ANALYSIS OF ACCESS TO AND UTILIZATION OF MACADAMIA NUT INFORMATION ALONG THE VALUE CHAIN IN CENTRAL KENYA

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DECLARATION

This thesis is my original work and has not been submitted for a degree award in any university

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DEDICATION

I dedicate this thesis to my mum Susan Maina, my siblings; Kennedy Wang'ombe, Junior Kariuki, Josphine Nyawira and Ann Njeri.

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ABBREVIATION AND ACRONYMS

GDP	Gross Domestic Product
WB	World Bank
SDG	Sustainable Development Goals
ICTs	Information and Communication Technologies
SMS	Short Message Service
NGOs	Non-Governmental Organizations
NASEP	National Agricultural Sector Policy
GoK	Government of Kenya
FM	Frequency Modulation
DOI	Diffusion of Innovation
MIS	Management Information System
FFS	Farmer Field School
AFA	Agricultural Food Authority
SPSS	Statistical Package for the Social Sciences
MNL	Multinomial Logit
VIF	Variance Inflation Factors

ABSTRACT

Macadamia nut *(M. integrifolia and M. tetraphylla)* is a world finest desert nut that accounts for 1% of global tree nut production. It is a highly valued crop with a high market demand due to its nutrition content and poverty reduction potential. The demand for macadamia nut in the global and local markets is high despite low production in Kenya. This is attributed to access to content unspecific and inconsistent macadamia nut information and unreliable methods of information presentation used by value chain actors and mass media channels. These challenges limits decision making by actors in production and marketing. Therefore, this study was carried out to analyze access and utilization of macadamia nut information along the value chain in Central Kenya.

The objectives of the study were; i) to determine the types of information available to macadamia value chain actors; ii) to find out how information is presented along macadamia value chain; iii) to determine the factors influencing macadamia farmers' use of information sources. The study adopted multistage sampling technique with a sample size of 237 actors randomly selected along the macadamia value chain. Pre-tested questionnaires were administered to the value chain actors who included; input suppliers, farmers, middlemen, processors, and retailers from Embu, Nyeri, Kiambu and Murang'a Counties.

Data was analyzed using SPSS and STATA software. The results showed that information on market prices was accessed by all macadamia actors in the value chain. In addition, the input suppliers accessed further information about pest and diseases challenging macadamia farmers. The results also showed that verbal and written methods of information reception were used along the value chain compared to audio, visual and audio-visual methods. Further, use of tarmac road, market distance, macadamia nut yield and the number of macadamia trees had a significant influence on the use of macadamia information sources by farmers.

The study concluded that market information is vital and necessary to all value chain actors for decision making. In addition, verbal method of interpersonal communication is important and utilized in macadamia nut information dissemination. This is because it allows provision of immediate feedback and persuasion in decision making between communicating parties. Therefore, to realize an improvement in production of quality macadamia nuts, mass media and value chain actors should provide access to updated, timely and content specific macadamia nut information along the value chain.

CHAPTER ONE: INTRODUCTION

1.1 Background Information

According to Zhang *et al.* (2016), most of the under developed countries rely on agricultural production for social and economic development. This is because agriculture is the mainstay and contributor to households' food security and well-being of the community. World Bank (2017) noted that agriculture is key in poverty alleviation, raising farmers' income and achievement of food security for more than 80% of poor people in the world living in remote and dry areas. In Kenya, agriculture contributes 33% to the GDP directly and 27% of GDP indirectly through linkages with other sectors (Makini *et al*., 2018; Muriithi *et al.*, 2018).

A report by World Bank (2017) noted that more than one billion global poor live in the rural area. These people depend on agricultural production to earn a living for their families and the society. According to Schaafsma *et al.* (2018) strategies for enhancing farmers' and agricultural workers' livelihood are key to addressing global poverty. To achieve poverty reduction, all aspects of agricultural commercialization are important and should be considered in order to boost agricultural productivity and increase farmers' profit (Muricho *et al*., 2017).

Macadamia nut (*M. integrifolia and M. tetraphylla*) as an agricultural commodity has the potential to reduce poverty levels and achieve food security in several countries in the world. This crop has gained popularity in the world due to increased global demand (Yan *et al*., 2018). The nuts are highly nutritive with high health impact and as a result several countries have adopted the crop both as sources of food and income. According to Gitonga *et al.* (2008) the crop was first grown in Australia and commercialized in Hawaii. Its production has significantly changed due to increase in market demand, this has triggered China among the countries

producing macadamia nut to increase the number of trees annually with an aim of improving market supply (Parshotam, 2018).

Study by Gitonga *et al.* (2008) elaborate that macadamia is a highly valued crop that originated from Australia and introduced in Kenya in 1946 by Bob Harries. As shown in Table 1.1, Australia recorded the highest quantity of macadamia nut production with 14,100 MT as Kenya ranked third with 5,795MT. In addition, Parshotam (2018) added that macadamia nut industry in Africa has experienced rapid growth with South Africa, Kenya, Malawi and Mozambique increasing their production rate.

