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Influence Of Farmers' To Extension Services On Their Decision To Adoption Of Horticulture Farming In Nandi County, Kenya

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Abstract: ***The study sought to establish the influence of respondents' socio-demographic characteristics on adoption of Horticulture farming among small scale farmers in Nandi County, Kenya. A cross-sectional survey research design was employed and a sample of 400 respondents was systematically selected. A well structured Questionnaire, Focus Group Discussion and Key Informant Interviews were the main data collection tools used. Pearsons correlation test was used to establish relationships among variables under study. The study assessed the influence of gender, age, level of education, land size and income control. Findings showed that these factors influenced adoption of horticulture farming among the respondents in differing extents. Although horticulture farming has not been extensively embraced as the main commercial crop, respondents expressed high acceptability, rated it as highly compatible with their farming objectives and expressed a high inclination towards their further adoption. Various horticultural crops were planted by respondents namely kale, cabbages, bananas, traditional vegetables (managu, saka, mitoo and kunde), tomatoes, passion fruits and pineapples. However, among the various crops planted by the respondents horticultural crops came in fourth in terms of the proportion of land allocated to them. The study recommends that there is need to sensitize farmers on the benefits of engaging in the production such high value crops. The government also needs to come up with programmes that would provide information and train farmers on the trends that are taking shape on farming within the region and globally. Furthermore, agricultural promotions need to be targeted well among potential adopters considering that study has revealed the nature of farmers that are well placed to adopt innovations.***

Keywords: Adoption, Horticulture, Farming, Extension, Nandi, Kenya

I. INTRODUCTION

In Africa, agricultural and rural development is considered very important as they form the bedrock for effective development (World Bank 2007). Agriculture has stood out as the starting point of rural transformation, and the main economic base for small-scale farmers. Although horticultural farming has been considered a bright spot in many African countries (AVRDC, 2004), for a long time its growth has not kept pace with the rest of the world due to low uptake of innovations (Weinberger & Lumpkin, 2005). It faces unprecedented challenges (IFAD 2002) that include changing weather patterns, inadequate access to inputs, lack of market for the produce coupled with flooding of the local markets by imported products due to market liberalization. Compared to the rest of the world, a number of countries that were dependent on agriculture such as Malaysia, Mauritius, Thailand and South Korea have been transformed into newly

industrialized countries (National Economic and Social Council of Kenya (NESC), 2007) but farmers in many African countries continue to wallow in poverty. To realize such growth, there is need to harness science, technology and innovation to improve agricultural production, especially among smallholders (IFAD 2002).

However; scarce information exists to explain the low uptake of horticultural farming and production in sub-saharan Africa. In Kenya, commercially-oriented horticulture production dates back to the early days of the 20th Century when private entrepreneurs began to venture into large-scale commercial production (Minot and Ngigi, 2003). The horticulture industry mainly comprises of fruits, vegetables and cut flowers (Food and Agriculture Organization [FAO], 2003) and constitutes 33% of agriculture's contribution to the Kenyan economy. It is the fastest growing sub-sector in the country and is ranked second in terms of foreign exchange earnings from exports after tourism with tea following closely at third place (Adekunle, Ellis-Jones, Ajibefun, Nyikal, Bangali, Fatunbi & Ange, 2012).

In Kenya, the success so far realized in this sub-sector has been attributed in part to its natural advantage for the production of horticultural crops. In addition, there has been a lot of input and support in the form of policy and program implementation namely; the formulation of the National Agriculture and Livestock Extension Programme (NALEP) and the Small-Holder Horticulture Marketing Program (SHoMAP). There has also been the formulation of the horticulture policy 2010 that analyzes the various industry concerns and highlights the challenges faced. These interventions offers support services (financing the industry, research and extension), marketing (local, regional and export markets), infrastructure development as well as regulatory and institutional arrangements (Ministry of Agriculture, 2010). The policy provides for the capacity building and empowerment of farmers engaged in horticulture farming. Besides the policy interventions, the country also actively participates in a number of regional initiatives, such as the harmonization of horticulture standards for the East Africa Community (EAC), Horticulture Council of Africa (HCA), and in sharing of information and experiences on high value agriculture (Omondi, 2006).

Over time, horticulture production had been practiced but it was not until 2008 that the Ministry of Agriculture within its "Strategy for Revitalizing Agriculture, 2004-2014" put in a lot of effort to increase the quantity and improve the quality of horticultural production by small-scale horticulture producing households. Emphasis was put on the role of the extension service as a facilitator, connecting the farmer with private sector services rather than managing government handouts (Melinda et al, 2006). Farmers have for long time accessed information through various sources and mechanisms, such as visits from extension agents, participation in training activities, and exposure to mass media. Learning has also been acknowledged as another key source of information for farmers, and one that is fundamental for promoting adoption because it helps to modify the perceived risk of innovations (Munshi, 2005; Yamauchi, 2007).

