

**SOCIO-CULTURAL AND INSTITUTIONAL DETERMINANTS IN THE UPTAKE OF
HORTICULTURE FARMING IN ALDAI DIVISION, NANDI COUNTY, KENYA**

**BY
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**A THESIS SUBMITTED IN FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF DOCTOR OF PHILOSOPHY IN SOCIOLOGY**

DEPARTMENT OF SOCIOLOGY AND ANTHROPOLOGY

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DECLARATION

This thesis is my own original work and has not been presented to any other University for award of a degree.

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DEDICATION

This thesis is dedicated to my mother, the matriarch of the Korir family and, all its members who acted as a steadfast source of hope and inspiration and who stood with us both financially and emotionally when the going got tougher at one point. “*Matakoek-son boisionik che kiiyai*” (your efforts and sacrifices were not in vain).

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ABSTRACT

Horticultural farming has been identified as the key to eradicating poverty and addressing food insecurity in many African countries including Kenya. However, its growth has not been as envisaged despite favorable climatic conditions, targeted policy and program implementations through several innovations. Uptake of horticultural farming by small-scale farmers supplying the domestic market continues to lag behind despite several interventions to improve production. Studies have focused on technical aspects of adoption among export farmers with little attention given to innovation mechanisms to improve production among small-scale farmers. This study therefore investigated how prevailing socio-demographic, cultural and institutional factors influence adoption of horticultural farming among small-scale farmers in Aldai division, Nandi County. The study was based on Diffusion of Innovations theory by Everett Rogers (1995) and human agency theory by Long Norman (2001). Diffusion of innovations theory argues that a complex series of influences namely; individual attributes, attributes of the social system and perceived attributes of the innovation influence individuals' adoption decisions. Human agency theory holds that different social formations develop under the same structural circumstances and emergent deferring social formations reflect variations in ways in which actors attempt to adapt to the situations they face. The study utilized an ex-post-facto survey research design where a sample of 400 household heads was selected from a base population of 5004 households using systematic random sampling technique. Data was collected from household heads using a semi-structured questionnaire. Expert opinions were sought through Key Informant Interviews while respondents' consensual opinions were sought through Focus Group Discussions (FGDs). Data was analyzed descriptively using percentages, frequencies, Pearsons product moment correlation, logistic regression technique and through content analysis and presented in tabular and textual form. Findings showed that females, youthful respondents and those with more respondents had adopted horticulture farming. Income from horticulture farming was controlled more by females than men and adoption of horticulture farming was positively associated with access to inputs, access to credit, group membership, availability of extension services and government interventions. However, marital status and education level indicated no relationship. Horticulture farming was prevalent among respondents owning less than two acres of land with crops namely kales (*Brassica oleracea* var *acephala*), cabbages (*Brassica oleracea* var *capitata*), managu (*Solanum spp*), saka (*Gynandropsis spp*), mitoo (*Crotalaria spp*), kunde (*Phaseolus spp*) and bananas (*Musa spp*) having been adopted extensively. The findings illustrate existence of favorable social, cultural and institutional environment supportive of enhanced adoption of horticulture farming. The study therefore recommends for enhanced consideration of prevailing social and cultural factors during innovation development and enhancement of approaches utilized in provision of inputs, credit and extension services for wider accessibility among targeted adopters.

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LIST OF ABBREVIATIONS AND ACRONYMS

AVRDC	World Vegetable Center
ACP	African, Caribbean and Pacific
AFC	Agricultural Finance Cooperation
ASDS	Agricultural Sector Development Strategy
ASFG	African Smallholder Farmers Group
CAADP	Comprehensive Africa Agriculture Development Program
CBK	Central Bank of Kenya
CBO	Community Based Organization
DAP	Double Ammonium Phosphate
DFID	Department for International Development (of the United Kingdom)
EAC	East Africa Community
EU	European Union
ERP	Economic Recovery Programme (Ghana)
ERS-WEC	Economic Recovery Strategy for Wealth and Employment Creation
FAO	Food and Agriculture Organization
FBO	Faith Based Organization
FGD	Focus Group Discussion
FPEAK	Fresh Produce Exporters Association of Kenya
FAP	Farm Action Plan
FSD	Financial Sector Deepening
GAP	Good Agricultural Practices
GMO	Genetically Modified Organisms
GoK	Government of Kenya
HCA	Horticulture Council of Africa
HCDA	Horticultural Crops Development Authority
HCU	Horticultural Co-operative Union
HDC	Horticultural Development Council
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
ICT	Information Communication Technology

IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IRRI	International Rice Research Institute
ISAAA	International Service for Acquisition of Agri-biotech Applications JOYWO Joyful Women Organization
KFA	Kenya Farmers Association
KALRO	Kenya Agriculture and Livestock Research Organization
KAPP	Kenya Agricultural Productivity Programme
KARI	Kenya Agricultural Research Institute
KENFAP	Kenya National Federation of Agricultural Producers
KEPHIS	Kenya Plant Health Inspectorate Services
KFC	Kenya Flower Council
KMDP	Kenya Maize Development Program
KNBS	Kenya National Bureau of Statistics
LH	Lower Highlands
MCP	Millennium Challenge Programme (Ghana)
MDG	Millennium Development Goal
MoA	Ministry of Agriculture
MoFA	Ministry of Food and Agriculture (Ghana)
MoTI	Ministry of Trade and Industry (Ghana)
MUERC	Maseno University Ethics Review Committee
NAAIP	National Accelerated Agriculture Input Program
NAAIAP	National Accelerated Agricultural Inputs Access Programme
NCPB	National Cereals and Produce Board
NALEP	National Agricultural and Livestock Extension Programme
NARP	National Agricultural Research Project (Ghana)
NMK	Njaa Marufuku Kenya program
NASEP	National Agricultural Sector Extension Policy
NESC	National Economic and Social Council of Kenya
NGO	Non-Governmental Organization
NHRC	National Horticultural Research Centre

NHTF	National Horticulture Task Force
OCB	<i>l'Organisation Camerounaise de la banana</i>
P4P	Purchase for Progress
R4D	Research for Development
SACCO	Savings and credit cooperative
SHDP	Smallholder Horticulture Development Project
SHoMAP	Small Holder Marketing Program
SILC	Savings and Internal Lending Communities
SPSS	Statistical Package for Social Sciences
SRA	Strategy to Revitalize Agriculture
SSA	Sub-Saharan African
UH	Upper Highlands
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
US	United States
USAID	United States Agency for International Development
WFP	World Food Programme
WHO	World Health Organization

DEFINITION OF TERMS

Horticulture - The practice of cultivating, processing and trading in vegetables and fruits. In this study it is limited to the specific crops (kales, cabbages, traditional vegetables tomatoes and bananas) that were promoted for adoption by farmers and the related improved production systems that were targeted for adoption.

Innovation - Any technical product, scientific knowledge, application method, or practice that is perceived as new by an individual and which is aimed at facilitating problem solving among potential adopters. In this study, the transition of horticulture farming from the usual subsistence basis to promotion as a cash crop and adoption of accompanying improved varieties, production approaches and systems is perceived as innovations in this study.

Adoption/Uptake - The decision by an individual to undertake full or continued engagement in horticulture farming as an income generating enterprise after a careful consideration of related technical, economic and social factors. Thus it is the degree to which a ‘new technology’ (innovation) is used in the long run equilibrium when farmers have complete information about the technology and its suitability and potential

Diffusion - The process by which information and knowledge of horticulture farming is spread throughout a social system/population such as by learning or imitation.

Kilimo biashara – Kenya government input subsidy program that provides affordable agricultural financing to farmers who may lack equity capital by linking them with financiers who offer loans at low interest rate of 12 percent.

Kilimo plus – Kenya government input subsidy program that targets locally identified poor and vulnerable households and provide them with one time input grants of fertilizer and seeds enough to sow one acre of land (0.4 ha). Beneficiaries are expected to plough back proceeds from the harvests to purchase inputs for the next planting season and to purchase inputs in future.

Uwezo fund - Kenya government input subsidy program that provides affordable loans to farmers in groups. It is a flagship programme for Vision 2030 aimed at enabling women, youth and persons with disability access finances to promote businesses and enterprise.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

There is no region of the world that has developed a diverse, modern economy without first establishing a successful foundation in agriculture (AGRA, 2017). Agriculture thus forms the starting point of rural transformation, the main economic base for small-scale farmers in Africa (IFAD, 2002) and the bedrock for effective development (World Bank, 2007). However, farmers in many African countries continue to wallow in poverty (Blein, Bwalya, Chimatiro, Faivre-Dupaigre, Kisira, Leturgue, Wambo-Yamdjeu, 2013). To realize growth, there is a need to harness science, technology and innovation to improve agricultural production, especially among smallholders (IFAD, 2013). The World Bank supports this approach by urging rich countries to stop spending \$1 billion a day on subsidies, but rather accelerate transfer of new technologies, innovations and more technological aid, particularly to Sub-Saharan Africa (Hafkin and Hambly, 2002).

Globally, horticultural production has grown intensively especially on a per capita basis, which has increased 60 percent over the last 20 years. Horticultural crops cover 1.1 percent of the world's total agricultural area, with Europe and Central Asia contributing 12 percent of the total global area, and 14 percent of global production. The total European production value of fruit and vegetables is estimated to be more than 50 billion Euros (Fruit logistica, 2018). This has been attributed in part to Europe's climate that is hugely varied, thus enabling production of a wide range of crops on a large scale, with the notable exception of tropical fruits. In Africa, horticultural farming plays a vital role as source of food, creating employment and earning income and as a result has been considered as a bright spot in many African countries (AVRDC, 2004). Whereas prior to the mid-1990s, horticultural production was significant in South Africa, Zimbabwe and Kenya, today the list has expanded to include Ghana, Ivory Coast, Uganda, Ethiopia, Egypt, Nigeria and Zambia (Kurt, Ronald, and Florian (eds), 2009). Currently, Nigeria is the largest producer of fresh fruits in Sub-Saharan Africa, accounting for 22% of the region's total production followed by Republic of South Africa with 18% and Kenya at 12% (Yabs and Awuor, 2016). These countries have tried out different approaches that have emerged with

different levels of success due to factors such as low uptake of innovations (Weinberger & Lumpkin, 2005); lack of market for produce (IFAD, 2013); changing weather patterns, declining soil fertility, population growth and low uptake of external inputs (Pretty, Toulmin & Williams, 2011).

In Kenya, horticulture production dates back to the early days of 20th Century when private entrepreneurs began to venture into large-scale commercial production, exporting passion fruit juice, temperate horticultural crops and Asian vegetables (Minot and Ngigi, 2003). The Kenyan horticulture industry has grown over time and currently contributes 33% of the agricultural GDP. The main horticultural crops are vegetables accounting for 44.6% of the total value of produce; flowers contribute 20.3%, fruits account for 29.6%, while nuts and medicinal and aromatic plants (MAPS) contribute 5.8% (Agriculture and Food Authority (AFA), 2017). Horticultural farming has therefore been rated as the fastest growing sub-sector in the country and ranks 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). However, it is worth noting that most of this production is concentrated in the central parts of Kenya and especially among large scale well established export-oriented farms with small-scale farmers who supply the local market being at the periphery.

Horticultural production in Kenya is both for local and international markets with large-scale growers dominating commercial export horticulture, while the majority of horticultural growers (about 80%) are small-scale farmers mainly producing for the domestic market. About 95% of horticultural products go to the domestic market and 5% to the export market. The value of domestic horticulture in 2015 was Ksh 211 Billion (2.1 Billion USD) with a total area under production of 719,158Ha (Mitullah, Kamau, and Kivuva, 2016). The total value of horticultural exports in the same year amounted to Ksh. 76.8 Billion with a total production quantity of 205,800 Tons (KNBS, 2016). The value of exports of fresh horticultural produce increased from US\$816 million in 2014 to US\$877 million in 2015. This was attributed to better unit prices for vegetables and higher volumes of fruits exported. The value of vegetables exported increased by 11.2 per cent from US\$182 million in 2014 to US\$203 million in 2015. The Kenya National

Bureau of Statistics (KNBS) data showed flower exports contributed US\$523 million, or 69% of the earnings, with the rest 31% coming from the export of fruits and vegetables (KNBS, 2016).

The sector also contributes enormously to food security and household incomes to a majority of Kenyan producers who carry out one form of horticultural production or another while also employing over six million Kenyans both directly and indirectly thus improving on their livelihoods (AFA, 2017). The direct employment results from on-farm employment of both producers and non-producers who work as permanent and temporary workers in farms while indirect employment arise from opportunities created by backward and forward linkage effects (Okello et al, 2014). Horticulture farming therefore offers the best alternative for increased food self-sufficiency, food security, improved nutrition, foreign exchange earnings and ensuring the generation of increased incomes and employment.

The success so far realized in this sub-sector is partly attributable to Kenya's natural advantage for the production of horticultural crops characterized by good climatic conditions all year round (Government of Kenya [GOK], 2009b; Kiriimi, 2008; Tim, Odenda, & Wamalwa, 2009). There has also been a lot of inputs and support in form of policy and program implementation on the part of government and non-governmental organizations' in capacity building of smallholder farmers. Programmatic efforts on the part of the government to revolutionize horticulture farming include formation of Horticultural Crop Development Agency (HCDA), formulation of the National Agriculture and Livestock Extension Programme (NALEP), the Small-Holder Horticulture Marketing Program (SHoMAP) and formulation of the horticulture policy 2010. Horticultural Crop Development Agency (HCDA) is a parastatal established under the 2002 Agriculture Act. HCDA offers vital services to the horticulture sub-sector to facilitate increased production of top quality horticultural produce for the export and local market (African Development Fund, 2007). The National Agriculture and Livestock Extension Programme (NALEP) emphasized a new systems approach to diagnosing problems at farm level with massive efforts to ensure that all farmers in focal areas were equipped with individual Farm Action Plan (FAP). Emphasis was also on the role of extension services as a facilitator, connecting farmers with private sector services rather than managing government handouts.

Focus was on a demand-driven and participatory delivery of extension services in a transparent and accountable manner (Melinda et. al, 2006).

This culminated in the formulation of SHoMAP program initiated on a pilot basis in 2007. It covered a geographical programme area comprising of fourteen horticulture-producing Districts namely: Kisii and Gucha in Nyanza; Bungoma North, Bungoma South, Bungoma West and Bungoma East in Western; Bureti and Nandi South (now Aldai sub-County) in Rift Valley; Embu, Imenti North, Meru Central and Imenti South in Eastern; and Nyandarua North and Nyandarua South in Central. The choice of these districts was on a weighted set of indicators relating to poverty, horticultural production potential, and presence of Kenya Agricultural Productivity Programme (KAPP) a World Bank-funded program and the National Agricultural and Livestock Extension Programme (NALEP) (Ministry of Agriculture, 2008).

Within each of the selected districts where SHoMAP was piloted, focus was on about three horticultural crops selected by stakeholders as having the greatest potential on poverty reduction. Demand driven programme activities that sought to strengthen the natural development of value chains rather than promoting radical alternative forms of structure, organization and trading were developed. The main target beneficiaries of the programme were smallholder farmers and players in the chain of input and produce markets (existing informal groups, input stockists, produce traders and brokers, purchasing agents, market managers and other relevant players). The programme targeted to build capacity of all players within the value chain. It also aimed to strengthen technical skills of all government staff and other service providers (Ministry of Agriculture, 2008).

Efforts were also put to identifying cost effective investments in market infrastructure that would break constraints in domestic horticulture value chain, add value to the produce, increase efficiency and equity with which marketing chains move commodities from farmers to markets and, improve the physical access of rural households to markets. These measures were expected to improve efficiency of agricultural input and produce markets, reduce unit-marketing costs, raise value added between points of harvest and consumers, improve competition and price formation, increase spatial and temporal price arbitrage, and reduce seasonal price instabilities

thereby contributing to effectiveness and efficiency in the domestic produce market (Ministry of Agriculture, 2008). Thus, the SHoMAP program was expected to bring about change in the conduct of horticulture farming within the targeted areas. Thus, the choice of Aldai sub County that was among the focal areas in this project for study was informed by the minimal engagement in other cash crops (tea and coffee farming) by its residents. Furthermore, over time, this area has demonstrated viable potential for enhanced horticulture farming given that residents have been practicing horticulture farming in one form or the other for many years. As a result, the Ministry of Agriculture with support from technoserve put in a lot of effort to increase the quantity and improve the quality of horticultural production by small-scale horticulture producing households (Ministry of Agriculture, 2010).

There has also been the formulation of the horticulture policy 2010 that analyzes the various industry concerns and highlights challenges faced. It offers policy interventions for production, support services (financing, 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 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 harmonization of horticulture standards for the East African Community (EAC), Horticulture Council of Africa (HCA), and in sharing of information and experiences on high value agriculture (Omondi, 2006). The private sector has also made tremendous contribution in this process through various initiatives. An example is Technoserve, an NGO that has been championing adoption of passion fruit farming by training horticulture farmers on good husbandry practices and providing them with passion fruit seedlings.

Despite the multiplicity of efforts to revolutionize horticulture farming in Kenya as enumerated above, a survey by Kenya Horticulture Competiveness Project indicated that production of horticultural crops remains largely unexploited due to low adoption of new horticultural knowledge, applications methods and practices in the country (Ministry of Agriculture, 2010). As a result, the yields and quality of horticultural crops especially by smallholder farmers are below the expected potential despite substantial potential for improvement through expansion of

irrigated horticulture and intensification of production (African Development Fund, 2007). However, there is no adequate information to explain the low uptake of innovations aimed to enhance the wellbeing of small-scale horticultural farmers. Thus, there is need to assess factors that hinder adoption of horticultural farming innovations by small-scale farmers in order to strengthen and improve the performance of the horticultural sub-sector thus enabling the above mentioned benefits accrue in the overall economy.

Drawing on the discussion above, it is hypothesized that factors influencing decision to adopt horticultural farming innovations are usually manifold and intertwined namely; social and economic importances attached to the competing farming activities, resource constraints, personal as well as environmental factors. This is because, uptake of horticultural farming does not occur in isolation, as it is part of a complex farming system. Therefore, there is need to understand the various factors that influence innovation adoption decisions among individual farmers if the rate of uptake of horticultural innovations (scientific knowledge, application methods and practices) is to be speeded up. Pannell et. al, (2006) supports this argument by arguing that, uptake of agricultural innovations depends on a range of personal, social, cultural, economic and institutional factors, as well as characteristics of the innovation itself. However, no study has examined the social, cultural and institutional factors that influence uptake of horticultural farming innovations in Nandi County. The only study that has been conducted among horticulture farmers in Nandi County is one by Biwott and Tuwei (2016) on Determinants of Small-scale Horticulture Farmers' Decision to join Farmer-based Organizations. This study found out that the level of horticultural FBO membership in Nandi County is very low at 23.27%. Their findings further showed education level, marital status, gender and size of farm under horticultural cultivation were significant determinants of small-scale horticultural farmer's decision to join farmer-based organizations (Biwott and Tuwei, 2016).

Many studies have been conducted on the Kenyan horticulture industry. Kang'ethe, (2005) highlights the strategic interventions contributed by public actors, collective actions, institutions and private actors as key change agents in Kenya's horticultural industry. Ogada et. al. (2014) analyzed the technical efficiency of the country's smallholder food crop farmers and established how it correlates with environmental factors. Nzomoi et. al., (2007) investigated determinants of

technology adoption in the production of horticultural export produce. Kirimi, (2008) looks at factors driving commercialization by rural households in Kenya. Kangai & Mburu, (2012) assessed how youth farmers have embraced the opportunities that facilitate GlobalGAP compliance and the challenges encountered in the process of acquiring GlobalGAP certification.

The focus of the above studies has been more general for the whole country with a bias on the technical aspects of adoption more so in production for export. These studies do not therefore provide context specific information on social, cultural and institutional factors at play in various regions of Kenya although; these regions might have varying potentials for adoption of horticultural innovations (scientific knowledge, application methods and practices) that are yet to be clearly documented. Currently, there is scanty information on social, cultural and institutional literature explaining the extent of uptake of horticultural farming innovations in Aldai sub County, Nandi County.

Kang'ethe, (2006) observes that farm-level uptake of innovation is hampered by poorly understood social, cultural and institutional constraints. Kalliny and Hausman (2007) support this argument by observing that not much research has analyzed effects of socio-cultural factors on horticultural innovation (scientific knowledge, application methods and practices) acceptance. However, various studies have tried to address these issues though in different contexts. Baide (2005) argues that farming subculture (social infrastructure) or farming style such as meeting expectations of sub-cultural norms is a fundamental part of social behaviour that influences uptake of innovations. The study notes that there are norms in farming subcultures about acceptable agricultural practices and, ideas that are different from those held are unlikely to be embraced thereby making subcultures a powerful force in resisting change. Drawing from this line of argument, within the research area, respondents reserve portions of their lands for culturally valued practices such as keeping livestock and farming maize for household consumption. There is also culturally informed clear-cut division of roles between men and women and among young and old members of households. These factors need to be analyzed in order to establish whether they influence adoption of horticultural scientific knowledge, application methods and practices within the research area.

Furthermore, some socio-demographic characteristics of adopters have been found to impede uptake of horticultural scientific knowledge, application methods and practices. According to Baide (2005), age, farming experience, education and training received, socio-economic status, aspirations, economic motivation and innovativeness are some of the socio-demographic characteristics that act as barriers to the uptake of innovation. Furthermore, the lack of engagement of key actors mainly women and men in priority-setting and innovation processes are some of the reasons for their limited adoption of innovations. Such cultural underpinnings constrain potential adopters in their consideration of the social acceptability, and cultural appropriateness of innovations availed to them (Meinzen-Dick et al, 2010). This shows that unless appropriate physical, economic, socio-cultural and institutional infrastructure is in place, farmers may be unable to adopt horticultural innovations. This study therefore seeks to ascertain whether the framework within which horticultural farming innovations are being promoted on within the research area is compatible with the prevailing socio-demographic and cultural environment.

Research has also shown that membership in farmer groups in their varied forms influence uptake of innovations by acting as channels of information and thus avenues for learning and as a source of informal finance including credit and insurance. A farmers' position in groups also determines how they access information and best ways of applying new and improved technology and complementary resources such as credit, land and subsidized inputs that are important in innovation adoption processes (Mario, Hartwich, & Halgin, 2008). Moreover, farmer groups play a salient role because farmers observe and learn from others in their networks about suitability and profitability of innovations or methods (Hogset, 2005).

Land size has also been found to play a key role in adoption of agricultural innovations (Nzomoi et. al., 2007). However, land in Kenya has been extensively subdivided resulting in small farm sizes that make it difficult for the undertaking of various competing agricultural activities (Jayne & Muyanga, 2012). This is because continued land subdivision to uneconomical sizes; especially subdivision to less than an acre has been reported to make such small farms no longer economically viable (USAID, 2009). Kenya National Bureau of Statistics findings indicate that Aldai sub-County has a population density of 37 households per square kilometer which

translates to an average land holding of 2 acres per household (KNBS, 2010). Thus, farmers are continuously driven by increasing land scarcity, new technological possibilities and changing prices to adapt their agricultural practices to rapidly changing ecological, economic or social circumstances. There is a need therefore to assess how such small farm sizes influence uptake of horticultural farming innovations.

Access to agricultural inputs has also been identified as a key factor in adoption of innovations. As a result, the Kenyan government has initiated various programmes aimed at improving smallholder farmers' access to inputs, as a strategy for transforming smallholder engagement in farming from subsistence to commercial farming (Ministry of Agriculture, 2010). These programmes include national accelerated agriculture input access programme (NAAIAP), NALEP and Njaa Marufuku Kenya program (NMK). The primary objective of these programs is to improve technology adoption, specifically farm inputs (fertilizer and seeds) access and affordability for smallholder farmers in order to enhance food sufficiency at household level and generate incomes from sale of surplus produce (FAO, 2014). There is need to assess whether farmers within the research area had benefited from these programmes. This study sought to ascertain respondents' access to inputs and its influence on adoption of horticultural farming innovations.

Access to financial and input credit also plays a key role in adoption of innovations. Nzomoi et. al, (2007) found a positive relationship between access to credit and decision to adopt export oriented horticultural farming in Kenya. In their findings only 17.3 percent of respondents relied on bank loans with majority identifying financial incapacitation as the major constraint in their operations. African Development Fund (2007) echoes this by arguing that credit for farming remains the most dominant need with an increasing demand but less than 60% of this demand is unmet because of the low development of the agricultural finance market. These studies identify access to working capital as the major problem faced by farmers in their quest to adopt improved farming innovations. This is because, in the production chain, various processes require usage of funds and thus financially stable farmers tend to realize higher outputs than the less financially endowed ones.

Farmers' access to extension services is also another important determinant of the uptake of innovations and agricultural productivity performance. However, studies have shown that there is limited access to extension services in most parts of the country (Muyanga & Jayne, 2006). There have also been reported apparent gaps between what farmers need and what they receive. For example, they receive information on new varieties, planting methods or new crops, but important basic information on markets, how to gain more income and knowledge are normally lacking. Such information is also presented in isolated bits through the usual top-down approach instead of a comprehensive package accompanied by a lot of explanation (Murej et. al., 2013). There is a need therefore to assess whether such shortcomings in access to information brought about by institutional factors such as market conditions and government policies occur in Aldai sub County, Nandi County and how they ultimately influence adoption of horticultural farming innovations within the research area.

Thus, failure to analyze context specific socio-demographic, cultural and institutional factors threatens to negate the continued hope on adoption of improved agricultural practices and technologies as an important route to enhanced production, improved food security, nutrition, and poverty reduction in rural areas where farming is the main source of income. It is therefore important to understand the main mechanisms that drive or impede adoption of horticultural farming innovations within the research area in order to get a clear picture of factors that are key to successful uptake of innovations. A clearer understanding of factors that make an innovation likely to be adopted, or a farmer more likely to be an adopter, will therefore guide future targeted adoption processes (Bandeira & Rasul, 2006). Once aspects that hasten and factors that slow innovation adoption processes have been clearly understood, it will facilitate defining and thus mapping of environments where adoption is likely to occur more quickly.

1.2 Statement of the Problem

The Kenyan government has initiated many efforts (budgetary support to agriculture, marketing efforts), tried out many approaches (NALEP, SHoMaP) and formulated policies (horticulture policy 2010) that were aimed at transforming horticulture farming from a subsistence venture into a thriving and profitable enterprise. Despite the government's efforts and well-intended policies that were aimed at encouraging farmers to diversify into horticulture farming, there has been little

achievement in progression of horticulture farming from subsistence orientation to attaining market-oriented higher productivity. In addition, information on factors influencing adoption of improved horticultural crop varieties and practices by farmers within the research area is not readily available, yet these are the main determinants of productivity.

Though many studies have been conducted on this sub-sector, emphasis has been at the country level more so, the technical aspects of horticultural farming among farmers engaged in production for export. Not much research has been done to study farmers' engaged in production for the local market to ascertain how prevailing socio-demographic, cultural and institutional factors influence their decision to adoption horticulture farming. This is despite the understanding that farmers may be aware of several context specific constraints to adoption of innovations that may be at variance with what researchers perceive. This study therefore intends to examine how prevailing socio-demographic, cultural and institutional conditions affect acceptance and uptake of horticultural scientific knowledge, application methods and practices among households in Aldai sub County, Nandi County.

1.3 Research Questions

The general question for the study was how does the prevailing socio-cultural and institutional conditions influence uptake of horticulture farming in Aldai sub County, Nandi County. The specific research questions were:

- i) How do the prevailing socio-demographic factors influence uptake of horticultural farming innovations in Aldai sub County
- ii) How do the prevailing cultural factors influence uptake of horticultural farming innovations by farmers in the research area?
- iii) How have institutional factors influenced uptake of horticultural farming innovations in Aldai sub County?

1.4 Objectives of the Study

The main objective of this study was to find out the socio-cultural and institutional determinants in the uptake of horticulture farming in Aldai sub County, Nandi County. The specific study objectives were to:

- i) Investigate the socio-demographic determinants in the uptake of horticultural farming innovations in Aldai sub County.
- ii) Discuss the cultural determinants influencing uptake of horticultural farming innovations in the research area.
- iii) Investigate the influence of institutional factors on uptake of horticultural farming innovations in Aldai sub County.

1.5 Significance of the Study

The findings from this study revealed useful information that will guide horticulture stakeholders and farmers to enhance adoption of horticultural farming innovations in Nandi County. The study contributes information on uptake of horticultural farming innovations in the research area by shedding light on socio-demographic, cultural and institutional factors influencing adoption. In so doing, the study informs the process of community development by highlighting the context-specific factors within Aldai sub-County that influence uptake of innovations and unearth other related socio-demographic, cultural and institutional considerations. Furthermore, the study outcomes will guide formulation of policies and development of programs relating to horticultural crop promotion by the Ministry of Agriculture, Research institutions, policy makers and planners and other institutions in Kenya and other similar settings in developing countries. Study outcomes will also inform efforts towards realization of the vision 2030, sustainable development goals and the big four agenda by the government.

1.6 Scope and limitations of the Study

This study was confined to Aldai sub-County, Nandi County where Kemeloi and Ndurio locations were chosen for study. The choice of this area was informed by the minimal engagement in other cash crops (tea and coffee farming) by its residents, thus, they still had a lot of potential for adoption of any other new enterprise, which is yet to be realized. Furthermore, this area is also representativeness of the entire County because it cuts across both densely and sparsely populated areas.

The study targeted all horticulture farmers in the research area and engaged respondents from across all age brackets while considering gender. Focus was on influence of farmers' socio-

cultural and institutional factors on their decision to adopt horticultural farming innovations with the aim of ascertaining socio-demographic, cultural and institutional opportunities in the adoption of horticultural farming innovations that are unexploited within the research area.

The limitation of this study is that it covered small-scale horticulture farmers in Aldai sub County, Nandi County and therefore any generalizations made from the findings will be confined to this group of farmers.

1.7 Justification of the Study

This study contributes knowledge that complements the partial views given by previous studies by clarifying the socio-cultural and institutional factors at play in adoption of horticulture farming within the research area. The study contributes context-specific literature on farmers' socio-demographic, cultural and institutional determinants influencing adoption and non-adoption of innovations. Furthermore, it is hoped that the findings of this study will provide necessary information for scaling up agricultural innovation promotion programming in Kenya and other sub-Saharan Africa countries thus, resulting to programs that are responsive to prevailing local conditions that will hasten the pace at which development can be fostered.

1.8 Theoretical Framework

The study was informed by Diffusion of innovations theory developed by Rogers Evret (1995; 2003) and the human agency theory developed by Long Norman (2001). Rogers, (2003) diffusion of innovations theory argues that there are four main elements that influence spread of innovations namely, the innovation itself, communication channels, time and a social system. The human agency theory builds on diffusion of innovations theory argument by elaborating further, how prevailing social, cultural and institutional formations interact with the various attributes of an innovation to bring about the different levels of innovation adoption or acceptance. The two theories complement each other with the diffusion of innovations theory giving a structural description of methods and reasons for rates at which new ideas and innovations spread among individuals or across organizations. The human agency theory illustrates how attributes enumerated by the diffusion of innovations theory interact with different social, cultural and institutional formations to bring about the varied levels of adoption.

1.8.1 Human Agency Theory

Norman Long (2001) developed this actor-oriented approach, which claims that different social formations develop under the same or similar structural circumstances. According to this theory, emergent deferring social formations reflect variations in ways in which actors attempt to adopt, (cognitively, emotionally and organizationally), to the situations they face. Long (2001), in his notion of agency attributes to the individual (actor) the capacity to process social experiences and to devise ways of coping with life, even under the most extreme forms of coercion. This is because social actors are construed to possess ‘knowledgeability’ and ‘capability’ through which they attempt to solve problems, learn how to intervene in the flow of social events around them, monitor their own actions by observing how others react to their behaviour and taking note of the various contingent circumstances. In this process, a farmer’s decisions and actions are seen to be influenced by his or her idiosyncratic/personal characteristics such as age, gender, marital status and education. Long (2001), in his theory acknowledges individuals characteristics and their capability for deliberate autonomous action in their decision making while also illustrating how social systems interact with the various attributes of an innovation being propagated to bring about the different levels of adoption or acceptance among individuals.

According to this theory, the ability to make decisions, act accordingly and monitor outcomes are not only limited to individuals but also to capitalist enterprises, state agencies and other organizations that have means of reaching and formulating decisions and of acting. Institutions that farmers interact with, namely credit-providing agencies, agricultural extension service providers and the local political economy that influence provision of basic production and trade-enabling infrastructure (such as roads, irrigation) have the ability to make decisions which in the long run influence the nature of decisions that individuals make in relation to innovation presented to them. These institutions provide an enabling environment for the uptake of improved agricultural practices by lowering transaction costs associated with the search for information on credit, input and output markets and new technologies. Such action is depicted to be embodied in social relations where agencies charged with promotion of innovations are seen to possess certain persuasive powers or forms of charisma through which they influence others or pass on commands. This depicts how the various societal institutions charged with promotion of innovations are anticipated to interact with social systems within which they operate through

utilization of the various human social networks to bring about the various levels of innovation adoption.

Long (2001) further argues that development intervention models (or policy measures and rhetoric) serve as strategic weapons in the hands of those charged with promoting them. Thus, the constitution of social structures has both a constraining and an enabling effect on social behaviour, and this can only be understood within the framework of human agency. Long (2001) sustains this argument saying that an understanding of differential patterns of social behaviour must be grounded in terms of 'knowing feelings' of active subjects, and not merely viewed as being due to the differential impact of broad social forces such as ecological change, demographic pressure, or incorporation into world capitalism. There is a need to identify and characterize the differing actor practices, strategies and rationales, conditions under which they arise, how they interlock, their viability or effectiveness and their wider social ramifications in the adoption of horticultural farming innovations within the research area.

The human agency theory, further argues that reaching of decisions, or social positioning in relation to other actors, entails explicit or implicit use of 'discursive means' in formulation of goals, pursuit of interests and fulfillment of desires, and in presenting arguments or rationalizations for such choices and actions. Such discursive means (i.e. cultural constructions implied, points of view or value perspectives) vary and comprise a part of the differentiated stocks of knowledge and resources available to actors in their different socio-cultural setups.

Every society thus contains within it a repertoire of different lifestyles, cultural forms and rationalities which members fall back to in their search for order and meaning, and which they themselves play (wittingly or unwittingly) a part in affirming or restructuring. The decisions people make or the strategies they employ therefore do not arise haphazardly but are drawn from such stock of available knowledge (verbal and non-verbal) that are shared with other individuals, contemporaries and predecessors. Thus, however restricted the individuals choices may seem, some alternative modes of action and justifications for such choice always exists in every society. It is this acknowledgement of the active role of individuals in adoption and decision-making processes that make them social actors. This recognition of individuals as social actors lacks in

the diffusion of innovations theory. Instead, individuals are portrayed to be acting independently without any basis of reference for their decisions and actions.