Table 1.1 Macadamia production kernel basis by Country in 2017

Country	Quantity in Metric Tonnes (MT)
Australia	14 100
South Africa	13 383
Kenya	5 795
US	4 700
China	3 920
Guatemala	2 200
Malawi	1 286
Brazil	1 150
Others	5 320
TOTAL	51 854

Source: INC (International Nut & Dried Fruit, 2017)

Further, Partshotam (2018) indicates that South Africa is increasing the crop at a rate of over 600,000 trees per year and China at a rate of 2 million trees per year. Growth in South Africa's macadamia nut sector arose largely because of private investment and efforts by commercial farmers' inclusion in decision making. This was done despite the implementation of policies by the government stimulating agro-processing initiatives (Parshotam, 2018; Paumgarten *et al.*, 2018). This triggered smallholder farmers to embrace macadamia production due to inclusion in the value chain and thus contributing to poverty reduction in rural areas (Muimba-Kankolongo, 2018).

Further, in Africa, South Africa was the top globally nut producer for 2011 and 2013-2015, surpassing Australia and Hawaii (Parshotam, 2018). Kenya ranked second to South Africa and position three globally producing approximately 10% of global macadamia nut exports (Parshotam, 2018; Paumgarten *et al*., 2018). A study by Murioga (2018) noted that Kenya macadamia industry is growing fast with Embu, Meru, Nyeri, Kiambu, Kirinyaga and Murang'a Counties leading in production. World Bank (2017) indicated that macadamia forms an important export crop for the country. More so, it has a great potential of generating income, creation of employment and rural industrialization as recorded in Kenya's vision 2030.

Macadamia nut in Kenya involves a value chain which is short, according to Muthoka *et al*. (2008) & Murioga (2018) the value chain covers technologies and farmers at the primary end. Most of the players at this level are input supplier and smallholder farmers respectively. Further, along the value chain are cooperative societies and producer groups, brokers and local processing companies that are vital in production, processing, distribution and marketing. Since most of the cash crop commodity produced in Kenya are for the export market, Gitonga *et* al., (2008) affirmed that macadamia value chain involves both foreign and local wholesalers and retailers.

Despite macadamia being produced for both international and local market, the industry in Kenya has been faced with several challenges whose consequences results to low nut yield. The main challenges are related to limited access to production and marketing information by value chain actors (Biam *et al*., 2017). In addition, the disruption of marketing channel has resulted to farmers' exploitation by middlemen who buy macadamia nuts at the farm gates and at low prices (Lee & Tang, 2017). A report by Murioga *et al.* (2016) highlighted that macadamia value chain can be empowered through access to specific and consistent macadamia nut information.

A study by Lei *et al.* (2017) showed that China had achieved both agriculture growth and poverty alleviation through access to reliable, accurate, up to date and consistent agricultural information. Consistent information help farmers make right decisions based on the size of land, type of agricultural inputs to use and various agronomic practices that can enhance productivity (Howland *et al*., 2015). Zhang *et al.* (2016) added that the fast growth of ICTs resulted to effective generation, storage, analysis and dissemination of macadamia nut information to support input suppliers, farmers, processors, wholesalers and retailers in decision making along the value chain.

The main source of information in agriculture is the public extension sectors in most developed countries (Van Campenhout, 2017). This information enhances knowledge on cropping systems and technologies, appropriate inputs to use, farm operations and marketing strategies. Further, the department of agriculture and extension services in India receive knowledge from various research institutions of the Indian Council for Agricultural Research, related institutions and from government agricultural universities (Mittal & Mehar, 2016). The information is then channeled to users using appropriate communication channels such as mobile phone, web-based

portals (Ministry of Agriculture web portal), mobile internet services, mobile based text message (sms), radios and television (Griesdorf *et al.*, 2018).

In many countries, 70% of the population practice and depend upon agriculture for their livelihoods (Atay & Ayebare, 2017). According to Zhang *et al.* (2016) agricultural industries in China have been transformed from traditional to modern by integrating ICTs that have enhanced knowledge to the users. These technologies including mass media channels such television, radio and mobile phone and interpersonal channels are efficient in provision of information to macadamia value chain actors (Butt *et al*., 2017). Therefore with effective communication channels, flow of macadamia nut information is enhanced for production of quality macadamia nut in Central Kenya (Parshotam, 2018; Paumgarten *et al*., 2018).

1.2 Statement of the Problem

Macadamia nut production involve several actors along the value chain. These actors includes; input suppliers, farmers, middlemen, processors, wholesalers, retailers and consumers (Murioga *et al*., 2016). Each actor in the value chain carryout different role but contribute towards production of macadamia nut. Further, every operation carried out along macadamia value chain is informed by specific type of macadamia nut information. According to Abdelfattah, (2015) value chain actors rely on current, timely and need specific technological, agronomic and marketing information for informed decision making.

The crop has a high poverty reduction potential due to its market value and increased global demand. However, in Kenya there is low production of macadamia nut. This is attributed by factors such as ineffective technological delivery systems, poor link between research-extension-farmers and inappropriate communication strategies (Biam *et al*., 2017). This has led to access of insufficient, untimely and content unspecific macadamia nut information on production, crop

management practices and marketing. Muthoka *et al.* (2008) found that few study have been conducted on macadamia nut information creating a gap on technological knowledge useful in decision making along the value chain.