Agricultural extension work being one of such learning avenues has been created and recreated, adapted and developed over the centuries but, its practice as an organized exchange of information and the purposive transfer of skills is a rather recent phenomenon (Burton et al , 1997). Currently, agricultural extension services have been tailored to provide farmers with important information, such as new seed varieties, crop management, and marketing thereby increasing farmers' ability to optimize the use of the available resources (Muyanga & Jayne, 2006; Anandajayasekeram et al 2008). This information is aimed at improving knowledge, change farmer attitudes/behaviour, improving skills and facilitate uptake of new technologies (Government of Kenya, 2001). Drawing from the diffusion of innovations theory, new practices are expected to be transmitted (diffuse) to the targeted farmers by way of training on the part of the extension officers and by way of learning among the expected adopters.

In Kenya, there are private and public extension service providers in the horticulture industry. The public extension services can further be divided into the government extension system and community-based system. Kenya's small and medium-scale horticultural farmers have traditionally benefited from these two major public extension systems while large-scale farmers' depend on private extension services (Anandajayasekeram et al 2008). Among the public extension services is government extension system run by the Ministry of Agriculture with a focus mainly on food crops and livestock. The government has in this approach tried a number of extension models and styles, including the progressive/model farmer approach, integrated agricultural rural development approach, farm management, training and visit, attachment of officers to organizations, farming systems approaches and farmer field schools (Burton et. al., 1997).

The second type entails the commodity-based systems run by government parastatals, out-grower companies, and cooperatives. This approach deals mainly, but not exclusively, with commercial crops where, all aspects of producing and marketing a particular crop are tightly vertically coordinated, spanning the whole range from research, advice, and material support given to farmers, to organizing marketing and even exports (Muyanga & Jayne, 2006). This system is consciously motivated by profits, and tends to work well when both the firm and farmers benefit from the extension expenditures. A third type of extension service -private agricultural extension system comprising of private companies, non-governmental (NGOs), community-based (CBOs), and Faith-Based Organizations (FBOs) also emerged as a result of ineptness in the public extension system (Nambiro et al., 2005). This system normally complements the government provided services among small scale farmers and in areas that are perceived to have been marginalized or have high demand for the services vis-à-vis limited provision by the government.

All these approaches have emerged with varying levels of success. The top-down, uniform (one-size-fits-all) and the inflexible nature of the public extension services discussed above has been identified as the major cause of the declining effectiveness and one among other factors impeding horticultural growth in Kenya (ASFG, 2013). Furthermore, the current number of extension service providers has been found to be inadequate to meet the needs of horticultural farmers (Ministry of Agriculture, 2010), given the National extension

staff: farmer ratio that stands at 1:1,500. As a way of realizing reform, research and extension has been recieving the lion's share of the ministry's annual budget, averaging 70 percent (Muyanga & Jayne, 2006). Despite such immense financial investments along with evolutionary and transformational achievements, the uptake and use of extension services still remain low in Nandi County. This is even expected to change drastically with the devolvement of the agriculture function from 2013 to the county governments an aspect that is expected to bring in new dynamics and challenges.

Despite all this input, the outcomes have not been commensurate with the efforts. Kenya's small scale horticulture farmers have failed to achieve agricultural growth despite the many new technologies developed and the varied interventions formulated towards the transformation of this sector by diverse agricultural development actors. Horticultural productivity therefore continues to decline for reasons that are not adequately documented. Although this sub-sector has been extensively studied in Kenya, focus has been more general on the technical aspects of adoption yet institutional factors such as extension services that play a significant role in the successful uptake of innovations and change processes have been given little attention. Thus, there is need to assess the influence access to extension services on the uptake of horticulture farming in specific parts of Kenya with high potential for horticultural production.

Therefore the main objective of this study was to investigate how the prevailing socio-demographic characteristics of farmers influenced the uptake of horticulture farming in Nandi County. Specifically, the study sought to;

- ✓ Investigate the proportion and demographics of households engaged in horticulture farming and;
- ✓ Describe how access to extension services bear on farmers' decision whether to adopt horticulture farming or not.