Moreover, according to the human agency theory, in every society, attributes such as knowledge, power and prestige are attached differently to the concept of 'person'. Therefore, notions of agency are constructed differently in different cultures. 'Knowledgeability' and 'capability', which are the key elements of this theory, have to be understood culturally if they are to be fully meaningful. This is because, the way individuals interact in different cultural contexts results in the formation of different social structures and social networks that confer differential privileges, and constraints to members and this is bound to affect adoption of innovations differently. Such effects also tend to differ according to the type of policy, program, project or issue being promoted or put under consideration. For example, among the target respondents in the research area, men are accorded a higher status and privileges in access to and use of household resources more than the other members of the family are. Thus is bound to influence how adoption of horticultural farming innovations will vary across households headed by men in relation to those headed by women.

1.8.2 Diffusion of Innovations Theory

Rogers (2003) defines diffusion as 'the process by which an innovation is communicated through certain channels over time among members of a social system' (p. 5). He states that an innovation can be an idea, a practice, or a project perceived as new by an individual or any other unit of adoption. For the purpose of this study, innovation will be limited to scientific knowledge, application methods and horticultural farming practices propagated by the Ministry of Agriculture through SHoMAP towards alleviating poverty through increase in incomes and enhancing food security. This innovation diffuses through the process and or the various approaches utilized in propagating innovations among targeted farmer households.

According to diffusion of innovations theory, the speed at which members of a system adopt innovations can be predicted by five innovation characteristics: relative advantages, compatibility, complexity, trialability, and observability. An innovation's relative advantage refers to the degree to which an innovation is perceived as being better than a competing idea or

the idea it supersedes while compatibility is the degree to which an innovation is perceived to be consistent with existing values, past experiences, and needs of potential adopters. These two attributes promote diffusion and adoption if an innovation is perceived as advantageous and or compatible with existing values. It is therefore necessary to establish whether horticulture farming is advantageous in relation to the crops it intends to replace or against competition from other crops and whether it is compatible with the needs and cultural values of respondents.

Complexity, which is the degree to which an innovation is perceived as relatively difficult to understand and use is depicted in diffusion of innovations theory to be negatively correlated with the rate of adoption or uptake in that excessive complexity of an innovation acts as an obstacle to its adoption. Simpler innovations are more rapidly adopted than innovations that require adopters to seek new skills and understanding. Triability refers to the degree to which an innovation may be experimented with. An innovation that is testable presents less uncertainty to individual considering it for adoption. Observability, which is the degree to which results of an innovation are visible to others increases probability of adoption of innovations. The easier it is for individuals to see results of an innovation, the more likely they are to adopt because such visibility stimulates peer discussion of advantages and disadvantages of such innovations, which informs decision-making. Thus, triability and observability of innovations strengthens people's ability to judge whether innovations have relative advantages over others, its compatibility with existing or previous similar innovations, and whether or not it is sufficiently simple to understand and implement. This study therefore sought to ascertain whether uptake or not of horticulture farming by targeted farmer households have been informed by these parameters and, ultimately predict and account for factors that affect dissemination of innovations in the research area.

The various attributes of innovations (advantages, compatibility, complexity, triability, and observability) interact with the social system to determine prevailing levels of adoption. According to Rogers (2003), a social system is a set of interrelated units that are engaged in joint problem solving to accomplish a common goal. The units may consist of individuals, groups or organizations brought together according to accepted structures and norms with diverse membership who act and react differently. From these sets of different aspirations, distinct

patterns of farming or farming styles emerge. Within the research area, the ministry of agriculture among other stakeholder and partner institutions have been championing adoption of horticultural farming innovations and this study intended to investigate how prevailing socio-cultural and institutional factors interact with their efforts to result in the current level of horticulture farming.

Innovations are propagated through communication channels, which are the means through which knowledge and information about innovations are conveyed. Communication is categorized as either interpersonal or mass media in nature and as originating from a specific or diverse source. The more diverse the source of information is, the faster the rate of adoption. Rogers (2003), notes that social or communication structure of a system can facilitate or impede diffusion of innovations within that system. For purposes of this investigation, the scope of social system was confined to farmers in Aldai sub-County and the interpersonal communication channels utilized to facilitate interaction among target farmers and agencies tasked with promotion of horticulture farming. The current study aimed to find out whether governmental and non-governmental agencies charged with dissemination of innovations are effective in the promotion of adoption of horticultural farming innovations in the research area.

Given that individuals' innovation adoption decisions are neither authoritative nor collective, each member of the social system is depicted by the diffusion of innovations theory to be facing his/her own innovation-decision process that follows a 5-step process. The steps involved include knowledge stage, persuasion stage, decision stage, implementation stage and confirmation stage. During the knowledge stage, awareness of an innovation and some idea of how it functions is created followed by persuasion stage that entails formation of favorable or unfavorable attitude toward the innovation. Decision stage involves engagement in activities that lead to a choice to adopt or reject the innovation while implementation stage entails putting an innovation into use. At confirmation stage, one evaluates the results of an innovation-decision already made and adopts the innovation fully. According to Rogers (2003), the innovation-decision is reached through a cost-benefit analysis where the major obstacle is uncertainty. It is anticipated in this study that targeted farmer households go through the same innovation-decision process guided by the socio-cultural practices and norms within the community level and the

interconnectedness of the various actors in the innovation system (network) at village, regional levels and beyond.

This results in various adopter categories that indicate where a consumer stands in relation to other consumers in terms of the time taken by the consumer in adopting an innovation. The adopter categories are a classification of members of a social system based on innovativeness: the degree to which an individual adopt new ideas faster than other members of a system. The continuum of innovativeness therefore comprise five adopter categories namely; innovators, early adopters, early majority, late majority and laggards. Innovators are the first to try out the innovation, as they are willing to take risks and to cope with uncertainty about innovations. They comprise 2.5 percent and they play a gate-keeping role in the flow of new ideas into a system. The innovators have the ability to understand complex technical information, as they have to cope with a high degree of uncertainty about an innovation at the time of adoption. Early adopters comprise a greater number of opinion leaders, who act as role models for other members of a social system. They make up around 13.5 percent of the total consumer population. Potential adopters look to these early adopters for advice and information about the innovation. They are followed by the early majority do not take the first step to adopt the innovation, but they do accept it. They take time to fully adopt the new idea and they make up 34 percent of the total consumer population. The late majority adopt new ideas just after average member of a system. They are not willing to adopt the innovation but just do so because of necessity and peer pressures. They make up another 34 percent of the total consumer population. Laggards are the last in a social system to adopt the innovation. They tend to be suspicious about the new ideas and thus, must be certain that a new idea will not fail before they can adopt. Resistance to innovations may be rational from their point of view. This category is around 16 percent of the consumer population.

Rogers (1995, p. 281) illustrated that the way groups face an innovation follows a natural curve – a diffusion curve (Figure 2.1)

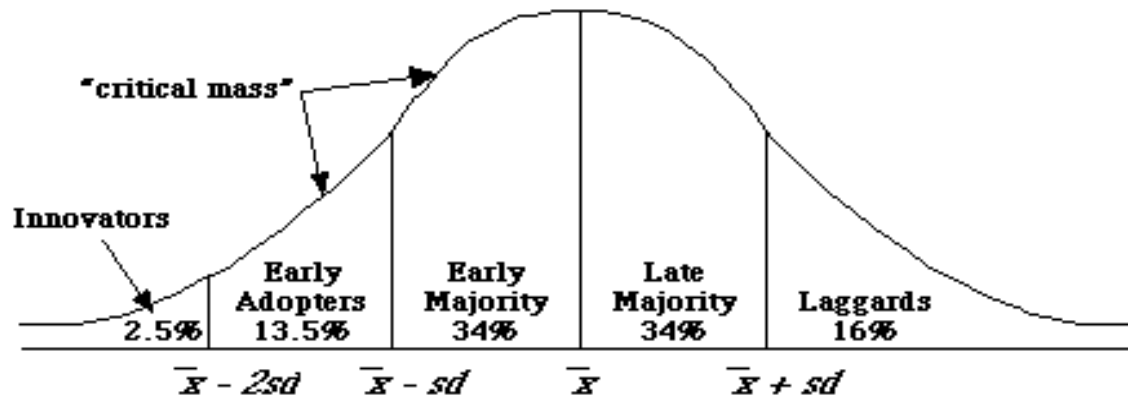


Figure 1.1: The diffusion curve (Rogers, 1995) (Image retrieved October 17, 2018 from http://www.acs.ucalgary.ca/~dmjacobs/phd/rogers_curve.GIF)

1.9 Conceptual Framework

The purpose of the study was to assess the socio-cultural and institutional factors influencing uptake of horticultural farming innovations in Aldai Sub-County, Nandi County, Kenya. Farm households are central in decision making in agricultural innovation adoption with the main objective being to meet their subsistence needs and increase incomes. Socio-demographic and cultural factors therefore play a key role in allocation of household resources in agricultural production activities undertaken by farmers. The outcome of the decision making process of the farm household is reflected in their innovation adoption patterns, farm productivity, incomes and livelihoods (Pender, 2002). Socio-demographic and cultural factors such as age, gender and level of education of household head, farm size, household size and income control while interacting with Institutional factors such as access to inputs, credit, and extension services along with membership in farmer groups were anticipated to influence adoption of horticulture farming. In this study, it was anticipated that adoption of horticultural farming innovations was influenced by the above-mentioned institutional factors that are in turn influenced by farmers' socio-demographic and cultural characteristics.

The decision to adopt horticultural farming innovations is influenced by farmers' socio-demographic and cultural characteristics that influence their perception about the suitability and utility of horticultural farming hence, their adoption behaviour. On the other hand, institutional factors served to modulate individuals' perception of horticulture farming by facilitating of

hindering presence of an environment that favours or discourages adoption. This study categorized farmers as either adopters or non-adopters of horticultural farming. Adoption was quantified using a binary variable, whereby, farmers who had adopted horticulture farming as an income generating investment were grouped as adopters and given a value of 1 while farmers who had not adopted at all and those who planted for household consumption only were grouped as non-adopters and given a value of 0.

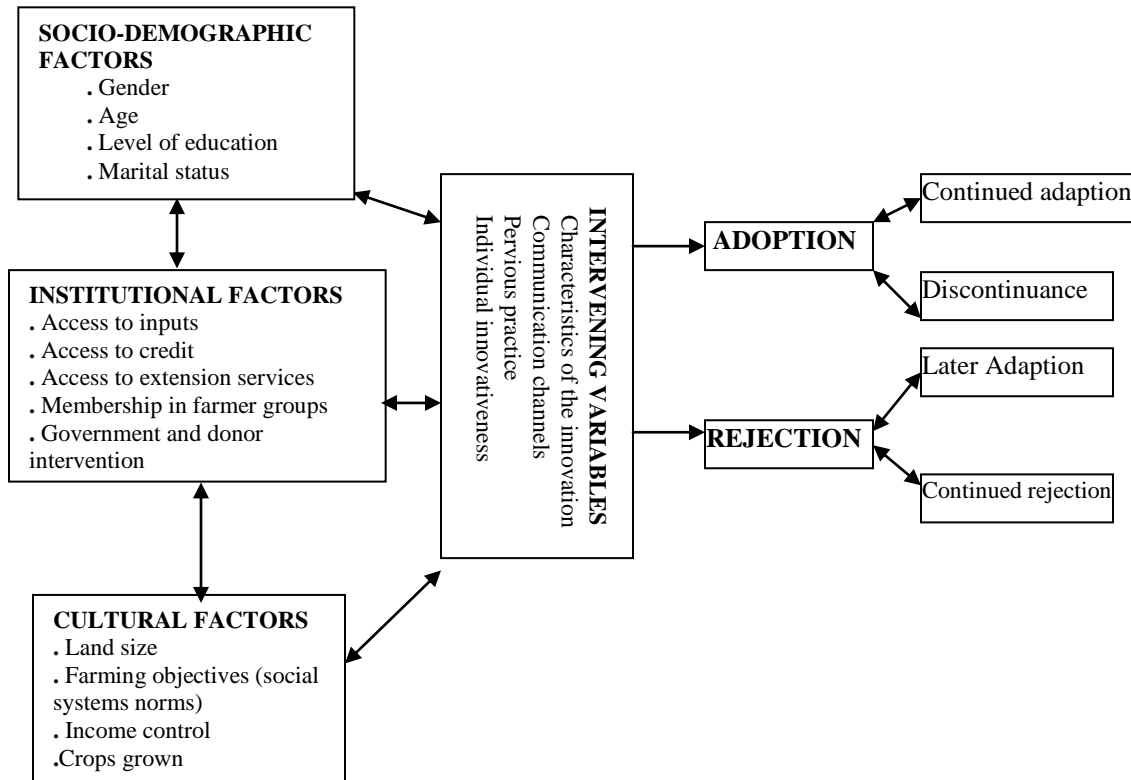


Fig. 1.2: The conceptual framework

CHAPTER TWO

LITERATURE REVIEW

This chapter focuses on studies that examine how socio-demographic, cultural and institutional factors influence uptake of horticultural farming innovations although other agricultural studies relevant to horticulture sub-sector were reviewed. Snowball approach was utilized in identification of other relevant literature from articles reviewed.

2.1 Overview of Horticulture Farming in Kenya

Research and investment in agriculture is essential for economic growth and in meeting United Nations (UN) Sustainable Development Goals (SDGs). Globally, horticulture is the single largest category in agricultural trade, accounting for more than 20 percent of world agricultural exports. During the period 2001-2011, the value of African horticulture exports grew more than six-fold, from US\$1.51 billion (2001) to US\$9.74 billion (2011) while Africa's horticulture exports produced doubled (from 3 to 6 percent) (AFA, 2017). Out of all agricultural sectors, the production of horticultural crops namely fruits, nuts, vegetables, herbs, medicinal plants and ornamentals, presents a promising opportunity for income generation and food production in both developing and emerging economies (AVRDC, 2004).

Africa has been the main producer of horticultural crops due to the favourable production environment characterized by a combination of favourable climatic conditions and the low production costs attributed to cheap labour (AVRDC, 2004). According to Geoff, (2009) the horticulture industry is reported to have developed first in Kenya due to the existence of broadly sound macro-economic policies and the long-history of private sector commercial farming. During the 1990's, the industry expanded rapidly to Zimbabwe, Cameroon and South Africa, where good management and marketing skills were able to compensate for longer transport distances and higher labour costs. The industry later spread, but on a smaller scale to other countries in the region namely Tanzania, Uganda and Zambia (Geoff, 2009). According to Jaeger, (2010) African horticulture industry embraces both large, multinational integrated businesses (West Africa, mainly Ivory Coast and Cameroon and citrus, grapes, apples and pears from South Africa) and smallholders growing less than one hectare (Jaeger, 2010).

In East Africa, the horticulture products first developed potential for a strong industry in Tanzania where a wide range of horticulture products including Asian vegetables, baby corn, baby marrow, beetroots, beans, cabbage, carrots and baby carrots, cauliflower, eggplant, kale, leeks, onions and shallots, okra, peas (mangetout, snap and snow peas), potatoes, spinach and tomatoes could be produced. These horticulture products are among the main export oriented crops mainly from the northern Tanzania zone of Arusha and Kilimanjaro regions, and in many other regions including the Coast, Morogoro, Iringa, Mbeya, Manyara and Tanga (Oswald et al, 2013).

The historical growth of the Kenyan fruit and vegetable sector has not been a smooth, continuous process. Instead, the sector has expanded unsteadily, with numerous changes in the commodity mix, the role of the state, the types of marketing institutions, and the characteristics of the participating farmers. The export horticulture industry in Kenya is traceable back to the coming of colonialists in 1895. In 1901, colonial white settler farmers founded the East African Agricultural and Horticultural Society later known as the Agricultural Society of Kenya (Minot and Ngigi, 2004). Independence necessitated three significant changes to the horticultural sector in Kenya. First, the independence government highly prioritized improvement of conditions for the African majority thereby launching a land reform program where the government purchased most of the land formerly farmed by Europeans (particularly, in the western highlands) and distributed it to tens of thousands of landless smallholders.

This was followed closely in 1967 by creation of Horticultural Crops Development Authority (HCDA) that played a more facilitative role, by coordinating various participants in the industry (Kimenye, 1995). The early independence period was therefore characterized by more active support for incorporation of smallholders in commercial horticulture, formation of HCDA, and increasing investment in horticulture farming including international investment (Minot and Ngigi, 2004). Kenya's horticulture export industry did not only achieve remarkable growth in terms of production, export volume and value, but also fostered the development of organizational structure of the sector. Such organizational structural growth through formation of

various agencies and linkages facilitated systemic sector responses to challenges rather than isolated action of individual players (Geoff, 2009).

Beginning around 1974, Kenyan fruit and vegetable production and exports are reported to have begun to grow more rapidly. The importance of fruit and vegetable exports in overall agricultural exports increased dramatically during this period and reached 14 percent by 1990 (Minot and Ngigi, 2004). This growth was driven by expansion in exports of fresh vegetables brought about by diversification by most farmers into fruit and vegetable farming. This was partly motivated by improved world commodity prices and the fall in coffee and tea prices forcing many farmers to look for alternative income-generating crops. This diversification resulted in enhanced diffusion and adoption of horticulture farming among small-scale farmers who were initially engaged in tea and coffee farming. It is worth noting here that this diversification happened in the central Kenya parts of the country and not within the research area. The growth in tourism is reported to have had an indirect effect on this growth in that the cargo capacity of passenger jets provided a means of airfreighting produce to Europe. On the other hand, the demand for high-quality fruits and vegetables by hotels and restaurants provided outlets for produce that did not meet export standards while giving Kenyan farmers additional experiences in horticultural production (Nyoro, 2002).

The government also went ahead to recognize and affirm the horticulture industry as a key engine of Kenya's economic progress, through formulation of various strategies including the Economic Recovery Strategy for Wealth and Employment Creation (ERS-WEC) and the Strategy for Revitalising Agriculture (2004–2014). The Economic Recovery Strategy for Wealth and Employment Creation (ERS-WEC) presented the roadmap of government's commitment to reviving and revamping agriculture as the engine of economic growth. On the other hand, the Strategy for Revitalising Agriculture (2004–2014) envisaged increased agricultural productivity, including diversification into high value horticultural crops for the market, thereby economically empowering poor farmers, and reducing the number of people suffering from hunger or starvation (Kurt et. al, 2009). The government's emphasis on such agriculture related endeavours is owed to the fact that about 80 percent of the Kenyan population live in the rural areas where

they derive their livelihood largely from agriculture, with about 56 percent of them living below the poverty line (African Development Fund, 2007).

The growth in Kenyan horticultural exports is also linked to the increasing involvement of smallholders in this sector. 3.5 million farming households with landholding sizes of less than 2 ha typically carry out horticulture farming and occupying roughly 60 percent of the 38 million ha under cultivation, which account for 75 percent of total production. Smallholder growers who constitute about 80 percent and produce about 55 percent of the total exports thus dominate the horticulture sub-sector (African Development Bank and Government of Kenya, 2007). Participation by smallholders was also enabled by the need to contract out production to smallholders who would make use of family labour and informal hired labour and in so doing make savings on cost of production (Harris et. al, 2001). Thus, virtually all households engage in horticulture production of some sort; somewhere between 75-80 percent (estimated at 200,000 smallholder farmers with landholdings of less than one hectare) are engaged in the production of horticultural crops, including fruits, vegetables, herbs and spices for sale (USAID, 2011). Essentially, all households produce some amount of horticultural produce regardless of their incomes or land sizes.

Furthermore, the combination of increasing local and global demand for horticultural products, the declining ability of developed countries to meet their own consumption demands, and the relative advantages of land and cheap labour available in developing countries, represents significant opportunity for horticultural growth and economic expansion (AVRDC, 2004). Nevertheless, for majority of small-scale farmer households, the increasing market demand for horticultural produce within Kenya presents a range of opportunities for those living in rural households to improve their incomes (Bawden et. al., 2002). Producer households consume about one third of all output and the majority of the remainder is traded within rural and neighbouring urban areas. This is because fresh vegetables and fruit are significant components of Kenyan diets with fruits and vegetables accounting for around 25 percent of all expenditure on food in urban areas. Irish potatoes, carrots, tomatoes, cabbages and kales are prominent among vegetables domestically marketed. This demand is catered for by more than 12.5 million tonnes of supply of vegetables per annum and over 2.0 million tonnes of fruit (KNBS, 2015).

There is a small, growing amount of sales of higher-quality produce through supermarkets. Currently this accounts for about 5 percent of the total quantity of marketed production (African Development Bank and Government of Kenya, 2007). According to the Kenya National Bureau of Statistics (KNBS), (2015) the total domestic value of horticultural production in Kenya in 2012 amounted to Ksh.119 Billion with a total production quantity of 12.17 Million Tons whereas the total value of horticultural exports in the same year amounted to Ksh. 89.8 Billion with a total production quantity of 205,800 Tons (KNBS, 2015). The domestic market for vegetables and fruit continues to grow and provide potential benefits to income growth among smallholder producers in rural households, small-scale rural traders who provide inputs and services to growers, and for those who provide post-harvest and marketing services and facilities (Bawden et. al, 2002).

In addition, the wide range of climatic conditions due to differences in altitude have made it possible for a wide-range of crops to be grown and for longer growing periods, unlike its competitors such as the Ivory Coast, Zambia and Zimbabwe that are relatively uniform geographically and therefore only grow a smaller range of crops for shorter periods. Despite such natural advantages, other competing horticulture producing countries have gone ahead and innovated conditions under which they produce such crops by growing them under shades, in greenhouses or through irrigation. This shows that production is not necessarily limited by availability of land or prevailing climatic conditions, but by many other factors including access to markets, competitive pressures and overall efficiency of operation (Geoff, 2009).

Drawing from the foregoing evolutionary process, Kenya has unrivalled horticultural production potential which has always been attributed to its strategic geographical location and climatic conditions, the diverse ecological zones that allow for a wide range of horticultural crops to be produced, the existence of a supportive policy environment, effective human capital among other factors. Yet, there has been minimal achievement in exploitation of these opportunities. Yet according to the diffusion of innovations theory, the combination of the above-discussed factors illustrates a favourable and conducive environment for wider embracement of horticulture farming. This study intends to shed light on why the benefits of prevailing favourable

environmental conditions that have been known for a long time to support horticulture farming along with policy and program interventions from the government have not been realized in Aldai sub-County, Nandi County.

2.2 Socio-demographic Factors on Uptake of Innovations

Socio-demographic factors play a great role in successful uptake of innovations and change processes and scholars have recommended that they should be the first to be assessed when uptake of innovations does not take place (Rono and Aboud, 2003; Bawden et. al, 2002). The various socio-demographic factors considered in this study were gender, age, marital status and level of education.

Gender is also a key factor that influences uptake of innovations. Strong relationships between gender and agriculture have been found in African, Caribbean and Pacific (ACP) nations where women are twice as likely to be more involved in agriculture-related activity as men are (Hafkin and Hambly, 2002). For example, in Sub-Saharan Africa, household studies have identified that 90 percent of women are farmers; they perform the bulk of the subsistence production (70 percent) and reproductive work as producers, and this goes beyond farming alone. Women's rural activities in many parts of Africa therefore cut across agricultural production and food processing, food provision, marketing and craftsmanship. In horticulture farming, women produce more than half of total smallholding contributions almost exclusively. This has in turn, created employment opportunities for them in that a majority of them (50 to 91 percent) constitute the horticultural labour (Dolan and Humphrey, 2004).

Observations from United Nations (2008) study conducted on agriculture in East Africa reveal that, despite contribution of women in terms of labour, time and their role in the entire production cycle, there are gender asymmetries and biases. The study indicate that men and women do not take up new technologies at the same rate nor benefit equally from their introduction as women adopt innovations and improved management systems at lower rates (United Nations, 2008). Sulo, Koech, Chumo, and Chepng'eno, (2012) in their study, 'Socio-economic factors affecting the adoption of improved agricultural technologies among women in Marakwet County, Kenya' support this perspective. They argue that women attributed the low

uptake rates of farming technologies to complexities in innovations, lack of access to land, high capital costs, non-conformity with the traditional food value systems and low market rates and profits of produce (Sulo et. al., 2012). The prevailing socio-cultural conditions such as division of labour and access to and use of family resources could be responsible for such outcomes. There is little literature however to demonstrate how these factors manifest as impediments to uptake and diffusion of horticulture farming in the research area.

This line of argument on influence of household head's gender on adoption of innovation is carried on by Odendo et. al, (2010), in their study on determinants of the speed of adoption of soil fertility enhancing technologies in western Kenya. The gender of the household head stood out as an important predictor of the time to adopt mineral fertilizer with male headed households having a high likelihood of adopting mineral fertilizer faster than their female headed counterparts. Their explanation for the faster adoption of mineral fertilizer by male-headed households was that such households were relatively wealthier and controlled the financial resources necessary for purchase of mineral fertilizer, unlike female-headed households. Obisesan (2014) in his study on adoption of technology found similar results that, gender had a significant and positive influence (favouring men) on adoption of improved cassava production in Nigeria. This result also concurs with that of Lavison (2013) on 'factors influencing the adoption of organic fertilizers in vegetable production in Accra', which showed male farmers were more likely to adopt organic fertilizer unlike their female counterparts.

Other researchers arrived at contrary findings. For example, Morris and Doss (1999) found no significant association between gender and probability to adopt improved maize in Ghana. They concluded that technology adoption decisions depend primarily on access to resources, rather than on gender. Thus, they hold that if adoption of improved maize depends on access to land, labor, or other resources, and if in a particular context men tend to have better access to these resources than women, then in that context the technologies will not benefit men and women equally (Morris and Doss, 1999).

Although most studies reviewed above show that men have in most cases been on position of advantage over women in adoption of agricultural innovations, research conducted by the

International Food Policy Research Institute (IFPRI) affirms the central role women play as producers of food, managers of natural resources, income earners, caretakers of household food and nutrition security (IFPRI, 2004). However, factors such as lack of access to land, high capital costs, non-conformity of innovations with the traditional food value systems and low market rates and profits for their produce are some of the obstacles to women's adoption of innovations. Such asymmetries could be accounted for by long-standing perceptions such as men being viewed as heads of household, and that women are just helpers (Finda, 2006). These factors are well illustrated in the context of the human agency theory argument that different social formations emerge under similar structural circumstances and reflect variations in the ways in which actors attempt to adopt certain practices. This approach gives a contextual understanding of how gender interacts with other factors to influence adoption of innovations. This study therefore, aimed to establish whether the aforementioned factors converge or diverge on uptake of horticultural farming innovations within the research area.

Age of the household head is another variable that plays an important role in explaining farmers' technology adoption behavior through influencing farmers' information access and shaping their ability to change the available information into action. However, there is contention on the effect of age on adoption of innovations. Some researchers argue that older farmers adopt innovations more than their younger counterparts do. In this case, older farmers are considered to have gained knowledge and experience over time and are better able to evaluate technology information than younger farmers (Mignouna et al, 2011). Ashenafi (2007) who argue that older farmers are more likely to adopt new technology due to their experience or reject it all together supports this view. Age therefore signifies greater exposure to production innovations and greater accumulation of physical and social capital and large family sizes.

Besides the line of argument presented above, the other assumption is that younger farmers are more likely to adopt innovations than older ones. This argument is supported by Conroy (2005) who found that younger farmers were likely to take up new technology than older farmers given that they are of higher schooling and have more contact with innovations. Biwott & Tuwei (2016) further support this line of argument in their study on determinants of small-scale horticulture farmers' decision to join farmer-based organizations in Nandi County, Kenya. In this

study, younger farmers appeared more alert to obtaining information from various sources that discuss several ways of improving their vocation than older farmers who sought access to such varying sources of information by joining Faith Based Organizations (FBO). The findings showed that use of farm information sources tend to decrease with increase in a farmers' age. Rogers (2003) also found that older farmers (above sixty years) lacked receptivity towards newly introduced technologies because they are risk averse due to failure to change their old ways of doing things and loss of energy.

Also increasing age is often posited to reduce the probability of use of improved farming practices, because of factors inherent in aging process or the lowered likelihood of payoff from a shortened planning horizon over which expected benefits can accrue (Batte and Johnson 1993; Barry et al. 1995, Shiferaw et al, 2009). Alexander and Van Mellor (2005) found that adoption of genetically modified maize increased with age for younger farmers as they gain experience and increase their stock of human capital but declines with age for those farmers closer to retirement. Thus, studies show that there is no conclusive evidence on the influence of age on agricultural innovation adoption. This study therefore sought to know the way respondents age bear on adoption of horticultural farming innovations within the research area.

Education status of the household head is the most common and important variable in explanation of farmers' agricultural technology adoption behavior. Education of the farmer has been perceived to have a positive influence on farmers' decision to adopt new technology. This is because, level of education household heads' who are the primary decision-makers have been found to increase their access, analysis and assimilation of information regarding the various technologies, their advantages, and the dangers of not adopting them (Maurice et. al, 2009; Mignouna et al., 2011; Lavison 2013; Namara et al., 2013). Masuki et. al., (2003) concurs with the above position and clarifies this argument further by holding that increase in education level catalyzes the process of information flow and exposes farmers to a wider field of knowledge thereby promoting adoption of innovations. Nzomoi et. al, (2007) concurs with the above position and argues that educated producers and marketers, who have exposure to new technologies and innovations, are more receptive and more willing to adopt them.

For instance, a study by Ajewole (2010) on adoption of organic fertilizers found that the level of education of a household head had a positive and significant influence on adoption of the technology. This is because higher education was considered to influence respondents' attitudes and thoughts making them more open, rational and able to analyze the benefits of the new technology (Mwangi and Kariuki, 2015). Cotlear (1990) agrees with this line of thought and further argues that general skills acquired in school reduce technical and allocative inefficiencies in production while attitudes acquired, encourage adoption of innovations and develop greater willingness to accept risks involved in adoption of innovations. It also acknowledges that education enables individuals control rates of message input and storage and retrieval of information for later use as this is very important for future decisions (Cotlear, 1990). On the other hand, some authors have reported insignificant or negative effect of education on enhancement of the rate of technology adoption. Studying the effect of education on technology adoption, Uematsu and Mishra (2010) reported a negative influence of formal education towards adopting genetically modified crops.

Since the above empirical evidence have shown mixed results on the influence of age, gender and education on adoption of agricultural innovations, more study need to be done in order to come up with a more consistent result. This is because adoption of horticultural farming has profound socio-demographic impacts that include gender-related issues of equity and social justice (Bawden et. al, 2002). Furthermore, the contradictions in reference to all these factors create a picture of considerable complexity for those concerned with horticultural promotion in Kenya. This, in turn, demands development approaches that focus simultaneously on a host of interconnected characteristics of the target population which calls for up to date and specific to context information that can guide in development of such approaches.

2.3 Cultural Factors on Uptake of Innovations

Cultural factors play a great role in the successful uptake of innovations. This, is because the prevailing organization of land and labour use along with the established power structures between men and women influence decisions on innovation adoption. According to Thandee (1978), societies in which agriculture is the predominant occupation, culture is formed largely through relations to plants, gardens, and agricultural fields. Consequently, emergent societal

beliefs, values, and patterns of behaviour may favour or discourage domestication of certain crops due to varied associations such as those of clan groups established around plant totems, linking given crops to particular ailments or degradation of soil fertility along with the differential importance attached to various crops.

Culture also facilitates adoption of innovations by providing grounds for human communication and interaction that ultimately shape individuals' perceptions and understanding of reality around them (Bourdieu, 1998). This is because, through communication and interaction processes, individuals are linked to others who are physically close to them and who are relatively homophilous in social characteristics such as socio-economic, cultural, educational and professional background. As a result, individuals develop different motivations and worldviews common to, or shared only among members of their groups (Deligiannaki and Ali, 2011). This is well illustrated by the diffusion of innovations theory argument that, culture creates conditions essential for diffusion of innovations. The various elements of culture (such as beliefs, art, values, social organization, economic system, customs and traditions) serve to modulate rates at which innovations that diffuse across cultural groups.

Furthermore, humans rely on social learning or cultural transmission to acquire majority of their behaviours (Bandura, 1977). As a result, they end up following rules, traditions, advices and actions of others. For instance, in adoption of horticultural farming innovations or any other innovation, culture has a powerful influence on information related behaviours. Ultimately, rates at which innovations diffuse among members of given groups are therefore a factor of how well innovation fits with the prevailing culture and cultural formations. Thus, various attributes of innovations including relative advantage, compatibility with existing practices, complexities, triability and observability play significant roles as they interact differently with structures in different cultural formations.

In a study by Batten (1967), a community agency working with groups on a banana experiment in Fiji remarked that purely technical "solutions" are useless if people's attitudes and feelings are not taken into account and that innovations must be practicable and desirable from the people's points of view (Batten, 1967). In the presence of favourable elements of culture, the resulting

social influence can positively shape adoption of innovations (Vannoy and Palvia, 2010). Despite such acknowledgement and recognition of the centrality of cultural factors in the adoption of innovations, little focus has been given to the study of these issues. It is this gap that this study set out to fill by illustrating its influence on adoption of horticultural farming innovations within the research area.

Social capital (the networks of relationships among people who live and work in a particular society) is also a central factor in fostering acceptance and adoption of innovations. Tuomi (2002) put it that, all innovation is social innovation. This means that innovation does not happen “out there” in the world of objects but in the social arena (Tuomi, 2002). Thus, the social nature of innovations and adoption arises out of the active utilization of social networks and interactions. According to Kohler et. al, (2007) and Hogset (2005), individuals membership in groups affect diffusion of innovations through social learning, joint evaluation, social influence, and collective action processes in people’s daily interactions. Through social learning, people learn about existence of innovations. Joint evaluation allows networking members to reinterpret and moderate risky innovations to make them more realistic and meaningful to their local contexts. Social influence therefore provides for enforcement of social norms and shapes opinions, attitudes, preferences and behavior of the members.

The formation of networks and collective actions facilitates coordination efforts required for adoption. Collective action-expressed, for example, through reciprocity norms-can also serve as a risk-sharing mechanism of mutual help for coping with labour shortages as well as with food insecurity, environmental, and price risks associated with innovations. A farmer’s position in such social network thus determines how he/she accesses information on the use of knowledge, technology and complementary resources such as credit, land, and subsidized inputs that are important in innovation processes. Furthermore, embeddedness in social networks enables farmers learn the best ways of applying new and improved knowledge and technology and to evaluate their usefulness and consequences (Mario, Frank and Daniel, 2008). In the process, collective actions facilitate adoption of innovations required in investments.

Belonging to a social group also, enhances social capital allowing trust, idea and information exchange (Mignouna et al., (2011); Uaiene *et al.* (2009). They argue that social network effects are important for individual decisions, and that, in the particular context of agricultural innovations, farmers share information and learn from each other. Studying the effect of community based organization in adoption of corm-paired banana technology in Uganda, Katungi and Akankwasa (2010) found that farmers who participated more in community-based organizations were likely to engage in social learning about the technology hence raising their likelihood to adopt the technologies.