Vidanapathirana (2012) highlighted that the role of communication channels and agricultural-related systems is to provide access to high quality, sufficient, content specific, accurate, and unbiased management and operational information to commodity value chain actors. Therefore, this study was relevant in finding out on access of macadamia nut information and utilization along the value chain.

1.3 Main Objective

The overall objective of the study was to analyze access to and utilization of macadamia nut information along the value chain for informed decision making by value chain actors.

1.3.1 Specific Objectives

i) To identify the types of information available to macadamia value chain actors

ii) To determine how information is presented along macadamia value chain

iii) To evaluate factors influencing macadamia farmers' use of information sources

1.3.2 Research Questions

i) What are the types of information available to macadamia value chain actors?

ii) How is macadamia information presented to actors along the value chain?

iii) What are the factors influencing macadamia farmers' use of information sources?

1.4 Justification of the Study

Macadamia nut information is critical to value chain actors in decision making on various operations. The results of this study show important information useful along the value chain and proper methods of dissemination. In addition the results reveals the need of an information system platform where macadamia actors can share knowledge and access reliable, relevant and up to date macadamia nut information.

Since macadamia nut has gained popularity globally, the market demand has increased. The study reveals important methods of macadamia nut information presentation along the value chain. Additionally, a study by Barrueto *et al.* (2018) noted that farmers are able to practice modern production techniques which they understand and have technical know-how.

Due to high participation of key macadamia nut actors, the study was relevant in Central Kenya to express actors' interaction along the value chain. In this regard, the study contribute directly to practitioners and researchers to develop ICTs based dissemination systems suitable for information sharing.

In addition, this study was imperative in directing mass media and interpersonal information providers to offer macadamia nut information to input suppliers, farmers, middlemen, processors, wholesalers and retailers in the most appropriate methods for utilization. Further, value chain actors tends to depend on sources that provide information in the most appropriate way to understand and address their specific needs.

CHAPTER TWO: LITERATURE REVIEW

2.1 Importance of Information and Communication in Development

Information refers to something that reduces uncertainties and facilitates decision making in the various aspects of life. According to Rogers & Valente (2017), information is a 'thing' that also incorporates the view of information-as-process, 'the telling of something'. They further suggest that if information can be thought as 'telling of something', then it means communication. However, information and communication are two distinct terms but used jointly, a study by Schement (2017) defined information as the message ready for transmission and communication as the method of transmitting the information from the source to the receiver through a communication channel.

Nath (2017) explained that information play a pivotal role technologically, economically, socially, culturally and in the spatial environment. Ospina & Heeks (2010) noted that some communities in Africa, Latin America, Asia and the Caribbean that are vulnerable to poverty uses ICT tools such as internet services, community radios and smart phones in empowering farmers' access to relevant information, increased technological awareness and networking opportunities. However, in macadamia value chain, access to relevant, up to date, reliable and consistent information has been a challenge thus resulting to low macadamia production and eventually low profit (Murioga, 2018).

A study by Singh *et al.* (2018) indicated that information is of importance in empowering macadamia actors' daily decision in production and marketing. Mittal *et al.* (2010) reported that every stage of agricultural production requires specific action and production decision. Further, every decision in production is informed by available and accessed information. Biam *et al.*, (2017) noted that flow of available information along a commodity value chain is influenced by

several factors such as information form, format, content and time taken before reaching the target audience.

2.2 Macadamia Farming in Kenya

In Kenya, smallholder farmers contribute more to the growth of the economy (Ricciardi *et al*., 2018). According to Chamberin (2008) smallholder farmers are individuals producing for both market and subsistence purposes, they have access to limited land and mostly rely on family labour. These farmers should not be thought as homogenous group because of variation in terms of farming scale, production objectives, farming systems and market orientation (Cousins, 2014; Parshotam, 2018; Paumgarten *et al.*, 2018).

According to Zhang *et al.* (2016) farmers are motivated to increase macadamia trees because of increase in consumers' demand which exceed market supply across the globe. In addition, macadamia consumption is attributed to increased interest in healthy foods and increased awareness on the benefits of nuts (Mbaka, 2013). In Kenya, production of macadamia nut aimed at diversifying coffee farmers' income. Further, Murioga (2018) found that the crop was more reliable to farmers during the period when coffee international market prices had declined. Kiuru *et al.* (2004) added that farmers who adopted macadamia nut production described it as a source household income because the market price was higher compared to coffee.

Since, macadamia nut is one of the world's finest desert nut with a good taste and nutritious benefits to the consumers (Yan *et al*., 2018), it's grown in Kenya both for subsistence and foreign exchange earner as a cash crop. It`s commonly grown in the Central and Eastern parts of the country including Kiambu, Murang`a, Kirinyaga, Nyeri, Meru, Embu counties and some other parts of the western regions (Murioga, 2018). In addition, the prevailing conditions in these regions are favorable for macadamia growth and production. World Bank (2017) underscored

that macadamia nut production has the potential to alleviate poverty level. However, challenges such as lack of information on the cultivars, lack of awareness on agronomic practices, inconsistent market information and poor handling of the nuts after harvesting limits the growth of the industry (Muthoka *et al*., 2008). Report by Murioga (2018) affirms the importance of specific macadamia nut information in providing the know-how on different operations along the value chain.