II. RESOURCES AND PROCEDURES

The study employed a cross-sectional survey research design to facilitate snapshot systematic gathering of descriptive data (Bhattacherjee, 2012) regarding socio-demographic characteristics of households engaged in horticulture farming in the research area. Survey is a systematic method which involves collecting relevant data and subsequently describing the behavior of a subject without manipulating it in any way (Bryman, 2004; Kothari, 2004). The study was conducted Nandi south sub-county in Nandi County, Rift Valley Province, Kenya. Nandi County is situated on the western part of the Rift-valley province, within latitude 0.25 (0° 15' 0 N) and longitude 35.08 (35° 4' 60 E). The altitude ranges between 1300 metres and 2500 metres above sea level (Government of Kenya, 2001). The county has a total area of approximately 2,920km² and a population of 752,965 people (Kenya National Bureau of Statistics [KNBS], 2010). Administratively, the county consists of five sub-counties namely; Nandi North, East, South, Central and Tindiret Districts. Nandi South has a total population of 157,967 people comprising of 78,209 males and 79,758 females with a total of 30,643 households (KNBS, 2010). The predominant farming activities are food crops such as maize, beans, banana, kales, onions and cash crop such as tea and coffee. The study targeted households in Aldai Division, Nandi South sub-county where Ndurio and Kemeloi locations were selected purposively as they are the locus of the horticulture promotion activities and, their representativeness of the entire county as they cut across both the highly and the lowly populated areas of the district. There are 23,281 households in Aldai Division with 3,476 being in Kemeloi while 1,528 in Ndurio (KNBS, 2010).

To arrive at the desired sample size, the following formula developed by Norman (2010:183) is used;

$$n = \frac{pqZ^2}{E^2}$$

where:

n- The desired sample size

p- Proportion of population estimated to have characteristics being measured (50%)

q- (p-100) =50%

Z- The standard normal deviate of the required confidence level (1.96)

E- Maximum error desired in estimating population parameter (.05)

$$n = \frac{(.50)(.50)(1.96)^2}{(.05)^2} = 384$$

This formula gave a sample size of 384 which was adjusted to 400 and data was collected from a minimum of 415 households in order for the sample population to be within ±5 of the population with a 95 percent level of confidence and to cater for non response.

The study utilized systematic random sampling technique to select farmers proportionately from Ndurio and Kemeloi locations. A list of all farmers was developed and in every 13th household, the household head or the representative, as designated by the household members, was sampled for interviewing.

A well structured Questionnaire, Focus Group Discussion and Key Informant Interviews were the main tools used to collect information from the key informants with regard to the study subject. To collect the quantitative data, the study utilized a questionnaire that was administered by the researcher to seek information from 400 household heads. Two focus group discussions of 10 and 12 members each were also held with knowledgeable leaders or representatives of horticulture farmers in every location. The Key Informant interviewees comprised individuals who were grounded in the community and, who had particular or "expert" knowledge about horticultural issues, the people and their livelihood activities. These individuals included the divisional horticulture officer, the district agriculture officer and those who had worked under the horticulture promotion project.

To analyze data the study utilized descriptive statistics namely measures of dispersion namely frequencies and percentages and cross tabulations. Pearson's correlation technique (r) was used to test for the statistical significance of associations between selected variables (Gupta, 2008). Data was then presented in form of tables of frequencies.

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III. RESULTS

Study findings showed that 60.1% of the respondents sampled were male while 39.9% were female. This finding was further supported by key informant interviews, which alluded to the dominance of men in horticulture farming. Pearson's correlation analysis yielded a correlation coefficient (p=-.181** p<.01). The result is significant at $p < .01$. The results point to a negative relationship between the respondent's gender and adoption of horticulture farming with the male respondents being more inclined to its adoption more than female respondents. Respondents' age was found to range between 20 to above 50 years with 3% of the respondents being aged less than 20 years, 28.25% were aged between 21-30 years, 27.5% were aged 31-40 years, 28.75% were aged between 41-50 years while 12.5% were aged 51 and above. Pearson's correlation analysis was utilized to ascertain the relationship between respondents' age and their likelihood to adopt horticulture farming and it yielded a correlation coefficient (p=.055* p<.05). The result is significant at $p < .05$. The results indicate a weak positive relationship between the respondent's age and adoption of horticulture farming. Findings on the respondents' marital status showed that 71.75% were married, 19.75% were not yet married, 8% were widowed while 0.5% were divorced/separated. This means that engagement in horticulture farming was prevalent among persons of all marital status with the majority being the married ones (71.8%). Pearson's correlation analysis was utilized to ascertain the relationship between respondents' marital status and their likelihood to adopt horticulture farming and it yielded a correlation coefficient (p=-.012* p<.05). The result is significant at $p < .05$. The results indicate a weak negative relationship between the respondent's marital status and adoption of horticulture farming. This means that although engagement in horticulture farming was prevalent among persons of all marital status, the majority were the married ones.