Farmers' membership in cooperative associations is yet another factor that influences farmer's desire and ability to adopt innovations. This stems from the understanding that, people organized in groups are better placed to access various sources of knowledge and information on new technology that can facilitate improved access to cheaper sources of credit and other essential inputs required in the process of transformation. Bandiera and Rasul (2006) assessed social networks in relation to technology adoption in Northern Mozambique and found that the likelihood of adoption is higher amongst farmers who discussed agricultural practices with others. Foster and Rosenzweig (1995) found that, initially, farmers might not adopt a new technology because of imperfect knowledge about management of the new technology. However, adoption eventually occurs due to own experience and neighbors' experience. It is these factors that play a great role in influencing farmers' decision to adopt innovations yet they have been given little attention in the Kenyan context.

Although many researchers have reported a positive influence of social group on technology adoption, social groups may also have a negative impact on technology adoption especially where free-riding behavior exists (Mwangi and Kariuki, 2015). Bandiera and Rasul (2002) supports this view by proposing an inverted U-shaped individual adoption curve, implying that network effects are positive at low rates of adoption, but negative at high rates of adoption. Currently, few studies have been conducted locally to ascertain the influence of membership in farmer and cooperatives on the uptake of horticulture farming. Yet, according to the human agency theory, social structures can have constraining effects on actions and behaviours of farmers on uptake of innovations.

Farm size also plays a critical role in adoption of innovations. Many authors have analyzed farm size as one of important determinant of agricultural innovation adoption. This is because farm size can affect and in turn be affected by other factors influencing adoption. Many studies have reported a positive relation between farm size and adoption of agricultural technology (Uaiene *et al.*, 2009; Mignouna *et al.*, 2011; Adimado, 2001; Kheralla *et al.*, 2001; Langyintuo and Mekuria, 2005). They argue that farmers with larger land holdings tend to be more concerned with farming activities and are more likely to adopt new and innovative farming practices than those with smaller land holdings. This is because; larger land holdings accords farmers more space to try out newer practices while they continue with their usual farming activities uninterrupted. Larger farm sizes are also associated with more wealth, increased availability of capital, higher risks tolerance and more returns especially with new investments and innovations (Norris and Batie, 1987). Moreover, farmers operating larger farms can surrender less productive areas to try out adoptions of innovations (Uaiene *et al.*, 2009); Odendo, 2010).

On the contrary, small land holding limits space to try out new practices without necessarily interfering with other initially adopted activities. Faced with limitations of space to accommodate new practices, people mostly opt to continue with the initially adopted practices for fear of facing uncertainties associated with new practices. Furthermore, small land holding tends to be associated more with limited incomes and the accompanying inability for one to finance new investments and practices. Such small farm sizes work against uptake of innovations given that farm sizes increases positively with adoption levels (Nzomoi *et al.*, 2007).

Some studies found a negative influence of farm size on adoption of new agricultural technology. Mwaura *et al.*, (2013) found that farmers with smaller land holdings were more likely to engage in production of indigenous vegetables when compared to those who had larger pieces of land. Findings from their study showed that 96.7 percent of those who owned less than 2.5 acres of land had adopted horticulture farming as compared to 72.9 percent of those who had more than ten acres of land. They attributed this to the need for intensive land use among small holders in order to maximize returns considering that horticultural crops were fast growing and yielded immediate high returns to the farmer. Farmers with small land are also more likely to adopt land-

saving technologies such as green house technology, among others as an alternative to increased agricultural production (Yaron, Dinar and Voet, 1992; Harper et al, 1990).

Feder et. al, (1982) further argues that some innovations are scale neutral. For example, the use of high yielding varieties and some modern variable inputs such as fertilizer are scale neutral since their adoption initially tends to lag behind on smaller farms but eventually catches up. Moreover, the intensity of adoption of higher yielding varieties on smaller farms exceed those of larger farms given that smaller and medium-size farms tend to adopt higher yielding varieties on larger proportions of acreage than larger farms. Feder et. al, (1982) and FAO, (2014) further argue that the "intensity" of adoption (such as 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 applies.

Farm size can therefore have different effects on rates of adoption of innovations depending on characteristics of innovations and the setting within which promotions of innovations take place. More specifically, relationships of farm size and adoption of innovations depend on such factors as characteristics of innovations defined by its compatibility, relative advantages, complexity and affordability. Other factors include; fixed adoption costs, risk preferences, skills required, credit constraints, labour requirements and tenure arrangements (Feder et. al., 1982). Nzomoi et. al, (2007) while concurring with Feder et. al, (1982) hold that technology adoption is not in any way dependent on farm size but on functions of factors exogenous to respective farms. Thus, innovations that involve higher fixed costs are likely to be adopted at a higher rate by larger farmers while innovations that are neutral to scale, are eventually adopted by all classes of farmers, although larger farmers are typically among the early adopters.

The pattern of land ownership has been found to have several implications in the uptake of innovations given that it determines who is likely to make decisions such as on the crops that are grown (Thandee, 1978). For example within the research area, land is culturally owned by men and control how it is used. Women therefore have to seek permission from their husbands for the use of land incase they would wish to engage in farming activities. Consequently, land tenure issues are key factors in uptake of innovations. Moreover, constraints related to land tenure system, such as insecurity of land tenure, unequal access to land, and lack of mechanisms to

transfer rights and consolidate plots also slow down uptake of innovations (Muyanga and Jayne, 2006). Further, land tenure systems are complicated by the growing rural population that exerts immense pressure on land, and water resources the result of which is unsustainable plots (USAID, 2012a). There is, however, substantial potential for improvement through such interventions as expansion of irrigated horticulture and intensification of production (African Development Bank and Government of Kenya, 2007).

Compatibility of an innovation with respondents needs also serves as a precondition to adopting it. In studying determinants of adopting Imazapyr-Resistant maize (IRM) technology in Western Kenya, Mignouna *et al.* (2011) stated that, the characteristic of the technology play a critical role in adoption decision process. They argued that farmers who perceive the technology being consistent with their needs and compatible to their environment are likely to adopt since they find it as a positive investment. Farmers' perception about performance of innovations significantly influences their decision to adopt them. A similar result was arrived at by Wandji *et al.* (2012) when studying perception of farmers towards adoption of Aquaculture technology in Cameroon. Their study indicated that perception of farmers towards fish farming facilitated its uptake. Thus, it is important that for any innovation that is being introduced, potential adopter's perspectives are considered. There is need therefore to assess whether horticultural farming innovations are compatible with perceptions and expectations of farmers in Aldai sub County, Nandi County.

The foregoing arguments conform to the observations by Kalliny and Hausman, (2007) to the effect that, most research on adoption has focused on the innovativeness of the idea, and thus, the need to consider consumers' perceptions of innovations given that different adopters perceive and assess innovation in a variety of ways. Indeed, Rogers (2003) suggests the need for analysis of innovations in the contexts of adopters' own potential perspectives and situations. Despite such important observations, it is often assumed that good innovations will thrive by virtue of their inherent worth, but in reality, many innovations actually fail. Studies show that, less than ten percent of innovations launched each year succeed (Cheng and Shiu, 2007), and of those that do, most diffuse at surprisingly slow rates (Rogers, 2003). There is need therefore to ascertain how adoption of horticultural farming innovations interacts with adopters' perspectives to result

in the current prevailing situation within the research area. There is need to establish the missing link about the adopters' perspectives and how they interact with horticultural innovations and adoption processes.

Further, avoidance of uncertainty, that is, the level of tolerance to risks (Dwyer, Mesak, and Hsu, 2005) is another critical cultural dimension that influences uptake of innovations. Greater avoidance of uncertainty among people has been found to lead to emergence of rigid rules within society that eventually slows down diffusions and acceptance of innovations (Kalliny and Hausman, 2007). This usually occurs when relative advantages of innovations are not perceived or when learning gaps are too great. To overcome these challenges, the processes of innovations development need to be integrated with diffusion, since the degree to which users are involved in designing processes are significant in determining whether or not innovations will be adopted and continue to be used once adopted. Furthermore, the high failure rates of substantial numbers of innovations have been attributed to inappropriate applications of innovations in diffusion models (Tolba and Mourad, 2010) with limited focus on socio-economic and cultural factors influencing decisions on such innovation processes.

2.4 Institutional Factors Influencing Adoption of Innovations

Institutional factors deal with the extent or degree to which institutions impact on technology adoption by smallholders. Institutions include all the services to agricultural development, such as finance, information dissemination and mechanisms that enhance farmers' access to productive inputs and product markets. According to Zhao (2005), access to information about innovations is a key factor that affects the dynamics of adoption processes. Over time, farmers have accessed information through various sources and mechanisms, such as visits from extension agents, participation in training activities and exposure to mass media.

Agricultural extension work as 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 strategies

thereby increasing farmers' ability to optimize the use of available resources (Muyanga and Jayne, 2006; Anandajayasekeram et. al, 2008). Extension information aims at improving knowledge, changing farmers' attitudes and behaviour, improving their skills and facilitating uptake of new technologies (Government of Kenya, 2001). Drawing from the diffusion of innovations theory, innovations are expected to diffuse to the targeted farmers by way of training on the part of the extension officers and by way of peer learning among the expected adopters. This is because learning has been acknowledged as a key source of information for farmers, and one that is fundamental to promoting adoption as it helps modify the perceived risks of innovations (Munshi, 2005; Yamauchi, 2007).

In Kenya, there exist private and public extension service providers in the horticulture industry. The public extension services are further divided into the government extension system and commodity-based system. The government extension system run by the Ministry of Agriculture focuses mainly on food crops and livestock. The government has here utilized a number of extension models and styles, including the progressive or model farmer approach, integrated agricultural rural development approach, farm management, training and visits, attachment of officers to organizations, farming systems approaches and farmer field schools (Burton et. al, 1997).

Government parastatals, out-grower companies, and cooperatives run the commodity-based system. This approach deals mainly, but not exclusively, with commercial crops where, all aspects of producing and marketing a particular crop are tightly vertically coordinated. It spans the whole range from research, advice, and material support given to farmers, to organizing marketing and even exports (Muyanga and Jayne, 2006). This system is consciously motivated by profits, and works well when both the firm and farmers benefit from the extension expenditures. Kenya's small and medium-scale horticultural farmers have traditionally benefited from these two major public extension systems while large-scale farmers' have depended on private extension services (Anandajayasekeram et. al, 2008). The private agricultural extension system comprises of private companies, non-governmental (NGOs), community-based (CBOs), and Faith-Based Organizations (FBOs). The involvement of these institutions in provision of extension services emerged owing to ineptness in the public extension system (Nambiro et. al,

2005). This system normally complements government provided services among small-scale farmers and in areas that are perceived to have been marginalized or to have high demand for the services although receive 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 their declining effectiveness and one among other factors that impedes horticultural growth in Kenya (ASFG, 2013). Furthermore, the current number of extension service providers has been reported 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 always been accorded a lion's share of the ministry's annual budget, (Muyanga and Jayne, 2006). Despite such immense financial investments coupled with evolutionary and transformational achievements, the uptake and use of extension services remain relatively low in Aldai Division, Nandi County. This is expected to further change drastically with the devolution of agriculture functions to County governments. This shift in resources to counties is expected to bring in new dynamics and challenges.

It is also worth noting that agricultural extension is not only affected by physical, economic, institutional and technological factors but also specific contextual social and cultural factors (Drinkwater, 1994). Previous agricultural extension studies have shown that cultural factors significantly influence innovation adoption process (Huang et. al., 2003). For example, the lack of synergy between the extension service providing agency and consumers of the extension services has contributed to disconnect and ultimately resulted in provision of services that are not in line with adopters' expectations, as providers perceive consumers to be unaware of what they actually need. This can partially be accounted for by the rapidly changing societal dynamics that is not in tandem with the rigid extension services provision approach. This study therefore seeks to establish the nature of farmers' needs and the nature of services available to them towards promotion of uptake and use of horticultural farming innovations and the resultant satisfaction or dissatisfaction with the services. This is because dissemination of innovations is itself a socio-cultural process and a critical component in developing sustainable change in a community.

Exposure to such information also enhances farmers' ability to optimize use of resources at their disposal (Davidson, Ahmad and Ali, 2001).

Many authors have reported a positive relationship between extension services and technology adoption. A good example include; Adoption of Imazapyr-Resistant Maize Technologies (IRM) by Mignouna *et al.* (2011); Factors determining technology adoption among Nepalese Karki and Siegfried (2004); Uaiene *et al.*, 2009; Adoption of improved maize and land management in Uganda by Sserunkuuma (2005); adoption of modern agricultural technologies in Ghana Akudugu *et al.* (2012) just to mention a few. This is because exposing farmers to information based upon innovation-diffusion theory is expected to stimulate adoption (Uaiene *et al.*, 2009). In fact, the influence of extension agents can counter balance the negative effect of lack of years of formal education in the overall decision to adopt some technologies (Yaron, Dinar and Voet, (1992).

Availability of working capital for the acquisition of inputs that enhance productivity among farmers is another critical factor influencing innovation adoption decisions. Access to credit has been reported to stimulate technology adoption (Mohamed and Temu, 2008). Despite its centrality to agricultural development, access to bank credits among farmers in Kenya and Aldai Division by extension is still a major challenge despite the existence of a relatively well-developed banking systems in the country (Government of Kenya, 2009b). Studies such as USAID, (2012a) have shown that small-scale farmers access credit through local banks and micro-financing organizations at prohibitively high interest rates varying from 10 percent–25 percent compared to most neighboring and competing countries such as Tanzania at 7.6 percent, Egypt at 9.3 percent, Ethiopia at 10 percent and Ecuador at 8.2 percent (USAID, 2012a). Furthermore, access to agricultural credit and rural finance has also been limited and concentrated within the most productive agricultural regions producing sugarcane, coffee and tea (African development fund, 2007). Worse still, very few banks are willing to offer credit to small-scale farmers due to the tainted reputation of farming as a highly risky investment (United Nations, 2008), lack of collateral by farmers, low and variable incomes and limited opportunities for diversification and mitigating risk (African development fund, 2007). Despite a strong

operational financial system with relatively large outreach, the focus has remained mainly on micro-enterprises not related to primary agricultural production.

Simtowe and Zeller (2006) argue that access to credit promotes adoption of risky technologies through relaxation of the liquidity constraint as well as by boosting household's-risk bearing ability. This is because with an option of borrowing, a household can do away with risk reducing but inefficient income diversification strategies and concentrate on more risky but efficient investments (Simtowe and Zeller, 2006). However, access to formal financial services is low, particularly in rural areas. A Financial Sector Deepening (FSD) Kenya and CBK, (2009) study found out that, access to credit was found to be slightly lower in rural than urban areas (37 percent compared to 41 percent). Rural households therefore relied more on informal sources of credit, such as shops, suppliers or family members (FSD Kenya and CBK, 2009). In most cases, rural households do not use credit for agricultural purposes.

In a survey carried out in 2005 by the Kenya National Bureau of Statistics, it emerged that only 6.8 percent of rural households borrow money to purchase agricultural inputs and to a lesser extent agricultural machinery. Instead, credit mainly goes towards paying for subsistence needs (39 percent), medical costs (17 percent) and school fees (16 percent) (KNBS, 2006). The Kenyan financial rural market has shown considerable demand for credit and other financial services. Credit for farming remains the most dominant need with an increasing demand but less than 60 percent of this demand is not met due to the low development of the agricultural finance market. Farmers therefore find it difficult to obtain credit for crop production as they lack collaterals and because they are unable to make regular repayments due to the seasonality of incomes from agriculture. Banks are also hesitant to expand into rural areas since servicing small-scale farmers can incur high transaction costs because of the small-scale deposits, dispersion of the population and poor infrastructure (Baumüller, 2015).

Data from survey carried out on Financial Sector Deepening Kenya programme by the government of Kenya and the World Bank show that while access to transmission services such as (pay for inputs, sell outputs or receive off-farm income), credit (e.g. to finance inputs), banking (e.g. to sell outputs or earn interest on savings) and insurance (e.g. to insure crops

against severe weather events) has improved considerably in the last few years (notably), access to other services is less common, especially in rural areas (Baumüller, 2015). Access to transmission services is common even in rural areas, due to the widespread availability of mobile payment services especially the Safaricom's *M-Pesa* which prior to its advent, economic transactions were mainly undertaken in cash or through barter trade (Suri et. al., 2012). Other providers have since entered the M-payment market, for example, Airtel money although its share of transfers remains minimal.

Mobile payment providers have recently begun collaborating with local banks to provide other banking services. *Iko Pesa* (Telkom Kenya and Equity Bank) and *M-shwari* (Safaricom, Commercial Bank of Africa and Vodafone), for instance, offer micro-loans and savings accounts (including interest) to their users. While M-payments are widely available, usage of the service among Kenyan farmers for agricultural purposes appears to be limited. A study carried out in three districts of Kenya finds that although almost all respondents had heard about M-payments (mainly *M-pesa*), just over half (52 percent) had used the service (Kirui et. al., 2010). Most of the M-payments were used for non-agricultural purposes. This study thus, intends to ascertain the ease with which small-scale horticulture farmers are able to access credit to advance their farming endeavours through institutional credit and providers of inputs.

A number of technical factors also influence uptake of horticultural innovations. Physical infrastructure such as road networks and marketing infrastructures are critical factors hindering access to markets, both for inputs and outputs (Kibaara et. al, 2008). Poor rural infrastructure, including roads, limits farmers' access to input and produce markets and, increases costs of transportation, often resulting in deterioration of produce, which ultimately increases costs of production (United Nations, 2008). According to a study by FAO (2007) in Kenya, the status of roads in Aldai Division are generally wanting thus hampering accessibility to markets particularly for such perishable farm produce. As a result, horticultural producers incur heavy transactional costs and post-harvest losses (FAO, 2007). Similarly, inadequate and poor storage facilities contribute to substantial post-harvest losses, which are estimated to be between 30 and 40 per cent of the produce (United Nations, 2008).

Other compounding factors that act in tandem with poor infrastructure include the absence of good communication networks in rural areas. This constrains the dissemination of knowledge and market information, both of which are vital to the survival of farmers in a free market economy (United Nations, 2008). Coupled with this are institutional factors such as market conditions and government policies. The prevailing market conditions form the general investment environment for farming including adoption decisions while government policies in the form of farming regulations, supportive initiatives such as subsidies, along with the resultant macro-economic environment, all of which affect farmers' decision-making and ultimately determine whether adoption of innovations will take place or not. Whether farmers perceive government interventions in their varied forms as positive or negative depends on the focus of the policy (Adesina and Zinnah, 1993). Currently, there is limited information as to whether and how government interventions influence adoption of horticultural production enhancing innovations; a gap that this study intended to fill.

2.5 Empirical Evidence and Research Gaps

From the foregoing literature reviewed, it is evident that little focus has been accorded to the study of socio-cultural factors and neither have the above-cited studies illustrate how institutional factors studied varied among the small-scale versus large-scale producers and those supplying the local market in relation to those engaged in production for export market. There is therefore, need to examine households engaged in small-scale horticulture farming to ascertain why they do not transform to 'profitable horticultural farming. It is also pertinent to find out how prevailing social, cultural and institutional conditions affect acceptance and uptake of horticultural farming innovations in Aldai Division, Nandi County. With such understanding, it will facilitate restructuring of innovation promotion efforts to be in line with needs of the target populations that are engaged in small-scale horticultural production geared towards the local market.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

The study employed an *ex-post-facto* survey design that facilitated snapshot systematic gathering of descriptive data regarding social, cultural and institutional factors influencing uptake of horticultural farming in the research area. This design involves collection of information from a sample drawn from a population that has received a natural treatment not designed by the researcher (Fraenkel & Wallen, 2000). The study attempted to describe the social, cultural and institutional factors in relation to adoption of horticultural farming in retrospect after the ministry of agriculture through the SHoMAP program had promoted them. Such field surveys are strong in their external validity (since data is collected in field settings), their ability to capture and control for a large number of variables, and their ability to study a problem from multiple perspectives or to use multiple theories. On the contrary, this design does not allow for the controlled selection of subjects who are similar in all aspects nor assign the subjects to different groups (Bhattacharjee, 2012). An *ex-post-facto* design was considered suitable for this study in order to facilitate capturing of reliable data from selected sample elements and enable comprehension of their characteristics as they relate to the current situation of horticulture farming within the research area.

3.2 Study Area

Nandi County is situated on the western part of the Rift valley, 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 borders, Uasin Gishu County to the North and East, Kericho County to the Southeast, Kisumu County to the Southwest and Vihiga County to the West. The County has a total area of 2,884.4 km² of land characterized by hilly topography with 212,505 ha being arable land. The County has a population of 813,803 comprising of 406,907 males and 406,896 females (as per the 2012 projections). The population has been growing at the rate of about 3.1% per year and was projected to reach 964,925 by 2017 (KNBS, 2010). Administratively, the County consists of six sub-counties namely Mosop, Nandi-hills, Aldai, Emgwen, Chesumei and Tindiret sub-County. Aldai sub County has a total

population of 157,967 people comprising of 78,209 males and 79,758 females with 30,643 households (KNBS, 2010). The sub-County has a population density of 258 people per square kilometer, which translates to an average of 37 households per square kilometer with an average land holding of 2 acres.

Aldai sub-County comprises two Divisions namely; Aldai with 12 locations and Kaptumo with 4 locations that cut across three main agro-ecological zones: Upper Highland (UH) that covers about 6 percent, Lower Highlands (LH1-2) covering about 34 percent and Upper Midlands (UM1-2) occupying 60 percent of the area. Generally, the County receives an average rainfall of about 1200mm to 2000mm per annum. The long rains start in early March and continue up to end of June while short rains start in mid-September and end in November. In Nandi it is rare for a month to pass without some rainfall (Jaetzold, Schimdt, Hornetz, shisanya & Ermittlbar, 2007). Most parts of the County experience mean temperatures of between 18 and 22 degrees centigrade during rainy seasons of July and August, while higher temperatures averaging 23 degrees centigrade are recorded during drier months of December and January (Government of Kenya, 2001). Given the reliable rainfall and fertile soils in the region, the area is ideal for growing of horticultural crops.

The predominant crops domesticated are food crops such as maize, beans, banana, kales, onions and cash crop such as tea and coffee (Agricultural Sector Development Support Programme (ASDSP), 2016). 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” and with support from technoserve put in a lot of effort to increase the quantity and improve the quality of horticultural production by small-scale horticulture producing households (Ministry of agriculture, 2008). The main horticultural crops promoted were cabbage, traditional vegetables, tomatoes and passion fruit along with adoption of modern farming techniques such as greenhouse. The choice of Aldai sub-County for study is because of the initial presence of the horticulture promotion program and minimal engagement in other cash crops (tea and coffee farming) by the residents. It therefore has a lot of potential for adoption of any other new enterprise, which is yet to be realized. The study was carried out in Ndurio and Kemeloi locations of Aldai sub-County due to concentration of SHoMAP horticulture promotion activities

and, their representativeness of the entire sub-County because they cut across both densely and sparsely populated areas.

3.3 Study Population

The study targeted households in Aldai division, Aldai sub-County where Ndurio and Kemeloi locations were purposely selected given that they had been the locus of horticulture promotion activities. There are 23,281 households in Aldai Division with 3,476 being in Kemeloi location while 1,528 are found in Ndurio location (KNBS, 2010). The study therefore utilized a population of 5004 households within the two locations.

3.4 Sample Size and Sampling Techniques

To arrive at the desired sample size, the following formula was utilized (Norman, 2010:183)

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

where:

n- The desired sample size

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

q- (p-100) =50 percent

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 as appropriate for this study. The sample was adjusted to 400 in order for the sample population to be within ± 5 of the population with a 95 percent level of confidence and data was collected from a minimum of 415 households in order to cater for non-responses.

The study utilized systematic random sampling technique to select households proportionately from the two locations chosen for study. Given the absence of a complete and accurate listing of all households in the selected area, the researcher through the guidance of the village elders selected every 13th household, from which the household head or representative, as designated by household members was sampled for questionnaire administration. This is because according to Tanui et. al., (2012), in researches targeting farmers, the appropriate unit of analysis is an individual decision maker (farmer) who heads the decision-making unit (farm household)

because decisions on allocation of land, labour and other farm activities and resources among the Nandi community are done at household level with the household head being the ultimate decision maker.

Among the Nandi community, within every homestead there are two or more houses however, the household head is one. This normally comprise of the main house, kitchen and may be a sleeping quarter for male children who are not yet married. Girls live with the parents either in a separate room within the main house or in a room in the kitchen house. However, in cases where male children are married, they move out of the parents homestead and establish their own homestead (Hollis, 1909).

Respondents for Key Informant Interviews and Focus Group Discussions were purposively selected. To ensure gender equity, both males and females were accorded equal chance of participation while seeking to attain near equal representation. Two focus group discussions of 10 and 12 members were conducted in every location. Ten participants were engaged in key informant interviews and this was determined by saturation level of the information collected.

3.5 Methods of Data Collection

The study utilized data collection methods appropriate for both quantitative and qualitative research methodologies.

3.5.1 Questionnaire

To collect the quantitative data, the study utilized a semi-structured self-administered questionnaire to seek information from 400 household heads. The questionnaire comprised both open-ended and closed-ended items. The closed-ended items included respondents' demographic data while open-ended items focused on adoption of horticulture farming, the social, cultural and institutional factors that influenced adoption of horticulture farming and challenges in the adoption process.

3.5.2 Focus Group Discussion (FGDs)

This technique targeted to obtain group opinion and consensus on issues under consideration. Two focus group discussions of 10 and 12 members each were conducted among leaders and lead horticulture farmers in every location. A discussion guide was utilized to direct discussions with two research assistants helping in note taking. Participants consent for their engagement in the FGDs was sought and their level of literacy taken into account and thus the researcher decided to conduct the sessions in Nandi language. The data targeted through this technique focused on existence of potential and willingness to adopt horticulture farming, the social, cultural and institutional opportunities and challenges in the adoption process. This information was useful for verifying those captured through questionnaires and for purposes of triangulation.

3.5.3 Key Informant Interviews

This technique targeted individuals with particular or “expert” knowledge about the people, their livelihood activities and horticultural issues. The interviews were guided by use of an interview schedule. Data collected using this instrument was on socio-cultural and institutional opportunities and challenges in adoption of horticultural farming innovations and services provided to horticulture farmers. The participants comprised the sub-County agricultural officer, the divisional agricultural officer, two ward agricultural officers, and six farmers’ representatives (model horticulture farmers and farmer leaders).

3.6 Validity and Reliability

Mugenda and Mugenda (2003) refer to validity as the quality that a procedure or instrument or a tool used in research is accurate, correct, true and meaningful. The data collection instruments were verified by three professionals to ensure that they were in line with the objectives of the study. The test-pre-test method was used to test reliability of instruments. The instruments were piloted in Kaptumo division which neighbours the study area and a reliability coefficient of 0.8 was obtained. Piloting also helped the researcher to eliminate any ambiguity in the research instruments to ensure they generated valid results for the study. Input from respondents and other invaluable sources was obtained during piloting which were useful in modifying the research instruments before a final set of questions were produced.

3.7 Methods of Data Analysis

To analyze data, the study utilized techniques appropriate for both quantitative and qualitative data. This was aided by use of statistical package for social sciences (SPSS) version 20.0

To analyze quantitative data, the study utilized both descriptive and inferential statistics. Descriptive statistics entailed use of measures of dispersion namely frequencies and percentages and cross tabulations that provided information on distribution of responses thus, aiding in visualization of results in a summarized form at a glance. Pearson's product moment correlation (r) technique was used to test for statistical significance of associations between selected variables (Gupta, 2008). To assess the relative contribution of significant factors, logistic analysis was employed and a predictive model with simple indicators was developed. This model predicted the probability that an individual with certain socio-economic characteristics chooses horticultural farming innovations (Gujarati, 2003). According to the logistic model, the probability, P_i , of a smallholder adopting horticultural farming innovations is given by:

$$\text{logit}(p) \log[p / (1 - p)] = \ln[p / (1 - p)]$$

$$\ln[p / (1 - p)] = a + b_1x_1 + b_2x_2 + b_3x_3 + \dots b_kx_k + e$$

Where p represents the probability of an event, b is the y-intercept, and b_1 to b_k represent the independent variables included in the model. Each independent variable's association with the outcome (log odds) is indicated by the coefficients x_1 to x_k . The coefficients demonstrate the effect of each explanatory variable on log of odds, e is the error term. The qualitative dependent variable is horticultural farming innovations (YIT), which takes on the value of 1 if the farmer adopts it and 0 if no adoption occurred. The estimated model therefore was:

$$Y = YIT = \beta_0 + \beta_1 \text{GEN} + \beta_2 \text{EDU} + \beta_3 \text{AGE} + \beta_4 \text{MAR} + \beta_5 \text{LSIZ} + \beta_6 \text{INCOM} + \beta_7 \text{COMP} + \beta_8 \text{INPU} + \beta_9 \text{CRED} + \beta_{10} \text{GRPS} + \beta_{11} \text{MKT} + \beta_{12} \text{EXTN} + \beta_{13} \text{INST} + e$$

Variables for which the test statistic was significant at a set cut-off point at 95 percent were considered associated, while those for which the test statistic was not significant were not associated. Data was then presented in form of tables of frequencies, and pie charts.

The qualitative data was analyzed through content analysis the drawing of inferences by systematically and objectively identifying special characteristics of the messages and themes emerging from the messages. The researcher then summarized and outlined major themes and

sub-themes according to the objectives. This facilitated analysis of trends and detection of the subtle differences among emergent themes. Findings from content analysis were presented in textual form and verbatim quotation forms alongside findings from other techniques, which therefore serve to verify them.

3.8 Ethical Considerations

To ensure the research ran smoothly, the following ethical considerations were borne in mind. Ethical validation and clearance to conduct fieldwork was sought from the university through Maseno University Ethics Review Committee (MUERC). Upon embarking on fieldwork, voluntary participation of respondents was ensured through provision of pertinent information and seeking informed consent from them. In reference to identity of respondents, privacy and anonymity was ensured by safeguarding any identifying details and information collected was held confidential and used for the sole purpose of this study. The data collected was stored safely under password protection.

CHAPTER FOUR
RESPONDENTS' SOCIO-DEMOGRAPHIC FACTORS AND THEIR INFLUENCE ON
ADOPTION OF HORTICULTURE FARMING

4.1 Introduction

This chapter discusses the social attributes of respondents and their influence on adoption of horticulture farming. The attributes discussed here are gender, age distribution, marital status, level of education and number of dependants among respondents.

4.2 Respondents Gender and its Influence on Adoption of Horticulture Farming

This study sought to investigate gender distribution of household heads who had been engaged in the study. The findings showed that majority of respondents were male in both adopter and non-adopter categories as shown in the table below.

Table 4.1: Showing Distribution of Respondents by Gender

Category	Adopters		Non-adopters	
	Frequency	Percent	Frequency	Percent
Male	182	58.7	55	61.3
Female	128	41.3	35	38.7

Within the non-adopter category, 61.3 percent were male while 38.7 percent were female. Within the adopter category, out of 310 respondents who had embraced horticulture farming as their main cash crop, 58.7 percent (182) were male while 41.3 percent (128) were female as presented in the figure 4.1 in the next page. Thus, male respondents were the majority within both the adopter and non-adopter categories. However, comparing the proportion of males and females who had embraced horticultural farming innovations as their mainstream economic activity in relation to their proportion in the sample, it is 75% male as compared to 80% female. Key informant interviews further supports this by alluding to dominance of women in horticulture farming. This dominance of women in horticulture farming comes closely to the arguments of Hafkin & Hambly (2002) who hold that women are twice as likely to be involved in agriculture-

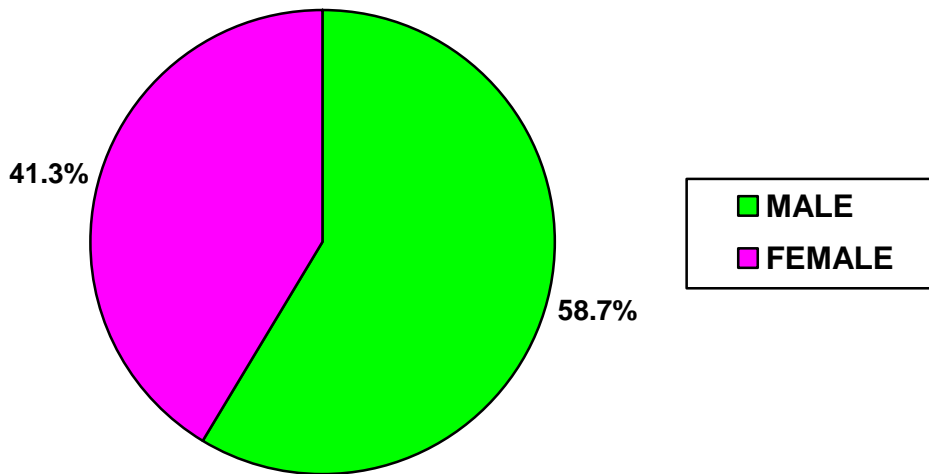
related activities as men are. This suggests that horticulture promotion efforts should target more women if higher adoption levels of horticultural farming innovations are to be realized.

Although horticulture farming had initially been a woman's domain when its focus was subsistence oriented, men have joined in more vibrantly since its promotion as a cash crop. The increasing participation of men in market-oriented horticulture farming is seen to be informed more by community's division of labour where culture puts men in control of the main means of family income. Omonona *et al.*, (2006) and Mignouna *et al.*, (2011), clarify such dominance of men by arguing that gender effects on innovation adoption arise since the head of the household is the primary decision maker and men have more access to and control over vital production resources than women due to socio-cultural values and norms.

However, despite the increased participation of men, women are still the majority. Female respondents were reported to have been more involved in the process of introduction and active promotion of horticultural farming innovations within the research area than their male counterparts have. This is because most groups that actively worked with the ministry of agriculture, Technoserve and those who had received funding support from SHoMAP were majorly comprised of women. In addition, women were the main providers of labour for the farms whether as family labour or hired labour. Thus, although women did not own the horticulture farms, they were more involved than men in the production and marketing of horticultural produce.

The above finding is in line with that of Mwaura, Muluvi and Mathenge (2013), where women were found to engage more in the production of horticultural crops as compared to men. This was attributed to men's better opportunities for farm and non-farm enterprises, which contribute much income than vegetables, as compared to women who face many significant constraints in obtaining alternative employment opportunities and thus engage in horticultural farming as a primary source of income. However, within the study area, there are a few alternative income-generating activities apart from farming, that members can engage in and thus men and women tend to compete for the opportunities created by the few cash crops namely tea and a few horticultural crops domesticated here.

