Narok divisions in Njoro sub-county. The respondents were sampled using different approaches for quantitative and qualitative aspects of the survey. For quantitative segment, simple random sampling was done to identify beneficiaries' households (HHs) for the household survey. The survey target 240 farmers who were organized into 2 clusters of 12 farmer groups (Each cluster 6 groups) comprising of 20 farmers each working as a production group in Mauche and Mau-Narok divisions in Njoro sub-county Nakuru County, Kenya. Therefore, the population of this study was assumed to have approximately 240 individual farmer's household beneficiaries. The sample size representative of the farmers in this study was 148. It was determined based on the Krejcie and Morgan's (1970) sample size calculation which is the same as using the Krejcie and Morgan's sample size determination table. The sample size determination Table 1.0 is derivative from the sample size calculation which is expressed as below in equation (1) (Krejcie and Morgan,

1970). The Krejcie and Morgan's sample size calculation was based on $p = 0.05$ where the probability of committing type I error is less than 5 % or $p < 0.05$.

$$s = \frac{\chi^2 NP(1-P)}{d^2(N-1) + \chi^2 P(1-P)} \tag{1}$$

Where,

s = required sample size.

χ^2 = The table value of chi-square for 1 degree of freedom at the desired confidence level (0.05 = 3.841).

N = the population size. (240)

P = the population proportion (assumed to be 0.50 since this would provide the maximum sample size).

d = the degree of accuracy expressed as proportion (0.05).

$$148 = \frac{3.841 \cdot 240 \cdot 0.50(1-0.50)}{0.05^2(240-1) + 3.841 \cdot 0.50(1-0.50)}$$

Table 1: Table for Determining Sample Size

	N (POPULATION SIZE)	S (SAMPLE SIZE)
	200	132
	210	136
	220	140
3.3	230	144
	240	148
	250	152
and	260	155
	270	159
	280	162
	290	165
core	300	169

Data Collection Methods and Tools

Various data collection methods, tools processes were employed during the study exercise to gather rich and high quality primary data and information. These tools endeavored to capture all the survey indicators and objectives in accordance with the TOR and project

logical framework. Primary data collected integrated a combination of quantitative and qualitative methods including group discussion, structured interview, semi-structured interview, Key

informant Interviews (KII) and some PRA tools such as Venn diagram, Gender Analysis Matrix, and Time Trends. The study was based on data and information gathered from both primary and secondary sources. Secondary sources comprised of relevant project documents and State and Non-state partner reports. Primary data was collected from sampled beneficiaries in the project focal areas.

3.4 Training enumerators and FGD facilitators

All the data collectors were trained in a central place for a period of 1 day including understanding, translation, review of tools that were used and use of digital phones/mobile phones in data collection. The purpose of the training was to equip the enumerators and FGD facilitators with basic principles of the survey as well as requisite skills for data collection including interviewing skills, communication skills, and ethics of research involving human subjects, data quality management and Standard Operation Procedures during field work. Once the training was completed, a pretest was done in another 1 day to ensure that the data collection tools were appropriate and the data collectors were competent to carry out the assignment.

3.5 Data Collection Process

The data collection processes will be undertaken by a group of trained and competent enumerators and FGD facilitators. The exercise will involve seeking verbal informed consent before administration of questionnaires as well as explaining the purpose of the survey beforehand. FGD facilitators on the other hand will conduct sessions with selected community representatives in the selected project sites. The sessions will be voice recorded using digital recorders after seeking informed oral consent of the participants. Key informants will be interviewed and responses recorded using digital recorders upon receipt of consent. The information generated from the qualitative survey will be used to triangulate quantitative data. Moreover, secondary information will be gathered through document reviews to augment and strength primary data collected using the aforementioned tools.

4.0 Results and Discussion

4.1 Socioeconomic Characteristics of Respondents

The socioeconomic characteristics of the sampled women farmers are shown in table 1. The table shows that 47.5 percent of the respondents were in their active age (31-40 years) while majority (92.5 percent) of the respondents were married, and about 66 percent of the respondents had one form of formal education or the other. So also 56.3 percent of the respondent had maximum number of four members in their household while 71.3 percent of the respondent practice farming as their primary occupation. Another 96.3 percent of the respondent had farm sizes between 1 and 5 hectares while most (52.5 percent) of the women obtain information from market places. From the findings of the study, the high literacy level might help in faster adoption of farm innovations

Table 1: Distribution of Respondents by Socio-Economic Characteristics

Variable	Frequency	Percentage
Age(Years)		
21-30	35	13.75
31-40	62	47.5
41-50	50	32.5
51-60	26	2.5
61 And Above	27	3.75
Marital Status		
Married	43	3.75
Single	43	3.75
Divorced	114	92.5
Level of Education		
Non-formal	57	33.75
Primary	68	47.50
Secondary	40	12.50
Tertiary Level	35	6.25
Household Size		
0-4	85	56.25
5-9	62	27.5
10-14	53	16.25
Occupation		
Farming	117	71.25
Others	83	28.75
Farm size (HA)		
1-5	137	96.25
6-10	63	3.75
Source of Information		
Mass Media	38	10.0
Extension Agents	50	25.0

market	72	52.5
other farmers	40	12.5

Source: Field Data, 2018

4.2 Extent of Use of Innovations

The agricultural innovations still in use as shown in Table 2 include regular weeding (6.3%), disease control (10.0%), fertilizer application (5.0%) and crop spacing(8.8%). Others are planting techniques (15.0%), adequate disease control(3.8%) hybrid seed (8.8%), tools and equipment(5.0%)and processing/storage facilities (8.8%). It can be observed that the percentages of the respondents still using of these innovations are low. It therefore justifies the need to investigate the constraints to the adoption of the innovations in the study area.