In reference to the level of education, majority of the respondents were found to be literate with 15.75% having attained primary education level, 34.5% had attained secondary level education, 39.25% had attained middle level college (certificate and diploma) education while 10.5% had attained university level education. This reflects a fairly high level of literacy given that majority (84%) of the respondents had attained secondary level of education and above. Pearson's correlation analysis yielded a correlation coefficient (p=-.058; p<.05). The result is not significant at $p < .05$. Thus, there is no association between the respondent's level of education and adoption of horticulture farming. This is because respondents of all levels of education were engaged in horticulture farming with the majority (84%) having attained secondary and middle level college education.

Land is a major factor of production and thus it is the centre around which farming decisions and activities revolve. Study findings showed that respondents had varied land sizes with 22.5% of them having less than 2.5 acres, 37.3% had between 2.6-5 acres, 16.6% had between 5.1-7.5 acres, 12.4% had between 7.6-10 acres while 11.2% had more than 10 acres. Taking a comparative view of the farm allocated to the various crops planted/activities engaged in, the results showed that tea were allocated the largest portion with 32.25% of the respondents having less than one acre while 43.5% had between 1-2 acres. This was followed closely by cereals where 47.25% of the respondents had less than one acre while 35% allocated between 1-2 acres. Livestock farm came third with 45.25% of the respondents having less than one acre while 27.25% allocated between one to two acres. Horticulture came fourth with 81.1% of the respondents having less than one acre, 15.7% allocated between 1-2 acres, 2.2% allocated between 2-3 acres while 1% allocated 3-4 acres. Pearson's correlation analysis yielded a correlation coefficient (p=.207** p<.01). The result is significant at p<01. This implies that respondents who had large land holding engaged more in horticulture farming.

Respondents' propensity to adopt horticulture farming was also studied and the findings showed high levels of acceptance of horticulture farming with 34% of the respondents rating it as highly acceptable, 23% rated it as fairly acceptable 32% rated it as acceptable, and 11% rated it as least acceptable or unacceptable. It is only flowers that respondents did not favour engaging in their production with 70% of them rating it as least acceptable, 5% rated it as fairly acceptable, 10% rated it as acceptable and 7% rated it as highly acceptable. Findings further showed that 83.75% of respondents planted bananas, 77% planted kales (*sukuma wiki*) and cabbages, 72.25% planted traditional vegetables (*managu, saka, mitoo* and *kunde),* 66.75% planted tomatoes, 57.75% planted passion fruits while 25.75% planted pineapples. It is only the flowers that farmers didn't engage in its production given that none of the respondents sampled was engaged in their production.

Access to extension services/personnel was also assessed in terms of the frequency of contacts/visits (weekly, monthly and when called upon) that an extension service provider had with the respondents. Findings showed that 56% of the respondents had access to extension services (out of which 61.5% were male while 38.5% were female) while 44% reported not to have access to extension services. Among respondents who had access to the extension services, majority were aged 20-50 years with their distribution even across the age groups. Majority of those who had access to the extension services had attained secondary and middle level college education (74.4%). The size of land holding was also found to vary among those who had accessed extension services with those having1-2.5 acres comprising 17.57%, those with 2.6-5 acres comprised 47.75%, while those who had 5.1-7.5 acres comprised 13.96%. The study sought to ascertain whether availability of extension services influenced respondents' decision to adopt horticulture farming. Pearson's correlation test was administered and study findings yielded a correlation coefficient (p=.026* p<.05). The result is significant at $p < .05$. The results indicate a weak positive correlation between access to extension services and adoption of horticulture farming.

In reference to the provider of the extension services, 93.25% of the respondents reported to have been served by the government's ministry of agriculture (MOA) staff while, 6.75% reported to be provided by NGO/Donor and 1% reported to have been served by private providers. The frequency of visits by the extension officers, were reported by

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64.5% to be when they are called upon, 30.75% reported to have been visited monthly while 4.75% reported to have been visited on a weekly basis. The frequency of visits by extension agents' was found to significantly influence adoption of horticulture farming. Pearson's correlation test yielded a correlation coefficient (p=.127* p<.05). The result is significant at $p < .05$. The results indicate a positive correlation between the frequency of visits by extension agents and adoption of horticulture farming.