Fig. 4.1: Distribution of Adopters of Horticulture Farming by Gender



Logistic regression analysis was utilized to predict adoption of horticultural farming innovations using gender, age, marital status, level of education and number of dependants as predictors. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between adopters and non-adopters of horticultural farming innovations (chi-square =26.167, df=5, $p < .05$). Step wise logistic regression was administered and Nagelkerke's R^2 statistic findings showed that 73.7 percent of the variation in the dependent variable (adoption of horticultural farming innovations) is explained by the logistic model comprised of gender, age, marital status, education level and number of dependants [$p = .714 (> .05)$]. It indicates a moderately strong relationship between the predictors and the prediction. In reference to the various variables that were included in the regression model, the Wald statistic showed that respondents' gender contributed significantly to adoption of horticultural farming innovations. When the effects of other variables in the equation are controlled, male respondents appeared 1.5 times more likely to adopt horticultural farming innovations than their female counterparts did. Wald statistic significant at $p = .013$. Thus, although a high proportion of women had embraced horticulture farming, men exhibited a higher likelihood of embracing horticultural farming innovations than women. This is attributable to men's control of the main sources of household income and other family resources including decision-making power.

The higher likelihood of participation of men in horticulture farming is attributed to the culturally entrenched notion that men are the providers in families while women are in charge of domestic chores. Among the Nandi community, culture puts men in charge of the main means of family income whereas women are left in charge of the subsistence means (Hollis,1909). The kitchen gardens where horticultural crops for subsistence use are normally planted are thus culturally a preserve of women. This could be due to rules of inheritance, which are discriminatory against women and, therefore, disadvantage them in the control of more productive sectors of the economy. Such division of labour and distribution of resources is well illustrated by the human agency theory, which argues that, every society contains within it a repertoire of different lifestyles, cultural forms and rationalities which members fall back to in their search for order and meaning, and which they themselves play (wittingly or unwittingly) a part in affirming or restructuring. The strategies people employ or decisions they make therefore do not arise haphazardly but are drawn from such stock of available knowledge (verbal and non-verbal) that are shared with other individuals, contemporaries and predecessors. Thus, however restricted the individuals choices may seem, some alternative modes of action and justifications for such choice always exists in every society. In the community under study, men are accorded higher status in control of family resources as compared to women due to the patriarchal nature of the Nandi people (Hollis,1909). Culture and traditions continue to support male dominance in the control of family resources and main sources of livelihood.

Among the respondents also, they have predominantly practiced mixed farming mainly dairy farming and production of tea, maize and beans. Over time, returns from these initial income-generating ventures have remained low, resulting in some farmers venturing into other agricultural activities that promised high returns through support of the ministry of agriculture. Horticultural farming innovations were therefore propagated aggressively by the ministry of agriculture through the Smallholder Horticulture Marketing Programme (SHoMAP) as an alternative area of focus that promised high returns. Although horticultural farming innovations were promoted among both male and female farmers, the male farmers who chose to embrace them went in as cash crop farmers to earn income for their families. Despite this increased participation of men in horticulture farming, their proportion remains lower than that of women. This increasing participation of men in activities that were initially described as female domains

depict change in gender roles in response to changes in the structuring of larger societal economy. According to the human agency theory, these changes in roles reflect the way individuals process social experience and devise ways of adjusting to emergent needs and situations in society that are occasioned by changes in the structuring of the larger society. Male respondents embraced horticultural farming innovations in a bid to earn more income to enable them meet the varied and increasing needs of their families brought about by the changes taking place in the larger society.

The increasing dominance of men in horticulture farming is reinforced by other factors such as women's limited access to critical farm resources (land, labor, and cash). Male farmers and male headed households are therefore more likely to use improved and sustainable farming practices because they tend to have greater access to a wide range of resources, including working capital from off-farm employment (Matshe and Young 2004), that may be useful in adopting such practices than their female counterparts. Quisumbing (1995) argues that female farmers or heads of households often have limited access to working capital since they are, in most cases, widowed and/or poorly educated. Gender differences may also arise from male bias in the ownership and access to productive resources (e.g., land, credit and agricultural information) in most patriarchal societies such those in Africa (Quisumbing, 1995; Doss and Morris, 2000; Doss, 2001; Quisumbing and Pandolfelli, 2010). This seems to be the case within the research area given that male household heads control the allocation of family resources to the various uses.

The above findings run contrary to those of Morris et. al, (1999) in their study on adoption and impacts of improved maize production technology in Ghana. Their findings showed that both modern maize varieties and fertilizer had been adopted less extensively by women than by men. In their study, 39 percent of female farmers planted modern maize varieties compared to 59 percent of male farmers, and 16.2 percent of female farmers applied fertilizer to their maize fields compared to 22.5 percent of male farmers (Morris et. al., 1999). Despite this outcome, authors of this study caution that it was not possible to determine from the data whether women had access to the same quality of land, level of education, labour, contact with extension services, and market access as men. They thus concluded that adoption decisions depended primarily on access to these resources, rather than on respondents' gender *per se*.

This line of argument on influence of the gender of household head on adoption of innovation is carried on by Odendo et. al, (2010), in their study on determinants of the speed of adoption of soil fertility enhancing technologies in western Kenya. The gender of the household head stood out as an important predictor of the time to adopt mineral fertilizer with male headed households having a high likelihood of adopting mineral fertilizer faster than their female headed counterparts. Their explanation for the faster adoption of mineral fertilizer by male-headed households was that such households were relatively wealthier and controlled the financial resources necessary for purchase of mineral fertilizer, unlike female-headed households.

World Bank, FAO and IFAD (2008), further illuminates the challenges faced by women at the institutional level. These 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. Such norms and structural inhibitions restrict women's mobility or decision making thereby, limiting their opportunities and sources of livelihoods and ultimately restricts them on technologies to be adopted.

Limited women's access to information dissemination meetings such as village *barazas* and field day trainings owing to their household responsibilities was also reported in this study. This in the long-run was seen to constrain women's ability to access and or adopt innovations. One key informant interviewee remarked,

Yes, at times meetings are done although we women who are the majority horticultural farmers we do not find time to attend them because we are mostly busy with the household chores (40-year-old female respondent).

Women have also been characterized as lacking in capacity, education, self-confidence, and have more limited opportunities to join groups and organizations, yet these often serve as platforms and avenues for consultations and information-sharing with other actors including policy makers, researchers, and technical experts (Ragasa, 2012). FAO (2014) in their study carry on this argument by holding that socio-cultural norms do not perceive women to be full and equal participants in the community and the economy, and women sometimes lack skills and confidence to approach institutions that have traditionally been the domain of men. It is evident,

therefore that, an understanding of local cultural practices and preferences are important if women are to benefit from agricultural innovations (Meinzen-Dick et. al., 2004). Also, institutions charged with provision of information and services essential to adoption of innovations should be made women friendly by enrolling more women to provide these services and developing programs that are specifically targeted at women.

These arguments illustrate how communal and larger societal agencies have been structured in ways that systematically constrain and ultimately lock out women or relegate them to the periphery of innovation formulation and adoption processes. The result has been women being brought in during implementation stage where the main aim is to ensure demand for products and services that arise from the innovations and technologies and to attain greater commercialization of innovations and technologies. Furthermore, lack of engagement of women or men as key actors in priority-setting and innovation processes are cited by some studies as reasons for the limited responsiveness of the innovations developed to their needs and their exclusion during formulation constraints social acceptability and cultural appropriateness of the innovations developed (FAO, 2010).

Meinzen-Dick et al., (2004) supports this observation by arguing that embedded norms, behaviours and practices in any society can either encourage or discourage adoption of a particular innovation. It is the institutionalized structures and processes which differentially confer privileges and constraints to members of society based on their gender that contribute to the disparities between men and women in adoption of horticulture farming. If the rate of adoption of innovations among men and women is to be brought at par, such discriminatory structures and processes that disadvantage women in their access to various societal opportunities should be changed.

The findings of the above studies contradict the findings of this study given that the disparity between men and women in adoption of horticultural farming innovations is informed less by gender differences in access to capital resources necessary in the process of adoption but by gender *per se*. Given that within the research area men control access to and use of land and other family resources in most cases, they therefore have undue advantage over women when it

comes to adoption of innovations. Ironically, findings showed that a higher proportion of women engaged more in horticulture farming than men. Women are therefore increasingly becoming farm managers and heads of households. This is despite arguments such as that of Michael and Cheryl (1999) that, throughout many parts of sub-Saharan Africa, women have greater difficulty than men in obtaining labour, especially male labour needed for land preparation activities such as clearing, burning, and ploughing while men mostly lay claim over women's labour, but women do not have similar claim over men's labour (African Development Fund, 2007).

Drawing from the notion of adoption as illustrated by diffusion of innovations theory, the high proportion of women in the adoption of horticultural farming innovations is informed by the fact that they have been engaging in its production on a subsistence basis for a long time. Thus, it was easier for them to upgrade the level of production than for male respondents who were venturing into a very new enterprise that they had not been partaking-in. Embracement of horticultural farming innovations by men will therefore tend to progress slowly as illustrated by the diffusion of innovations theory that adopters fall into different categories.

4.3 Respondents Age and its Influence on Adoption of Horticulture Farming

In reference to respondents' age, study findings showed that it ranged between 20 to above 50 years. This depicts horticulture farming as prevalent among persons of all ages within the research area. This is attributable to the typically rural set up for the study, where engagement in farming remains the main occupation for majority of households due to unavailability of alternative income generating activities. This is reinforced further by high fertility of land within the study area, which makes it possible for production of various crops including maize, beans, tea, coffee, bananas and horticultural crops as the main occupation for majority of respondents.

Table 4.2: Distribution of Respondents by Age

Age	Adopters		Non-adopters	
	Frequency	Percent	Frequency	Percent
Less than 20	9	2.9	3	3.33
21-30	95	30.65	17	8.89
31-40	91	29.36	19	21.11
41-50	87	28.05	31	34.44
51 and above	28	9.04	20	22.22

Although horticulture farming was depicted by the results to be prevalent among persons of all ages, youthful respondents engaged in horticulture farming in greater numbers than older members of this society given sixty three percent of respondents are under forty years of age. On the contrary, within the non-adopter category, majority of the respondents were aged above forty years.

Pearson' Product moment correlation test was carried out to determine whether respondents' age influenced their decision to adopt horticultural farming innovations and study findings yielded a weak positive correlation coefficient ($p=.055^*$ $p<.05$). The result is significant at $p <.05$. This finding shows a weak association between respondents' age and adoption of horticulture farming. This means that age does not increase adoption of horticulture farming. This is in line with descriptive data findings, which showed no significant differences in extent of adoption of horticultural farming innovations among persons of various age groups; given persons of all age groups had embraced horticulture farming. However, high levels of adoption were concentrated among respondents aged between 21 to 40 years, meaning that youthful respondents had embraced horticultural farming innovations than the much older members of their society did, in particular the middle age years. Logistic regression analysis was utilized and the Wald statistic showed that respondents' age contributed significantly to adoption of horticulture farming. When the effect of other variables in the equation was controlled, respondents aged 31 to 40 appeared 20 times more likely to adopt horticultural farming innovations than their counterparts of other age groups. Wald statistic significant at $p=.026$.

Thus, although age *per se* may not be significant to the adoption of horticulture farming, the concentration of higher levels of adoption among respondents aged 21 to 40 years tend to be informed more by obligations respondents have towards their families more than by their age.

One key informant remarked that

You see even at the local community here, our society has totally changed. Our young men and women now have their children in private schools that charge fees and their lifestyle is of a higher standard as they buy most of their necessities from markets. So they no longer sleep as they are constantly faced with the reality of a changed society and they have to measure to its expectations by working hard and adopting systems that can deliver adequate income to cater for their varied needs. This has forced them to be alert to innovative and improved ways of doing things, now they are the majority of those who have embraced horticultural farming innovations (63-year-old male key informant).

These individuals face demands for provision towards their school-going children coupled with other obligations for provision, which place many demands on them. Such individuals are compelled by the demands for provision to look for other alternative ways of getting additional resources to gather for the needs of their families.

From the results presented above, age plays a significant role as an important factor influencing respondents' decisions to adopt horticultural farming innovations in the research area. If adoption of horticultural farming innovations is to succeed, greater emphasis should be concentrated on targeting younger farmers during promotion efforts if higher levels of adoption are to be realized. However, although age might be an important factor in innovation adoption process, younger persons may not have significant amounts of capital to spur adoption. Furthermore, they lack significant share of land where adoption can be undertaken because their parents still have stronger say on major farm and farming decisions.

The prevalence of horticulture farming among younger respondents is best explained by the human agency theory, which argues that individuals have the capacity to process social experience and to devise ways of coping with it as they possess knowledgeability and capability. Individuals with varied levels of knowledgeability and capability are expected to interact differently with the innovation adoption process. In addition, because horticulture farming requires certain specific skills that evolve and change with time for its effective management; younger members of society are better placed to possess these skills than older members do as they have been out of school recently. Also given the agility of younger members of society, they

are more willing to seek these skills than older members do. Moreover, horticulture farming is a labour intensive endeavour and youthful persons are best placed to handle such demands than the older members of society do.

From other studies reviewed, there is contention on the direction of the effect of age on adoption of innovations. One assumption is that younger farmers are more likely to adopt innovations than older farmers are. This argument is supported by Conroy (2005) who found that younger farmers were likely to take up new technology than older farmers given that they are of higher schooling and have more contact with innovations. Biwott & Tuwei (2016) further supports this line of argument in his study on determinants of small-scale horticulture farmers' decision to join farmer-based organizations in Nandi County, Kenya. The findings showed that use of farm information sources tend to decrease with increase in a farmers' age. In this study, younger farmers were found to be 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).

Rogers (2003) also found that older farmers (above sixty years) lacked receptivity towards newly introduced technologies because they are risk averse due to failure to change their old ways of doing things and loss of energy. Also increasing age is often posited to reduce the probability of use of improved farming practices, because of factors inherent in aging process or the lowered likelihood of payoff from a shortened planning horizon over which expected benefits can accrue (Batte and Johnson 1993; Barry et al. 1995, Shiferaw et al, 2009). Older farmers, perhaps because of investing several years in a particular practice, may not want to jeopardize it by trying out a completely new method. In addition, farmers' perception that technology development and the subsequent benefits, require a lot of time to realize, can reduce their interest in the new technology because of farmers' advanced age, and the possibility of not living long enough to enjoy it (Caswell *et al.*, 2001; Khanna,2001).

Besides the line of argument presented above, the other assumption is that older farmers are more likely to adopt innovations than younger ones. Ashenafi (2007) who found that older farmers are more likely to adopt new technology due to their experience or reject it all together

supports this argument. Older farmers are assumed to have gained knowledge and experience over time and are better able to evaluate technology information than younger farmers (Mignouna et al, 2011). Age is therefore depicted here to signify greater exposure to production innovations and greater accumulation of physical and social capital and large family sizes. Thus, studies show that there is no conclusive evidence on the influence of age on agricultural innovation adoption. This argument is supported by Conroy (2005) who found that command of age on farmer's contribution to new technology is indecisive.

Drawing from the above studies, it can be concluded that influence of a respondent's age on adoption of innovation is dependent on the nature of innovation under consideration. Innovation such as horticulture is more likely to be adopted by younger farmers given their accessibility to new information through education and willingness to take risk, while innovations that build on the existing ones are more likely to be adopted by older members of society given their accumulated experience.

4.4 Influence of Respondents' Marital Status on Adoption of Horticulture Farming

The study findings showed that respondents sampled for study were of varied marital statuses namely married, not yet married, widowed and separated as presented in table 4.3 below. However, descriptive data showed that, respondents in both adopter and non-adopter categories were of varied marital statuses, married respondents were more than their counterparts of other marital statuses. The higher participation of married respondents in horticulture farming can be attributed to cultural expectations among the Nandi community where, individuals who have attained puberty are considered adults and at this age one can marry or get married (Hollis, 1909).

Table 4.3: Distribution of Respondents by Marital Status

Marital status	Adopters		Non-adopters	
	Frequency	Percent	Frequency	Percent
Married	222	71.75	47	52.2
Not yet married	61	19.75	39	43.3
Widowed	25	8	4	4.5
Separated	2	0.5	0	0

Thus, the high number of married respondents is attributable to the fact that, like any other community, these respondents had chosen to “settle down in life” and establish their families having attained the expected age of getting married or marrying in keeping with societal agency expectations. The high proportion of married respondents is further attributable to the fact that the study targeted household heads. Thus, they are more likely to have many obligations towards their families and children and therefore are more likely to engage in alternative income generating activities (IGAs), horticulture farming being one of them, to provide additional financial resources for their families. Such families are influenced by the need for provision to adopt horticultural farming innovations. This is well illustrated by the human agency theory argument that, emergent differing social formations reflect variations in ways that actors attempt to adapt to situations that they find themselves-in. Different individuals will therefore adopt different approaches, which include horticultural farming innovations among others in a bid to earn more income to facilitate provision for their families. Logistic regression analysis was utilized and the Wald statistic showed that respondents’ marital status did not contribute significantly to adoption of horticulture farming.

Majority of respondents (75.8 percent) had between 1 to 6 dependants. The study findings revealed that 19.6 percent of respondents had between 1 to 3 dependants, 56.2 percent had between 4 to 6 dependants, 20.3 percent had between 7 to 9 dependants while 3.9 percent had ten or more dependants. Given that most respondents were married, this is associated with additional household members in form of marriage partner, children and dependants who serve to motivate one for more productivity by being a source of additional labour. Dependants such as children and or marriage partner can assist with the various farm activities thus enabling households

address the labour intensive nature of horticulture farming more effectively when compared to those who have few dependants, small household size or are not yet married.

In addition, the high number of dependants translates to many demands for provision by the household heads. One key informant remarked that,

You see even at the local community here, our society has totally changed. Our young men and women now have their children in private schools that charge fees and their lifestyle is also of a higher standard as they buy most of their necessities from markets. So they no longer sleep as they are constantly faced with the reality of a changed society and they have to measure to its expectations by working hard and adopting systems that can deliver adequate returns to cater for their varied needs and demands. This has forced them to be alert to innovative and improved ways of doing things. Now they are the majority of those who have embraced horticultural farming innovations (63-year-old male key informant).

This implies that because of changes taking place in society, individuals face increased needs for provision that are brought about by transformations in society. This argument is supported by Biwott & Tuwei (2016) who concluded 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 of production. Increase in household size therefore, increases the tendency of a household to seek alternative resources or sources of livelihood to cater for the increased demands. This is illustrated by FGD discussants, who argued that,

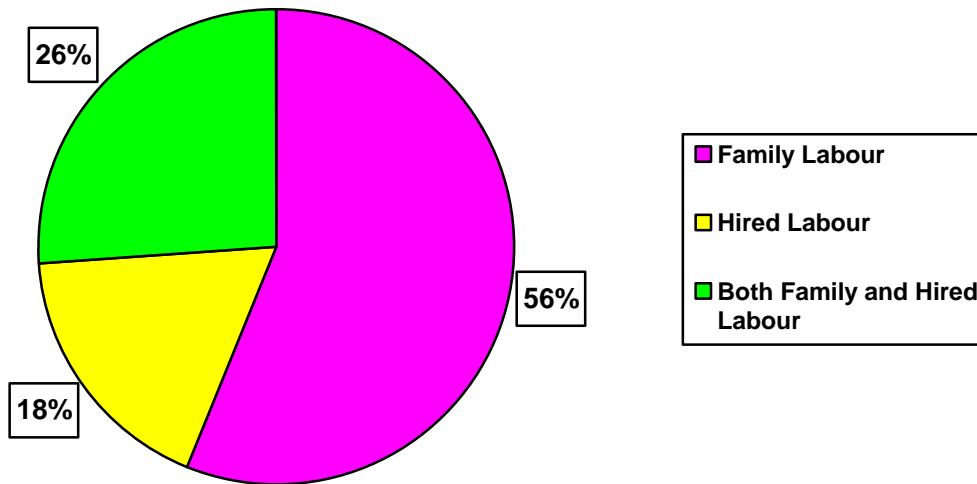
The land is diminishing and we no longer have ample space as our fathers did. Therefore, if we are to live up to the expectations of our society there is need for us to change the way we do things. Our children are growing up and they have to be provided for but; if we continue with what our parents used to do then we will not be able to educate our children. Everyone is therefore looking for ways to improve how they conduct their farming activities so that they can earn more from the little spaces they have (FGD 2 discussants).

This shows a strong desire and determination by the study population to adopt innovative and more productive activities such as horticultural farming innovations as mechanisms for generating additional income that can enable them educate their children and meet needs that come with challenges of modern day life.

However, study findings showed a relationship between number of dependants and an individuals' choice to adopt horticulture farming. When the effect of other variables in the logistic regression equation was controlled, respondents who had between 4 to 6 dependants appeared two times more likely to adopt horticultural farming innovations than their counterparts who had fewer or more dependants. Wald statistic significant at $p=.048$. This finding implies that households that had more dependants were more likely to adopt horticultural farming innovations than those who had fewer dependants.

The dependants therefore serve as a driving force in adoption of horticultural farming innovations because of the increased demands of basic needs and as a source of labour required in horticulture farms. High number of dependants in a household thus translates to a large pool of labour that make it easy for households to adopt horticultural farming innovations than households that have few dependants and therefore are more likely to face labour deficiencies. This is because drawing from the notion of agency, horticulture production occurs in a complex and dynamic human and physical ecology influenced by complex intra-household decision-making processes relating to labor, financial and natural resource allocations (Fischer and Qaim, 2012). The labor resource allocation relates to intra-household decisions on the roles of different household members in relation to the farm activities, and enterprises. Moreover, it is at the household level where decisions on how much labor is allocated to non-agricultural activities, e.g., non-farm employment, household maintenance and leisure are done. This is because non-agricultural activities also create competition for labor, and affect the kinds of agricultural/farming practices that households can engage in. Conversely, labour shortages can prevent or retard adoption of horticultural farming innovations especially in households with few dependants and are unable to hire alternative labour. This is because study findings had shown that majority of respondents (56 percent), relied on family labour, 18 percent relied on hired labour while 26 percent utilized both family and hired labour in their horticulture farms.

Fig. 4.2: The Nature of Labour Utilized by Adopters of Horticulture Farming



This variation in the way marital status, household size and number of dependants influence adoption of horticultural farming innovations within the research area is well illustrated by the agency theory, which argues that different individuals within the same situation will adopt different ways of coping. Individuals who are not yet married or married but may not have dependants who can assist with the various farm activities may resort to engaging hired labour if they are endowed with financial capital to facilitate acquisition of the same. Thus, they will be able to engage in horticulture farming just like those who are married and have dependants to provide the requisite labour to facilitate adoption of horticulture farming. This applies to individuals who could be married or not yet but are employed in other sectors.

4.5 Education Level and its Influence on Adoption of Horticulture Farming

All respondents were found to be literate, with their levels of education ranging from primary level to university. The results showed a fairly high level of literacy given that majority of respondents in both adopter and non-adopter categories had attained secondary level of education and above. Such high levels of education tend to go hand in hand with high level of awareness and ability to understand, process and make informed decisions based on information given. Such higher education levels are also bound to influence respondents' attitudes and thoughts making them more open, rational and able to analyze critically the benefits of new technology (Mwangi M. & Kariuki S., 2015). The high levels of education among respondents also portrays

horticulture farming as an income generating engagement that cuts across persons of all levels of education and social status.

Table 4.4: Distribution of Respondents by Level of Education

Level of education	Adopters		Non-adopters	
	Frequency	Percent	Frequency	Percent
Primary	49	15.75	16	17.78
Secondary	107	34.5	34	37.78
Middle level college	121	39.25	23	25.55
University	33	10.5	17	18.89

For respondents who had attained primary and secondary level of education, horticulture farming was reported as their main occupation given the limited employment opportunities within the study area other than farming. For those who had middle level college and university education, they were reported to engage in horticulture farming as a disguised form of unemployment while still seeking employment in other sectors while those who had been employed in other sectors engaged in horticulture farming as an alternative or additional income-generating venture. A key informant interviewee who stated as follows reported this,

Generally, for most residents here especially those who attained only primary or secondary level of education, their main income generating activity is farming. However, for me horticulture farming is a part time engagement that I do alongside other farming activities namely tea farming and dairy. I am also a teacher in a nearby school and I engage in these farming activities to enhance my income sources as opposed to majority of residents here who engage in horticulture farming on a full time basis as their main occupation. Infact my involvement in horticulture is like that of some other people employed in other sectors and graduates who are unemployed and therefore get into horticulture as they still seek formal employment opportunities in other sectors (38 year old male discussant).

Pearson’s Product moment correlation test was utilized to ascertain the association between respondents’ level of education and adoption of horticulture farming. Findings depicted a non-significant relationship between respondents’ level of education and adoption of horticultural farming innovations ($p = -.058$; $p < .05$). The finding shows that there are no notable differences

among respondents with varied educational levels in regard to adoption of horticulture farming. This is because respondents of all levels of education were engaged in horticulture farming with majority having attained secondary and middle level college education. Logistic regression analysis was undertaken and the Wald statistic showed that respondents' level of education was not significant in adoption of horticulture farming.

Given descriptive data had shown respondents level of education to be variable, it is therefore not *per se* the level of formal education that is key to successful adoption of innovations but the ability of individuals to understand information being communicated. This view is supported by Pramanik et. al, (2001) who argue that, although majority of farmers at grassroots may be less educated, they emphasized the need to recognize that they can be very efficient in some recommended agricultural innovations, if properly presented to them. This brings into perspective the fact that in adoption of innovations, practical skills are equally important as the ability to comprehend information because they reinforce each other.

On the contrary, education level can have a converse effect on adoption of innovations. Educated households may be less likely to invest in labour-intensive technologies and practices because they may be earning higher returns from their other formal employment sources of income. However, findings in this study contradict the above line of argument given respondents employed in other sectors within the research area (such as teachers and other civil servants) were found to be more involved in horticulture farming. For example, most respondents who had embraced horticultural farming innovations and who participated in this study as key informant interviewees and focus group discussants were reported to be primary school teachers in nearby schools. They utilized the non-farm incomes derived from their formal employment as capital to spur adoption of hybrid cabbage and tomato farming through purchasing inputs and financing acquisition of other necessary requirements.

This is supported by other studies that have shown off farm income has a positive impact on innovation adoption. This is because off-farm income acts as an important strategy for overcoming credit constraints faced by the rural households. According to Diiro (2013) off-farm income is expected to provide farmers with liquid capital for purchasing productivity enhancing

inputs such as improved seed and fertilizers. For instance, her study when analyzing the impact of off-farm earnings on the intensity of adoption of improved maize varieties and the productivity of maize farming in Uganda, Diiro reported a significantly higher adoption intensity and expenditure on purchased inputs among households with off-farm income compared to their counterparts without off-farm income (Diiro, 2013).

It is therefore inferred in this study that higher education levels facilitate individual's capacity to learn and make informed decisions. This is because education enables individuals to seek and apply information in their day-to-day problem solving. Accessibility to information on agricultural innovation is here portrayed to be directly associated with literacy. The diffusion of innovations theory illustrates this well in the innovation communication and the innovation decision processes all of which call for literacy among targeted adopters if they are to go through these two crucial processes in adoption successfully. This is because one has to acquire knowledge on several aspects such as production management, marketing strategies and nutritive value, before embarking on their production (Mwaura, et. al, 2013).

For example, Maurice et. al, (2009), in their study 'production risk and farm technology adoption in rain-fed semi-arid lands of Kenya' found that education of household heads 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 et. al, (2009) and clarifies this argument further by holding that increase in education level catalyzes the process of information flow and exposes farmers to a wider field of knowledge thereby promoting adoption of innovations. Weir and Knight (2000) carry on this argument by asserting that, to some extent, educated farmers are more likely to be willing to take risks with new technology and are more likely to be adopters of successful innovations than those who are less educated. Nzomoi et. al, (2007) concurs with the above position and argues that educated producers and marketers, who have exposure to new technologies and innovations, are more receptive and more willing to adopt them.

Cotlear (1990) agrees with this line of thought and further argues that general skills acquired in school reduce technical and allocative inefficiencies in production while attitudes acquired, encourage adoption of innovations and develop greater willingness to accept risks involved in adoption of innovations. It also acknowledges that education enables individuals control rates of message inputs and stores and retrieves information for later use as this is very important for future decisions (Cotlear, 1990).

From the above studies, it can be concluded that, education serves to increase prior access to external sources of information while also enhancing the ability of individuals to access and process information on innovations such as horticulture farming. Educated persons are thus more capable and willing to acquire information about potential innovation and make rational evaluations of risks involved in trying out innovations such as new inputs, crops or methods. Educated farmers are also more aware of benefits of innovations and have enhanced ability to learn new information, hence easily adopt innovations. Moreover, educated farmers are able to interact more effectively with support institutions such as credit and extension agencies. This is because they understand processes of transactions, requirements and keep required records properly. Through this, they increase the likelihood of accessing and obtaining such services. Furthermore, increased literacy and numeracy help farmers acquire and understand information and appropriately calculate input quantities as required in the modernizing and rapidly changing societal environment. All these functions of education are summed up by the diffusion of innovations theory which argues that, communication about innovations can only be possible when the two communicating parties understand each other and individual's level of education plays a pivotal role in this process.

4.6 Conclusion

This chapter focused on analysis and interpretation of findings relating to social determinants in the uptake of horticulture farming. Specifically, this chapter discussed gender, age, marital status, number of dependants and respondents educational level. The findings showed that although men were the majority in the sample, adoption of horticultural farming innovations was higher among women than men. This is attributable to societal structuring and division of labour where women have been culturally in charge of the kitchen gardens where production of

horticultural crops for household consumption has been practiced over time. It was therefore much easier for them to upscale engagement in horticulture farming from subsistence to market oriented level much more easily than men who had no initial production experience. Findings also showed that although women were not owners of the horticulture farms, they were the majority in the production and marketing of horticultural produce. In addition, although horticultural farming innovations had been embraced across all age groups, youthful farmers were more than the rest of the members of their society. This dominance of youthful farmers in adoption of horticultural farming innovations is attributed to their ability to handle the labour intensive nature of horticulture farming better than the younger and older members of society and possess new knowledge that older members of society may not have. They also have many needs for provision in their families and this compels them to seek additional sources of income. They also have limited productive resources such as land and therefore have to seek ways of reaping the most out of these limited resources thus resorting to horticultural farming innovations due to its high returns.

The study also showed that majority of respondents engaged in the study were married. The prevalence of married respondents in horticulture farming is seen to be informed less by individuals' marital status but more by obligations that go with getting married and the dependants brought about by marriage. These dependants besides creating pressure for provision also motivate adoption of horticultural farming innovations by being a source of labour required in horticulture adoption process. Respondents' level of education showed no notable differences with regard to adoption of horticultural farming innovations given that respondents of all levels of education had embraced horticulture farming. However, for respondents who had attained primary and secondary levels of education, horticulture farming was reported to be their main income generating activity. For those who had acquired professional training in other fields, they engaged in horticulture farming as a disguised form of unemployment as they sought employment in the formal sectors or as an additional source of income for those who were already employed. This study acknowledges that education besides increasing prior access to external sources of information serves to enhance individuals' ability to seek, acquire and understand information by transforming individual's mindset to be receptive to new information and approaches.

CHAPTER FIVE

RESPONDENTS CULTURAL FACTORS AND THEIR INFLUENCE ON UPTAKE OF HORTICULTURE FARMING

5.1 Introduction

This chapter discusses the influence of respondents' cultural attributes on adoption of horticulture farming. It presents land size owned, control of income, community perception of horticulture farming and compatibility of horticulture farming with respondents farming objectives. How these factors bear on adoption of horticultural farming innovations is culturally informed given that within the study area, men are the defacto household providers and therefore they control the household income. Land is also culturally owned by men and access to and use of family land and other resources has to be approved by the male household head (Hollis, 1909). In reference to horticulture farming, the various practices that members engage in are culturally informed given that there are specific culturally valued practices. For example, keeping of cattle has been accorded a higher prestige and value over other practices that may even be bringing in more income. Baide (2005) exemplifies this more clearly, when he argues that farming subculture such as meeting expectations of sub-cultural value systems is a fundamental part of social behavior which influences uptake of innovations. This is because there are norms in farming subcultures about acceptable agricultural practices where, ideas that are different from those currently held are likely to face resistance thereby making subcultures a powerful force in resisting change. This view is propagated further by MackenWalsh (2009), who argue that, small-scale production in farming and fishing sectors is underpinned less by economic rationality but more by existential rationality where, focus is on sustainability of enterprises as an intrinsic part of local socio-cultural fabric.

5.2 Land Ownership and its Influence on Adoption of Horticulture Farming

Land is the major factor of production and therefore the centre around which farming activities and decisions revolve. Study findings revealed that respondents owned varied land sizes ranging from less than 2.5 acres to more than 10 acres as presented in the table below. From the study findings above, it is evident that majority (59.8 percent) of respondents in the adopter category had less than five acres of land. Among the non-adopters, majority of them (61 percent) had

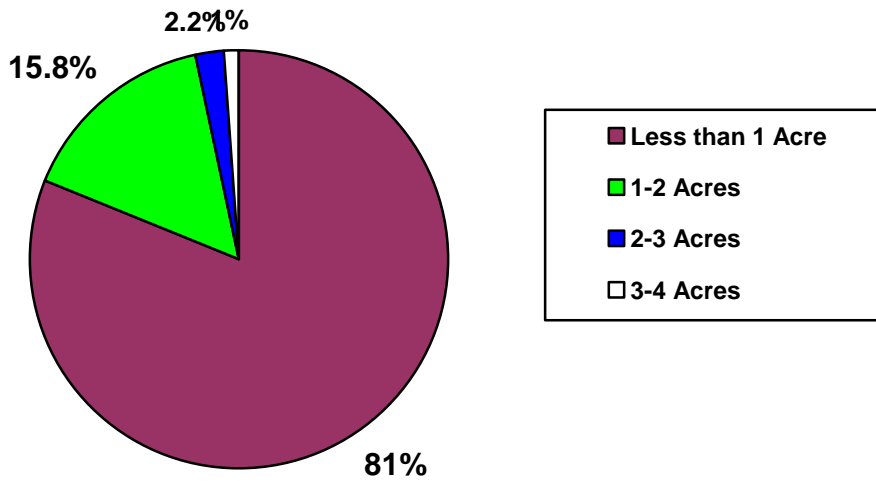
more than five acres. The prevalence of small land holdings among horticulture farmers implies limited space for undertaking of the various competing farming activities and this call for a delicate balancing.

Table 5.1: Distribution of Respondents by Land Size

Land size	Adopters		Non-adopters	
	Frequency	Percent	Frequency	Percent
Less than 2.5	70	22.5	11	12.22
2.6-5.0	116	37.3	25	27.78
5.1-7.5	51	16.6	19	21.11
7.6-10	38	12.4	13	14.44
More than 10	35	11.2	22	25.45

The study further ascertained how horticulture farmers allocated their farms to the various farming activities. Findings showed that tea farming was allocated the largest portion with 32.25 percent having less than one acre while 43.5 percent had between 1 to 2 acres. Cereals followed this closely where 47.25 percent had less than one acre while 35 percent allocated between 1 to 2 acres. Livestock farm came third with 45.25 percent allocating less than one acre while 27.25 percent allocated between one to two acres. This was followed by horticulture farms where 81.1 percent of respondents had less than one acre, 15.7 percent had between 1 to 2 acres, 2.2 percent had between 2 to 3 acres while 1 percent had 3 to 4 acres. Forested farm area was also assessed and 80.5 percent allocated less than one acre while 16.5 percent had between one to two acres. Thus, although respondents had embraced horticulture farming, they still allocated larger portions of land to practices they considered integral to household livelihood such as cereals and livestock while tea farms were common among respondents who had 2.6 acres and above.