Table 2: Distribution of Respondents According to Extent of Use of the Technologies

Extent of Use	Use &Discontinue	Not All the Time	Some of the Time	All the Time	Still in Use
Regular Weeding	30(7.5)	53(36.3)	35(13.8)	53(36.3)	29(6.3)
Disease Control	31(8.8)	53(36.3)	44(25.0)	40(20.0)	32(10.0)
Fertilizer Application	28(5.0)	59(43.8)	46(27.5)	39(18.8)	28(5.0)
Crop Spacing	34(12.5)	54(37.5)	44(25.0)	37(16.3)	31(8.8)
Planting Techniques	38(17.5)	53(36.3)	40(20.0)	33(11.3)	36(15.0)
Adequate Disease Control	33(11.3)	55(38.8)	42(22.5)	43(23.8)	27(3.8)
Hybrid Disease Control	31(11.3)	53(36.3)	52(35.0)	31(8.8)	31(8.8)
Tools &Equipment's	36(15.0)	52(35.0)	54(37.5)	28(5.0)	28(5.0)
Processing &Storage	38(17.5)	55(38.8)	47(28.8)	31(8.8)	31(8.8)

Source: Field Data, 2018

4.3 Effects of Adoption of Innovation

Table 3 shows the effect of the adoption of innovations such as increased productivity, increased output, increase income, health security, environmental security, food security, improved varieties, adequate control measure and improved seed. The table also ranks the extent to which the

respondents accept these effects from the use of the innovations as strongly accepted, accepted, and not accepted. The table reveals that adequate control measure was ranked first (2.13) as the major effect of adoption of the innovation introduced. This was followed by improved varieties (2.11), increased income (1.9), environmental security (1.88), Health security (1.85), increased productivity (1.37), increase output (1.18), food security (1.17) and finally improved seed (1.10) as the least effect that resulted from the use of innovation. This implies that majority of the respondents accepted that the use of the introduced innovations had impacted positively in areas the highlighted.

Table 3: Distribution of Respondents According to Effect of Used Innovations on Agricultural Production

Effect	Not accepted	Accepted	Strong Accepted	WMS	Rank
Adequate disease control	38(17.5)	62(47.5)	51(33.8)	2.13	1
improved varieties	31(11.3)	74(62.5)	44(25.0)	2.11	2
increased income	30(7.5)	83(70.6)	41(21.3)	1.9	3
environmental security	39(18.8)	77(66.3)	34(12.5)	1.88	4
health security	42(22.5)	77(66.3)	32(10.0)	1.85	5
increased productivity	69(56.3)	52(35.0)	27(3.8)	1.37	6
increased output	98(63.8)	67(23.8)	26(2.5)	1.18	7
food security	70(57.5)	45(26.3)	26(2.5)	1.17	8
improved seeds	82(72.5)	34(12.3)	25(1.3)	1.01	9

Source: Field Data, 2018

4.4 Constraints to Adoption

Table 4 reveals the constraints encountered by women in the adoption of innovations. It also ranks the level of constraints encountered by the respondents as serious constraint, mild constraint and not a serious constraint. The table ranks unstable market price as the most serious constraints (2.40), closely followed by insufficient finance (2.30), inadequate supply of innovation (2.20),

high cost of innovation (2.20), like of production skills (2.20). Other constraints as their seriousness declines are inadequate agricultural input (2.10), shortage of land for farming and disease attack (2.00) as the least constraint encountered by the women. This implies that shortage of land for farming and disease attack are the least constraints to adoption in the study area.

Table 4: Distribution of Respondents According to Constrains to Adoption

Constraints	Not a constraint	Mild constraint	Serious constraint	WMS	Rank
unstable market price	26(2.5)	68(55.0)	57(41.3)	2.4	1
insufficient finance	28(5.0)	65(51.3)	57(41.3)	2.3	2
high cost of innovations	30(7.5)	64(50.0)	54(37.5)	2.2	3
inadequate supply of innovations	28(5.0)	69(56.3)	52(35.0)	2.2	3
lack of production skills	34(12.5)	59(43.8)	57(41.3)	2.2	3
inadequate agricultural inputs	33(11.3)	67(53.8)	49(31.3)	2.1	6
shortage of land for farming	35(13.8)	75(63.8)	39(18.8)	2.0	7
disease attack	36(15.0)	63(48.8)	40(32.5)	2.0	7

Source: Field Data, 2018

4.5 Innovativeness of Rural Women in Njoro Sub-county

Rural innovation contains components that supersede the components they replace because they embody a new core design concept. Existing components become obsolete because the new components are based on novel design concepts rather than simply being improvements on established design concepts.