The quality of the extension service provided was also assessed based on the respondents' observation and the findings showed that 42% rated it as high, 47.5% rated the quality to be moderate while 10.5% rated it to be low. This shows that majority of the respondents considered the quality of extension services provided to be in line with their expectations and thus competent enough to address their problems. In reference to who caters for the cost of the extension service, 20.5% of the respondents reported to be catered for by the farmer, 71.75% reported to be catered for by the providing agency while 7.5% indicated that the cost is shared. Its was further reported that since the agriculture function was devolved to the county government the divisional ministry of agriculture offices had scaled down the nature of activities and services that they provide to the farmers due to funding limitations. Study findings yielded a negative correlation between farmers catering for the cost of extension services and adoption of horticulture farming. Pearson's correlation test yielded a correlation coefficient (p=-.114* p<.05). The result is significant at $p < .05$. The results indicate a negative correlation between farmers catering for the cost of extension services and adoption of horticulture farming.

IV. DISCUSSION

The high number of male participants in horticulture farming is attributed to division of labour among the Nandi community, where culturally men control the main means of family livelihood/income. This follows from rules of inheritance which are normally considered discriminatory to women and therefore disadvantaging them in the control of lucrative sectors of the societal economy (Hollis, 1909). Such division of labour and distribution of resources is illustrated well by the human agency theory which puts it that in every society, concepts of power and prestige are attributed differently to persons of different gender. Thus, although horticulture farming had initially been women's domain when its focus was subsistence oriented, however, men have dominated it since it was introduced as a cash crop.

The lower participation by women is also explained by the culturally entrenched division of labour coupled with other factors such as women having limited access to critical farm resources (land, labor, and cash) and being discriminated against in terms of access to external inputs and information (Ragasa, 2012). Michael and Cheryl (1999) explains further the disparity between male and female adopters that, throughout many parts of sub-Saharan Africa, women have greater difficulty than men in obtaining labor, especially male labor needed for land preparation activities (e.g., clearing, burning, plowing), and men mostly have claim over women's labor, but women do not have similar claim over men's labor. World Bank, FAO and IFAD (2008), illuminates further the challenges faced by women to include a combination of gender-blind legislation and policies and gendered norms that often place men in positions of benefit more than women such as in market opportunities or public programs that directly or indirectly influence technology adoption decisions. Furthermore, the lack of access to information about the technology and more so the lack of engagement of key actors (women and men) in priority-setting and innovation processes are hindrances to a much improved and faster adoption of new technologies in society (Meinzen-Dick et al, 2010). Study by Oduol and Mithöfer (2014) found out that female-headed households tend to have low levels of education and smaller household sizes, indicating that they could be facing severe constraints related to access to information and labour than male headed households. Such structural inhibitions and norms restrict women's mobility or decision making and limit their opportunities and sources of livelihoods and ultimately restrict them on the technologies to be adopted. It is therefore the differentiated lack of access to these technologies and complementary inputs and resources between men and women that mainly explain the observed slower adoption rate of technologies by women than men. Thus, technology adoption decisions depend primarily on access to these resources, rather than on gender *per se*.

Horticulture farming was found to be prevalent among persons of all ages however younger respondents engaged in horticulture farming than the older members of their society. High levels of adoption were therefore concentrated among respondents aged between 21–40 years. This means that youthful respondents engaged in horticulture farming more than the older members of society do. This is attributable to horticulture's need of certain specific skills for effective production. These skills evolve and change with time, therefore younger members of society are more placed to possess these skills (Conroy, 2005) and if not, then they are more willing to seek these skills than the older members of society given their agility. Also, horticulture farming is labour intensive and owing to such intense labour demands youthful persons are more placed to handle them than the older members of society. Furthermore, given the study area was typically rural with no other active economic sector other than farming; this may have contributed to the prevalence of engagement in horticulture farming across the various age groups as the main form of occupation for a majority of households. This can be explained by the high fertility of land within the study area which makes it possible for the farming of various horticultural crops and other crops such as maize, beans, tea and bananas.

However, in existing literature, there is contention on the direction of the effect of age on adoption decisions. One assumption is that younger farmers are more likely to adopt innovations than older ones. This line of argument is supported by Biwott (2016) who found out that young farmers were more alert to obtaining information from various sources that discuss several ways of improving their vocation than older farmers who were found to seek access to such varying sources of information by joining Faith Based Organizations

(FBO). Conroy (2005) found out that younger farmers are likely to take up new technology than older farmers given that they are of higher schooling and have more contact to innovations. Gockowski and Ndoumbe (2004) found out that age of the household head had a significant negative and elastic effect on adoption decisions with younger farmers being more likely to adopt intensive mono-crop horticulture than older ones.