FAO (2015) identified macadamia nut as a crop that involves a value chain because of different operations contributing to quality nut production. Along macadamia value chain, different operations are performed by actors who includes input suppliers, producers, processors, distributors, retailers and consumers and other stakeholders. Study by Murioga (2018) highlight that input suppliers includes extension agents offering extension services to farmers and agro-dealers at the technology level. Further, Muthoka *et al.* (2008) noted that both producers and middlemen carry out some roles at farm gate level. Farmers carry out production activities and management practices while the middlemen carry out harvesting and purchasing of the nuts. However, Muthoka *et al.* (2008) found that the middlemen exploit farmers at farm gate level by purchasing the nuts at low prices.

Along the value chain, processors carry out the role of value addition on the raw nuts, packaging, distribution to market and determination of market prices (Murioga *et al*., 2016). In addition, one of the key stakeholder in macadamia value chain is AFA which has the responsibility of ensuring production of quality nut under the national oil and nut crop regulation (Kaimuri2018). Therefore for proper production and marketing of quality nuts, FAO (2015) supports the need of credible information sources that avail relevant and timely macadamia nut information along the value chain for proper decision making.

2.2.1 Sources of Macadamia Information Along the Value Chain

Adio *et al.* (2016) define information sources as tools or carriers that avail information to the audiences at a particular time. According to Zhang *et al.* (2016) several studies have been conducted in China on information sources, however a few cases provided a full analytical review on different sources of information and suitable communication channels. Further, Oladele (2011) & Sani *et al.* (2014) noted that lack of information in agriculture is a factor that limit growth of agricultural industry in developing countries. This serves as an indicator that macadamia nut information is useful in decision-making process and growth of nut industry. Further, Njuguna *et al.,* (2018) added that for informed decision making, macadamia nut information requires advancement through research.

In addition, the relevance of agricultural information was noted by several researchers in the past several years (Dervin 1976; Rogers 2003; Arslan *et al*., 2014; Singh *et al*., 2016). These researchers gave a comprehensive report on increasing agricultural productivity and enhancement of producers' livelihood. According to Vidanapathirana, (2012) to increase macadamia nut production, information sources should provide access to timely and relevant information to the actors. However, despite presence of many information sources, a relative small proportion of macadamia actors are accessing the information (Odini, 2014).

According to Wanyama *et al.* (2015) there are three main source of agricultural information. They includes; Public (government agents and public research institutions), private for profit (private firms, input dealers among others) and private non-profit (Non-governmental organizations, farmer based organizations, individual farmers, faith based organizations). However, macadamia actors' preferences to any of these sources is influenced by socio-economic factors including; group membership, age, household size, land size and ownership of

a mobile phone (Howland *et al*., 2015). A research in Nigeria by Opara (2008) concluded that there should be a regular identification of information sources by an extension agency to suit farmers' preferences. Barrueto *et al.* (2018) illustrated that different information sources provide distinct information types to macadamia actors along the value chain. For instance, Poulton *et al*. (2010) point out that input suppliers rely on the input specifications from the macadamia producers.

For decades, Kenya agricultural extension has been used as a key tool for dissemination of relevant agricultural information (Erbaugh *et al*., 2019). Republic of Kenya (2010) and Agriculture Sector Development Strategy (ASDS) emphasized the relevance of agricultural extension as a critical agent needed to transform farming from subsistence to commercial agriculture. Report by FAO (2015) show the importance of staffing and increasing facilitation for agricultural extension for effective information dissemination. Manfre & Nordenhn (2013) noted that NASEP (2012) outlined the desired ratio of extension staff to farmers as 1:400, however, the study showed that the current ratio is 1:1000. Erbaugh *et al.* (2015) underlined the importance of increasing agricultural extension staff for proper and effective provision of extension services.

2.2.2 Communication Channels used Along Macadamia Value Chain

Study by Mittal & Mehar (2016) showed that most farmers in the recent past acquired information from input dealers, fellow farmers, buyers/middlemen and traditional communication sources such as newspaper, television and radio. These information sources were restrictive and the level of penetration to the society was high as they provided generic information that was content specific. NASEP in Kenya noted that extension service providers

and the farmers should greately utilize ICT for exchanging agricultural information (GoK, 2008). This agrees with study by Rogers (2003) that mass media channel are used for creating awareness and interpersonal channels used for persuasion between two or more parties. Furthermore, Munyua (2008) & Munyua *et al.* (2008) explained that internet, websites and web-based application, email, Frequency Modulation (FM) radio stations, are greately relevant in sharing agricultural information to boost small-scale agriculture.

Rashid (2016) noted different ICT interventions have been developed and tested globally with varied degrees of success. A study by Rogers & Valente (2017) outlined that slow adoption of ICT tools by the actors resulted to a negative impact in agriculture. This concurs with study by Demiryurek *et al.* (2008) that inappropriate and insufficient information sharing through research and extension services made it complex for actors to make informed decisions in production and marketing.