Table 5: Rural Women Innovativeness in the Study Area

Innovation	Percentage
Greenhouse construction using local materials	34%

Drip irrigation using bottles	23%
Grafting of fruits	44%
Use of weeds Mexican marigold as pesticides	47%
Covering of potatoes with polythene to initiate chitting	67%
Use of charcoal and saw dust to make local refrigerator for cooling milk	55%
Breeding of local birds with high breeds	68%
M-pesa technology	92%
Organic farming	48%

Source: Field Data, 2018

The social, economic, and political structures of the social context of innovation do not exist in isolation from one another. In any development setting, a contextually informed understanding of agricultural innovation must consider the relationships among these different types of structures (Butler & Mazur, 2007). While it may no longer be as fashionable as it once was, the adoption-diffusion model still has much to offer in such efforts. The model refers implicitly to structural effects of socioeconomic status and communication behavior, though these are conceptualized at an individual level (FAO, 2011). Structural analysis has recently moved more firmly into this interdisciplinary realm, particularly in economics. With the appropriate structural tools, rural sociologists could make notable contributions to our understanding of how the social structures of markets influence innovation.

Technological change in agriculture is still vitally important throughout the world and, correctly applied, diffusion research can assist in its investigation. It is important to consider the consequences of technological change as well as the determinants of adoption of innovation. It is critical to apply the model to environmental practices and other "noncommercial" innovations in agriculture. In-depth case studies over time are needed to further our understanding of how and why individuals and agricultural social collectives adopt technological change. Above all, the social, economic, and political contexts of innovation must be studied with the models and methods of modern structural analysis. All this provides a basis for continuing to build on a wealth of research materials.

4.5 Socio-economic Variables Influencing Access to and Use of Agricultural Information

Variables reviewed under this category include; sex, age, marital status, educational level, household size, farming experience, farm size. The rest are type of farm ownership, labour availability, engagement in off- farm work, and the cultivation of additional crops.

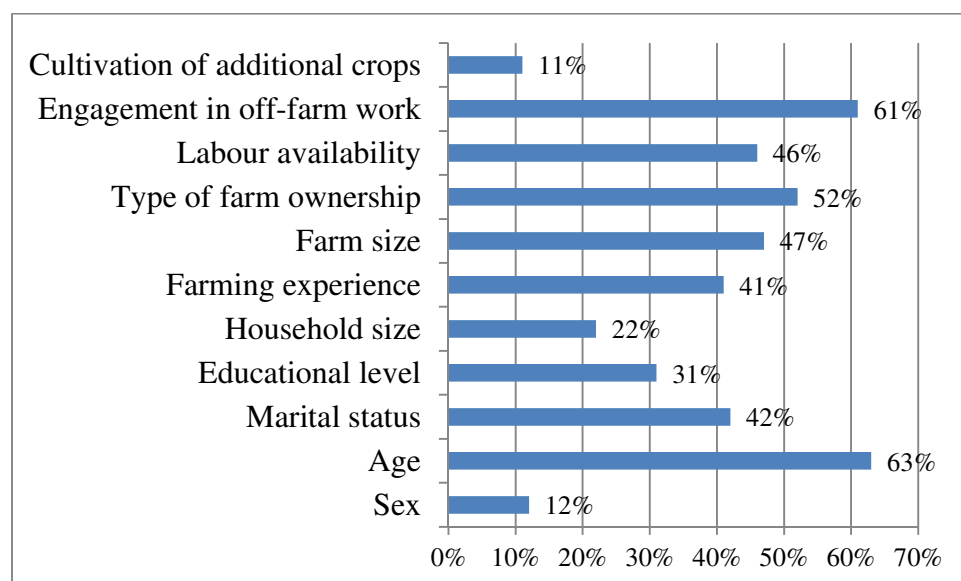


Figure 1: *Socio-economic variables influencing use of agricultural information*

Source: Field Data, 2018

(i) sex

Gender of the household head is a factor that limits access to agricultural information and its use. Women are traditionally occupied by household chores while the man has the liberty of mobility, participate in different meetings and trainings consequently have greater access to extension services. Male-headed households tend to build and maintain larger network ties with relatives and friends than female-headed households (IFAD, 2011). Kimani and Kombo (2010) in assessing access to agricultural extension in SSA found out that sex is an important determinant in the seeking of agricultural information. Male farmers sought for agricultural information more than their female counterpart. A positively significant relationship was established between sex of household head and adoption of improved agricultural technologies in the cultivation of Irish potatoes

(Buchanan & Keohane, 2011). On the other hand, Maertens and Swinnen, (2009) found out that there was no significant relationship between sex and access to agricultural information

(ii). Age

Age is also one of demographic characteristics which describe how long a person has been in existence. Young farmers are ardent to get knowledge and information than older farmers. It might also be that older farmers want to avoid risk and are not likely to be flexible than younger farmers and thus have a lesser likelihood of information utilization. But several studies report different results; Greve (2011) reports of older farmers being more experience and have accumulated more capital as a result they are more likely to invest in innovation. Similarly, Bhatti, Olsen and Pederson (2011) reported positive relationship between age and adoption behavior of farmers. However, Rogers (2003) suggest that older people were unwilling to pay for agricultural information delivery technologies such as print, radio, farmer-to-farmer, expert visit, and television. He revealed that, as age increased, the willingness to pay for these agricultural information delivery technologies decreased, meaning that older farmers were less willing to get information than younger ones. Old age also increases with conservativeness and negatively impact on adoption while young farmers tend to be more innovative and risk adverse (Boushey, 2016). A study conducted by Bhatti, Olsen and Pederson (2011) on diary women farmers proved that age has a negative influence on agricultural information network of farm women. The study is that older women do not seek many new ideas, since they try to conform to practices they have followed for a long time in their life. Berwick, (2003) also found out that both younger and old tried new things introduced to them thus there was no significant relationship between age and the use of improved inputs and practices.