The other assumption is that older farmers are more likely to adopt innovations than younger ones. Ashenafi (2007) found out that older farmers are likely to adopt new technology due to their experience or reject it all together. Age is depicted here to signify more exposure to production innovations/technologies and greater accumulation of physical and social capital and large family sizes. Thus, studies show that there is no conclusive evidence on the direction of influence of age on agricultural innovation adoption. This argument is supported by Conroy (2005) who holds that command of age on farmer's contribution to new technology is indecisive. Drawing from the above studies it can be concluded that the influence of a respondent's age on adoption of innovation is dependent on the nature of innovation under consideration. Totally new ideas and practices/innovations are more likely to be adopted by younger farmers while ideas and practices/innovations that build on the existing ones are more likely to be adopted by the older members of society given their accumulated experience.

The high number of married participants in horticulture farming is attributable to the fact that among the Nandi community that was studied here, individuals who have attained puberty are considered adults and at this stage/age one can marry or get married (Hollis, 1909). Thus, there is a high likelihood that they would be married owing to their ages and such other factors as the societal expectations on its members. Like any other community/society, the respondents had chosen to "settle down in life" and establish their families having attained the expected age in keeping with the societal agency expectations. It can also be explained by the fact that married individuals have a lot of obligations towards their families/children and therefore are more likely to engage in alternative income generating activities such as horticulture farming to earn income for financing provision for their families. Majority of the respondents engaged in this study (75.8%) had between 4 to 6 dependants and this translates to a lot of demands for provision by the heads of families. This is because marriage brings with it additional household members in the form of marriage partner, children and dependants who besides creating more pressure for provision can in the contrary motivate more productivity by being a source of additional labour. Children/dependants can assist with the various farm activities and thus enabling households address the labour intensive nature of horticulture farming more effectively as compared to those who had few dependants/small household size. This argument is supported by Biwott (2016) who held that large households spend more on food and other needs and such higher expenditures associated with larger household sizes tend to cause more resource constraints and hence the need for external support such as adoption of more effective innovations/techniques of production. This argument is reinforced by study findings which showed that majority of the respondents (56%) relied on family labour, 18% relied on hired labour while 26% utilized both family and hired labour in their horticulture farms. Thus, the number of dependants that ranged from 4-6 in most households serves as a source of labour for the horticulture farms. On the contrary, labor shortages may prevent/retard adoption of horticulture farming especially in households with small family size and are not able to hire alternative labour. This variation in the way marital status, household size and number of dependants influence adoption of horticulture farming is illustrated well by the agency theory, which argues that different individuals within the same situation will adopt different ways of responding/coping with the situation.

This high level of education also reflects horticulture farming as an income generating engagement of choice among persons of all levels of education and works of life and underscores horticulture's requirement of certain specific skill/expertise for its management. Such high levels of education connotes high level of awareness and ability to understand, process and respond appropriately/make informed decisions based on the information given. The above finding is in line with that of Mwaura et al (2013), in their study on African leafy vegetables, who found out that 72.2 percent of farmers had attained secondary level education and above while about 10.8 percent were uneducated. Horticulture farming therefore stands out as an income generating activity of choice among persons of all levels of education where for some it is the main form of occupation/income generating activity and for others it is a refuge/disguised form of unemployment or an alternative or additional source of income. For those who had attained primary and secondary level of education, horticulture farming was reported to be their main occupation given that there are limited opportunities for employment in the study area apart from farming. For those who had middle level college and university education, some engaged in horticulture farming as a disguised form of unemployment as they sought employment in other areas while those who had been employed in other sectors engaged in horticulture farming as an alternative/additional income generating venture. Study has also shown that education increases awareness and prepares people for innovative changes. Maurice et al (2009) in their study of Production Risk and Farm Technology Adoption in Rain-Fed, Semi-Arid Lands of Kenya, found out that education of the household head increased the probability of a farm household adopting terracing. This is because through education, household heads who are the primary decision-makers are more capable of accessing, analyzing and assimilating information regarding the various technologies, their advantages, and the dangers of not adopting them if they are better educated. Masuki *et al*., (2003) concurs with Maurice that increase in education level catalyzes the process of information flow and exposes farmers to a wider field of knowledge thus promoting adoption of the new technologies. The high level of literacy/education reflected by the above results is expected to positively affect/influence the diffusion and adoption rate of horticulture farming because education is a key determinant in adoption of new ideas in many aspects of live as it enhances how individuals seek, access, perceive,

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understand issues and phenomena so as to make informed decisions. From the above studies, education serves to either increase prior access to external sources of information or enhance the ability to acquire information through experience with new technology. Educated persons also are better able and willing to acquire information about potential innovation and to make rational evaluations of the risks involved in trying such new innovations (new inputs, crops or methods). Educated farmers may also be more aware of the benefits of modern technologies and may have a greater ability to learn new information hence easily adopt new technologies/innovation. Also educated farmers are able to interact more effectively with support institutions such as credit and extension agencies, because they can understand processes of transactions, requirements and keep records properly thus increasing the likelihood of accessing and obtaining such services. Furthermore, increased literacy and numeracy also help farmers to acquire and understand information and calculate appropriately input quantities as required in the modernizing or rapidly changing societal environment.