The basic elements to ensure effective communication are best understood by answering the questions who, says what, in which channel, to whom, and what is the feedback (Lasswell, 2017). "Who" is the communicator with the message; "says what", refers to the actual message or content; "to whom", refers to the message recipient; "what channels", refers to the medium used to transmit the message. With "what effect", refers to the feedback of the message (Ouirdi *et al*., 2014)

Rogers (2003) noted that mass media and interpersonal communication channels are commonly used in dissemination of information from the source to the targe audience. Rodriguez *et al.,* (2015) & Rogers (2003) further underscored that mass media are useful in creation of awareness to the target audience on new ideas, new technologies and processes while interpersonal

communication channels are used for persuasion since information is exchanged face to face. Tata & McNamara (2016) showed that mass media communication channels such as cellular phones, radio, internet, television, newspaper and web-based applications have become greatly important in exchanging and dissemination knowledge.

2.2.3 Factors Influencing Value Chain Actors' Use of Information Sources

The preference of ICTs for dissemination of agricultural knowledge is based on their effectiveness and capacity to reach audience and to meet the perceived credibility (Mugwisi *et al*., 2015). According to Mittal & Mehar (2016) farmers require updated information on the macadamia varieties and others relevant inputs, technology, pest and diseases control, agronomic practices, weed management, prices and information on government run agricultural schemes or programmes. Sleeper *et al*. (2016) noted that participants share information with each other for the necessity of awareness creation, persuasion towards an aspect which is of interest to them. A study by Rogers & Valente (2017) emphasized on the importance of utilizing information as a factor that enhance knowledge in the value chain, however, sleeper *et al*. (2017) does not consider factors that hinder the utilization of the perceived message by the target audience.

A study by Mugwisi *et al*. (2015) identified agricultural services that can be accessed using ICT tools which includes; communications between researchers, extension (knowledge) workers and farmers; weather forecasting; online information services; updates on the market information; input supplication; available credits and other relevant commodity based information along the value chain. Tadesse & Bahiigwa (2015) noted that lack of access to information influences it`s utilization and affect operations at different levels macadamia value chain.

Research by adio *et al* ., (2016) noted that macadamia actors capacity to utilize ICT tools are influenced by education level, age, gender, income, perceived importance and availability of the

relevant infrastructure to operate such as internet. Mittal & Mehar (2016) point out that several communities in Africa, Latin America, Asia, and the Caribbean that are vulnerable to poverty utilizes ICTs such as, internet, smart phones and community radio in empowering farmers' access to relevant information, networks and increased technology awareness. However, the cost of acquiring radio, television and mobile phone is high for rural farmers (Tata & McNamara, 2016), this limits their potential of accessing appropriate macadamia nut information along the value chain.

Mugwisi *et al.* (2015) noted that illiteracy levels and low income of macadamia farmers limits acquisition of basic ICTs skills useful in operation, access and utilization of information. This limits their decision-making capability in macadamia value chain. Tata & McNamara (2016) added that gender bias is a limiting factor in increasing productivity where women are sidelined despite their commitment in macadamia production, they lag behind men in access and use of ICTs tools.

2.3 Theoritical Framework

This study is anchored on diffusion of innovation (DOI) theory. According to Rogers (2003) diffusion is the process by which an innovation is passed through a paticular medium, over time, among individuals of a social system. It is a special type of communication where the messages are concerned with new ideas or relevant information to the target audience. It is the "newness" of the concepts in the content of the communication that introduces diffusion with its special aspects (Rogers, 2003).

Rogers & Valente (2017) further elaborated that communication is a means of divergence or convergence as two or more individuals sharing information in order to move toward each other

in the meaning that they impute to events. Therefore DOI is the spread of concepts and ideas, technical information, and actual practices or processes within a social system, where the spread signifies the flow or movement from a source to the target audience, through a communication channels that is available to the audiences (Crook *et al*., 2016). It is a social process through which subjectively perceived information about an idea is communicated (Mugwisi *et al*., 2015).

This theory acknowledges that new idea, process, practice and object is adopted according to the the values of a social system, perceived atributes, communication channels used and the duration of time the idea and information takes to get to the potential adopter (Griesdorf *et al*., 2018). The theory explains five characteristics that make accessible information attractive for utilization by audience namely; compatibility to their need, complexity interms of understanding, triability, relative advantage and observability of the results to the users (Tata & McNamara, 2016).

Based on the study, diffusion refers to a mechanism through which the innovation, that is, macadamia information being passed through a particular medium, including mass media channels such as television, radio and internet to macadamia actors (Mwombe *et al*., 2014). Brown (2018) suggested that information flow from the source of the message to the receiver through a medium and then the receiver provides back the response. A study by Laswell (2017) emphazised more on the mass media as the medium of creating awareness by spreading relevant information to the audience and allowing for feedback based on the received message. DOI informed the study in the fact that for a communication to happen, there should be an information sources, communication channels and the receiver of the information .