(iii) Marital Status

Marriage is considered as an important social institution in the Ghanaian society. Marriage is an institution which can be found in every human culture. Boushey (2010) working on the topic “Decentralization and access to Agricultural Extension services in Kenya” established that the marital status of farmers significantly influenced their access to extension services. Greve, (2011) also noted that there was a positive association between marital status and agricultural information access and use. However, marital status of the farmer was found by Buchanan , Cole and Keohane, (2011) to negatively affects the probability of access to information, signifying that the single farmers had access to agricultural information more than married farmers which could be attributed

to the fact that un-married farmers take part in more social activities due to limited responsibilities, while married farmers stay in house to attend to family issues.

(iv) Educational level

Education generally is associated with receiving and absorbing of agricultural information and use of the information. Because education is believed to increase farmers' ability to obtain, process and analyze information disseminated by different sources and helps him/her to make appropriate decision to utilize agricultural information through reading and analyzing in a better way. The ability to read and understand sophisticated information that may be contained in a technological package is an important aspect of access to agricultural information (Rogers, 2005). Ganguli, Souza, McWilliams and Mehrotra (2018) found out that education of respondent had a significant relationship with their access to agricultural information; an increase in the educational level of the respondents increased their access to agricultural information. Better education according to Kimani, and Kombo (2010) would lead to improved access to knowledge and tools that enhance productivity. However, Termine, (2010) established that irrespective of farmers educational level it had no influence on their access to agricultural extension services. With regard to the use of agricultural information, World Bank (2007) posits a positive significant relationship between level of formal education of fish farmers and information use. According to Kakota, Nyariki, Mkwambisi and Kogi-makau (2013), education is expected to create a favorable mental attitude for the acceptance of new practices especially of information- intensive and management intensive practices.

(v). Household Size

The household is the number of individuals eating from the same pot of the family. It is generally agreed that increase in household size comes with extra hands to work on the farm thus more use of agricultural innovations. On the other hand increase in household size also put extra burden on the family as not being able to invest in the farm. Buchanan, Cole and Keohane, (2011) asserts that an increase in size of household increases the probability of access to information. The increases in household size put pressure on the demand for household needs and hence the need to produce more for family and earn more to cater for the household which could lead to agricultural information seeking and use. Rogers (2003) has also found family labour as positively related to adoption and intensity of fertilizer use which is determined by the family size. However,

Buchanan, Cole and Keohane, (2011) established no significant between household size and agricultural extension services access.

(vi) Farming experience

Farming experience is the number of years the household has spent with that particular crop.

The number of years spent in farming is a very important household related variable that has relationship with the production process. Longer farming years comes with accumulated farming knowledge and skill which contributes to the use of agricultural information. Several studies support this argument. Longer farming experience implies accumulated farming knowledge and skill which contributes to utilization of agricultural technologies Buchanan, Cole and Keohane, (2011) also argues that experience in a particular activity equips the individual and makes the person more matured to take right decision. Greve, (2011) also asserts that “number of years the farmer has owned his farm is assumed to influence the investment behaviour”. However Buchanan, Cole and Keohane, (2011) posit that farming experience has no relationship with access to extension services. Greve, (2011) also establish a non- significant relationship between agricultural information access and farmers years in farming in Pakistan.

(vii) Farm Size

Farm Size is the measure of the total land area under cocoa cultivation and the size in bearing will determines the yield. Ganguli , Souza, McWilliams and ,Mehrotra (2018) in studying effects of farmers’ socio– economic characteristics found of a highly significant relationship between respondent size of land holding and their access to agricultural information. Similarly. Greve, (2011) who also found a highly significant relationship between land holdings of the respondents and their access to information. Cocoa farmers with large farm sizes are usually wealthy and there is more likelihood that they would readily adopt any high inputs innovation. Large farm size facilitates easy realization of the benefits due to economy of scale (Rogers 2003). Ganguli , Souza, McWilliams and Mehrotra (2018) found farm size a significant positive relationship farm size and farmers’ adoption of modern agricultural production technologies, the bigger the size of a farm, the higher the probability for adoption of current ideas by farmers.

(viii) Off– farm work engagement

Off- farm activities, defined as the participation of individuals in remunerative work away from a “home plot” of land, is seen as an important tool in sustainable development and poverty reduction, especially in rural areas (FAO, 2011). Since farming is a seasonal activity, off-farm occupation

comes in with extra income to support the household needs and investment on the farm. IFAD (2011) states that off-farm employment is alternative source of income for farmers thus a way to boost rural economic activity and employment in many developing countries.

Off- farm income was noted to have a positive relationship with access to agricultural information by Owuor et al. (2008) in their study Determinants of Agricultural Information Access by Small Holder Tea Farmers in Bureti District in Kenya. This implies that the more a farmer earned from off- farm work they are likely to look for information to invest in their tea farms. Income from non-farm activities has been found to increase the farmers' probability to invest in new technologies (Owuor, Kovoï & Siele, 2011). However, Owuor et al. (2012) found out that off-farm activities had a negative relationship with adoption of technologies; this is because they are likely to interfere in the other activities that the farmer is carrying out.