Fig. 5.1: Size of Land Allocated to Horticulture Farming by Respondents



The prevalence of small horticulture farms (less than one acre) among respondents can be attributed to the small land sizes owned by respondents; the labour intensive nature of horticulture farming alongside the low levels of mechanization, which force individuals to resort to having small manageable farm sizes. Data obtained from in-depth interviews and key informant interviews showed that individuals who had small farm sizes favoured engagement in horticulture farming as they considered horticultural crops to have higher returns than ‘traditional’ economic activities such as dairy, tea and maize farming. A female key informant interviewee remarked,

People are increasing everyday but the land is becoming smaller and smaller because of subdivision. However, over time I have noted that, as land becomes smaller, more people resort to horticultural farming because they can plant different crops and for more times in a year than if they were to plant maize or tea. It is majorly farmers who still have large land portions who still plant maize and tea but for those whose land cannot reach one acre, the way to go and which has become the trend here is horticultural farming (56-year-old female discussant).

Horticultural farming is depicted here to be predominant among small landholders. Despite this increased inclination of small landholders towards horticulture farming, respondents reported to still reserve some portions of their lands for other culturally valued practices such as livestock keeping and maize farming for household consumption. The few participants who had more than

one acre of horticultural farms were progressive farmers who owned larger farms and had capital sufficient resources to facilitate investment and management on a higher scale.

The study further sought to assess the association between an individual's land size and adoption of horticulture farming. Pearson's product moment correlation test was administered to ascertain these relationships and findings indicated a significant positive correlation ($p=.207^{**}$ $p<.01$). The result is significant at $p<.01$. The results show that 4.29 percent of variation in adoption of horticultural farming innovations is explained by land size owned by respondents. This implies that respondents with larger land holdings allocated more land to horticulture farming. This finding is in line with the logistic regression finding which showed that size of land owned by respondents was significant in adoption of horticulture farming. When the effect of other variables in the equation was controlled, respondents who had between 2.6 to 5 acres appeared 2.3 times more likely to adopt horticultural farming innovations than their counterparts who owned smaller or bigger land sizes. Wald statistic significant at $p=.043$. This category comprises majority of horticulture farmers (37.3 percent).

This finding is also supported by Mwaura et. al, (2013) who found that farmers with smaller land holdings were more likely to engage in production of indigenous vegetables when compared to those who had larger pieces of land. Findings from their study showed that 96.7 percent of those who owned less than 2.5 acres of land had adopted horticultural farming innovations as compared to 72.9 percent of those who had more than ten acres of land. They attributed this to the need for intensive land use among small holders in order to maximize returns considering that horticultural crops were fast growing and yielded immediate high returns to the farmer. Small farm size therefore is seen as an incentive to adopt technology especially labor-intensive or land-saving technology such as horticulture farming. Farmers with small farm sizes are therefore more likely to adopt land-saving technologies such as green house technology, among others as an alternative to increased agricultural production (Yaron, Dinar and Voet, 1992; Harper et al, 1990).

Other researchers found a contrary relationship between farm size and decision to adopt innovations (Adimado, 2001; Kheralla et. al., 2001; Langyintuo and Mekuria, 2005). They argue

that farmers with larger land holdings tend to be more concerned with farming activities and are more likely to adopt new and innovative farming practices than those with smaller land holdings. This is because; larger land holdings accords farmers more space to try out newer practices while they continue with their usual farming activities uninterrupted. Larger farm sizes are also associated with more wealth, increased availability of capital, higher risks tolerance and more returns especially with new investments and innovations (Norris and Batie, 1987). Moreover, farmers operating larger farms can surrender less productive areas to try out adoptions of innovations (Uaiene *et al.*, 2009); Odendo, 2010).

Other farmer-specific factors likely to influence farmer behavior and decision-making regarding adoption of innovations are capacity endowments of the household. These include natural, financial and physical capital endowments that bestow the capacity, for instance, to adopt production technology or practice. Endowment with more land, a form of natural capital, is directly associated with the decision to adopt improved practices (Marenya and Barret 2007; Oduol *et al.* 2011). Studies further indicate that differences in quality of land (including topography, fertility) significantly affect household's decision to adopt farming practices (Feder and Umali 1993; Baidu-Forson, 1999; Caswell *et. al.*, 2001).

The findings from this study contrast this argument given that in reference to proportion of land put under horticulture farming, respondents who had smaller land holdings devoted greater portions of their land to horticultural farming than those who had larger holdings. Logistic regression findings showed that respondents who had between 2.6 to 5 acres appeared 2.3 times more likely to adopt horticultural farming innovations than their counterparts who owned smaller or bigger land sizes. The descriptive findings showed that, among respondents who owned 1 to 2.5 acres 96.7 percent allocated horticulture farming less than one acre. Those who owned between 2.6 to 5.0 acres, 80.1 percent allocated horticulture farming less than one acre while 19.2 percent allocated between 1 to 2 acres to horticulture farming. Those with 5.1 to 7.5 acres, 70.6 percent allocated horticulture farming less than one acre while 26.5 percent allocated between 1 to 2 acres. For those who owned between 7.6 to 10 acres, 63.9 percent allocated horticulture farming less than one acre while 27.8 percent allocated between 1 to 2 acres, while for those who had more than ten acres 81.4 percent allocated horticulture less than one acre

while 11.9 percent allocated between 1 to 2 acres. Thus, a higher proportion of land is allocated to horticulture farming among respondents who owned smaller land holdings. The prevalence of small horticulture farms is well illustrated by diffusion of innovations theory, which argues that adoption process is gradual with individuals trying out the innovations first on a small scale before adopting them on a large scale once they are satisfied with them. Furthermore, farmers with smaller land holdings would seek to maximize returns from the limited spaces that they have and therefore are more likely to adopt innovative approaches that deliver to them higher returns one of them being horticulture farming.

The finding on allocation of small farm portions to horticulture farming is in line with Biwott & Tuwei's (2016) study whose findings showed that majority of residents of Nandi County (94 percent) relied on farming as their primary occupation. As a consequence, this has led to greater land subdivisions to portions that are uneconomical and thus, farmers in Nandi County allocated about 10 percent of their available land to horticultural production. Horticultural farming is therefore more appropriate in such fragmented land portions. Furthermore, owing to the labour intensive nature of horticulture farming and the absence of mechanization, farmers would invest in small plots that can be run effectively with the aid of the labour available within the households.

Feder et. al, (1982) further argues that some innovations are scale neutral. For example, the use of high yielding varieties and some modern variable inputs such as fertilizer are scale neutral since their adoption initially tends to lag behind on smaller farms but eventually catches up. Moreover, the intensity of adoption of higher yielding varieties on smaller farms exceed those of larger farms given that smaller and medium-size farms tend to adopt higher yielding varieties on larger proportions of acreage than larger farms. Feder et. al, (1982) and FAO, (2014) further argue that the "intensity" of adoption (such as 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. They argue that large-scale farmers adopt innovations that involve higher fixed costs at a higher rate while innovations which are neutral to scale are eventually adopted by all classes of farmers, although larger farmers are typically among the early adopters.

Farm size can therefore have different effects on rates of adoption of innovations depending on characteristics of innovations and the setting within which promotions of innovations take place. More specifically, relationships of farm size and adoption of innovations depend on such factors as characteristics of innovations defined by its compatibility, relative advantages, complexity and affordability. Other factors include; fixed adoption costs, risk preferences, skills required, credit constraints, labour requirements and tenure arrangements (Feder et. al., 1982). Nzomoi et. al, (2007) while concurring with Feder et. al, (1982) hold that technology adoption is not in any way dependent on farm size but on functions of factors exogenous to respective farms.

However, during data collection it was observed that farmers had not embraced all aspects of horticulture farming. Practices such as tissue culture development were reported to be a preserve of those who could afford to set up greenhouses and had the technical know-how for its management. However, two green houses that had been provided by ministry of agriculture through the SHoMAP program existed, although they had been abandoned due to lack of reliable water supply, lack of financial resources to cater for their operation and poor managerial skills among respondents.

Besides land size, decisions relating to adoption of innovations are affected by security of land tenure. This study did not endeavour to ascertain the nature of land tenure arrangements prevalent in the research area however; this arose as an appendage to land ownership. About 20 percent of respondents reported to own small parcels of land but leased on short-term basis greater portions that they used for agricultural activities. Thus, farmers that are more aggressive leased some land parcels from weaker farmers and attempt to generate maximum profits in shorter terms. The leased farms were mainly used for production of crops that matured within shorter periods namely vegetables and cereals. Land tenure was however found to be an insignificant factor in adoption of horticultural farming innovations in this study. It is therefore evident that issues of land tenure are not critical in the uptake of horticultural farming innovations given that most horticultural crops require shorter maturity periods and thus can be planted even on leased farms. In addition, their higher returns compensate for the higher investments that might have been incurred during adoption such as fencing the leased land. It is

then possible that probability of adoption of horticultural farming innovations would be higher because of its possible embracement by farmers with both secure and insecure land tenures.

Women have largely been cited in literature as lacking security of land tenure but, within the research area, utilization of family land by women was reported to be informed by cultural norms guiding access to and use of such land. For example, married women were reported to generally have access to their husband's land, all they needed to do was inform their husbands to give consent for use of the land. In this study, land access challenges with regard to women were not reported unless where land was too small and had to be shared among the various competing uses. Mostly in such cases, culturally valued practices such as owning cattle were reported to take precedence over horticulture farming that may be less valued.

Other studies have demonstrated similar results. For example, Asrat et. al, (2004) found that formal land ownership (holding title deed) was not a significant factor in farmers' willingness to pay for soil and water conservation practices. This was due to farmers' confidence in having long-term access to land despite lack of title deeds. Research by Hagos and Holden (2006) on influence of tenure security on farm level investments supports Asrat et. al,'s (2004) findings that tenure security has weaker influence on willingness to invest than perceptions of return on investments and improved crop yields. This argument is also supported by Place and Swallow (2000) who argue that relationships between property rights and adoption of innovations are complicated in several respects. They hypothesize that the nature of technology or investment will affect relationships between adoption and property rights for instance tenure security. According to them, adoption of innovations may occur even in insecure tenure situations if overall short-term costs are lower and benefits accrued quicker such as in horticulture farming (Place and Swallow, 2000).

The degree of tenure insecurity is expected to have greater influence on incentives to invest in and adopt difficult-to-implement soil and water conservation practices such as terracing, fencing, water harvesting, agro-forestry, and fallowing. Conversely, the effect of insecure tenure is not necessarily pervasive since higher-expected profits can overcome negative incentives that result from insecure property rights (Place and Swallow, 2000). Farmers without secure land tenure

(such as leased land) prefer short-term investments on land such as horticulture and maize as was reported in this study.

5.3 Compatibility of Horticulture with Respondents Farming Objectives

Respondents were also assessed in reference to their farming objectives and extent of compatibility of horticulture farming with such objectives. Rodgers' (1995) definition of compatibility was adopted. Rodgers defines compatibility to encompass the degree to which an innovation is perceived as consistent with existing values, past experiences, and needs of potential adopters. An idea that is more compatible is less uncertain to the potential adopter, and fits more closely with individual's life situation. Furthermore, innovations can be either compatible or incompatible in various perspectives such as with socio-cultural values and beliefs, with previously introduced ideas, or with client needs for the innovation (Rodgers, 1995).

Three major farming objectives were cited by respondents namely, to get food, create employment for themselves and to earn income. Thus, horticulture farming appears well suited among both the subsistence and market oriented farmers given that for horticultural crops that are not necessarily part of the main household foods, they can be grown for purpose of selling them in the market. Respondents who had embraced horticultural farming innovations therefore perceived it as compatible with their farming objectives but for non-adopters, majority (63.33 percent) perceived as incompatible as shown by findings in the table below.

Table 5.2: Compatibility of Horticulture Farming with Respondents Farming Objectives

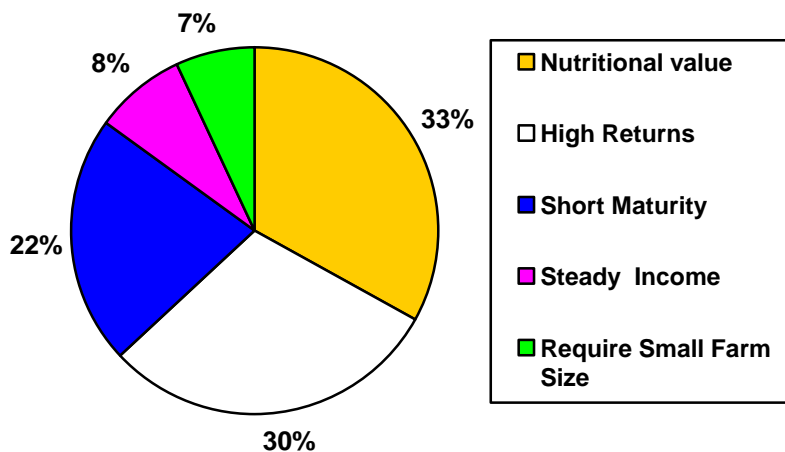
Compatibility	Adopters		Non-adopters	
	Frequency	Percent	Frequency	Percent
Compatible	273	88.1	33	36.67
Incompatible	37	11.9	57	63.33

The high compatibility of horticulture farming with respondents' farming objectives show that horticulture enjoys high acceptability and potential for wider embracement as the mainstream agricultural activity. The reasons reported by respondents in support of this high level of

compatibility of horticulture farming with their farming objectives included 33 percent attributing it to the nutritional value of horticultural crops, 30 percent, 22 percent, 8 percent and 7 percent attributed to high returns, their short maturity period, their steady cash and their requirement of small farm size respectively. Such high levels of innovations compatibility with adopters' value systems and expectations is well illustrated by diffusion of innovations theory, which cites compatibility as one of the attributes of innovations that influences levels their acceptability and ultimately adoption. It argues that innovations that are compatible with respondents' value systems and expectations are more likely to be adopted than those that are deemed incompatible.

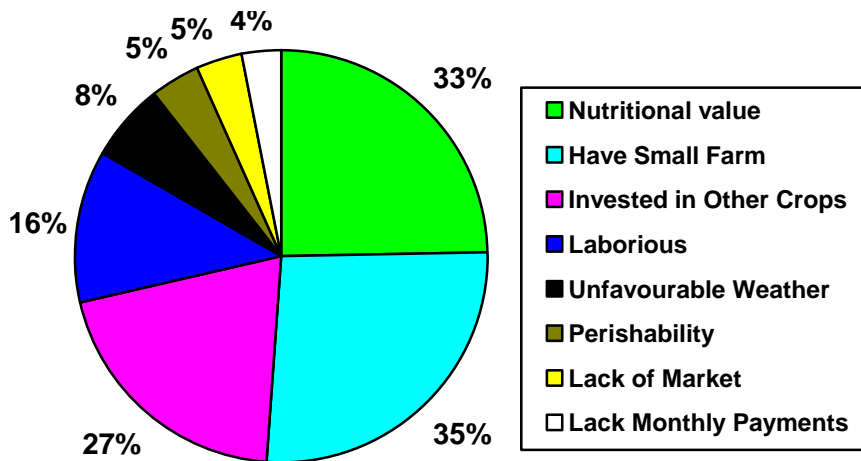
This is supported by findings of Mignouna *et al.* (2011) in studying determinants of adopting Imazapyr-Resistant maize (IRM) technology in Western Kenya, who stated that, the characteristic of the technology play a critical role in adoption decision process. They argued that farmers who perceive the technology being consistent with their needs and compatible to their environment are likely to adopt since they find it as a positive investment. Farmers' perception about the performance of the technologies therefore significantly influences their decision to adopt them. A study by Adesina and Zinnah (1993) showed that farmers' perception of characteristic of modern rice variety significantly influenced their decision to adopt it. A similar result was reported by Wandji *et al.* (2012) when studying perception of farmers towards adoption of Aquaculture technology in Cameroon. Their study indicated that perception of farmers towards fish farming facilitated its uptake.

Fig. 5.2: Reasons for Compatibility of Horticulture with Respondents Farming Objectives



The above view of those who saw horticulture as compatible with their value systems and expectations contrasts the views of those who reported horticulture farming to be incompatible. The reasons cited to discourage respondents include 35 percent citing their small farm sizes, 27 percent had invested in other crops, 16 percent saw horticulture farming as very demanding, laborious and tedious because it is done manually. A further 8 percent, 5 percent, 5 percent and 4 percent reported the unfavourable weather conditions, high perishability of horticultural crops, lack of a ready market and lack of monthly payment respectively.

Fig. 5.3: Reasons for Incompatibility of Horticulture with Respondents Farming Objectives



Other reasons that were reported to discourage respondents from adoption of horticultural farming innovations pertained to harmful effects associated with various horticultural crops including unfounded fears based on genetically modified organisms (GMO) conception that scientifically improved crop varieties (a case in point being tissue culture bananas), cause cancer. Kales (*sukuma wiki*) were also reported to be highly acidic and therefore not consumed by majority individuals with health conditions related specifically to ulcers. Furthermore, kales were reported to be soil degrading. There were no associated harmful effects reported on traditional vegetables, passion fruits, cabbages and pineapples although there was a general fear that the high levels of chemicals used in their production might have an effect on consumers. These fears are therefore thought to have contributed to slow adoption of the listed crops with the fear on use of chemicals slowing down adoption of most horticultural crops that require repeated use of

chemicals in their production. However, these fears were more pronounced in production that is geared towards household subsistence use than where focus is market oriented.

Pearson's correlation test was utilized to ascertain whether respondents' perception of compatibility of horticulture with their farming objectives influenced their decision to adopt horticulture farming. Findings yielded a correlation ($p = -.377^{**}$ $p < .01$). The result is significant at $p < .01$. The results show that 14.2 percent of adoption of horticultural farming innovations is accounted for by respondents' perception of compatibility of horticulture farming. The high compatibility of horticulture farming with respondents' value systems, farming objectives and prevailing socio-cultural values, beliefs and attitudes shows that there is potential for wider adoption as a mainstream agricultural activity.

This finding is supported by logistic regression finding which showed that respondents' perception of the prevailing value system, socio-cultural values, beliefs and attitudes was significant in adoption of horticulture farming. When the effect of other variables in the equation was controlled, respondents who had reported their perception of the prevailing value system, socio-cultural values, beliefs and attitudes as compatible appeared 2.177 times more likely to adopt horticultural farming innovations than their counterparts who perceived as incompatible. Wald statistic significant at $p = .05$. This is further supported by prevailing community attitude towards horticulture farming that was rated overwhelmingly by 95 percent of respondents as favourable while only 5 percent termed it as unfavourable.

In reference to the undertaking of the various roles entailed in horticulture farming, descriptive data showed that both men and women shared in the farm activities. From the findings, 71 percent of respondents reported men to be more involved in planting, weeding and harvesting, while 11 percent reported to be concerned with ploughing. A further 11 percent of men were involved in spraying while 7 percent were engaged in crop management generally. Women's roles were reported by 83 percent of respondents to be in planting, weeding and harvesting, while 17 percent reported to engage in marketing. Some norms were also reported to inhibit both men and women from engaging in horticulture farming activities. For example, 5 percent of respondents reported that culturally, men do not engage in subsistence-oriented production. A further 0.75 percent reported that culturally women are not supposed to go to the farm when they

are experiencing their monthly periods, as it was believed that this would cause crops to wither. However, these inhibitions were reported to be insignificant having faded with time given that majority of respondents no longer believed in them. The FGD discussants argued that,

Currently women engage freely in vegetable farming because previously held beliefs about influence of their impurity on farm productivity have faded. However, there are still some beliefs that affect both men and women, for example, the belief that some people have 'bitter' hands and thus when they harvest anything from farms whatever remains withers. These people are known and are not allowed to enter farms (FGD 4 discussants).

Such variations in roles played by men and women in horticulture are well captured by human agency theory, which argue that, in every society, concepts of power, knowledge and prestige are attributed differently to persons of different gender given that notions of agency are constructed differently in different cultures. In the community under study, there are culturally defined roles such as men being in charge of the market oriented farming activities while women are left in charge of the subsistence ones. Such definitions tend to constrain individuals on the nature of activities that they can engage in and this in the long-run influences acceptance or rejection of innovations that are targeted at men or women.

The above line of argument is supported by MackenWalsh (2009), who found that, small-scale production in farming and fishing sectors is underpinned less by economic rationality but more by existential rationality where, focus is on sustainability of enterprises as an intrinsic part of local socio-cultural fabric. A strong social and cultural attachment to their occupation was reported among members of farming and fishing case study groups where both farmers and fishers attributed significant importance to the community based networks, conventions and practices or social capital that underpinned the livelihoods of their respective occupational groups. Although farmers were traditionally primarily a rural social group in Ireland, MackenWalsh holds that they showed resistance to engagement in 'alternative' routes towards income generation outside of farming with many of them continuing with what had officially been categorized as non-viable farms.

Another example is presented by the introduction of miracle varieties of rice in Philippines in the mid-1960s. These varieties bred at the International Rice Research Institute (IRRI) were touted

to triple farmer's rice yields and they spread very rapidly throughout Asia, causing a "green revolution." Despite being high yielding and resistant to pests, this new variety did not taste "right" to farmers like the initial variety they had planted. They thus engaged in its production for sale in the marketplace, while continuing to plant the traditional rice variety for their own family consumption (Rogers, 1995).

These two studies compares well with the mindset shared among members of the Nandi community that were engaged in the current study where ownership of cattle is central to an individual's identity. This is a value shared across pastoralist and agro-pastoralist communities (Hollis, 1909). Thus, individuals try all possible options to own a cow even if through the communal loaning system (this is where families that do not have cattle can seek them from those who have so that they keep for them as they benefit from the milk). Ownership of a cow is therefore an integral part of the respondents' cultural life, as it is believed to accord one prestige besides serving as a source of livelihood. As a result, individuals prioritize land for keeping cattle over and above land for use in any other income generating activity.

Also within the research area, horticultural crops that were not part of crops traditionally considered food/edible and therefore planted by the community attracted low levels of adoption as compared to indigenous vegetables. This is attributed to community's perception of such crops as being of lesser value both economically and nutritionally given their consideration as foreign. Such valuable forms of knowledge that have accumulated within the community over generations (the value attached to cattle and the traditional vegetables) appear to underpin small-scale forms of production and as a result, they influence individual's decisions on what they can adopt or not.

This is well illustrated by the human agency theory, which argue that individuals act according to their attitudes, beliefs and state of knowledge possessed, all of which must change first in order for changes in societal structure and processes to occur. Furthermore, people's behaviours and actions result from rational decisions determined by circumstances surrounding people's lives that ultimately shape local socio-cultural realities. Thus, who does what, has what, and controls what including gender-specific structural and institutional constraints and the relative status and

opportunities open to women, men and the youth in society are determined by the prevailing value system, attitudes, beliefs and state of knowledge possessed and shared among the members. Therefore, for adoption to take place, such mental states have to be changed first so that they can allow and facilitate changes in behaviours and consequently enable adoption to occur. However, this can only be possible once environmental, institutional, and psychological states that shape people's decisions and choices have been made favourable to adoption of new practices and innovations.

An innovation need not only be compatible with deeply embedded cultural values as presented above but also with previously adopted ideas. According to Rogers (1995), old ideas are the main mental tools that individuals utilize to assess new ones. Individuals cannot deal with innovations unless based on previous experiences. Previous practices therefore serve as familiar standards against which innovations are interpreted, therefore reducing uncertainty. Fals Borda, (1985), gives examples of use of past experiences to judge new ideas in a diffusion study among Colombian peasant community. Farmers are reported to have applied chemical fertilizers on top of their potato seeds (as they had done with cattle manure), thereby damaging the seeds and causing lower yields. Other peasants sprayed their potatoes with insecticides excessively, transferring to the new idea their old methods of watering plants. Thus, compatibility of innovations with preceding ideas can therefore either speed up or retard rates of adoption. In these two cases, perceived compatibility of new ideas with previous experiences led to adopters incorrectly utilizing the innovations. In this case, compatibility led to adoption of a new idea, but then putting it to incorrect use.

Drawing from this line of argument, the slow uptake of horticultural farming innovations can be attributed to the structured nature of work that respondents have become accustomed in tea and maize farming that they have practiced for a long time. When compared to horticulture, tea and maize farming are less laborious except during planting and harvesting but have ready and steady markets. This contrasts horticulture farming that is highly laborious throughout the production cycles given that most activities are done manually coupled with the delicate nature of horticultural produce and the lack of ready and consistent markets. With regard to maize, farmers in the study area harvest lower yields because over the years it has become the norm for them to

manually plough their farms, plant fewer maize seeds per acre and with limited fertilizer, wrong timing of planting season with no top dressing of the crops. Similarly, tea farmers have widely learnt to apply less fertilizer, herbicides and often delay plucking and pruning their tea all of which reduce yields and incomes. This approach has been carried over to horticulture farming resulting to inappropriate adoptions that lead to low yields and consequently low incomes to the horticulture farmers thus discouraging other potential adopters.

5.4 Control of Income and its Influence on Adoption of Horticulture Farming

Respondents were assessed about whom in the household controlled income accruing from horticultural farming. The findings showed that, male household heads in most cases controlled income from horticultural farming. The greater control of income by men tends to be informed by their larger representation in the sample given that 60 percent of respondents were male. Findings among the non-adopter category indicated the contrary, as women were the majority in control of income from horticulture farming. This is because among this category, horticulture farming is not the main source of household income.

Table 5.3: Control of Income from Horticulture Farming

Income control	Adopters		Non-adopters	
	Frequency	Percent	Frequency	Percent
Man	161	52	36	40
Woman	149	48	54	60

However, comparing the proportion of female and male respondents among the adopter category (60 versus 40 percent), and their proportion in control of income (52 percent men versus 48 percent women), results show that even in some cases where respondents were male, women were reported to control income from horticulture farming. This is because although culturally men control the main sources of family income, women were also allowed to control income from their ‘small’ sources such as kitchen gardens (*kabungui*) where horticultural crops for household consumption are grown and women can trade any extras. The increased proportion of women in control of income from horticulture farming show that the patriarchal nature of the

Nandi community where men normally controlled sources of family income, enterprises and other properties valued by the community is fading away. Women have assumed a central place and role in the economic life of this community. This finding comes closely to that of Mwaura, Muluvi and Mathenge (2013) who found out that, when disaggregated by gender, women have higher share of incomes from garden vegetables as compared to men. This was apparently accounted for by men's other better opportunities for farm and non-farm enterprises, which generate more incomes as compared to incomes from vegetables.

Pearson's product moment correlation test was administered to ascertain whether there was any association between control of income from horticulture farming and uptake of horticultural farming innovations. Findings depicted an insignificant relationship ($p=.095$; $p<.05$). The result is not significant at $p < .05$. This implies that, there are no significant gender differences in control of income from horticulture farming. This finding is in line with the logistic regression results. When the effect of other variables in the equation was controlled, where income was reported to be controlled by the male household head appeared 1.2 times more likely to adopt horticultural farming innovations than where income is controlled by female household heads although this finding was not significant. Wald statistic significant at $p=.287$. This implies that whether the male or female household head controlled the income, this was did not significantly influence adoption of horticultural farming innovations

Although among the respondents studied, men traditionally controlled the main sources of family incomes, women were reported to control incomes from their 'small' sources such as kitchen gardens (*kabungui*) where they produce for subsistence consumption and would sell extra produce to generate their incomes. Thus, where women controlled the incomes, horticulture farming was not necessarily the main source of household income. In such cases, women had their kitchen gardens (*kabungui*).

The dominance of women in control of incomes from horticulture farming is further explained by a study carried out by Stephanie et. al, (2005) which found out that despite modernization of production in large scale established farms, horticulture farming remains a labour-intensive sector, with labour accounting for 50–60 per cent of farm costs. A significant amount of this employment is temporary and involves females. In their observation, the dominance of women in

horticulture farming is largely socially instilled as girls are prepared for domestic roles within society. From the above arguments, it is evident that any promotional efforts on adoption of horticultural farming innovations are therefore more likely to be successful if targeted more at women rather than men.

5.5 Extent of Adoption of Horticulture Farming

Respondents' propensity to adopt horticulture farming was studied and measured as least acceptable, acceptable, moderately acceptable and highly acceptable. Least acceptable meant one may not be engaging in its production now but given an opportunity he/she would be ready to adopt; acceptable meant the respondent just engages in its production on a subsistence basis; moderately acceptable meant horticultural crops are among the top three cash crops the respondent has embraced; while highly acceptable meant horticultural crops are the current main cash crop for the respondent. Findings showed high levels of acceptance of horticulture farming. For instance, 34 percent of respondents rated it as highly acceptable while 23 percent, 32 percent and 11 percent rated it as fairly acceptable, acceptable, and least acceptable respectively. On the contrary almost 47 percent of the non-adopters rated acceptability of horticulture farming as least acceptable while 30 percent, 21 percent and 2 percent rated as acceptable, moderately acceptable and least acceptable respectively. It is worth noting that none of the respondents sampled engaged in production of flowers with 80 percent rating them as least acceptable and 20 percent rated as acceptable.

The above findings show that 89 percent of respondents rated horticulture farming as acceptable given they engaged in their production. Such high levels of acceptability of horticulture farming is attributable to its compatibility with individuals' farming objectives, preferences and internal states that according to the human agency theory would favour or discourage adoption of such 'new' innovations within existing social and cultural context. According to this theory, individuals act according to their attitudes, beliefs and state of knowledge, all of which have to be changed first in order for individuals to embrace changes in societal structure and processes such as adoption of horticulture farming.

Table 5.4: Extent of Acceptability of Horticulture Farming

Propensity to adopt	Adopters		Non-adopters	
	Frequency	Percent	Frequency	Percent
Least acceptable	34	11	42	46.67
Acceptable	100	32	27	30.0
Moderately acceptable	71	23	19	21.11
Highly acceptable	105	34	2	2.22

The above findings are in line with Ragasa, (2012) who argued that, individually or in groups, farmers have certain expectations on technology advancement based on their socio-cultural conditions. Individually or collectively, they use these socio-cultural based indicators to monitor and evaluate these technologies for adoption. This is supported by the human agency theory which argues that, people’s behaviours and actions result from rational decisions determined by circumstances that surround their lives and ultimately shape their socio-cultural reality on who does what, has what, and controls what. This includes gender-specific structural and institutional constraints and the relative status and opportunities open to women, men and the youth in society. In the long run, new behaviours that lack institutional or agency and environmental support to make them pay off may not be adopted, or if adopted they will not persist for lack of support. However, findings show that horticulture farming enjoys a lot of institutional or agency and environmental support among the respondents.

5.6 Horticultural Crops Grown by Respondents

This study sought to investigate the various horticultural crops grown by respondents. The major horticultural crops were bananas (*musa spp*) 83.75 percent, kales (*Brassica oleracea var acephala*, in Swahili ‘*sukuma wiki*’) and cabbages (*Brassica oleracea var capitata*) 77 percent, traditional vegetables (African nightshades-*Solanum spp* locally known as *managu*, Spiderplant-*Gynandropsis spp* locally known as *saka*, Sunnhemp-*Crotalaria spp* locally known as *mitoo* and Runner beans-*Phaseolus spp* locally known as *kunde*) 72.25 percent, tomatoes (*lycopersicon esculentum* locally known as ‘*nyanya*’) 66.75 percent, passion fruits (*passiflora edulis* locally

known as ‘karandile’) 57.75 percent and pineapples (*Ananas comosus*) 25.75 percent as shown in the table below.

Table 5.5: The Various Horticultural Crops Grown by Adopters

Horticulture crops grown	Frequency	Percent
Bananas (<i>Musa spp</i>)	335	83.75
Kales and cabbages (<i>Brassica oleracea</i> var <i>acephala</i> and <i>Brassica oleracea</i> var <i>capitata</i>)	308	77
Traditional vegetables (African nightshades- <i>Solanum spp</i> , Spiderplant- <i>Gynandropsis spp</i> , Sunnhemp- <i>Crotalaria spp</i> and Runner beans- <i>Phaseolus spp</i>)	289	72.25
Tomatoes (<i>Lycopersicon esculentum</i>)	267	66.75
Passion fruits (<i>Passiflora edulis</i>)	151	37.75
Pineapples (<i>Ananas comosus</i>)	103	25.75

It is worth noting that none of the respondents sampled was engaged in production of flowers. Focus group discussion findings further confirmed that none of the residents within the research area engaged in their production. The various reasons cited to discourage respondents from engaging in flower farming were; high investment required in putting up green houses, lack of a reliable water supply source within the research area and lack of a local market.

The propensity of respondents to adopt the various horticultural crops on a more enhanced scale was assessed as totally unacceptable, least acceptable, fairly acceptable, acceptable and highly acceptable. Totally unacceptable meant one has never considered engaging in their production at all and would not consider them for adoption at all. Least acceptable meant one may not be engaging in its production now but given opportunity, they are ready to adopt it. Fairly acceptable meant one just engages in its production on a subsistence basis now. Acceptable meant horticultural crops were among one’s top three income generating engagements while highly acceptable meant that horticultural crops were their current main cash crop.

Findings in reference to the various horticultural crops grown showed that 77 percent grew kales (*Brassica oleracea* var *acephala* locally known as ‘sukuma wiki’) and cabbages (*Brassica oleracea* var *capitata*). Their prevalence is attributable to their widespread popularity and consumption and thus have a vast and ready market. When respondents were asked about their propensity to adopt kales (*sukuma wiki*) and cabbages as their main horticultural crops, less than 1 percent of respondents cited them as totally unacceptable, 11.25 percent rated as least acceptable, while 20 percent, 34.25 percent and 34.25 percent reported as fairly acceptable, acceptable, and highly acceptable respectively. Respondents in support of the high acceptability of kales (*sukuma wiki*) and cabbages cited various reasons namely; their wide consumption locally and in accessible markets in nearby towns coupled with their low susceptibility to diseases and changes in weather conditions. They were also seen as a crop that cannot result in 100 percent loss to the farmer in any event.

Bananas (*Musa spp*) were planted by 83.75 percent of respondents. Its propensity for adoption as the main crop was also high. It was rated as totally unacceptable by 2.25 percent, least acceptable 8.25 percent, fairly acceptable 21.75 percent, acceptable 21 percent, while 46.75 percent rated them as highly acceptable. Besides their ready market locally and in neighbouring towns, other reasons cited by respondents in support of acceptability of bananas were that they can serve as a stable food crop, they are less laborious and less capital intensive to produce, have a long productive lifespan, their low perishability that can still enable one to look for market once they are ready and that their stalks also serve as fodder for livestock. The high acceptability of kales and cabbages along with bananas conforms to findings of Kavoi et. al (2004) who argued that bananas and kales (*sukuma wiki*) are the most concentrated horticultural crops both geographically and at the household level in Kenya. Each is produced throughout the country and is actively marketed. It was observed during data collection that in most areas, at least three quarters of rural households engaged in market oriented production of bananas and kales (*sukuma wiki*).