Another important aspect in acess of information as informed by the communication development under DOI is the use of ICTs for development. Rogers (2003) explained the

function of the digital media in development of communication to empower people and further advance the overall project of the society. According to McAnany (2012) local population in the Sundarbans, across Bangladesh and around the world are defining mobile phone use for crop pricing, health, agriculture and baking. This informs the study on use of ICTs as communication channels in transmitting macadamia information to all actors along the value chain (Waisbord, 2018).

CHAPTER THREE: METHODOLOGY

3.1 Study Area

The study was conducted in Embu, Nyeri, Murang'a and Kiambu Counties. These counties invest more in agriculture as the main source of food and income as well as contributing towards economic growth at County and National level (Murioga *et al*., 2016). Macadamia nut in the region has been grown mainly as a cash crop with some farmers growing it for coffee shading purposes and marking boundaries (Toft *et al*., 2016).

The study chose Embu, Murang'a, Nyeri and Kiambu Counties because of presence of key actors in the region who actively participate in the value chain. In addition, the prevailing suitable weather condition that support growth and production of macadamia trees contributed to the selection of the counties. This study was relevant in the region in finding out on the actors' information needs to integrate an information system to suit dissemination of reliable, specific and consistent information to increase productivity. Further, macadamia in the region is of economic importance and has attracted all genders in production and marketing.

3.1.1 Embu County

Embu County occupies an area of 2,818 square kilometer with a population of 543,221 persons (Rao *et al*,, 2015). The rainfall is bi-modal where the long rains occurs between March and June while the short rains fall between October and December. It has a tropical climate and has an average rainfall of 1067.5mm annually and ranging from 640mm in some areas to as high as 1495mm per annum (Murioga *et al*., 2016). Temperature ranges from a minimum of 12 ^{0}C in July to a maximum of 30 ^{0}C in September. July is the coldest month with an average temperature of 15 ^{0}C while September is the warmest month with an average temperature of 27.1 ^{0}C (Ndirangu *et al*., 2017). Embu County has a diversed agro-ecological zones that allow

production of several crops including cereals, horticulture and industrial crops mainly macadamia nuts, coffee, tea and cotton (Murimi *et al*., 2019). Macadamia nuts are mostly grown in coffee zones in the county which are Embu West and Embu East parts of the County.

3.1.2 Murang'a County

Murang'a County is 85 kilometer Northeast of Nairobi County and it covers an area approximately 2,558.8 square kilometer (Kagombe *et al*., 2018). It has an approximate population total of 942,581(male-48% and female-52%) according to the Kenya National Bureau of Statistics 2009 national census report (Pingo, 2015). The County receives an average rainfall of 1195mm per annum and an average annual temperature of 20 ^{0}C (Murioga *et al*., 2016). November is the warmest month with an average temperature of 22.5 ^{0}C and August is the coldest with an average temperature of 18.1 ^{0}C. Agriculture accounts for the largest income generating concentration in the County (Murioga, 2018). In addition, macadamia nuts grown for commercial purposes are found in the coffee zones including Kandara, Gatanga, Kangema and some other parts in the County (Kamau *et al*., 2019).

3.1.3 Nyeri County

Nyeri County occupies an area of 3,337 square kilometer with a population of 693,558 people according to Kenyan National Census 2009 and (Odhiambo *et al*., 2013). It has an average annual temperature of 17.1 ^{0}C and an average precipitation of 1004mm (Mavuti *et al*., 2017). The County has the lowermost temperatures in Kenya which ranges between 12^0 C in the cold months (June and July) and 27^0 C in the hot months (January-March and September-October) with high precipitation all year round (Odhiambo *et al*., 2013). According to Mbaka (2013) rainfall ranges between 500mm to 1600mm during the short and long rains periods making it favorable for

production of macadamia nut. Nyeri has six sub-counties including; Tetu, Othaya, Mathira, Mukurweini, Kieni, and Nyeri town sub-counties where agriculture in the predominant source of income and food to the dweller in the regions. It has suitable ecological climate that supports the growth and production of macadamia nut (Murioga *et al*., 2016).

3.1.4 Kiambu County

The County occupy 2,543.5 square kilometer with a population of approximately 1,623, 282 people (Kenya, 2010). It has twelve Sub-counties namely;-Githunguri, Kiambaa, Kabete, Limuru, Lari, Gatundu North, Gatundu South, Ruiru, Kikuyu, Juja, Thika Town and Kiambu sub-counties (Oduor *et al*., 2016). The County receives an average rainfall of 962mm and an average temperature of 18.8^0C. The month of July is the coldest with an average temperatture of 16.4^0C and March is the warmest month of the year with an average temperature of 20.4^0C.

The County has 60 percent urban settlement due to close proximity to Nairobi County with 40 percent rural population (Ndung'u, 2015). However, the County has a suitable and fertile soil that support production of several agricultural products (Murioga, 2018). Among the income generating cash crops produced in the County include; coffee, tea, pineapples, sisals and horticultural crops such as macadamia nut, fruits, vegetables and flowers. Further, macadamia nut production in the County is of economic importance with several farmers producing it for both household consumption and income generation. In addition, macadamia industry has grown fast with the County leading in Kenya with several macadamia processors and exporters such as Afrimac Nut Company Ltd, Jungle Nut Mac EPZ Ltd, Sasini Nut EPZ Ltd and others.