(ix) Farm ownership type

Ownership of one's own farm normally comes with an enthusiasm to invest in it since all the benefits would accrue to you than doing a shared cropping. In agreement with this assertion, Kinyili, (2003) states that, farmers naturally do not feel sound emotionally when they are not cultivating on their own land and as such do not invest in land development and will not use inputs efficiently. According to Lagat, Ithinji and Buigut, (2003)they found that land ownership as a major factor influencing investment into land to boost productivity. He states that in Uganda, land owners invest in soil management practices than tenant farmers and other occupants. Mwabu Mwangi and Nyangito (2006) also revealed that land use and ownership affected maize output implying that farmers that owned land are able to adopt technologies that will enhance their yields than sharecroppers.

(x) Labour availability

The use of new agricultural innovations usually is labour intensive so therefore availability of labour in the locality will aid farmers to practice new innovations. Studies such as Agbarevo and Benjamin (2013) states that improved practices require lots of labour and hence the household with relatively high labour force uses the technologies on their farm plots more than those with low labour force. Koskei, Langat, Koskei and Oyugi (2013) inferred from the positively significant relationship between labour availability and adoption of Agricultural innovation and concluded that labour availability is a requirement for technology adoption which increases the yield of

farmers. McNamara (2009) also found a positive relationship between labour availability and intensity of use of improved forages as improved practices are labour intensive.

(xi) Additional crops cultivation

Crop diversification is one of the coping mechanisms of food security, production and market risks. Growing of other crops such as maize, cassava, vegetables among others helps farmers feed their families thus the little income from the major crop on the farm. Crop diversification also serves as additional source of income apart from the main crop cocoa. For example, diversification was the single most important source of poverty reduction for small farmers in South and Southeast Asia (FAO, 2011). According to Washington, and Obidike, (2011) mention of diversified maize cultivation into growing other crops to earn additional income apart from cocoa and also ensure food security and income stability.

4.7 Institutional Factors Influencing Access to and Use of Agricultural Information

The factors considered to enhancing access to and use of agricultural information in this study is access to credit, frequency of market visit, distance to the nearest agro-input market and group membership

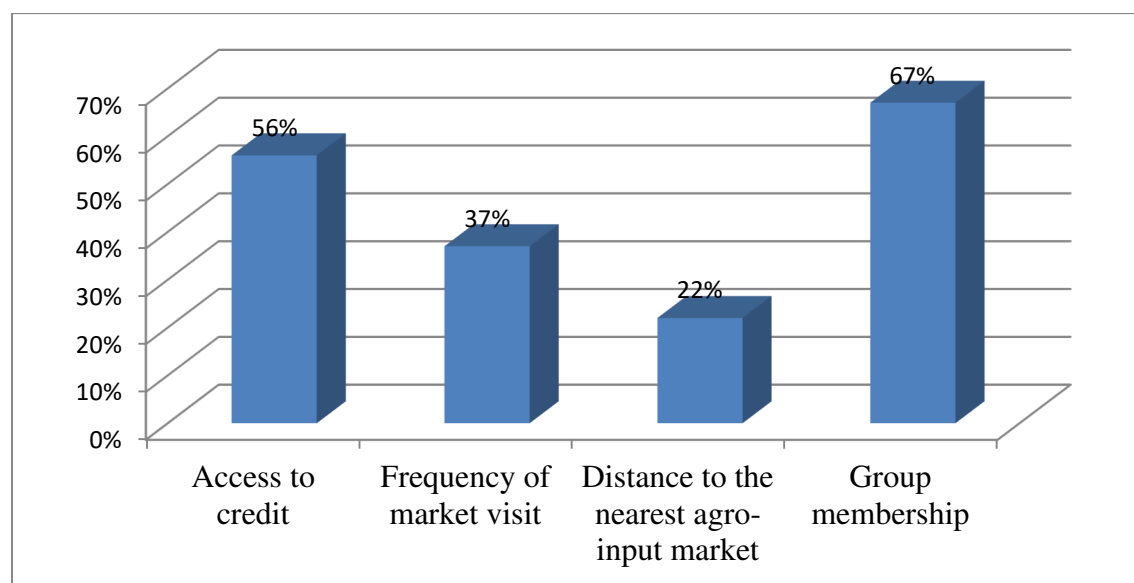


Figure 2: Institutional factors influencing access to agricultural information

Source: Field Data, 2018

(i) Group membership

A farmer's association with other farmers is a means of sharing knowledge, information and other resources. Farmers who belong to a group are exposed to their sources of their colleague farmers such as their experience in farming, successful practices on their farms and many more. Belonging to a group serves as a contact for services provided for groups such as extension services, loans and agro- inputs. Rogers (2005) concludes that: "The heart of the diffusion process consists of interpersonal network exchanges between those individuals who have already adopted an innovation and those who have not are then influenced to do so". In conformity with this view, Okwu and Iorkaa (2011) state that group membership increases the capacity of an individual to access information about current innovation and its benefit from other members. It also increases individual farmer's awareness and as a result increases the likelihood for adoption of new technology.