Traditional vegetables namely African nightshades-*Solanum spp* locally known as *managu*, Spiderplant-*Gynandropsis spp* locally known as *saka*, Sunnhemp-*Crotalaria spp* locally known as *mitoo* and Runner beans-*Phaseolus spp* locally known as *kunde* were reported to be planted by 72.25 percent of respondents for both subsistence and commercial purposes. In reference to

their propensity to adopt these crops on an enhanced scale, 3.5 percent cited them as totally unacceptable, 5 percent rated as least acceptable, while 15.25 percent, 32.25 percent and 44 percent reported to be fairly acceptable, acceptable, and highly acceptable respectively. The production of indigenous vegetables in the research area is reported to be advantageous because of their uniqueness such as short production cycles, requirement of a few purchased inputs, can thrive in poor soil, are resistant to pests and diseases (indigenous vegetables), are quite acceptable to local tastes, are well suited to the small plots and limited resources of rural families and produce high yields with strong nutritional value. These crops were therefore reported to support rural populations in terms of subsistence and income generation, without requiring huge capital investments. This is especially so for the resource poor farmers with low capital investments capabilities as in the case of the research area.

Department for International Development (DFID) and Research for Development (R4D), (2010) concurs with the foregoing findings by arguing that horticultural crops namely kales (*sukuma wiki*), cabbages, traditional vegetables (*managu, saka, mitoo, kunde*) and bananas have increasingly become important commercially in Kenya over the last 15 years as they have increasingly featured in both formal and informal markets as a result of the enormous growth in their demand. The increased demand has resulted in these produce entering supermarket chains and other lucrative markets which has resulted in better incomes for producers, however this is not the case in the research area. Among respondents engaged in this study, the main markets for their produce were the local shopping centers and markets where buyers from neighbouring towns such as Kapsabet and Nandi Hills went to buy the produce. Thus, there is still room for producers to expand their market access and command however, this will require a change in production systems given the high standards that they have to meet in order for their produce to be able to compete with those in the market now.

Tomatoes (*Lycopersicon esculentum*) were also found to enjoy a wide adoption among respondents as they had been embraced by 66.75 percent of respondents. In reference to respondents' propensity to adopt production of tomatoes at an enhanced scale, 3.5 percent rated as totally unacceptable, 5 percent, 15.25 percent and 32.25 percent rated as least acceptable, fairly acceptable and acceptable respectively, while 44 percent rated as highly acceptable. Although tomatoes attracted high levels of acceptability few respondents domesticated them.

Various reasons were cited for their unpopularity by respondents, namely; their highly fluid market price, their vulnerability to diseases and pest infestation and their short production period during the dry season owing to the unfavorable weather that necessitates use of green houses during rainy season. Despite these production challenges, most respondents who expressed acceptance for tomatoes and those who had embraced them cited its marketability locally, high returns and short maturity period as the main factors motivating them to embrace its production.

Passion fruit (*Passiflora edulis*) was found to be a relatively new horticultural crop having been introduced into the research area by techno-serve among farmers who had entered into agreement and partnered with processing companies' agents based in Eldoret town. Its extent of adoption was still low although 37.75 percent of respondents planted them on small plots on a 'wait and see' basis given the crop had just been introduced on a platform of high returns as compared to already existing horticultural crops. The reasons cited by respondents for the low popularity of passion fruits included their highly fluid market price and its vulnerability to diseases and pest infestations that can lead to huge losses. Despite these fears, passion fruits still attracted a high propensity for adoption with only 2.25 percent citing them as totally unacceptable, 26.75 percent, 18 percent, and 25 percent citing as least acceptable, fairly acceptable and acceptable respectively while 28 percent rated as highly acceptable. The reasons given in support of the high propensity for adoption of passion fruits included ease of processing into other value added products locally, the longer productive life of the crop and readily available local market. One respondent remarked that,

Passion fruits have a wide market given that you do not need to wait for buyers from urban areas as they can be sold easily in local markets and to school going children. They are easy to market locally given that passion fruits are not as expensive as other fruits brought from outside for sale in our local markets (45 year old female key informant).

Pineapples (*Ananas comosus*) were also found to have been newly introduced by SHoMAP a bit earlier than passion fruits. However, it had the least level of adoption with 25.75 percent of respondents having adopted them. Their low level of adoption was attributed to their lack of readily available market locally coupled with competition posed by other fruits from outside the research area that are relatively cheaper. The respondents' propensity to adopt them was low with 7.25 percent rating them as totally unacceptable, 30.5 percent rated as least acceptable,

while 21 percent, 22.5 percent and 18.75 percent rated as fairly acceptable, acceptable and highly acceptable respectively. The reasons given to explain the low level of likelihood of adoption include the unfavourable climatic conditions that cause them to take long time to mature and competition from other cheaper fruits that lock them out of market locally while the outside market is not promising due to low production volumes that make them uneconomical to market. One passion fruit farmer remarked,

I was among the first farmers to embrace pineapple farming and I have struggled with it so much. As you can see, my farm is now overgrown with weeds because it has proven to be economically unviable. The crops have taken so long to mature because it seems to be colder here. In fact, when I consulted an extension officer, I was advised to shift to other crops but I am not ready yet to do so given I still hope to recover some of the costs I had invested once I sell whatever little that I will get from the farm (62 year old male key informant).

Although non of the respondents engaged in production of flowers, their propensity for adoption was also assessed and 40.75 percent rated them as totally unacceptable, 35.75 percent reported as least acceptable, while 7 percent, 10 percent and 6.5 percent rated as fairly acceptable, acceptable and highly acceptable respectively. It is important to note that none of the respondents sampled was engaged in flower farming (floriculture) and it was confirmed in a focus group discussion that none of the farmers within the research area engaged in their production. The reasons given for its low acceptability were the high skill requirement for its production, high amount of capital required to put up greenhouses and acquisition of recommended planting material and transportation equipments, lack of steady water supply system within the research area, their highly perishable nature and lack of local markets.

The above findings on the current extent of adoption of the various horticultural crops and their potential for further enhancement show that there is a lot of untapped potential for enhanced adoption and expansion of horticulture farming within the research area. This is attributed to the high interest and optimism in horticultural farming as expressed by respondents. However, study findings equally underscore the need to address the challenges that were reported to discourage respondents from embracing the various horticultural crops further. Furthermore, it was also observed that although respondents had adopted various horticultural crops, it was only few respondents who had adopted domestication of the hybrid varieties. This was the case in

reference to bananas, traditional vegetables and cabbages where respondents were found to domesticate the local varieties even when improved varieties that are more productive were available in agrochemical stores. In the case of bananas, respondents complained that the improved varieties that are touted to be more productive are only for ripening, as they cannot be boiled while the highly productive traditional vegetables and cabbage varieties were reported to be too expensive for them to afford. Thus, respondents generally planted that were less productive and which in the long-run limit amount of returns they can get from their investments.

5.7 Conclusion

This chapter advanced analysis and interpretation of findings on cultural determinants in the uptake of horticulture farming. Specifically, this chapter presented discussion of farm size, control of income from horticulture farming, compatibility of horticulture with respondents' farming objectives, community perception towards horticultural crops and the various horticultural crops adopted by respondents.

Horticulture farming was found to be more prevalent among respondents who had smaller land holdings than those with larger ones. Furthermore, the proportion of land allocated to horticultural crops was also found to be higher among respondents with smaller land holdings. Horticulture farming was therefore found to be more preferred by smallholder farmers. With regard to control of income from horticultural produce, women had greater control as compared to male respondents. This contradicts initial finding which had shown that majority of participants in horticulture farming were male. This is because access to and control of household income among respondents was reported to be culturally informed. In addition, households where horticulture farming was not the main source of household income, women had their own kitchen gardens where they undertook horticulture farming for subsistence and for generating additional income from extra produce that they would trade in local markets. Thus, it is only in instances where horticulture farming was the main source of household income that male household heads controlled the income.

Horticulture farming was also found to be in line with respondents' farming objectives namely; to get food, create employment for themselves and to earn income. Also community perception towards adoption of horticultural farming innovations among respondents was reported to be

favourable. Various horticultural crops were found to be domesticated by respondents namely; *Brassica oleracea var capitata*-kales (*sukuma wiki*) and *Brassica oleracea var acephala*-cabbages, traditional vegetables (*Solanum spp* locally known as *managu*, *Gynandropsis spp* locally known as *saka*, *Crotalaria spp* locally known as *mitoo* and *Phaseolus spp* locally known as *kunde*), *musa spp*-bananas, *lycopersicon esculentum*-tomatoes, *passiflora edulis*-passion fruits and *ananas mosus*-pineapples. However, respondents had not adopted hybrid varieties of bananas, traditional vegetables and cabbages. Thus, for successful adoption of horticultural farming innovations to occur, emphasis should be put on small-scale farmers and more so the female farmers. Efforts should also be made to avail hybrid varieties of the various horticultural crops to farmers by reviewing their cost given respondents have not been able to acquire them on their own due to capital resources limitations. This chapter is followed by chapter six that presents discussion on influence of institutional factors on the uptake of horticulture farming.

CHAPTER SIX

INSTITUTIONAL FACTORS AND THEIR INFLUENCE ON THE UPTAKE OF HORTICULTURE FARMING

6.1 Introduction

This chapter presents findings on institutional factors and their influence on adoption of horticulture farming. This section deals with how respondents interacted with the various institutions that play a pivotal role in promotion of adoption of innovations. The issues discussed are respondents' access to inputs, credit, membership in groups or cooperatives, marketing of produce, access to extension services and adoption of horticulture farming.

6.2 Respondents' Access to Farm Inputs and its Influence on Adoption of Horticulture Farming

This study endeavoured to find out whether respondents had access to government provided farm inputs namely; fertilizer, seeds, insecticides and equipment. The findings as presented in table 6.1 below show that 92.5 percent of respondents had not accessed inputs while 7.5 percent were accessible to inputs. In reference to provider of inputs, 93 percent of respondents reported to have sought inputs from private distributors and stockists and catered for relating costs on their own, 3.75 percent acquired inputs from farmer association namely Kenya Farmers Association (KFA) or Agricultural Finance Corporation (AFC) while a further 3.25 percent acquired inputs from an intermediary.

Out of the 7.5 percent of the respondents who had accessed government provided inputs, 35 percent, 30 percent and 20 percent reported to have accessed fertilizer, seeds and necessary equipment while 65 percent, 70 percent and 80 percent reported not to have them respectively. It is important to note that, in the few cases where respondents reported to have accessed inputs, it was the government-subsidized fertilizer and other inputs provided by Technoserve, an NGO that was supplementing government's efforts in passion fruit farming. Thus, findings show that most respondents (93 percent) had no access to the subsidized inputs and therefore purchased inputs on their own from private stockists. The above findings come closer to that of ActionAid's

fieldwork in West Pokot, Greater Trans Nzoia and Greater Kakamega districts now counties, where, only 14 per cent of the farmers were found to have benefited from government’s input subsidy programme (Action-Aid, 2013).

Table 6.1: Adopters’ Access to and Source of Farm Inputs

Descriptor	Category	Frequency	Percentage
Whether farm inputs are provided	Yes	23	7.5
	No	287	92.5
Source of farm inputs	Intermediary	10	3.25
	Association	12	3.75
	Self (private stockist)	288	93
Payment for inputs	One-off payment	287	92.5
	Monthly installments	23	7.5

The mode of payment for inputs was also assessed and 92.5 percent of respondents reported to make a one off payment while 7.5 percent paid in monthly installments. The respondents who made the one off payment for the inputs refer mainly to those who sourced their inputs from private stockists. Such one off payment for inputs was reported by respondents to eat into their little capital thereby limiting them on the amount of input resources that they can acquire.

The study also sought to establish whether there was any association between the way respondents sourced farm inputs and their decision to adopt horticulture farming. Pearson’s product moment correlation test was utilized to assess their association and study findings yielded a coefficient correlation ($p = -.78^*$ $p < .05$). The result is significant at $p < .05$. This means that how respondents accessed farm inputs explains 60.84 percent of their decision to adopt horticulture farming. Respondents who sought inputs on their own adopted horticultural farming innovations at a higher level than their counterparts who were facilitated by farmer associations and intermediaries. Logistic regression analysis was utilized and the Wald statistic showed that respondents’ access to inputs was significant in adoption of horticulture farming. When the effect of other variables in the equation was controlled, respondents who sought inputs on their own

appeared 17 times more likely to adopt horticultural farming innovations than their counterparts who acquired input from farmer associations and intermediaries. Wald statistic significant at $p=.037$.

These inputs (fertilizer and seeds) are the most integral component in production processes as they are the main determinants of the ultimate output by farmers. Thus, where resource deficient farmers are left to source inputs on their own as shown by the above findings, they are bound to resort to cheap and substandard inputs as they try to undertake their farming activities within the confines of the little resources at their disposal. The absence of well-regulated institutions where farmers can get inputs also open a window of opportunity for private distributors to exploit them as they monopolize distribution of such important production inputs. Furthermore, absence of specific designated source points for inputs discourage potential adopters from embracing innovations as it compounds uncertainties they need to overcome before choosing to adopt new practices and innovations presented to them.

However, despite the limitations in accessing inputs, respondents had been able to attain averagely high levels of adoption of horticultural farming innovations as reported in this study despite complaints on absence of the right fertilizer when they were highly needed during planting season. One respondent remarked:

To us information on inputs has become of little importance because if you rely on them, your farming plans will be disoriented. We keep being informed that subsidized fertilizers are available but when you visit the agriculture offices to seek them you are taken through a long process of vetting and approval that by the time you finish, the planting season will have lapsed. Again, you may pay for planting fertilizer and by the time of collection, you are informed that they are out of stock and therefore we are at times forced by such circumstances to take top- dressing fertilizer so that we do not lose our money. Mostly, fertilizers that are brought to the depot are those specifically for maize and horticulture farmers have just to contend with that (FGD 3 discussants).

The above response depicts a farmer population that is deficient of essential inputs that are key to adoption of horticultural farming and other innovations. In reference to the procedure for accessing the subsidized fertilizer, one is required to get an introduction letter from the local administration either the area chief or the assistant. This introduction has to be endorsed by the divisional agriculture officer who confirms that the bearer of the letter is indeed a farmer and

recommends the amount of fertilizer that the farmer can be given basing on the farm assessment. Upon presenting the endorsements from the local administration and the agriculture officer at the NCPB depot, the farmer is issued with an invoice against which he/she make payments at the nearest Kenya commercial bank (KCB) branch (either Serem which is 20 km or Kapsabet which is 50 km). After making the payment through bank deposit, the farmer then presents the deposit slip to the NCPB depot where he/she will be issued with the inputs if they are available or be entered in the waiting list if the inputs are out of stock.

The above response contradicts reports from the government that there have been initiated various programmes aimed at improving smallholder farmers' access to agricultural inputs, as a strategy for transforming smallholder engagement in horticulture farming from subsistence to commercial farming (Ministry of Agriculture, 2010). It is worth noting that, although the government had initiated various programmes that were intended to improve smallholder farmers' access to agricultural inputs, as a strategy for transforming smallholder farming from subsistence to commercial farming, these programmes were focused on cereals and dairy farming. They include NAAIAP, NALEP and Njaa Marufuku Kenya program (NMK). The primary objective of these programs is to improve technology adoption, specifically farm inputs (fertilizer and seeds) access and affordability for smallholder farmers in order to enhance food sufficiency at household level and generate incomes from sale of surplus produce (FAO, 2014). However, inputs essential to horticulture farming were lacking given the government subsidy programs are normally geared towards supporting maize production and dairy farming and not horticulture *per se*. Horticulture farmers have therefore been left on their own, save for general inputs like fertilizer that they may, at times, find useful as they can be utilized across many agricultural practices. Thus, there are no specific input provision efforts tailored to the needs of horticulture farmers or promotion of horticulture farming.

Also, although there were subsidized fertilizer that were being sold to farmers at reduced price at Kobujoi divisional agriculture offices, it is important to note that this fertilizer was being supplied by the National Cereals and Produce Board (NCPB) Kisumu depot at a price of ksh 1800. The nearest main input distribution depots in Nandi County were reported to be at Kapsabet (approximately 50 km) and Mosoriot (approximately 75 km) from the research area.

Besides the distant location of these depots from respondents, the procedure for accessing subsidized fertilizer was also cumbersome (as reported by FGD 3 discussant above) coupled with other factors such as fertilizer being packaged in 50 kg bags which make it more expensive and bulky for majority of small scale farmers who require small amounts of such inputs. Respondents reported that, owing to the distant location of depots and the bulky packaging of the government provided subsidized fertilizer, they resort to buying inputs from private distributors due to their availability locally and in much smaller units such as one-kilogram pack. One key informant reported,

We have many farmers who have chosen to go the horticulture way but the government has not created a conducive environment for them. These 'real' small-scale farmers work on small plots owing to the small farm sizes that they own and the little capital they have. These farmers therefore face many challenges as they cannot benefit from government subsidy programs that target maize farmers only. In addition, for most horticulture farmers who farm less than one acre of land, they cannot get the ten-kilogram fertilizer pack that is commensurate with their farm sizes at the government depots as they are mostly packaged in fifty-kilogram bags. These farmers are therefore left with no other option other than to buy such small quantities of fertilizer from private distributors who sell a ten-kilogram bag at almost half the price of the fifty-kilogram bag of government subsidized fertilizer (43-year-old female key informant).

Upon following up with ministry of agriculture staff at Kobujoi divisional office and enquiring from input stockists at Kobujoi market, the claim of high prices was confirmed. A ten kilogram pack of DAP was retailing at ksh 850 while a fifty kilogram bag retailed at ksh 3500 as compared to the government provided subsidized fertilizer that retailed at ksh 1800 for a 50 kgs pack.

It was also noted that mostly required fertilizer such as DAP and NPK were out of stock (at the time of data collection, these fertilizer were reported to have been out of stock for six months after the consignment that had been supplied for the January-March planting season was exhausted and were waiting for supplies during the next maize planting season that was still three months ahead). Ammonium sulphate fertilizer that is normally used for top-dressing cereals was the only fertilizer available. Thus, horticulture farmers who were engaged in this study widely complained of absence of the right fertilizer when they were highly needed during planting season. In the long-run, such lack of essential inputs affects yields resulting in low

returns and hence low incomes. This discourages the horticulture farmers and potential adapters from engaging in production. The unavailability of inputs in small packaging also limits the ability of potential adopters to try out innovations and practices given that adoption processes are normally gradual beginning with small trial plots that are then expanded gradually if outcomes are encouraging to the farmer.

6.3 Respondents Access to Credit and its Influence on Adoption of Horticulture Farming

The study also endeavoured to find out whether respondents had access to financial credits from lending institutions and input credits from governmental and private stockists' of agrochemicals. Findings showed that nearly two-thirds (57.2 percent) of respondents lacked access to financial credit for purchase of inputs while 42.8 percent reported to have accessed financial credit. Further findings showed that only 12.3 percent of respondents had accessed financial credit from mainstream lending institutions while 30.5 percent sought inputs on credit from private stockists and financial credit from informal lenders. The above findings depict a farmer population that is disempowered in terms of access to working capital resources for acquisition of production inputs. Thus, respondents depended on their own alternative ways to finance adoption of new production innovations an aspect that is seen to have slowed down the process of adoption of horticulture farming.

Table 6.2: Adopters Access to Credit

Descriptor	Category	Frequency	Percentage
Access to credit	Accessed	133	42.8
	Had no access	177	57.2

The study also endeavoured to ascertain whether respondents' access to capital credit had any bearing on their decision to adopt horticulture farming. Pearson's product moment correlation test was utilized and study findings yielded a correlation coefficient ($p=.190^{**}$ $p<.01$) which is significant at $p < .01$. This implies a weak positive correlation showing that respondents' accessibility to capital credit explained 3.61 percent of their decision to adopt horticulture farming. Logistic regression analysis outcome showed that respondents' access to capital credit

was significant in adoption of horticulture farming. When the effect of other variables in the equation was controlled, respondents who had been able to access capital credit appeared 1.72 times more likely to adopt horticultural farming innovations than their counterparts who lacked access to capital credit. Wald statistic significant at $p=.050$.

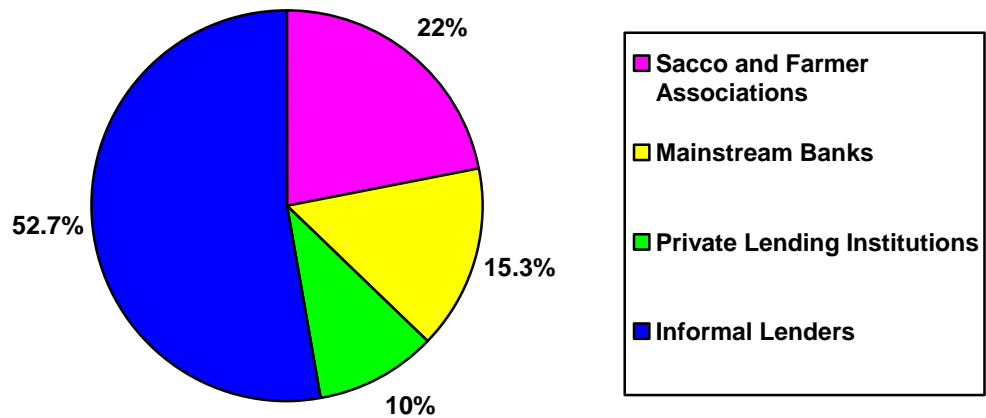
The above findings indicate that farmers with easy and enhanced access to credit are better placed to adopt horticultural farming innovations as they have access to capital necessary for acquisition of farm inputs and other services required in the adoption process. This is because access to capital credit is a key determinant as to whether a farmer will have sufficient working capital to facilitate adoption of horticultural farming innovations or not. Where such capital was lacking or inadequate, some respondents resorted to cheap and substandard inputs that ultimately resulted in low productivity and consequently loss to farmers. Access to credit therefore stands out as a critical factor among respondents in adoption of horticulture farming. Without access to financial credit at low interest rates, farmers are often unable to invest in adoption of new production innovations or expand their farming enterprises and therefore may not risk diversifying into new crops or practices. This is because access to financial credit enhances small-scale farmers' access to production inputs that they may not have been able to afford, and this in turn results in increased production, and consequently incomes for resource poor farmers. Furthermore, with an option of borrowing, a household can do away with risk reducing but inefficient income diversification strategies and concentrate on more risky but efficient investments (Mwangi M. & Kariuki S., 2015).

This findings compares well with Nzomoi et. al, (2007) who found a positive relationship between access to credit and decision to adopt export oriented horticultural farming in Kenya. In their findings only 17.3 percent of respondents relied mainly on bank loans with most identifying financial incapacitation as the major constraint in their operations. African Development Fund (2007) which argues that credit for farming remains the most dominant need with an increasing demand but less than 60% of this demand is unserved because of the low development of the agricultural finance market supports this. With regard to adoption of innovation, 96.3 percent of respondents were unanimous that it required funds to implement. Access to working capital is therefore identified by the current study as the major problem faced by farmers in their quest to

adopt horticultural farming innovations. This is because, various processes in the production chain require usage of funds and thus financially stable farmers tend to realize higher outputs than the less financially endowed ones.

The main sources from which respondents sought financial credit in their order of priority were, saccos and farmer associations 22 percent {Hekima sacco for tea farmers, Kenya Farmers Association (KFA), Agricultural Finance Corporation (AFC) and Joyful women Organization (JOYWO)}, mainstream banks 15.3 percent (Equity bank, Kenya Commercial Bank (KCB) and Kenya Women Finance Trust), and 10 percent from private lending institutions such as Alpha Capital. A further 52.7 percent of respondents sought financial credit from informal lenders (family members, fellow farmers and village moneylenders) and inputs from private stockists on credit. FAO (2014) and African Development Fund (2007) support this finding on limited access to financial credit. They argue that loans are the primary resource for pursuing farming opportunities in rural areas yet available lending options are village moneylenders, commercial banks, local merry-go-round schemes, and individual foreign sponsors of young people, which are always limited and may not gather for every farmer.

Fig. 6.1: Sources of Credit



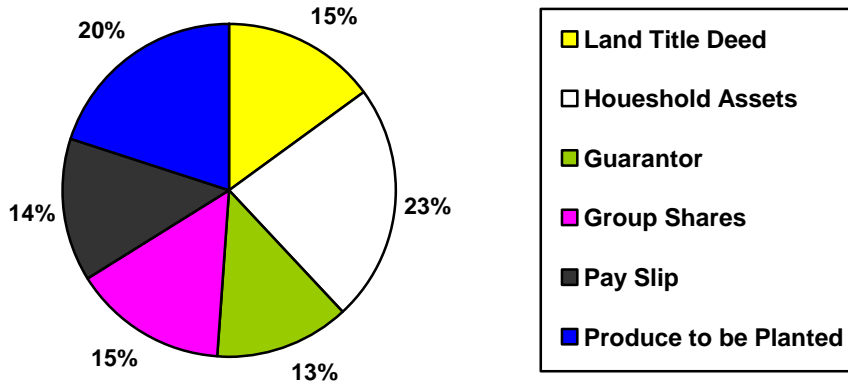
Although it is widely acknowledged that access to financial and input credit is integral to enhanced adoption of innovations, respondents engaged in this study reported a number of bottlenecks in their quest to access financial and input credit. The major hindrance was the high interests charged on financial credit facilities by banking institutions and established lending

organizations. This ranged between 10-15 percent by 28.6 percent, 47 percent reported to range between 15-20 percent and, 11.5 percent reported to range between 20-30 percent. The high interest rates besides discouraging farmers from seeking the loans also erodes the little profit that farmers would get from their farming investments.

The duration for repayment is yet another challenge in accessing credit. This was reported to be too constrained as it ranged from one year (42.8 percent) to two and three years (2.15 percent). This finding shows that majority of respondents had to repay the credit within one year. This left them with no time to focus on the investment and see it grow given that farming is generally a low returns investment. Most respondents also reported that loans had proven unreliable due to their late disbursement. Some respondents reported that, by the time loans were released to them, the early planting season could have passed and they just had to farm once and return whatever they generate to lending institutions. For some, they reported to invest half of the money and leave some for facilitation of monthly repayments of the loan given that lending institutions do not give a grace period for investment before they can begin repaying the loans. This process of borrowing, investing then returning to lenders whatever you get reduces farmers to conduits for facilitation of lenders' profits.

When asked whether credit-providing entities demanded any collateral as security, 41.1 percent reported to have had to provide securities while 58.9 percent were not required to provide any security. The nature of collaterals that were utilized by respondents were variable with 15 percent using land title deeds, 23 percent used household assets and cattle, 13 percent looked for a guarantor, 15 percent used group members' shares, 14 percent utilized pay slip of other income (tea or employment) while 20 percent used produce to be planted as security.

Fig. 6.2: Nature of Collaterals Utilized by Respondents to Secure Credit



Initial findings showed that majority of respondents (58 percent) relied on credit for their farming endeavours to progress. Since respondents largely lacked collaterals that would otherwise act as securities against the loan, they ended up failing to secure the highly sought for capital to finance acquisition of essential inputs. Consequently, farmers ended up lacking the requisite inputs that would facilitate adoption of horticulture farming. One farmer remarked,

Fulfilling requirements surrounding access to credit has been very challenging to most farmers here given they at times end up losing whatever security they had used when crop failure arises. Also, because of the limited value of assets that we own and utilize as security for credit, the amount of loan we get is little and therefore cannot cater for all farming needs that we would wish to fulfill (Discussants FGD 3).

The impression painted by the above findings is in line with those of a study by FAO (2014) which showed that the only option for most small-scale farmers is working to save money given their inability to meet terms set by lending institutions. Respondents studied by FAO expressed fear regarding repayment terms and interest rates, which were reported to reach 50 percent in some cases, as in the case of microloans offered by village moneylenders (FAO, 2014). However, saving money is not a viable option among horticulture farmers in Aldai sub County given their minimal income that have to be delicately balanced among the various competing needs.

Farmers gave various reasons for not taking the loans. The major reasons were the high interest rates and the lack of collateral by most farmers especially women, (who happen to be the majority in horticulture farming) who did not have title deeds to their lands and thus could not

satisfy banks' collateral requirements. Many also feared that by taking loans, they might lose the securities they had used if they fail to repay it while others feared that they could not afford to start paying back the loan even before their crops had matured due to lack of alternative sources of income. For some, they lacked information on available support schemes and how to go about accessing such resources. Drawing from the human agency theory, the constraining and enabling effects of the social structures presented above can only be understood within the context of the target respondents. At the moment, the situation among horticulture farmers studied is cyclical and self-perpetuating where banks are less likely to lend to them because of lack of collaterals required. Consequently, the low-return enterprises where they invest in and lack of access to larger financing therefore characterize farmer's endeavours.

As a result, respondents had devised various ways for dealing with the financial access challenges that they faced. From study findings, 37.3 percent had accessed mainstream loan providing institutions such as banks and cooperatives while majority relied on merry-go-rounds of different kinds. As a response, women reported to have formed various groups through which they assisted each other financially by loaning money to one another on a rotational basis. Besides such traditional merry-go-round groups, the Catholic Church in particular had introduced other forms of merry-go-rounds called Savings and Internal Lending Communities (SILC) that were more structured in their operation and also incorporated trainings on how to invest the money. Study findings showed that most farmer groups that worked with the ministry of agriculture, Technoserve and those who had received funding support from SHoMAP majorly comprised women. Such developments in response to financial access challenges are well illustrated by the human agency theory, which argue that individuals have the capacity to process social experience and devise ways of coping with it, as they possess knowledgeability and capability. These varied approaches that respondents had developed are adaptive responses to the challenges that they faced.

Ragasa (2012) supports the responses that respondents had embraced in an attempt to deal with challenges they faced in accessing financial capital. Ragasa argues that microcredit is helpful particularly in societies where women do not already have extensive networks and well-designed group-based models for accessing financial services for their empowerment. However, Ragasa

cautions that although, microcredit can help in some cases, they are normally limited in terms of their effects on productive ventures for women. For example, women's credit needs are more diverse than the initial focus of small group loans and microcredit schemes as women need longer-terms and larger amounts of credit to build assets and invest in viable and productive activities. Furthermore, besides women being majority in horticulture farming, they have proved to be better savers than men are, are better at repaying loans, and are more willing to form effective groups to collect savings and thus decrease cost of delivering many small loans (Ragasa, 2012).

To address the challenge of accessing loans by small-scale farmers, the Kenyan government has formulated various credit programmes, namely Agricultural Finance Corporation (AFC), the government's main institution for providing agricultural credit. There is also the Women Enterprise Fund launched by the government in 2007 and managed by the Ministry of Gender, Children and Social Development as a source of finance for women who cannot easily access the formal financial sector. Also, important is the *Kilimo Biashara* scheme launched in 2008 as a component of the NAAIAP programme (FAO, 2014). *Kilimo Biashara*, seeks to reduce production costs (and ultimately food prices) by providing affordable credit to farmers and building business capacity of smallholder farmers by supporting the farming-as-a-business strategy.

Although the government has set up these varied programs aimed at addressing challenges of accessing loans by small-scale farmers, they have not effectively benefited the target households due to their unavailability, stringent requirements in accessing loans and their unreliability due to untimely and often late disbursements (FAO, 2014). The biggest concern with these government support schemes, however, relates to the highly bureaucratic and rigid access requirements along with corruption that pervades them. Action-Aid (2013) notes that farmers in one focus group reported that they could not meet Equity Bank's requirements to access such credit, due to lack of collaterals such as log books and land title deeds or the requirement to produce receipts for the last three years of sale of maize to the National Cereals and Produce Board (Action-Aid, 2013).

Despite the multiple hurdles in their quest for credit, respondents exuded a lot of optimism with 98 percent agreeing that provision of credit enhances their capacity to adopt horticultural farming innovations and were ready to take it up if it was readily available and conveniently accessible while only 2 percent did not share this opinion. From the above discussions, it is evident that farmers in the research area face multiple challenges in their quest to access capital credit. This in the end affects the pace at which they adopt innovations that can help them transform their farming activities and livelihoods. Thus, there is need for enhancement of small-scale farmers' accessibility to capital credit. This can be realized by reviewing the various access requirements that have been reported in this study as constraining farmers from accessing credit.

6.4 Respondents Membership in Farmer Groups and Cooperatives and its Influence on Adoption of Horticulture Farming

The study sought to ascertain whether formal or even informal groups existed among respondents given that group membership is a form of social network that was anticipated to influence adoption of horticultural farming innovations. Farmer groups and cooperatives are key factors towards organization of farmers in production as they facilitate enhanced access to inputs and in marketing of produce. Study findings showed that 27.5 percent of respondents were members in farmer groups while 72.5 percent were not as presented in the table below. Furthermore, 80 percent of respondents rated farmer groups that existed among them as inefficient while 20 percent rated as efficient.

Table 6.3: Adopters Membership in Farmer groups and Cooperatives

Descriptor	Category	Frequency	Percentage
Membership in cooperative	Yes	85	27.5
	No	225	72.5
Cooperatives efficiency	Efficient	62	20
	Inefficient	248	80

Respondents attributed the low level of membership in farmer groups and cooperatives to high incidences of mismanagement and misappropriation of farmers' resources by individuals

entrusted to manage them. In addition, most respondents (80 percent) perceived them as inefficient and ineffective thus did not consider them as key instruments for their empowerment. It is worth noting that, there was no specific cooperative for horticulture farmers in the study area, although respondents who reported to be members in cooperatives belonged to a tea farmers' cooperative that only existed by way of the certificate obtained during registration. On the ground, however, there was limited awareness of its existence given that there was nothing to signify its existence. The low level of membership among respondents is well illustrated by the human agency theory, which argues that individuals have access to a wide stock of knowledge from which they choose the appropriate response to utilize in responding to given challenges or fulfilling their desires. Individuals therefore having adequate knowledge on the importance of belonging to farmer groups choose whether to join them or not. In return, they learn from one another and through trainings that may be organized by the groups. Group membership also enhances the reach of service providers to a wider clientele as opposed to situations where farmers work individually.

Respondents were however found to be members in informal groups within their localities. This included Savings and Internal Lending Communities (SILC), merry-go-rounds, environmental conservation groups and other forms of groups. Focus group discussion findings revealed that there existed unregistered farmers' groups (Kimaran women group, Kapkurumeny kibagenge group, Chemalin women group, Chematich self help group, Timoek self help group). However, these groups were ineffective owing to the inefficient management occasioned by lack of entrepreneurship skills amongst most members and poor leadership and management skills on the part of executive members. A case in point is a farmers' group that had been duly registered with the department of social services and even acquired funding to facilitate acquisition of a green house and tissue culture banana seedlings (along with other earlier cases that related to dairy farmer groups). Its members were also equipped with skills on production and management of tissue culture bananas. However, upon withdrawal of donor support and supervision, the group eventually collapsed and its activities were run-down to the extent that by the time of the study respondents did not want to be identified with it.