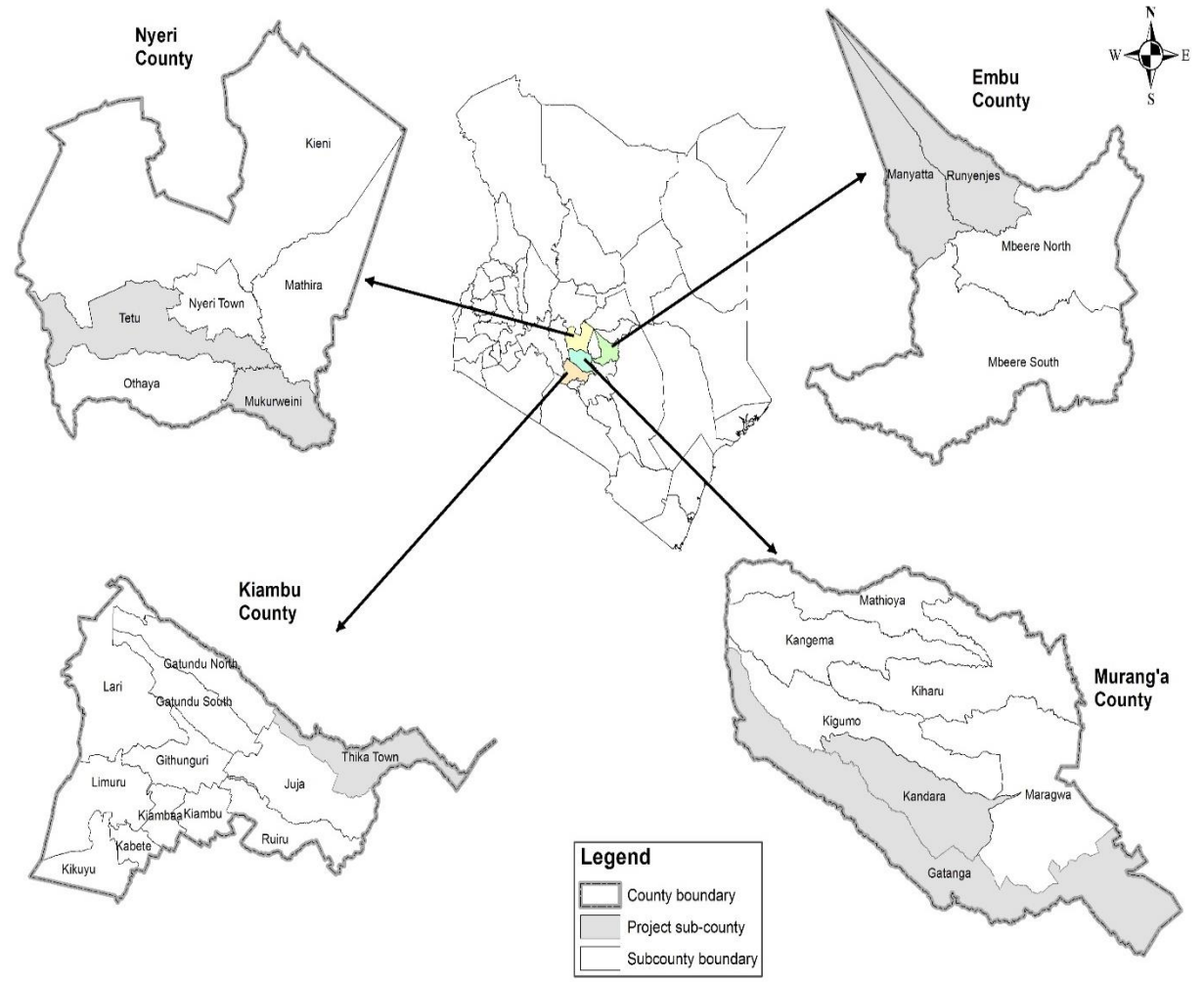

Figure 3.1: Map showing Embu, Nyeri, Murang'a and Kiambu Counties

Source: Google maps of Kenya

3.2 Conceptual Framework

The choice of macadamia information was relevant to access and utilization when focusing on production of quality macadamia nut in Kenya. Agricultural-information provision services influences decision of the value chain actors on reliance and utilization of suitable, available, current and need specific information to inform decision on various operations. This is because macadamia actors requires different types of information relevant to every level of production.

Some of the macadamia information providers includes; public and private extension agencies, research institution and NGOs.

Available macadamia information from agricultural information providers was disseminated to value chain actors through a suitable communication medium. The communication channel used also provided a feedback mechanism for clarification to the actors. The communication channels commonly used were; mass media such as television, radio and mobile phone and interpersonal communication channel used included face to face channel. As shown in figure 3.2, access and utilization of macadamia information was also influenced by macadamia value chain supporters including actors' associations and groups that play key role of determining the type of information to be disseminated along the value chain and types of channel to be used.