Group participation was found to stimulate information exchange among members as a result of each other's experience and knowledge (Opara, 2008). Sudath (2008) in their study of determinants of Herbicide Utilization in Striga Hermonthica control among maize farming households identified group membership as a factor influencing use of herbicides in maize farming. Washington and Obidike, (2011) mention of access to credit, inputs and aids from government and extension services as benefits by farmers in groups which aid in the use of agricultural information. Mwabu, Mwangi, and Nyangito (2006) identified group membership as significantly related to information usage because farmers influence each other in a group as a result of experience shared

.

(ii) Frequency of agro-input market visit and distance

Distance to market and frequency of market visiting is a factor in the access and use of agricultural information and inputs, longer distances to inputs shops tend to make prices high thus constraining poor farmers from purchase. Regular visits to the market make farmers aware of new technologies; it also serves as a platform to share information with other farmers from other localities. The closeness of the market to farmers' is a great catalyst for farmers to receive information (Koskei et al., 2013).Distance to market was found by Washington and Obidike, (2011) to have had a significant effect on the adoption of crossbred dairy. Rogers (2005) also show that market distance is negatively and significantly related to adoption decision which is also confirmed by Maertens and Swinnen (2009) that, distance to nearby markets negatively influenced farmers' access and

use of inputs as it adds cost to purchasing inputs implying that longer distances comes with higher prices of inputs hence reducing the use of agricultural information by farmers

(iii) Access to credit

Smallholder farmers are most often financially constrained thus access to credit in the form of money or agro- inputs will go a long way in the search and use of agricultural information by farmers. Availability of credit is important if improved technology in the form of purchased inputs is to be available to farmers, especially small- scale producers. Inputs such as improved seed, agrochemicals and fertilizer require capital in the form of short- term production credit. Access to credit can relax the financial constraints of cocoa farmers'. There are different reports of significant positive influence on the adoption behaviour of farmers regarding improved technologies (Sudath, 2008). Washington and Obidike (2011) found out that access to credit had a positive impact on the use of improved agricultural inputs as it helped farmers' to access seeds, fertilizers and other inputs on credit. Makokha, (2008) established a significant relationship between adoption and credit. They say credit help farmers to purchase most modern technologies which are expensive thus difficult for many rural farmers, who are normally poor to acquire and utilize them without assistance in the form of supply of affordable credit and other financial services (Washington & Obidike, 2011). For instance, it has been reported that most small scale farmers in the country are unable to afford basic production technologies such as fertilisers and other agrochemicals resulting in low crop yields due to poverty and limited access to credit (Mwabu, Mwangi & Nyangito, 2006).

4.8 Orientation towards Improved Farming and Access to Agricultural Information and Its Use.

Access to agricultural information and its use could be highly influenced by farmers' orientation towards improved farming. It included farmers' attitude towards improved farming practices, farmers' innovation proneness, farmers' achievement motivation and their information seeking behaviour.