Respondents who had large land holding engaged more in horticulture farming. Farmers with larger land holding tend to be interested in issues that concerns their farming activities and will be more likely to adopt new and innovative farming methods/crops than those with small land holdings. The large land holding will also accord them more space where they can try out new crops/approaches while still being able to continue their usual farming activities without any inhibition. Larger farm size is also associated with greater wealth, increased availability of capital, and high risk bearing ability which makes investment in new technologies/innovations more feasible (Norris and Batie, 1987). The findings from this study contrasts this argument given that in reference to the proportion of land put under horticulture farming, respondents who had small land holding devoted a greater portion of their land to horticulture farming than those who had large land holding.

Study findings showed that among respondents who owned 1-2.5 acres 96.7% allocated horticulture farming less than one acre; among those who owned 2.6-5 acres 80.1% allocated horticulture farming less than one acre while 19.2% allocated between 1-2 acres to horticulture; among those who owned 5.1-7.5 acres 70.6% allocated horticulture farming less than one acre while 26.5% allocated between 1-2 acres to horticulture; among those who owned 7.6-10 acres 63.9% allocated horticulture farming less than one acre while 27.8% allocated horticulture between 1-2 acres; while for those who had more than ten acres 81.4% allocated horticulture less than one acre while 11.9% allocated between1-2 acres. Feder et al (1982) and FAO, (2014) support the above finding that the "intensity" of adoption (e.g., proportion of area allocated to new variety, quantity of fertilizer per. acre) may be higher on smaller farms, under certain conditions, while in other cases the opposite is observed. Farm size can therefore have different effects on the rate of adoption of innovations depending on the characteristics of the technology and institutional setting. More specifically, the relationship of farm size to adoption of innovations depends on such factors as characteristics of the innovation being adopted where characteristics imply its compatibility, relative advantage, complexity and affordability. Other factors include; fixed adoption costs, risk preferences, human capital/skills required, credit constraints, labor requirements, tenure arrangements, (Feder et al., 1982).

Study findings allude to the popularity of the government sponsored/funded extension services provided by employees serving under the ministry of agriculture. This was confirmed upon visit to the divisional agriculture office (now sub-county office), there were other additional staff/employees who had been brought in under the devolved government system as ward extension officers. Despite such concerted efforts on the part of the central and now county government to provide extension services respondents did not have a widely accessible extension service given that almost half (44%) of the respondents reported not to have access to the extension services. This can be attributed to the high client:extension staff ratio that hinders farmers' ease of accessing the extension staff as a result of the high demand. This is compounded with by government's orientation towards client centered approach to extension (FAO, 2014) where it is the farmer that is expected to seek the services/trigger the need for the service to be provided.

The above findings run contrary with that of other studies that smaller farms are less likely to engage with agricultural extension agents than are larger ones. In a study by FAO (2014), findings showed that, the share of farms obtaining extension information generally increases with farm size, and the smallest farms are always the least likely to have access to such information (FAO, 2014). There are also differences between men and women farmers in access to extensions services, contacts with extension agents and, the access to community meetings or meetings held by extension agents. According to findings from ActionAid's fieldwork in West Pokot, Greater Trans Nzoia and Greater Kakamega districts, findings showed that only 5 per cent of women farmers receive extension services, less than 2 per cent have access to credit and 14 per cent benefit from the government's input subsidy programme (ActionAid, 2013). Although the number of female farmers accessing the extension services is lower than the male their proportion is higher than as reported in the ActionAid (2013) study.

Extension agents often engage men farmers more than women, partly because social norms restrict women's contacts with men extension agents. Time constraints and lower levels of education also prevent women from participating in certain types of extension activities unless these are specifically oriented to women. According to Ragasa, (2012) in many cases, social and cultural barriers and greater time burdens are major constraints affecting women in acquiring information, education and training. More restrained opportunities for participation and leadership in groups and organizations also limit women's ability to use these platforms and avenues for consultations and information. Reduced delivery of extension services to women also largely reflects the lack of appropriate policies such as gender-sensitive staffing policies in extension services (Ragasa *et al.*, 2014).