The above findings on low level of membership in farmer groups and cooperatives is in line with that of Biwott & Tuwei (2016), where farmers with secondary and tertiary level of education were found to be 0.571 times unlikely to join Faith Based Organizations. This was attributed to their being more exposed to knowledge than those with primary level of education were. This is contrary to conventional knowledge that persons with formal education have adequate knowledge on the importance of belonging to associations and thus they would be more likely to join farmers' groups of various kinds.

Pearson's product moment correlation test was utilized to ascertain whether respondents' membership in farmer groups and cooperatives influenced their decision to adopt horticultural farming innovations. The findings yielded a correlation coefficient ($p=.179^* p<.05$). The result is significant at $p < .05$. The results indicate that respondents' membership in farmer groups and cooperatives explains 3.2 percent of their decision to adopt horticulture farming. Logistic regression analysis was conducted and the Wald statistic showed that respondents' membership in farmer groups and cooperatives was significant in adoption of horticultural farming innovations. When the effect of other variables in the equation was controlled, respondents who were members in farmer groups and cooperatives appeared 1.57 times more likely to adopt horticultural farming innovations than their counterparts who reported not to be members. Wald statistic significant at $p=.044$.

Group membership as a form of social network therefore stands out as a key determinant in adoption decisions given that respondents involved in informal and or formal groups appear better placed, compared to those acting individually in terms of access to information, inputs and possibly credit and market access. This is because farmer groups and other social networks are expected to facilitate access and exchange of information that increases farmers' bargaining power and help them earn higher returns in marketing their products and in purchasing inputs. Cooperatives and other forms of farmers groups also bring farmers together to work collectively to create a consistent system of production, distribution and marketing for target outputs. This ultimately culminates in formation of major production farms, simplification of distribution process and eventually improves management of agricultural cooperatives resulting to increased incomes to members.

Centrality of farmers groups and cooperatives in enhancement of adoption of innovations is supported by Mario et. al, (2008), who found out that a farmers' position in their groups influences how they access information on the use of knowledge and technology and complementary resources such as credit, land, and subsidized inputs that are important in innovation adoption processes. Embeddedness in farmer groups therefore enables one to learn the best ways of applying new and improved knowledge and innovations and to judge their success levels. Odendo et. al, (2010) also holds a similar view by arguing that membership to groups enable farmers to learn about innovations through other members and from other development agencies. Group membership thus serves to speed up adoption of innovations.

Katungi and Akankwasa (2010) in their study on 'the effect of community based organization in adoption of corm-paired banana technology in Uganda' found that farmers who participated more in community-based organizations were likely to engage in social learning about the technology hence raising their likelihood to adopt the technologies. Through such organizations farmers' access information, which in turn reduces the uncertainty about an innovation's performance hence changing individual's assessment of the innovation from purely subjective to objective over time. This is because farmers need to know the existence of technology, its benefits, and its usage for them to adopt it. Thus, the low level of adoption of horticultural farming innovations within the research area can be attributed to the absence of effective avenues where farmers can access information about innovations, jointly evaluate them and decide whether to adopt or not.

Despite the minimal existence and dismal role that farmer groups and cooperatives play in adoption of horticultural farming innovations in the research area, farmers' organizations in whatever form will continue to play a key role in the agricultural sector, especially among small-holder farmers. Farmers thus need to be educated on the importance of joining farmers groups, cooperatives and associations. This is because with the advent of globalization, they will play an even greater role in mobilizing smallholders who would otherwise be marginalized, and thus be well positioned to reap benefits of expanded markets. According to FAO (2008), companies prefer working with farmers' groups because group liability for credit reduces lending risks, while economies of scale reduce transaction costs. In addition, farmers are better placed to deal

with exporters, supermarkets and other larger companies when they coordinate among themselves within groups. Groups also comply better with contractual requirements of companies than individual members, and therefore serve as convenient organizational units around which companies can coordinate procurement of produce, inputs, credit and technical assistance to growers (Biwott & Tuwei, 2016). Moreover, when dealing with purchasing companies, negotiating strength of farmers' groups is greater than that of its constituent individual members.

Given the above listed importance of farmer groups, cooperatives and associations, and the low levels of membership among respondents, emphasis should be concentrated on organizing farmers to join into groups. To attain this, farmers specializing in production of the same crops should be encouraged to form multipurpose groups as avenues through which they can interact in various ways with the various players in the value chain and the subsector.

6.5 How Respondents Marketed Their Produce and Its Influence on Adoption of Horticulture Farming

The way respondents marketed their produce was also assessed and findings showed that 97.5 percent marketed their produce individually while 2.5 percent marketed as a group as presented in the table in the next page.

Table 6.4: Marketing of Produce

Descriptor	Category	Frequency	Percentage
How produce is marketed	Individually	302	97.5
	As a group	8	2.5
Where produce is sold	Local market	294	94.75
	Organized market	16	5.25
How produce is delivered to market	Individual means	302	97.5
	Provided means	8	2.5
Distance to the market	Less than 1 km	62	20
	Between 2-3 km	64	21
	Between 3-5km	42	13.5
	More than 5 km	142	45.75
How payment for produce is done	Cash	298	96.25
	Bank deposit	12	3.75
Frequency of payment	Weekly	73	23.5
	Monthly	40	13
	Upon delivery	197	63.5

The individual marketing of produce by respondents is attributable to situations where they farmed on a traditional “speculative” basis and the lack of farmer groups and cooperatives that could bring them together for joint production planning and marketing. Under such circumstances, every farmer works individually trying to anticipate market requirements by making their own farming decisions in the hope of finding market once their produce is ready. Respondents’ decision to market produce individually leaves them exposed to exploitation by intermediaries. As individual sellers, farmers also have little bargaining power. Furthermore, their lack of organization into groups restricts their access to main markets that require large quantities of produce and continuous delivery throughout the season or year such as hotels, supermarkets and other large-scale outlets. Likelihoods of wastage are also high due to the

isolated pockets of produce and the difficulty in acquiring production and marketing skills that would be easily available in groups.

Study findings further showed that 94.75 percent of respondents sold their produce in local village weekly markets (to intermediaries from surrounding towns who come to buy produce from farmers at local itinerant weekly markets). The remaining 5.25 percent sold them in organized markets such as supplying nearby schools and institutions or selling to buyers from surrounding towns who bought produce directly from farms on specific agreed days of the week or arrange with farmers to send produce to them on agreed upon days.

Respondents who sold their produce in the local market reported to fetch low prices due to over supply that characterizes these markets and the few bulk buyers present there. This is also attributable to exploitative pricing by buyers taking advantage of farmers' fear of their produce going to waste because of perishability and unavailability of storage and preservation equipment. Furthermore, due to periodic nature of such market days, farmers incur losses as they wait for market days especially when produce that is ready for harvesting is affected by unfavourable weather factors such as hail stones or go to waste due to over-maturity.

The study sought to investigate whether the way respondents marketed their produce influenced their decision to adopt horticulture farming. Pearsons product moment correlation test was utilized to assess the relationship and study findings yielded a correlation coefficient ($p=.099^*$ $p<.05$). The result is significant at $p < .05$. The results indicate a weak positive correlation between the way respondents marketed their produce and adoption of horticulture farming. This means the way respondents marketed their produce contributed though on a small degree to adoption of horticulture farming. Logistic regression analysis was utilized and the Wald statistic showed that the way respondents' marketed their produce was significant in adoption of horticulture farming. When the effect of other variables in the equation was controlled, respondents who reported to sell their produce in organized markets appeared 1.474 times more likely to adopt horticultural farming innovations than their counterparts who sold their produce in the local market. Wald statistic significant at $p=.051$.

The above findings show that accessibility to rewarding markets positively influenced adoption of horticulture farming. Thus, where farmers are not able to secure rewarding markets for their produce as shown by findings of this study, their adoption of horticultural farming innovations would be low. This is because in the absence of markets, farmers are not able to sell their produce profitably thus resulting to low returns that cannot accord them sufficient capital to finance further adoption of innovations. Access to rewarding markets also serves to motivate farmers to enhance their farming endeavours by adopting more innovative and effective production systems.

The above finding is in line with that of FAO (2014), while acknowledging necessity of markets argue that farmers with access to markets, including local markets for their produce, have stronger incentives to innovate given that innovation and markets are interdependent and therefore reinforce each other. This is because, technologies help farmers enter the market by allowing them to produce marketable surplus, while availability of market opportunities provide farmers with incentives to produce more or change their production patterns, such as add value to their commodities and adopt more productive innovations. Therefore, integrating family farms into markets be they local, national or international, is essential if communities are to innovate and increase their productivity.

From study findings, however, some efforts towards supporting marketing of horticultural produce were noted. These include; establishment of horticultural produce markets (Kaptumo and Kobujoi market stalls), improvement of access roads (murraming and culvert construction along Ndurio Kiprot-korik and Ndurio-Kimaren rural roads) and training of farmers through the SHoMAP program on formation of formal groups and registering with relevant authorities. These investments in physical and institutional market infrastructure have enabled farmers' access markets both for their produce and for inputs. What was lacking was influence over marketing costs that respondents reported to be eating into what would have been their little profits. This is well illustrated by a key informant interviewee, who remarked,

Horticulture farming has become one of our core economic activities here in Aldai sub County. Although this sector has engaged many people and earns income for many households, little effort has been put to uplifting it. Take the case of this Kobujoi-Kimaren-Nandi rock road that you used. Vehicles operating here will charge you two

hundred shillings to deliver one sack of vegetables to Kobujoi due to its bad state instead of usual fifty shillings. From there given that, there are no buyers, you pay a similar amount to get your produce to Kapsabet or hundred shillings to Serem. Now when you get to the market intermediaries present there want to buy your produce at almost price of the transport cost you incurred. As a farmer, you remain wondering as to the worth of your produce. To avoid these problems, we farmers prefer selling produce at the farm and the buyer caters for transport costs and all related challenges (55-year-old male interviewee).

Drawing from experience of other countries, several measures towards enhancing marketing of agricultural produce can be tried both by the government as well as by farmers' groups and individual farmers namely; regulated agricultural produce marketing yards, producer-consumer markets and village weekly markets (Sharma, 2004). However, agricultural sectors and governments need to review and regulate the way domestic market is opened-up to imports in order to protect local farmers. They should instead facilitate local farmers to be in a position to produce marketable products that can be exported to the outside markets.

Findings further showed that 60.75 percent of respondents were aware of existence of alternative markets for their produce while 39.25 percent were not. The main alternative markets included neighbouring towns such as Kisumu and Kapsabet, nearby institutions and buyers from other towns who made arrangements with farmers for purchase of produce on certain agreed days of the week. The existence of these alternative markets enables farmers to compare prices and make informed decisions on where to sell their produce therefore maximizing their returns on farming investments. They also serve as a fallback when there is glut in markets that farmers usually supply especially, those who normally supply local markets.

The study also assessed whether respondents at times supply their produce to these alternative markets. Fifty-five percent (55 percent) of respondents acknowledged to at times supply these markets while 45 percent did not. A number of reasons were given in support of their inclination and disinclination towards these markets. For those who saw the organized market as an alternative they cited; convenient and reduced transport costs given that buyers cater for costs (25 percent), they buy produce in bulk (40 percent), fair or better pricing (38 percent), and monthly payments (7 percent). Those who saw local market as alternative they cited immediate

payment (44 percent), buyers did not mind the quality of produce (32 percent), proximity (27 percent) and as a last resort (16 percent).

Pearson's product moment correlation test was utilized to determine whether selling produce in alternative markets influenced respondents' decision to adopt horticulture farming. Study findings yielded a correlation coefficient ($r=0.191^{**}$ $p<.01$) which is significant at $p < .01$. The result shows that 3.65 percent of the decision to adopt horticultural farming innovations by the respondents is explained by utilization of alternative markets. The results indicate a low positive correlation between utilization of the varied markets and adoption of horticultural farming innovations by respondents. The findings show that respondents who utilized alternative markets were more likely to adopt horticultural farming innovations than their counterparts who did not utilize them. This is because utilization of the various available markets assured one of market for produce thus saving them from incurring losses. The assurance on availability of markets for produce encourages farmers to innovate so that they can produce more marketable produce that can earn them more incomes from the markets.

Despite the high levels of awareness of varied markets among respondents, only a few of them utilized such markets. Their inability to tap to these varied markets was attributed to current legislation and regulations governing marketing of agricultural produce that were reported to be restrictive and play a major role in constraining exploration and development of more efficient marketing arrangements. As it is now, most markets are concentrated in urban areas far away from production areas. Consequently, producers have not been able to supply such markets with fresh produce due to challenges such as poor roads and lack of reliable and affordable means of transport. Furthermore, given that prices offered by buyers in these markets are not significantly different with those offered by intermediaries and buyers in local markets, farmers resort to selling their produce to intermediaries who pick them up at the farm gate. A further limitation to farmers' access to urban markets relates to current global trends that have forced the opening up of markets to produce from outside the country. This has led to increased supplies of high quality fresh produce into local markets thereby lowering prices to the disadvantage of local farmers. Despite this, respondents exuded a lot of optimism in adopting horticultural farming innovations if any interventions aimed at addressing existing marketing challenges were put in place with 97 percent of them agreeing while only 3 percent did not share in this opinion.

The distance to market was assessed in terms of walking distance in kilometers. This is because market accessibility is crucial to horticultural farming enterprise as it positively or negatively influences farmers' decisions in various ways. For example, better market access can influence participation in output and input markets, and enhance availability of information. Findings showed that 20 percent of respondents ranged within less than one kilometer, while 21 percent, 13.5 percent and 45.75 percent ranged within 2 to 3, 3 to 5 and above five kilometers respectively. The findings reflect a fairly high level of ease of accessibility to markets given majority of respondents ranged within five kilometers from markets. However, it is important to note that there were an equally large number of respondents (45.75 percent) who ranged more than five kilometers away from markets. Such farmers who are further away from markets are more likely to incur higher transport costs in trying to get their produce to markets and this in turn may discourage them from adoption of horticulture farming.

The distance from farms to markets and its influence on respondents decision to adopt horticultural farming innovations was assessed and Pearson's product moment correlation yielded coefficient ($r = -.081$ $p < .05$). The result is not significant at $p < .05$. Although correlation findings showed an insignificant relationship between distance to markets and adoption of horticulture farming, logistic regression findings showed that distance to markets was significant in adoption of horticulture farming. When the effect of other variables in the equation was controlled, respondents who ranged within 1 to 2 and 2 to 3 kilometers appeared 1.27 and 1.74 times more likely to adopt horticultural farming innovations respectively than their counterparts who were at higher distances from markets. Wald statistic significant at $p = .049$. Thus, respondents who were closer to the markets were more likely to adopt horticulture than those who were further away.

One key informant interviewee confirmed and clarified what had been observed during data collection that distance to markets extended to even 30 kilometers in some parts of the division. Farmers in such areas would have to incur high transport costs given the poor road network within the research area and the limited tarmac roads with exception of one connecting main markets and shopping centers of Kaptumo, Kobujoi, Serem and Chavakali and towns namely Nandi-hills and Kapsabet. The above findings do not augur well with uptake of production of such highly perishable crops given the poor road network that make it difficult for farmers to

deliver produce to markets in a timely manner and in good condition. Furthermore, given low production volumes, this translates to high transportation costs per unit of produce, which ultimately erodes what would have been farmers' profit. This explains why most respondents resorted to selling their produce to intermediaries who exploited them by buying produce at prices as low as 50 percent of prevailing market price owing to higher transport costs that they claim they would still incur in trying to deliver the produce to main markets. The situation was reported to be worse during rainy seasons when roads are rendered impassable and buyers are not willing to fetch produce from farm gates thus leaving produce to waste since farmers have no alternative buyers.

Within the research area, various feeder road improvement projects, bridge constructions, rural road routine and spot maintenance were reported to have been initiated by the SHoMAP program with the aim of enhancing farmers' access to markets. This was expected to result in increased adoption of innovations and participation of producers at local markets, increased variety of available agricultural products and the geographic size of markets for agricultural products. However, these short-term interventions ended with the termination of the SHoMAP program. Such improvement of rural roads were therefore expected to result in elimination of frequent road closures during rainy seasons, reduction in vehicle operating costs and increased traffic volume, access to market and social services, and improvement in passenger services (World Bank, 1996). However, within the research area this was not realized given that road networks here are still in a bad state and this consequently translates to high transport costs.

The above findings come closely with that of Serem, (2010) who found out that nearly 50 percent of African farmers still spend five hours or more to get to markets because of fewer passable roads. Indeed transport costs to markets in Africa are reported to be among the highest in the world, reaching as much as 77 percent of the value of produce. This is supported by Nzomoi et. al, (2007) who found out that only 10.7 percent of respondents were accessible to markets while the rest either had poor access roads or were simply inaccessible. This was especially the case among farmers who lacked financial capacity to improve access roads leading to their farms (Nzomoi et. al, 2007). Kibet et. al, (2011) advances this argument further by holding that distances near good roads and towns are used to capture differences in transaction

costs involved in marketing and its relationship to adoption of innovation. The higher the transaction costs involved, the lower the probability to adopt innovations. Further to this, Odendo et. al, (2010) argues that living far from major markets reduces the expected profitability of new innovation and creates barriers associated with limited information about distant marketing outlets and increased transaction costs. Living at greater distances from major markets therefore retards speed of adoption of innovations. Drawing from study findings which had shown that majority of respondents (48.25 percent) lived far away from main markets for their produce coupled with poor road networks within the research area, horticulture farmers are bound to incur higher transaction costs that in turn may discourage or slow down adoption of horticultural farming.

In reference to how respondents delivered their produce to markets, 97.5 percent delivered them using private means while 2.5 percent delivered them through a means provided by the buyer or agent. The main means of transport was donkey and for some motorbike, while those who sold produce to organized market groups had their produce picked-up by a truck financed by the buyers. Payment for transport costs was reported by 93 percent of respondents to be catered for by farmers while 7 percent reported to be catered for by the buyer. Most respondents thus relied on private means for transportation of their produce and this resulted to high transportation cost especially where farmers were not organized in groups so that they could share the costs. Consequently, most respondents continued to lose the little profit they would obtain to the high transportation costs an aspect that contributes to the slow adoption of horticulture farming.

Further, there was interest to know how frequently payments for the produce are made to farmers. Results showed that 63.5 percent of respondents had their payments made upon delivery, 23.5 percent were paid on a weekly basis while a further 13 percent had their payments made on a monthly basis. Ninety six percent of farmers were paid in cash while four percent were paid through Mpesa or bank deposits. This findings show that payments were made on a timely basis to respondents. However, where payments are made in cash more so on a weekly basis as in this case, makes it hard for recipients to have all the money accruing from a given farm project brought together so that they can be used to finance other projects. Such kind of piecemeal payments reduce farmers to living from hand to mouth while rendering them unable to

invest further in their farming endeavours. In addition, the manner in which payments are made; through cash or bank deposit is a significant factor in establishment of individual's credit worthiness record that ultimately enables them secure credit from lending institutions when in need. Given that most respondents were paid in cash, this is likely to limit them in terms of access to banks credit due to their inability to demonstrate their credit-worthiness given their low income and inaccessibility to banks.

6.6 Availability of Extension Services and its Influence on Adoption of Horticulture

Farming

Access to extension services and personnel was also assessed in terms of frequency of contacts or number of visits (weekly, monthly and when called upon) that extension service providers made with farmers. When asked about existence of extension services, 56 percent of respondents confirmed their availability (out of which 61.5 percent were male while 38.5 percent were female) while 44 percent reported not to be available. In reference to providers of extension services, 93.25 percent of those who had accessed the extension services reported to be provided by the government's ministry of agriculture (MOA) staff, while 5.75 percent were served by NGO or donors with a further 1 percent being served by private providers.

The results show that government funded extension services provided by employees serving under the ministry of agriculture were the mostly utilized by respondents (93.25 percent). This was confirmed upon visit to divisional agriculture office (now sub-County office) where other additional employees had been brought in under the devolved government system as ward extension officers. Despite such concerted efforts on the part of central and now county government to provide extension services, respondents' access to these services was not as extensive as expected given that a substantial proportion (44 percent) reported not to have access to the extension services. This average level of accessibility to extension services can be attributed to the high farmer to extension staff ratio that hinders farmers' ease of accessing extension staff due to high demand.

This is supported by study findings in reference to frequency of visits by extension officers, which showed that 64.5 percent were visited when they called upon the extension officer, 30.75

percent were visited monthly while 4.75 percent reported to have been visited on a weekly basis. From this finding, it is evident that extension officers and the accompanying services provided were readily available to respondents. However, it is the procedure for accessing these services that stood out as an inhibitor to respondents given they reported to cater for the travel cost of extension officers if they are to be visited. Upon visit to the divisional agriculture office at Kobujoi (now sub-County office), it was observed that the motorcycle and van that were used to facilitate field visits had been grounded due to the office's inability to facilitate their repairs.

Table 6.5: Adopters' Responses in Reference to Extension Services

Descriptor	Category	Frequency	Percentage
Access to extension services	Yes	174	56
	No	136	44
Provider of extension services	Government	289	93.25
	NGO/donor	18	5.75
	Private	3	1
Who pays for the extension services	Providing agency	220	71
	Farmer/self	64	20.5
	Cost-sharing	26	8.5
Frequency of extension officers' visits	Weekly	15	4.75
	Monthly	195	30.75
	When called upon	200	64.5
Quality of extension service	High	130	42
	Moderate	147	47.5
	Low	33	10.5

The study sought to ascertain whether access to extension services influenced respondents' decision to adopt horticulture farming. Pearson's correlation test was administered and findings yielded a correlation coefficient ($p=.026^*$ $p<.05$). The result is significant at $p < .05$. This

indicates a weak positive correlation between access to extension services and adoption of horticulture farming. This shows that existence of extension services minimally influenced uptake of horticulture farming. This implies, the limited the farmers access to extension services the less likely they are to adopt horticulture farming. Logistic regression analysis was conducted and the Wald statistic showed that respondents' access to extension services was not significantly related to adoption of horticulture farming.

The above findings are in line with descriptive data findings that showed almost half of respondents (44 percent) had no access to extension services. This can be attributed to the high farmer to extension staff ratio that limits farmers' ease of accessing extension staff as a result of the high demand. This is coupled with government's orientation towards client-centered approach to extension service provision (FAO, 2014) where clients are expected to trigger the need for services to be provided.

The above findings are contrary to that of Beets, (1990) who alludes to centrality of extension services in adoption of innovations. He argues that agricultural technologies can largely be disseminated through a good agricultural extension service system, which is chronically lacking in most countries. More effective disseminations require better coordination between different agencies, particularly the national ministries of agriculture, development planning and rural development. A study by Owens et. al, (2010), concurs with Beets (1990) by arguing that ability of farmers to effectively diversify their farming system is influenced by their degree of contact with agricultural extension officers.

Agricultural extension services play an important role in the diffusion of innovations among farmers by enabling them access knowledge and skills that they did not initially have. Consequently, they learn new skills, for example, technical skills on how to use a new technology or farm management skills such as record keeping. Extension services therefore should not only diffuse new messages and technologies but also remain actively involved in aiding adoption processes (Holt and Schoorl, 1985). This is because extension services are important for training new participants through innovation–adoption process. Furthermore, extension services serve as the technical backstop during initial trial-and-error periods when

adopting innovations, in assuring on quality and reassuring farmers during retirement of old techniques (obsolescence) and their replacement with newer innovations or techniques.

Many authors have reported a positive relationship between access to extension services and technology adoption. A good example include; Adoption of Imazapyr-Resistant Maize Technologies (IRM) by Mignouna *et al.* (2011); Factors determining technology adoption among Nepalese Karki and Siegfried (2004); Uaiene *et al.*, 2009; Adoption of improved maize and land management in Uganda by Sserunkuuma (2005); adoption of modern agricultural technologies in Ghana Akudugu *et al.* (2012) just to mention a few. This is because exposing farmers to information based upon innovation-diffusion theory is expected to stimulate adoption (Uaiene *et al.*, 2009). In fact, the influence of extension agents can counter balance the negative effect of lack of years of formal education in the overall decision to adopt some technologies (Yaron, Dinar and Voet, (1992); Bonabana- Wabbi 2002).

Through extension, farmers also get technical advice and information that help them make informed decisions. Such information includes credit sources and requirements, potential markets and prevailing prices. This enables farmers to sustain and improve their enterprises. Furthermore, because farmers always require organizations through which they can express their interests, and to serve as avenues for taking joint actions, extension services will assist farmers set up, structure and develop such organizations. Extension agents also encourage farmers by infusing motivation and self-confidence while guiding and assisting them to take initiative (Luukkainen, 2012). This important role of extension services is informed by the human agency theory which argues that individuals who have access to a wide stock of knowledge from which they can choose appropriate responses are better placed in dealing with their desires and challenges. Thus, extension services help farmers evaluate varied options and guide them on how to choose what is appropriate for them.

The Kenyan government has recognized and acknowledged centrality of extension services and in order to realign agricultural advisory services with this new reality, the National Agricultural Extension Policy was changed to the National Agricultural Sector Extension Policy (NASEP). NASEP focuses on commercialization and privatization of extension services, and regulation,

coordination, monitoring and evaluation of extension systems and structures for resource mobilization (Government of Kenya, 2012). The government also formulated Agricultural Sector Development Strategy (ASDS) that is intended to strengthen agricultural research, extension and training, to promote demand-driven research and transfer of research outputs to farms and farmers. ASDS calls for and upholds pluralism in delivery of extension services to ensure that modern innovations are conveyed to and are adopted at farm levels (FAO, 2014).

There have also been differences reported between men and women farmers in access to extension services, contacts with extension agents and access to meetings held by extension agents with findings showing that women farmers have the least access (FAO, 2011, Meinzen-Dick et. al., 2011). According to African Development Fund, (2007) although women are key to agricultural production and contribute about 60 percent to 80 percent of all labour in household, reproductive and agricultural production and contribute about 50 percent in cash crop production, they receive only 7 percent of agricultural extension information (African Development Fund, 2007). According to findings from ActionAid's fieldwork in West Pokot, Trans Nzoia and Kakamega districts (now counties), only 5 percent of women farmers receive extension services (Action-Aid, 2013). Although the number of female farmers accessing extension services in the current study is lower than that of the male farmers, their proportion is higher than as reported in the Action-Aid (2013) study. In the current study findings, out of 56 percent of respondents who confirmed to have access to extension services, 61.5 percent were male while 38.5 percent were female which translates to 16.75 percent of the study sample.

Extension agents have been found to engage male farmers more than women (Action-Aid, 2013). This is partly because social norms restrict women's contacts with male extension agents. Time constraints and lower levels of education were also found to prevent women from participating in extension activities such as meetings and attendance of field schools unless these are specifically oriented to women. Ragasa, (2012) agrees with this argument and holds that women farmers generally have lower levels of education that affect their understanding and consequently adoption especially if the technology requires use of more technical and intensive knowledge. Social and cultural barriers and greater time burdens are also cited as major constraints affecting women in acquiring information, education and training. However, it was noted that among

extension officers based at the Kobujoi ministry of agriculture divisional office, they were balanced in terms of gender and further confirmed that both male and female farmers benefited equitably from their services.

In reference to the nature of extension services provided, 55 percent of horticulture farmers reported to be crop specific while 45 percent reported to be general in nature. This observation was reinforced by key informants' responses, which indicated that government provided extension services have been made farmer driven where farmers call in extension officers whenever they have problems. The quality of extension service provided was also assessed based on respondents' observation and 42 percent rated it as high, 47.5 percent rated as moderate while 10.5 percent rated as low. This shows that majority of respondents (87.5 percent) considered the quality of extension services provided to be in line with their expectations and thus competent enough to address their problems. This also signifies respondents' level of confidence in particular service providers, which are key in their choices and decision.

Further, findings showed that 73 percent of respondents were provided with training while 27 percent had not received any training. Provision of training by extension officers was supported by key informants who noted that, whenever farmers call upon the government extension officers, they are advised to inform neighbouring farmers of the scheduled visit. During the visit, farmers would be mobilized so that if they had the same problems or others, they would be assisted as a group. This was reported to aid a lot in reducing repeated visits to the same area by extension officers and thus according them time to visit farmers in other areas. The specific areas of training that were reported to be focused on by extension officers were crop husbandry, marketing and financial access and management. Other than the above trainings, other general trainings on health and safety, financial services and post harvest management were reported to be provided mainly during field days and whenever seminars are organized for selected farmers who have organized themselves in groups and registered with the ministry of agriculture.

Birkhaeuser et. al, (1991) supports provision of training to farmers by arguing that it has a positive effect on adoption of agricultural technologies. In their study, training farmers in basic agricultural technologies increases rates of adoption of innovations. Farmers also gain a lot from access to improved information provided through extension services which enables farmers

participate more actively in extension trainings and therefore more likely to adopt agricultural innovations. This is because training broadens their knowledge and gives them chance to learn about the benefits of adopting new agricultural technologies. Pontius et. al, (2000) and Asiabaka et. al, (2002) argue that farmers can acquire education through informal and formal organized forums (Farmer Field Schools).

With regard to who caters for the cost of extension services, 20.5 percent of horticulture farmers reported to be catered for by farmers, 71 percent by the providing agency while 8.5 percent reported to be shared. This finding was reaffirmed by key informants who reported the cost aspect as the main deterrent to their access to extension services. One key informant confirmed;

Since the agriculture function was devolved to the County government, our divisional, ministry of agriculture office has scaled down nature of activities and services that they provide to farmers due to funding limitations. For example, cost sharing has been informally introduced with farmers calling for extension services being required to cater for the travel costs of extension officers if they request such services. This limits farmers' access to extension services given that most of them are poor and therefore cannot afford to cater for extension officers' transport costs (38-year-old male key informant).

The cost factor in access to extension service was also assessed and study findings yielded a negative correlation coefficient ($p = -.114^* p < .05$) between farmers catering for cost of extension services and adoption of horticulture farming. The result is significant at $p < .05$. The result indicates that where farmers cater for cost of extension services, it impacted negatively on adoption of horticulture farming. This is because it brought additional cost to potential adopters, which make the overall process of innovation adoption expensive. Thus, where farmers lack resources to finance extension officer's visit, they are left with no other option but to make their farming decisions without the services.

From the results presented above, it is apparent that there exists a robust and widely accessible agricultural extension system. However, extension services as currently structured do not ensure easy and equitable accessibility to all farmers. The informal introduction of cost sharing hinders most farmers that are capital deficient and those unable to cater for travel expenses of extension officers in order to be provided with the services. This in the long-run slow down the pace at which new information such as on new crop varieties, practices and agricultural innovations are communicated to target recipients and potential adopters. New agricultural practices such as

horticulture farming therefore end up being adopted at slow pace among respondents. Despite these shortcomings, respondents exuded a lot of optimism with 99.75 percent strongly believing that existence of extension services enhanced adoption of horticultural farming innovations while only 0.25 percent (one respondent) did not share in this opinion.

Thus, new approaches to extension should be formulated by bringing on board the various players in the sector. The government should also acknowledge that it is limited in its ability to meet varied farmers needs and therefore equip and encourage farmer organizations, private companies and non-governmental organizations to come up with extension approaches that are adaptive to the current societal structuring, specific ecological circumstances and needs and; partner by contracting them to provide these services.

6.7 Influence of Government, NGO and donor Institutions on Adoption of Horticulture Farming

The study also sought to find out whether there are any interventions provided by various supporting institutions such as government, NGOs and donors in the uptake of horticultural farming innovations within the research area. Findings showed that majority of horticulture farmers (80 percent) had benefited from governmental assistance while 20 percent could not recollect of any government assistance in promotion of horticulture farming.

Table 6.6: Existence of Government, NGO and donor Support

Descriptor	Category	Frequency	Percentage
Governmental assistance	Yes	248	80
	No	62	20
NGO and Donor assistance	Yes	39	12.5
	No	271	87.5

The main supports reported to be provided by the government were extension trainings, facilitation of access to farm loans such as *uwezo* fund for groups and provision of free fertilizer

to vulnerable members of society besides general provision of subsidized fertilizer to farmers who would wish to buy them from national cereals and produce board (NCPB) depots.

Pearson's product moment correlation test was administered and study findings yielded a correlation coefficient ($p=.195^{**}$ $p<.01$). The result is significant at $p < .01$. The results indicate that 3.8 percent of adoption of horticultural farming innovations can be explained by interventions provided by government. This implies that government's intervention towards adoption of horticultural farming innovations were instrumental in enhancing adoption levels of horticulture farming. This finding comes closely to an earlier one on provision of extension services where majority of respondents relied on government provided extension services and other forms of support provided through its varied agencies.

It should be noted that the government interventions were not specifically geared towards promotion of horticultural farming innovations but were general. The limited role of government in promotion of horticultural farming innovations is attributable to the fact that the research area did not fall under areas categorized as those in need of governmental, NGO and donor support and thus the limited government and donor interventions. Furthermore, this may have been occasioned by government's change of approach from integrated approach to cost-sharing approach along with proliferation of private service providers.

The specific intervention by government that targeted promotion of horticultural farming innovations was SHoMAP. This programme facilitated farmers' accessibility to markets by repairing and maintaining access roads, promotion of horticultural crops that had demonstrated viability for wider adoption and providing financial capital to active farmers' groups to kick-start horticulture farming. There are also other programmes that have been initiated by the government that were intended to improve access of smallholder farmers to agricultural inputs so as to transform smallholder agriculture from subsistence to commercial farming. These programmes targeted agriculture as a whole with the aim to promote culture of farming as a business. One of these programmes is the NALEP programme that emphasized a new systems approach to diagnosing problems at the farms to ensure that all farmers in focal areas are equipped with individual farm action plans (FSAP). Further, emphasis was put on the role of extension services facilitators that connect farmers with private sector service providers rather

than managing government handouts. The focus was on a demand-driven and participatory delivery of extension services in a transparent and accountable manner (Melinda et. al, 2006).

The other programme is NAAIAP, which has two components: *Kilimo Plus* and *Kilimo Biashara*. The *Kilimo Plus* initiative targets the locally identified poor, vulnerable households and provides them with one-time input grants of fertilizer and seeds enough to sow one acre of land (0.4 ha). Beneficiaries are expected to plough back proceeds from the harvest to purchase inputs for the next planting season and to purchase inputs in future (FAO, 2014).

The second component of NAAIAP, the *Kilimo Biashara* initiative provide agricultural financing as part of the input subsidy programme. The goal of the programme was to reduce production costs and ultimately food prices by providing affordable credit to farmers. In addition, the programme aimed to build the business capacity of smallholder farmers, and consequently support farming-as-a-business strategy. *Kilimo Biashara* is intended to support the *Kilimo Plus* initiative by making affordable credit available to farmers who may lack equity capital to finance agricultural production. This program also assists farmers to collaborate with financiers who offer loans at a low interest rate of 12 percent.