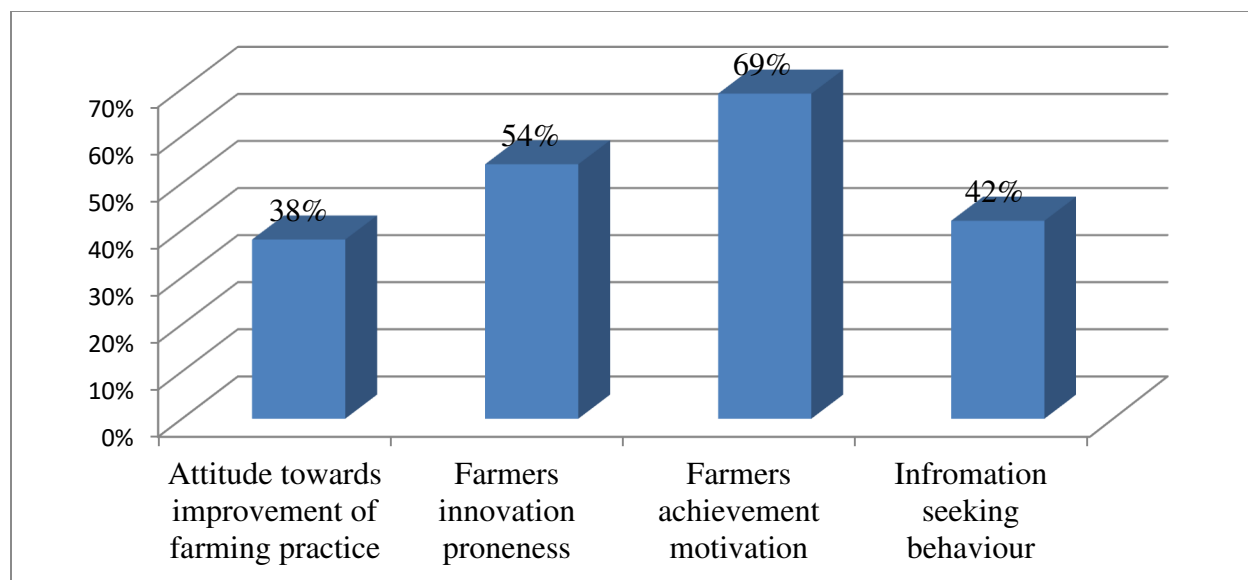


Figure 3: Orientation towards accessing agricultural information

Source: Field Data, 2018

(i). Information seeking behaviour

This variable reflects the degree at which the respondent was eager to get information from various sources on different agricultural activities. Olwande, and Mathenge, (2012) explains information-seeking behavior as the “totality of human behaviour in relation to sources and channels of information sought,” Omamo, (2014) advocates for the need for farmers to possess good information search behaviour to enable them to adopt improved production technology. Olwande, and Mathenge, (2012) mentions of vast information available for use by snail farmers who are interested in increasing their productivity, but they exhibit diverse information seeking behaviour, some having a high seeking behaviour while others do not and the difference in their attitude thus affect the information sought after and their productivity. Sharing problems, asking and weighing options exposed people to a variety of hygiene and sanitation information than people with no such behavior (Omiti, et al., 2009). Omamo, (2014) established that as information seeking behaviour of farmers increases, their utilization of accessed information also increases.

(ii) Achievement motivation

Achievement motivation is the value associated with an individual, which drives him to excel or do well in an assignment he undertakes. Achievement motivation helps an individual to decide and complete the tasks in certain direction, which in turn helps in achieving the desired results. According to Njuki et al., (2009), “Achievement motivation is what gets you going, keeps you

going and determines where you are trying to go”. Achievement motivation among cocoa farmers for the search and use of agricultural information could be increase in yield of cocoa, improvement in their standard of living as a result of increase income, self- recognition etc. Moti, (2007) found out that farmers motivation for engaging in rice training programmes were ambition to make friends, self- recognition, market availability, profitability, loan, personal needs, improve standard of living, increase yield etc. which is in agreement with Olatidoye (2008) who reports improving the standard of living as a motivational factor for participating in a programme. In achieving farmers’ motivation for entering into farming, access and use of agricultural would play a pivotal role. Several studies have emphasized the relationship between achievement motivation and access to and use of agricultural information. Morrison, Raju, and Sinha (2007) asserts a significant relationship between achievement motivation and agricultural information access and use in his studies access and utilization of agricultural information by resettler farming households.

(iii) Attitude towards improved farming practices

Montshwe (2006) defines attitude as a “disposition or tendency to respond positively or negatively towards a certain thing (idea, object, person, and situation). They are closely related to our opinions, beliefs and are based upon our experiences”. Attitude simply refers to “a person’s evaluation of any psychological object”. These evaluations are represented as items of knowledge, which are based on three general classes of information: cognitive information, emotional information, and information about past behaviours (Olwande & Mathenge, 2012). This study looks at attitude towards improved farming as the degree of positive or negative opinion of respondent farmers towards improved farming practices. Attitude is a prerequisite for behavioural change to occur. Positive attitude towards improved farming practice is supposed to enhance the use of such practices and recommendation to other farmers. Attitude towards improved farming was found by Omamo (2014) to have a significant relationship with agricultural information access and use as farmers seek for information exposes them to new information for their activities and influences it use. Olwande and Mathenge, (2012) in his study of adoption of dairy innovations, its income and gender implications in the Adami Tulu District reported that attitude towards change had a statistically significant relationship with dairy adoption. Farmers’ had an unfavourable attitude towards the use of fertilizer as they complained of fertilizer promoting weed growth and decreasing the shelf life of produce (Ngqangweni, 2000).

(iv) Innovation proneness

Innovation proneness was operationally defined as the rate of acceptance of an innovation by an individual for his/her agricultural activities. Studies conducted to assess its influence on access to and use of agricultural information include; Termine.(2010) report of a statistically significant relationship between innovation proneness and access to productive role information and utilization of women. Boushey (2010) in studying farmers' adoption behaviour in rice technology found out that innovation proneness of respondents significantly affected adoption of selected rice cultivation practices. Similarly, Greve, (2011) in their study of adoption behaviour of dairy innovations by small farmers under different farming systems established that innovation proneness was very significant in the adoption of dairy farming practices

4.9 Sources of Agricultural Information

Table 4. shows farmers source of agricultural information. From the results obtained, it can be deduced that radio is the most accessible with a percentage of 94.5% followed by Television with 75.0%. Family/Friends(70.8%) was the next followed by extension services (49.2%), input dealers (39.2%), farmer groups (21.9%), NGOs/Private extension providers (20.0%), Newspapers (12.3%) and LBCs (10.4%). This finding is consistent with that of Li, & Baoguo (2011) in their study on information-seeking behaviour and utilization among snail farmers in China. They report of about 65% and 76% of farmers receiving information from radio and television respectively. This could be as a result of radio and TV being the cheapest means of passing information to farmers Farooq, Muhammad, Chauhdary, & Ashraf (2007) and it being the effective medium of reaching farmers with information (Chen & Wu, 2009). A small standard deviation of 0.21 for the access to radio means the responses varied while a relatively higher value of 0.50 for access to extension service. A means the responses were varied

Table 6: Rank of Agricultural Information Sources Based on their Access

Source	Freq.	Per	Mean	Std. Dev	Rank
Radio	248	95.4	0.95	0.21	1
TV	105	40.1	0.40	0.50	4
Famers Groups	184	70.8	0.71	0.45	2
Internet	21	9.8	0.098	0.14	11
Newspaper	82	36.7	0.37	0.41	6