Agricultural extension services play an important role in the diffusion of innovations and therefore should not only diffuse new messages and technologies but should remain

actively involved in aiding the adoption process (Holt and Schoorl, 1985). This is because extension services are important for training new participants (innovation–adoption). Furthermore extension services serve as the technical backstop for the initial trial-and-error period when adopting an innovation, in assuring the quality such as of seed and inputs, and reassuring farmers during the retirement of old techniques (obsolescence) with newer innovations or techniques. Extension services therefore play a very important role among the recipients. First farmers are able to access knowledge and skills which they do not have. This new information enables the farmer to learn new skills, for example technical skills of how to use a new technology or farm management skills for keeping records. Through extension farmers also get technical advice and information that helps them to make informed choices/decisions. Such information includes credit sources and requirements, existence of markets and the prevailing prices among other information that enables them to sustain and improve their enterprises. Thirdly, because farmers always require organizations through which they can express their interests, and utilize it as an avenue for taking joint action, extension services will assist them to set up, structure and develop such organizations. Extension agents also act to encourage the farmers by infusing motivation and self-confidence that they can change things by guiding and assisting them to take initiative (Luukkainen 2012).

Sulaiman and Hall, (2002) argues that the traditional public agricultural extension approach cannot meet all the varying needs of different and diverse farmers and rural communities. In many countries, reforms of public sector extension services have led to the emergence of mixed advisory systems in which services are provided by a broader range of actors, including the private sector and civil society (Sulaiman and Hall, 2002). Some governments are continuing to finance extension while contracting private firms, NGOs and farmers' organizations to provide services (Rivera and Zijp, 2002). Joint ventures between governments and the private sector have also been created in the provision of extension services. These varied formulae increase the choice of services available to farmers and are thought to strengthen incentives for improved performance (Kjaer and Joughin, 2012). Advisory services may also be provided by entrepreneurs selling inputs and equipment to farmers or retailers, or by the buyers of farmers' produce. In these cases, extension is often not a stand-alone activity but is provided to complement more tangible commercial services.

Beets, (1990) alludes to the centrality of extension services in the adoption of new innovation by suggesting that agricultural technologies can largely be disseminated through a good agricultural extension services system which is sadly lacking in most countries. More effective disseminations are reported here to require better coordination between different agencies particularly the national ministries of agriculture, development planners and rural development. Thus, it can be concluded that there is no single best method for providing extension advice that responds to different needs, purposes and targets. The right approach depends on the specific policy and infrastructure environment, the capacity of potential service providers, the farming systems used, the extent of market access, and the characteristics of local communities, including their willingness and ability to cooperate. Different situations will require different approaches, but to succeed, extension has to adopt a flexible approach (FAO, 2014).

V. CONCLUSION AND RECOMMENDATIONS

The study found out that majority of the respondents were male and that the respondents' gender and size of land owned significantly influenced adoption of horticulture farming. Respondents' age, marital status, level of education and income control did not yield any significance in reference to their influence on adoption of horticulture farming. Majority of the respondents who had access to extension services; majority were aged 20-50 years with their distribution being even across the age groups and had attained secondary and middle level college education. The size of land holding was also found to vary among those who had accessed extension services with the majority having between 1-5 acres. Availability of extension services, the frequency of visits to farmers by extension officers and catering for the cost of extension services were fond to influence respondents' decision to adopt horticulture farming. The study concludes that, although the level of optimism that was expressed by the respondents coupled with other factors such as land size, level of education, high acceptability of horticultural crops and the youthful population that is ready to adopt, there is need for the various institutions charged with the promotion of horticulture farming to put in place the necessary structures and ensure a supportive environment that takes into consideration the varied needs of the respondents.

The study recommends that various stakeholder should put in place strategies that help accelerate wider adoption of available improved technologies and innovations in the area. In addition, stakeholders should in jointly promote technologies with wide ranging utilization and options so as to enhance increased uptake of the same among resource-poor farmers. There is also need to sensitize farmers on the benefits of engaging in the production of high value crops. The government also needs to come up with extension programmes that would provide information and train farmers on the trends that are taking shape on farming in the region and globally. Given study has shown that availability, ease of access and cost constraints limit farmers from accessing extension services these factors should be considered keenly during planning by the various stakeholders concerned. Furthermore, agricultural promotions need to be targeted well among potential adopters considering that study has revealed the nature of farmers that are well placed to adopt innovations.

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