Besides the programmatic efforts, there has been liberalization of fertilizer and other inputs marketing that was expected to increase fertilizer and other input use especially among farmers who were non-users or who were using less than optimal amounts. Despite the enhanced input distribution, the anticipated increment in fertilizer and other input use by smallholder farmers has not been evident. The targeted small-scale, horticulture-producing farmers are therefore seen not to have benefited fully from the liberalization of inputs marketing in the country (FAO, 2014). Respondents in this study reported retail prices for fertilizer that ranged between Ksh 3000-4000, which are generally unaffordable for most small-scale farmers along with absence of the right fertilizer and other essential inputs for horticulture farming.

According to FAO (2014) there are various active programmes aimed at facilitating productivity, commercialization and profitability of smallholder producers, and yet horticulture farmers have not benefited much as expected. These programmes include the United States Agency for

International Development (USAID), Agricultural Cooperative Development International-Volunteers in Overseas Cooperative Assistance (ACDI-VOCA); Kenya Maize Development Program (KMDP, 2002–2012), the input bundles scheme of the One Acre Fund, and the World Food Programme's (WFP's) Purchase for Progress (P4P) model. Thus, there is need for more integrated efforts among the various stakeholders involved in production, distribution and provision of these inputs. This partnership can be modeled following the approach of the Ghana Grains Partnership that brought together funders (an enterprise fund), banks, fertilizer companies, NGOs, local buyers and traders and farmers' groups to ensure that farmers have access to inputs (Guyver and MacCarthy, 2011).

When respondents were asked about government officers' efficiency, 63 percent rated them as efficient while 37 percent rated them as inefficient. This means that respondents saw the ministry of agriculture staff whom they worked with in promotion of horticultural farming innovations to have been instrumental in the development of this enterprise. This is attributable to the minimal presence of other alternative service providers within the research area. The government thus plays a significant role, which enables horticulture farmers to enhance adoption, production and marketing strategies. Nzomoi et. al, (2007) agrees with the above findings and argues that the justification of the enhanced role played by government in the uptake of innovations is that successful adoption of some technologies might require government facilitation. However, Nzomoi cautions that intervention measures aiming to enhance adoption of innovations should be designed to include appropriate government role although government's role should be minimal since excessive government meddling can, on the contrary, curtail productivity (Nzomoi et. al, 2007).

It is important to note here that the study was undertaken when the agriculture function had just been devolved to County governments. Therefore, various roles that were initially played by national government during introduction of horticultural farming innovations had been taken over by the County government. However, during the handover and transition period when the study was undertaken, there were reported coordination challenges such as lack of adequate funding at the divisional offices, disruptions in supply of inputs to depots and introduction of ward extension officers whose roles conflicted with those of existing officers.

With regard to whether there had been any NGOs and donor assistance in promotion of horticulture farming, 87.5 percent of respondents could not recollect of any donor assistance while 12.5 percent reported to have received donor assistance at one point. The initial donor assistance reported was one by technoserve, an NGO that championed adoption of passion fruit farming in the research area having partnered with Coca-Cola company as the ultimate buyer of produce. A lot was reported to have been accomplished under this program such as training farmers in passion fruit husbandry practices, with some horticulture farmer groups that were active applying for funding support for establishment of passion fruit nurseries, construction of green houses and, in setting up water supply systems. The efficiency of such NGOs and donor interventions was also assessed and 77 percent of respondents rated them as inefficient while 33 percent saw them as efficient. The reasons cited in reference to their inefficiency included the fact that they focused on progressive farmers and that their interventions were only for a short duration when they promoted their products for adoption and thus lacked continuity.

Findings on effectiveness of NGOs interventions on adoption of horticultural farming innovations yielded a correlation coefficient ($p=.212^{**}$ $p<.01$). The result is significant at $p < .01$. The results indicate a positive correlation between NGOs interventions and adoption of horticultural farming innovations implying that 4.5 percent of the decision to adopt horticultural farming innovations is attributable to NGOs interventions. Although the above results point to an active role played by NGOs in the adoption of horticulture farming, there was limited engagement by farmers in production of passion fruits.

It is worth noting that besides provision of extension services, the government and Technoserve played other roles such as policy formulation and other oversight functions. Despite such concerted effort by the government, NGOs and donors, there has been little progression in transformation of horticultural sector in the research area. This calls for concerted efforts on the part of farmers as the main stakeholders, and a limited role for government and NGO/donors in the running of horticultural sector institutions.

6.8 Conclusion

This chapter expanded the adoption discussion begun in chapter five. It focused on analysis and discussion of findings relating to influence of institutional factors on uptake of horticulture farming. Specifically, this section presented a discussion on how respondents' access to inputs, access to credit, group membership, marketing of produce, access to extension services, and how effectively the government and NGOs play their roles influenced adoption of horticulture farming. This chapter has shown that availability of inputs among respondents did not significantly influence adoption of horticulture farming. This result may have been influenced by the fact that there were no inputs provided to horticulture farmers as illustrated by descriptive data, which showed most respondents were not accessible to inputs. Farmers' had average access to credit and this positively influenced adoption of horticulture farming. However, multiple challenges made it difficult for farmers to access credit due to the general lack of collateral and the limited institutions providing financial credit to farmers. Farmer membership in groups and cooperatives was found to be low although it was significant in adoption of horticulture farming. This is because groups provide easy avenues to reach as many people as possible at a time, and that most of the initial horticulture promotion efforts targeted farmers who were organized in groups. Despite the centrality of groups and cooperatives to enhanced adoption of innovations, data showed that membership in farmers' groups and cooperatives was low among respondents.

Study findings further showed that most respondents marketed their produce individually although this minimally influenced adoption of horticulture farming. Most respondents also sold their produce to intermediaries who picked produce at the farm gate. With such marketing arrangement, respondents widely complained of exploitation by intermediaries because of lack of alternative markets for their produce. Further, findings showed existence of extension services positively influenced adoption of horticulture farming. Although extension services were widely available to farmers, accessibility challenges were reported. This was attributed to the few extension officers in relation to the high number of farmers coupled with lack of other alternative providers of extension services. Thus, there is need for formulation of new approaches to extension such as bringing on board various players to comprehensively meet the varied needs of farmers. The findings also showed that government, through the ministry of agriculture, had been effective in performance of its functions and this was positively associated with adoption of

horticulture farming. The government, was reported to provide inputs, provide capital through various schemes such as *kilimo plus* and *kilimo biashara* and provided extension services.

CHAPTER SEVEN

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS OF THE STUDY

7.1 Introduction

This chapter presents summary of study findings, conclusions and recommendations of the study as well as suggestions for further research. Specifically, it shows how empirical data collected contributes to the understanding of how social, cultural and institutional factors influence adoption of horticultural farming innovations within the research.

7.2 Summary of Key Findings

The major concern of this study was to assess how prevailing socio-demographic, cultural and institutional factors influence adoption of horticultural farming innovations in Aldai sub County, Nandi County. Although the government has initiated many efforts, tried out many approaches and formulated many policies that were aimed at enhancing adoption of horticultural farming innovations to make it a thriving and profitable venture, there has been little achievement in progression and productivity of small-scale horticulture farmers in Aldai sub County, Nandi County.

The first objective of the study sought to assess the socio-demographic determinants in uptake of horticultural farming innovations in Aldai sub County, Nandi County. The findings revealed that horticulture farming had been widely embraced by respondents, majority of whom were females. The findings further showed female respondents were more inclined to adoption of horticultural farming innovations more than male respondents do. This dominance of women in horticulture farming is attributable to community's cultural structuring that place women in charge of the subsistence sources of livelihood while men control the main sources of family income and property. Thus, women had been able to enhance their engagement in horticulture farming from a pure subsistence basis to a market orientation by practicing it at a larger scale and widening the range of horticultural crops grown thus being able to produce in excess of their household requirements which they would sell. This is despite women's limited control over critical farm resources or factors of production (land, labor, and cash) along with their inability to interact

freely with service providers such as extension officers due to capital resource limitations, time constraints and cultural inhibitions. Such change is informed by the human agency theory which argue that, every society contain within it a repertoire of different lifestyles, cultural forms and rationalities that members fall back to in their search for order and meaning.

Respondents' age ranged between 20 to above 50 years however, majority were youthful. The dominance of youthful respondents is attributed to their possession of the required skills and probably were now at a critical age category with more dependants and greater demands and yet may not be having the necessary land resources and property to generate additional incomes they need. However, study findings indicated no association between respondents' age and adoption of horticultural farming innovations because persons of all age groups had embraced it. This is illustrated by the diffusion of innovations theory, which argues that although adoption of innovations may be gradual, over time a greater segment of society will have embraced it. Thus, given that horticulture farming has been practiced among the respondents over time, almost all members across all age groups have got accustomed to it as an integral part of life.

Further, findings showed that married respondents were more inclined to adoption of horticultural farming innovations than their counterparts of other marital status were. This is explained by the fact that marriage brings with it obligations that require more resources to support dependants. Also married respondents had more dependants who besides creating pressure for provision and support also served as a source of labour given most households relied on family labour in their horticulture farms. However, study findings showed a low relationship between number of dependants and adoption of horticulture farming. With regard to the level of education, high levels of literacy were noted with an overwhelming majority of respondents having attained secondary and middle level college (certificate and diploma) education. However, findings showed no significant differences between individuals' level of education and adoption of horticulture farming. This is probably because respondents across all levels of education had embraced horticulture farming. Furthermore, educated persons are more likely to be employed and to have more incomes from other sources and therefore do not easily embrace horticulture farming. The interaction between marital status, number of dependants, level of education and

adoption of horticultural farming innovations are well illustrated by human agency theory argument that different individuals within the same situation will adopt different ways of coping.

The second objective sought to ascertain the cultural determinants in the uptake of horticulture farming. In reference to the size of land owned, majority of respondents had less than five acres of land. The study observed that farmers with smaller land sizes are more likely to adopt horticultural farming innovations than those with larger land holdings. This is informed by the need for innovativeness and maximization of use of available land for survival by the small landholders, thus adoption of innovative practices that deliver higher returns. This is well illustrated by the diffusion of innovations argument that adoption process is gradual with individuals trying out the innovations first on a small scale before adopting them on a large scale. The various horticultural crops planted by respondents included bananas, kales (*sukuma wiki*) and cabbages, traditional vegetables (*managu, saka, mitoo* and *kunde*), passion fruits, tomatoes and pineapples.

Respondents also expressed high levels of acceptance for these horticultural crops as they rated them as highly compatible with their farming objectives. The high compatibility of horticulture farming with respondents' farming objectives is well illustrated by the diffusion of innovations theory which cites compatibility as one of the attributes of innovations that influences their levels of acceptability and ultimately adoption. With regard to control of income from horticulture farming, no much difference was noted in the proportion of male and female respondents however, even in some cases where respondents were male, women were reported to control the income from horticulture farming. This could be attributable to the fact that within the research area, horticultural farming has been women's domain. However, whether the man or the woman controlled income from horticulture farming, this did not significantly influence uptake of horticulture farming.

The third objective sought to investigate the influence of institutional factors on uptake of horticulture farming. Limited accessibility to inputs was noted, as respondents had to seek them individually from private stockists and cater for relating costs on their own. However, this did not significantly influence adoption of horticulture farming. Respondents also reported to face limited access to financial credit and findings indicated a strong positive association between

respondents' access to financial credit and adoption of horticulture farming. This is because access to financial credit enhances availability of capital resources necessary to facilitate acquisition of inputs and equipment essential to adoption of horticulture farming.

Study findings also indicated low levels of membership in farmers' groups and cooperatives among respondents. However, results indicated a strong positive correlation between membership in farmer groups and cooperatives and adoption of horticulture farming. This is because, membership in farmer groups and cooperatives strengthens interactions among farmers and hastens adoption decisions as they accord farmers better access to information, inputs, credit and markets than those acting individually. Respondents therefore need to organize themselves in groups if higher levels of adoption of horticultural farming innovations are to be attained. Findings on distance to market were found to average 5 kilometers. This reflects a fairly high level of ease of accessibility although the distance was found to extend to even 30 kilometers in some parts of the research area. However, distance to the market did not significantly influence adoption of horticulture farming.

In addition, majority of respondents marketed their produce individually at the local village market while some sold them in organized markets such as supplying nearby institutions or selling to buyers from surrounding towns who picked produce directly from farms. Respondents delivered their produce to the market using private means mainly donkeys or motorbikes. Those supplying organized market groups had their produce picked up by trucks financed by the buyers. Thus, it was noted that respondents lacked proper systems for transporting and marketing their produce.

In reference to extension services, majority of respondents accessed them. The extension services were provided mainly by government's ministry of agriculture (MOA) staff, supplemented by an NGO (Technoserve) and private providers. Respondents rated the quality of extension services as high and in line with their expectations and therefore considered them competent enough to address their problems. In reference to cost of the extension services, it was mostly catered for by providing agencies though in some cases, costs were shared. Respondents exuded a lot of optimism that existence of extension services enhanced horticulture farming although results

indicated weak correlation between these two variables. Conclusively, the results showed that the more respondents catered for the cost of extension services, the less they adopted horticulture farming.

7.3 Conclusion

Based on the study findings, the following conclusions were derived:

The findings have shown that re-orienting horticultural farming is necessary if farmers are to adopt it at an enhanced scale as envisaged in development planning. Findings showed that age and land size are key factors that need to be considered keenly in promotion of horticultural innovations. Horticultural farming need to be evaluated in light of the different needs and preferences of targeted males and females, the young and old, potential adopters owning varied land sizes. This is important because differential access to and control of productive resources such as land and; the roles played by the various genders in the adoption process are all crucial.

Secondly, given horticultural crops adopted and control of income from horticulture farming is culturally determined, formulation, promotion and implementation of decisions regarding horticulture farming need to be made context specific, concerning the specific situations in which practices are to be implemented and within circumstances in which targeted adopters' lives are embedded. This is because people make decisions based on a complex relationship of perceived needs, experiences and rewards while weighing the consequences relating to those decisions. Adoption planning therefore need to be tailored to particular contexts of target adopters' experiences (underlying personal, socio-economic and cultural conditions and knowledge) and on how well the innovations "fit" adopters farm plans, farming objectives and everyday operations.

Thirdly, the various institutions charged with formulation, promotion and marketing of innovations must adopt ambitious and multifaceted approaches that address varied needs and roles of targeted stakeholders. This is because emerging innovations must fit expectations of the various stakeholders if they are to achieve wider acceptability and support of all stakeholders. Therefore, formulation of innovations should not be left to single agencies and neither should any stakeholder be left out in this process. Partnerships should be forged among concerned

stakeholders and institutions throughout the value chain such as targeted adopters, national agricultural research systems, NGOs, government agencies, market players and private sector service providers, who should pool together their varied expertise in order to effectively address needs of the varied adopters within a wide range of situations, anticipated.

Fourthly, there is a need for enhancement of roles played by various institutions involved in innovations development and promotion processes. This include enhancement of input provision to attain easy and wider accessibility, ensuring easy access to loans and other capital resources, strengthening marketing infrastructure and enhancing provision of extension services. This complex yet important task is necessary if elaborate and effective programmes that can address disjoints that have existed in innovations development and promotion are to be developed.

7.4 Recommendations

1. Given the centrality of respondents' age, gender and education level in horticultural farming adoption decisions, it is important to take into account target recipients demographic and social considerations and situations during formulation of innovations so as to attain wider acceptance and ownership. Active participation and involvement of target recipients in formulation of innovations is therefore necessary so that social and cultural considerations are addressed appropriately.
2. In order to hasten adoption of horticultural farming, there is a need to take into account the prevailing cultural environment during formulation and promotion. This is because adoption, ownership and allocation of resources have been shown by the study to be culturally informed.
3. Owing to the minimal presence of farmers groups and cooperatives among respondents, there is a need to sensitize horticulture farmers on the benefits of forming producer organizations that can bring them together to formulate common objectives and pool efforts towards attaining their goals. This calls for training farmers on formation and management of successful farmer organizations.

4. Given that innovation adoption is a process that should bring together interrelated activities and agencies, there is a need for a review of approaches utilized by various institutions involved in innovation development and promotion (input suppliers, financial capital and extension service providers) to be responsive to the needs of targeted recipients. Innovation dissemination agencies should consider adopting cluster dissemination approaches instead of having disjointed repeated introductions of new practices by different agencies within short periods. Furthermore, subsidy programs need to be tailored to the needs and situations of the target beneficiaries such as making fertilizer available in 10Kg and 25 Kgs packaging.
5. There is a need for a review of ways in which extension services are normally provided to farmers by adopting approaches that are responsive to needs of target recipients. Extension services should be adequately funded to attain broader choice and wider accessibility. Further emphasis should be put on training of lead farmers who will in turn influence other farmers and therefore serve as multipliers and disseminators of relevant agricultural knowledge and practices.

7.5 Suggestions for Further Research

1. There is need for a comparative study to assess factors that make adoption of crops such as tea and sugarcane farming more successful.
2. Given that this study focused on the socio-cultural and institutional factors in adoption, another study focusing on technical and economic factors of adoption should be carried out.
3. Another study focussing on the innovation adoption opportunities and challenges along the various points of the horticultural value chain within the research area should be carried out in order to attain an indepth and holistic picture.

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APPENDICES

APPENDIX I: Questionnaire for Farmers

HALLO. I am a PhD student from Maseno University and I am conducting research. I thank you for agreeing to participate in this research assessing adoption of horticultural farming innovations in Nandi South. I request you to provide me with accurate information being sought in this questionnaire. You are also assured that the information you provide will be treated confidentially and used for the sole purpose of this study. Your support by filling this questionnaire is highly appreciated. WELCOME.

INSTRUCTIONS: Tick the appropriate choice or provide requested information

PART A: Demographic Characteristics

1. What is your gender? Male Female
2. How old are you?
Less than 20 21-30 31-40 41-50 51 and above
3. What is your marital status?
Married Not yet married Never married
widow/widower Divorced/separated
4. How many dependants/members of household do you have in total?
5. What is the highest level of education that you attained? Never went to school
Primary Secondary Middle level (certificate or diploma)
Degree and above
6. What is the size of your farm holding in acres
7. Farm allocation to the various farming activities undertaken in acres

ACTIVITY	FARM SIZE (Acres)
Horticulture crops	
Cash crops (Tea/Coffee)	
Cereals	
Livestock	
Trees	
Other	

Part B Horticulture Farming Adoption

8. Are horticulture crops among your main income generating enterprises?

1) Yes 2) No

9. If No why?

10. If Yes to item 8 above, which horticulture crops do you plant to generate income?

CROP PLANTED	ACREAGE PLANTED
Sukuma/cabbages	
Traditional vegetables	
Fruit trees	
Bananas	
Other (specify)	

11. For how long have you been practicing horticulture farming?..... years

12. State any special uses (nutritional, ceremonial etc) associated with the various horticultural crops by your community? (If there is non skip to question 13)

13. State any beliefs, taboos, values, attitudes or knowledge you are aware of that are inhibitive of the uptake of horticulture farming? (If there is non skip to question 14)

14. Are there any harmful impacts/effects (to humans or environment) that are associated with the following horticultural plants in your community?

PLANT	ASSOCIATED HARM	SUGGESTED SOLUTION
Sukuma/cabbages		
Traditional vegetables		
Fruits		
Bananas		
Others (state)		

15. What are the various roles played by men and women in the horticulture farming process.

Mens roles.....

Females roles

16. Are there any cultural norms inhibiting men or women from playing any role in the horticulture adoption process?

Norms inhibiting men

Norms inhibiting women

17. Rank the following horticulture crops on the basis of your propensity to adopt them. Least acceptable meant one may not be engaging in its production now but given an opportunity he/she would be ready to adopt; acceptable meant the respondent just engages in its production on a subsistence basis; moderately acceptable meant horticultural crops are among the top three cash crops the respondent has embraced; while highly acceptable meant horticultural crops are the current main cash crop for the respondent.

PLANT	Least acceptable	Acceptable	Fairly acceptable	Highly acceptable
Sukuma/ cabbages				
Traditional vegetables				
Fruits				
Bananas				
Flowers				
Others				

18. What is the main source(s) of labour in your horticulture farming?

Household members Hired labour

Both household members and hired labour

19. Who controls the income derived from the sale of horticulture produce?

20. How compatible is horticulture farming with your personal farming objectives?

Compatible Incompatible

21. How do you consider your community's social perception toward horticulture farming?

Favourable Unfavourable

Part C Institutional Factors

22. Who provides farm inputs?

Self Company/Association Intermediary Other

23. What farm inputs are provided?

Seeds Yes No
Fertilizer Yes No
Herbicides / pesticides Yes No
Application equipment Yes No

24. How are the payments for farm inputs made?

One off payment Monthly instalments

25. Do you access credit for the horticulture project?

Yes No

26. What are the terms for the loan/credit?

Loan provider
Repayment length
Interest rates

27. Does the loan/credit agent demand collateral?

Yes No

28. What collateral do you provide?

29. What is the distance from your farm to the crop delivery point km

30. How do you market your produce? Individually

As a group

Explain

31. By what means do you deliver your produce to the market?

32. Who pays for transportation?

33. Where do you sell your produce?

34. What are the terms of payment for produce delivered?

Method of payment

When

35. Are there other alternative markets for the crop?

Yes No

36. Do you at times supply your produce to these alternative markets?

Yes No

37. What are the advantages/disadvantages of this alternative markets?

Advantage

.....Disadva

ntage

38. Are you a member of any self help group/association or marketing cooperative?
 Yes No

Have you had any current or historical Government/NGO assistance or interventions in your group/cooperative? (Respond to the following questions)

39. Government assistance or intervention Yes No
 If yes, in what form / terms?

40. NGO/Donor assistance or intervention Yes No
 If yes, in what form / terms?

41. How effectively do the various stakeholders play their roles in supporting horticulture?

AGENCY & EFFECTIVENESS	CHALLENGES
Government officers	
Farmer groups	
Donor/CBO/NGO/FBO	

Part D Institutional Factors

42. Are there any extensions services provided? Yes No

43. If yes list them

44. Who/which institutions provide the extension services?

45. Frequency of visits by extension official
 Weekly Monthly When called upon

46. Who caters for the cost of service

47. What is the level/nature of extension Crop specific General

48. Are there any training offered by the extension officer? Yes No

49. If yes list them

50. How do you rate the quality/Experience/professionalism of extension provider
 High Moderate Low

Explain

51. What opportunities exist for your further extension/development of horticulture production?

52. Do you think provision of loan can help improve/ enhance horticulture farming in your area?

Yes Explain

No Explain

53. Do you think provision of extension services can help improve/ enhance horticulture farming in your area?

Yes Explain

No Explain

54. Do you think provision of marketing services can help improve/ enhance horticulture farming in your area?

Yes Explain

No Explain

55. What challenges exist in horticulture farming in your area at the following stages?

INDUSTRY	CHALLENGE	PROBABLE SOLUTION
Farming		
Processing		
Marketing		
Use		

25. How are the deliveries made?
 Fixed quotas Explain

.....
 Specified times Explain

.....
 26. Who pays for transportation?

27. What are the terms of payment for produce delivered?
 Method of payment

When

28. Are there other alternative markets for the crop? Yes No

29. If yes name/state them

30. Do farmers at times supply their produce to these alternative markets? Yes No

31. What are the advantages/disadvantages of this alternative markets?

Advantages

Disadvantages

32. Are there any self help group/association or marketing cooperative among farmers?

Yes No

Has there been any current or historical Government/NGO assistance or interventions in the group/cooperative? (Respond to the following questions)

33. Government assistance or intervention Yes No

If yes, in what form / terms?

.....

34. NGO/Donor assistance or intervention Yes No

If yes, in what form / terms?

35. How effectively do the various stakeholders play their roles in supporting horticulture?

AGENCY & EFFECTIVENESS	CHALLENGES
Government officers	
Farmer groups	
Donor/CBO/NGO/FBO	

Part D

36. Are there any extensions services provided? Yes No

37. Which institutions provide the extension services?
.....

38. Frequency of visits by extension official
 Weekly Monthly When called upon

39. Who caters for the cost of service.....

40. What is the level/nature of extension Crop specific General

41. Quality/Experience/professionalism of extension provider
 Low Moderate High

Explain

Part E

42. Rank the following horticulture crops on the basis of the farmers’ propensity to adopt them.

PLANT	Totally Unacceptable	Least acceptable	Acceptable	Fairly acceptable	Highly acceptable
Sukuma/ cabbages					
Traditional vegetables					
Fruits					
Bananas					
Others					

43. What opportunities exist for the further extension/development of horticulture farming in this area?
.....
.....

44. State any challenges facing horticulture farming in this area?

Thank you for your participation in the research

APPENDIX III: Focus Group Discussion Guide

1. Average size of land holding in acres in your area?
 - a. What are the main sources of income among households?
 - b. Do households plant horticulture crops?
 - c. How acceptable is horticultural farming innovations among the farmers?
 - d. Are there any cultural norms/beliefs/knowledge/practices supporting the adoption of horticulture farming?
 - e. Are there any cultural norms/beliefs/knowledge/practices inhibiting the adoption of horticulture farming?
 - f. How are the deliveries made?
 - g. What are the terms of payment for produce delivered?
 - h. Are there any incentives for farmers such as on the basis of Field operations, Production volume, Production quality, Timely delivery?
 - i. Are there other alternative markets for the crop?

2. Who provides inputs?
 - a. Who pays for the inputs?

3. Have households been able to access credit for the horticulture project?
 - a. Who is the loan/credit provider?
 - b. What were the terms for the loan/credit?

4. Do self help group/association exist among farmers in your area?
 - a. Have there been any current or historical Donor/Government/NGO assistance

5. How effectively do the various stakeholders play their roles in supporting horticulture?

6. Extensions services provision?
 - a) Nature of services provided
 - b) Who provides the services
 - c) Challenges in service provision

7. What opportunities exist for your further extension/development of horticulture?

APPENDIX IV: Translated Questionnaire for Farmers

Chamgei. Ane ko a kipsomaniat ab PhD kobun Maseno University ako ayaei chikilisiet/research. Kokikwein anyun iyeku agenge eng che kitebse eng chikilisioni kerei akobo kolsetab ingwek/horticulture farming eng Nandi muros tai. Awegun anyun gongoi eng kayanet-ngung iegu agenge eng che kitebse eng chikilosioni. Asomin anyun iwolwu tebutik che isubu koitita. Kora ayamisun ale kiy tugul ne iwendi imwaei keribe eng ungot ak keboisie kityo eng chikilisio ni. Awegun kongoi anyun eng kiy tugul ne iwendi iyaei eng walunet ab tebutik eng chikilisio ni. Itakat.

Arorutik: Iros anan isir walutyet ne nyolun eng tebutik che isubu

Komasta netai: Tebutik akobo inye

1. Tos i muren anan kwony? Muren Kwony
2. Itinyei kenysiek ata?
Che rekune 20 21-30 31-40 41-50 Che sirei 51
3. Tos iitunisioti? Aitunisiot Tomo atunisie Motunisie
 Mosok Kikebesiei
4. Tos mitei bik atau koingung eng tugul?
5. Kiit oletya eng somanet ngung? Ma iwe sukul Primary Secondary
college nebo kwen University degree
6. Tya imbaret ne itinye eng ekaisiek.....
7. Kiibyejinde ano minutik che ter ter imbaret ngung

Boisiet	Imbaret (Ekaisiek)
Ingwek /Horticulture crops	
Chaik anan ko kahawek	
Bek	
Kiakik	
Ketik	
Alak	

Komasta nebo aeng: Kolsetab ingwek/Horticulture Farming

8. Tos kiilewen igol ingwek/horticulture crops ko kabotisiet ne icheng'e keljin?
1) Woi 2) Acha
9. Ngot ko acha ko amune?

10. Ngot ko woi eng tebutietab 8, ko ingwek ingicho che ikole?

Nwek che ikole	Imbaret ole ikole
Sukuma/kobochek	
Nwek ab kipgaa	
Matundek	
Ndisinik	
Alak (sir)	

11. Kiikol ingwechu eng kasarta ne tya?..... kenysisiek

12. Tos mi boisiosiek che itabanotin (nutritional, ceremonial etc) che ketokyin/kiitjin ingwek che ter ter eng kokwotiwewwok? (Ngo mami iwe tebutiet 13)

13. Tos mi kayanutik anan ko nautik alak tugul che ingen che tere bik matkocham koletab ingweki? (Ngo mami iwe tebutiet 14)

14. Tos mi ng'emutik alak tugul eng bik anan ko emet che kiitjin ingwek che ter ter eng kokwatinwewwok? (Ngo mami iwe tebutiet 15)

Ingwot	Ng'emutiet	Walutiet
Sukuma/kibichek		
Ngwek ab kipgaa		
Matundek		
Ndisinik		
Alak (sir)		

15. Tos nee boisionik che ter ter che yoei murenik anan ko kwonyik eng kaboisietab ingwek
Boisionik ab murenik

.....
.....
.....

Boisionik ab kwonyik.....

16. Tos mi atebwokik/etanutik che kerei murenik anan ko kwonyik eng kabatisit ab ingweki?
 Etanutik che kerei murenik

Etanutik che kerei kwonyik

17. Tet ingwek che rubei kosubgei ak kayanet ngung ii kol.

Ingwot	Mayani kipgoi	Mayani koit ui	Ayani sinee	Ayanii	Ayanii eng tugul
Sukuma/ kobichek					
Ingwek ab kipgaa					
Matundek					
Ndisinik					
Mauwek					
Alak					

18. Tos ng'o che boisie eng imbaret ngung nebo ingkwek

Bik ab koinyu

Bik che kikisir (kiboitinik)

Bik ab kionyu ak kiboitinik

19. Ng'o ne namu anan teleljin chepkondok che bitune kolset ab ingwek eng koingung?

20. Tos namegei kolsetet ab ingwek ak tetutikuk che bo kabotisieti?

Namegei Manamegei

21. Tos uune keret ab bik ab kutit ngung eng kolsetab ingwek/horticulture farming?

Mie/chamat Mamie/machamat

Komastab somok: Institutional Factors

22. Konin ngo tukuk ab kabotisiet?

Anegei Kampuni Aldoik Alak

23. Tukuk ab imbar che uu nee che inyoru?

Keswek Woi Acha

Mbolea Woi Acha

KerichokHerbicides / pesticides Woi Acha

Tukuk che kiboisie/equipment Woi Acha

24. Tos ilipandoi ano tukukab imbar/farm inputs?

Tugul ye iibu Kila arawa

25. Tos inyoru besendo ne iboisie eng kolset ab ingweki? Woi Acha

26. Tos uu nee tetutik che bo besendo/credit?

Ngo ne konu

Kasartab lipanet

Melekto/Interest

27. Tos tebei ole inyorjini besendo security/collateral? Woi Acha

28. Tos nee ne kiigoite koek security/collateral eng besendo?

.....

29. Tya loindo kongete imbaret ngung agoi ole kioldoe kesutik km

30. Ioldoitoi ano kesutik kuk? Anekei Kikiyugei

Mwa eng koindo.....
.....

31. Iiptoi ano kesutik kuk agoi siro?

32. Ng'o ne lipani chepkondok che bo ibet ab kesutik?

33. Ioldoe ano kesutik kuk?

34. Uu nee tetet ab lipanet nebo kesutik?

Ole kilipandoi

Eng kasarta ne tya

35. Tos mi sirosiek alake che bo ingwek? Woi Acha

Mwa eng koindo

.....
ngap ioldoi kesutik kuk eng sirosiek chuto? Woi Acha **36.** Tos

37. Nee kararanindo anan ko yaityet ab sirosiek chuto alak?

Kararanindo

.....Yaityet

.....
.....
38. Tos kiisirgei eng self help group/association or marketing cooperative age tugul?

Woi Acha

Tos kionyoru toretet age tugul nebo serikali anan ko NGO eng group noto ng'wong?

39. Toretet age tugul ne kibun serikali Woi Acha
Ngot ko woi, ko ki eng or nee?
.....
.....

40. Toretet age tugul kobun NGO/Donor Woi Acha
Ngot ko woi, ko ki eng or nee?

41. Tos uu nee boisionik ab kebeberwe chu eng kabotisetab ingwek?

Kebeberta	Tiemutik
Kiboitinik ab serikali	
Groups che bo kabotik	
Donor/CBO/NGO/FBO	

Komasta nebo angwan. Institutional Factors

42. Tos mi boisionik ab extension che onyoru? Woi Acha

43. Ngot ko woi itetu

44. Ng'o anan ano che konu toretisio nito/boisionik chuto?

45. Tos kikonu toretisio ni eng kasar nee?

Kila wiki Kila arawa Ye kakigur kityo

46. Ng'o ne lipani melektab boisioni?

47. Tos igertai ano kanetutik ab extension Tokyin kabotiset ne ineet Bo
kabotiset ko tugul

48. Tos mitei kanetiset age tugul che konu kiboitinik abextension? Woi Acha

49. Ngot ko woi Itetu

50. Tos ikertoi ano ngulatietab kiboitinik ab extension provider

Mi barak Bo kwen Mi ng'uny

Mwa eng koindo

51. Tos igere kotakomi keljin nee eng tesetab kabotisiet ab ingwek?

52. Tos ibwati ile konunet ab besendo/loan kotos kanapta kabotisiet ab ingwek eng kokwet ngung?

53. Tos ibwati ile konunet ab boisionik ab extension kotos toret ko kanapta kabotisiet ab ingwek eng kokwet ngung?

54. Tos ibwati ile tetetab aldaeta ab kesutik kotos toret ko kanapta kabotisiet ab ingwek eng kokwet ngung?

55. Tos tiemut nee che nyoru kabatik ab ingwek eng kokwet ngung eng kasarwee chu?

Kasarta	Tiemutyet	Walutyet
Kabotisiet		
Ng'aet		
Aldaet		
Boisiet		

APPENDIX V: INFORMED CONSENT FORM

Maseno University, Department of Sociology and Anthropology

Thro' Maseno University Ethics Review Committee

P.O. Box Private Bag Maseno.

Name of the researcher: Sawe K. Edwin

PG/PhD/007/2011

P.O. Box Private Bag Maseno. C/o Sociology Dept.

Title of the study: Socio-Cultural and Institutional Determinants in the Uptake of Horticulture Farming in Aldai Division, Nandi County, Kenya

Purpose of the study: This study is undertaken for the purpose of thesis writing towards the award of a PhD degree at Maseno University.

Procedures:

The study will utilize questionnaires and interviews. The questionnaire will take approximately one hour to fill while the interviews will take approximately two hours. During the interviews the researcher will pose questions to the research participants and take notes as a way to record the conversations. This participation is totally voluntary, and the participants may withdraw their participation in the study at any time if he or she so desires without any negative consequences. The data collected will not be used against them at all. Where necessary, pseudonyms will be used to protect the identity of the participants, and all information will be treated confidential and stored securely. Throughout the research process all the participants will have access and say about the information they have provided.

I agree to the above statement and give my consent.

Participant

Name_____

Signature_____

Date_____

Researcher

Signature_____

APPENDIX VI: Map of the Research Area



Source: www.mapsofworld.com