Input Dealers	57	21.9	0.22	0.27	7
Family/Family	52	20.0	0.20	0.24	8
Marketing Boards	32	12.3	0.12	0.16	9
NGOs/private extension workers	27	10.4	0.10	0.19	10
County Government Extension Workers	127	49.2	0.49	0.48	3
KARLO extension workers	97	37.7	0.38	0.43	5

Source: Field Data, 2018

4.10 Level of Access to Agricultural Information

Respondents with access to the first seven sources (Table 4.9) indicated their level of access to the information sources with the help of their frequency of access, timeliness of access, clarity of language, clarity of information and relevance of the information. Figure 4.2 displays respondents' level of access to the top seven sources. Figure 4.2 indicates that majority of the respondents (62.3%) had a moderate level of access to agricultural information followed by 25.4% of low level of access. The respondents in the high level of access were 12.3%. With over 70% of respondents above the low level of access, cocoa farmers in the district could be said to have a relatively a high level of access to agricultural information

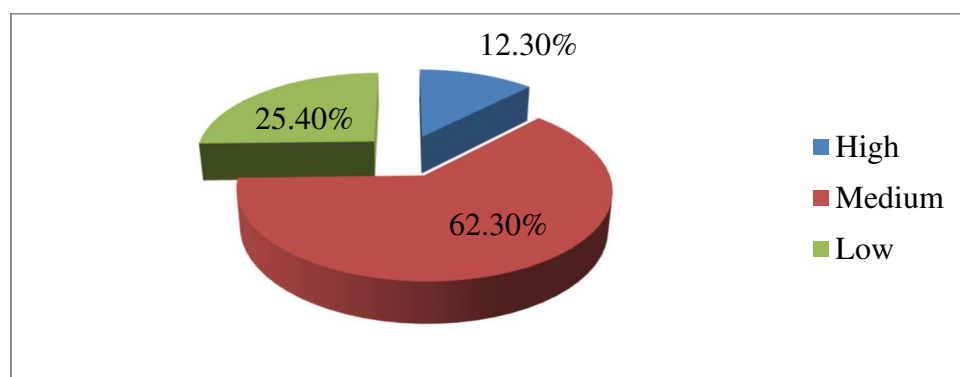


Figure 4: Level of Access to Agricultural Information

Source: Field Data, 2018

4.11 Information Seeking Behaviour of Farmers

Farmers were asked how often they seek information on major practices in cocoa production and other farming activities. The mean values for farmers' information seeking behaviour were calculated. Table 4.4 shows the Mean values of farmers' information seeking behaviour. Table 4.4 indicates that information seeking on disease control on cocoa was high. This was attested to by a mean of 3.39 out of a total of 5. This was followed by information seeking on pest control on cocoa with a mean value of 3.38; information seeking on recommended agro-chemicals for cocoa followed with a mean value of 3.35. Shade management in cocoa cultivation followed with mean value of 2.28 then information seeking on farm sanitation was next with a value 2.26, information seeking on raising nurseries (2.16), information seeking on cultivation of other crops (2.08) with information seeking on raising of animals being the least with a mean of (1.80). A summary of farmers information seeking behaviour revealed that the number of respondent who were in the moderate level were in the majority (51.2%) and 13.5% of the respondents were in the high level of information seeking. Therefore, the majority (64.7%) of interviewed farmers in the study are aware in the moderate level and above of information seeking behaviour. The plausible reason for the high level of information seeking among cocoa farmers is that cocoa farming has numerous challenges thus the seeking for remedies. Additionally there are a number of sources of information available to farmers as such farmers are able to report any problem they encounter on their farms for restoration

Table 7: Frequency and Type of Information Sought

Activity	Never (1)	Rarely (2)	Sometimes (3)	Very Often (4)	Always (5)	Mean	Rank
Type of crop to be grown	12%	3%	7%	23%	55%	3.86	2
Market Information	14%	16%	8%	18%	44%	3.38	4
Pest and Disease Control	8%	7%	26%	51%	8%	3.12	7
Type of Agro-Chemical to Use	11%	19%	23%	31%	16%	2.87	9

Breed of Animals to Rear	7%	18%	21%	30%	24%	3.91	1
Scale of Production	27%	11%	23%	19%	20%	3.76	3
Type of Fertilizer to Use	18%	6%	27%	22%	27%	3.14	6
Water Harvesting and Utilization	17%	13%	8%	32%	30%	2.14	12
Source of Credit	16%	21%	13%	24%	26%	3.23	5
Soil and Water Conservation Measures	17%	31%	9%	27%	16%	2.89	8
Livestock Management Practices	17%	12%	31%	13%	27%	2.67	10
Nursery Management Practices	8%	23%	25%	37%	7%	2.54	11

Source: Field Data, 2018

5.0 Conclusion and Recommendation

This study revealed that the rural women in the study area were introduced to new technologies such as Hybrid seed, adequate crop spacing, planting techniques, processing and storages facilities. The percentages of the respondents still in use of the innovations are low and the major source of information to the women is market places. Also majority of the respondents strongly accepted that adequate control measure, improved varieties and increased income are the major effects resulting from the use of Agricultural innovations introduced. Most of the respondent agreed that unstable market price, insufficient finance and inadequate supply of innovation were the most serious constraints encountered. Therefore, government should try as much as possible to stabilize market prices to reduce shortage and losses encountered by the farmers

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