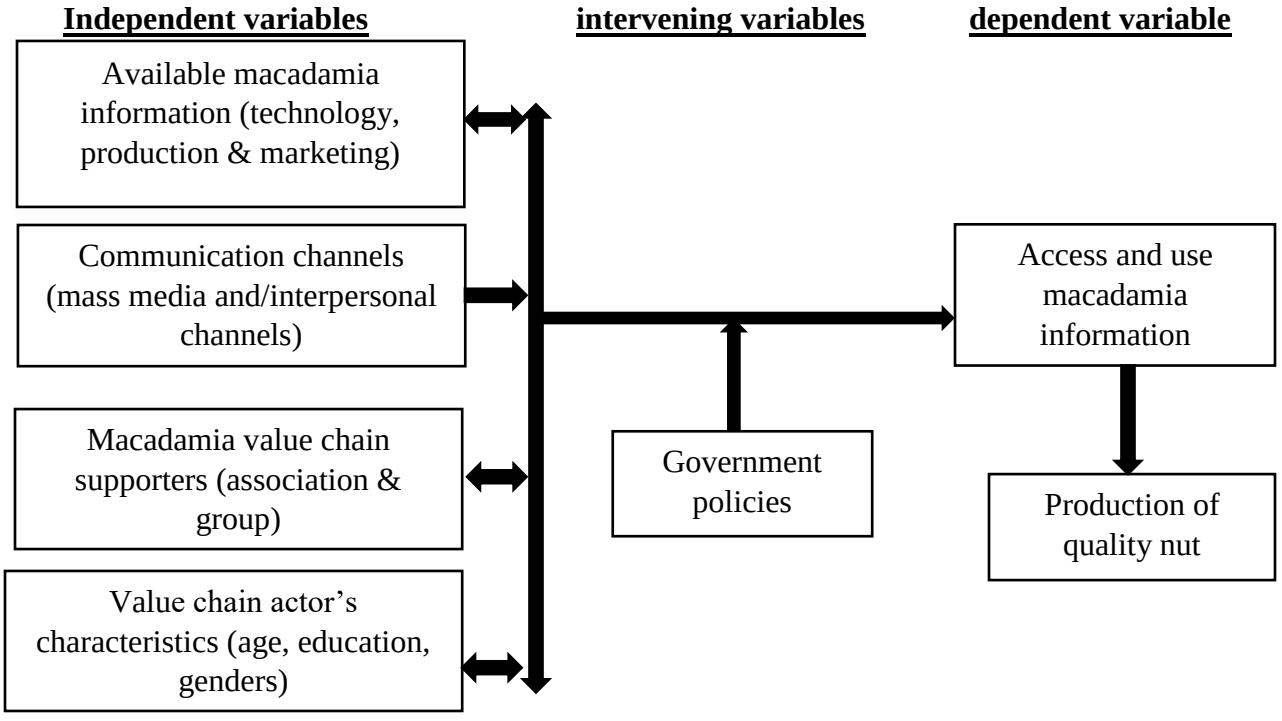

Figure 3.2: Conceptual Framework Showing Determinants of Access and Utilization of Macadamia Information Along the Value Chain

Source: Author (2019)

3.3 Research Design

The study employed cross-sectional research design where both qualitative and quantitative data was collected in four counties including Embu, Nyeri, Murang'a and Kiambu. In-depth and detailed data on access to and utilization of macadamia nut information along the value chain was collected using a semi-structured questionnaire and interview from value chain actors.

3.4 Sampling Procedure

Multistage sampling technique was used to arrive to sampling unit for the survey. In the first stage, Central Kenya was purposively selected due to availability of several key actors' participation in the macadamia value chain and availability of conducive climate that support production of macadamia in the region.

In the second stage, four counties including; Embu, Nyeri, Murang'a and Kiambu Counties were purposively selected due to availability of several macadamia trees in the area that has attracted key actors' participation in the value chain. In the third stage, two sub-counties per county were purposively selected where in Embu County, Embu East and Embu West sub-counties were selected as the only macadamia producing sub-counties; In Nyeri, Tetu and Mukurweini sub-counties were selected as the most macadamia nuts producing sub-counties in Nyeri with several active middlemen. In Murang'a County, Kandara and Gatanga sub-counties were purposively selected with several farmers participating in production of macadamia nut. In Kiambu County, the study purposively selected Thika town sub-county due to high numbers of processing firms and macadamia retailers.

In the last stage, 237 value chain actors who included 29 input suppliers, 174 farmers, 19 middlemen, 3 processors and 12 retailers were interviewed. Simple random sampling techniques was used at this level to select actors from different wards and villages in the sub-counties.

3.5 Sample Size Determination

Fisher's Formula (Fisher *et al*., 1998) at 95% Confidence Interval was used in determining the sample size for the study because it provide data on all the individuals from a selected population and eliminate sampling error.

$$n = \frac{p\,(1-p)Z^2}{d^2}$$ Where,

n-population sample size

d-desired level of precision

p-Estimated proportion of the population growing macadamia in Embu, Murang'a and Nyeri counties.

z-the abscissa of the normal curve that cuts off an area at the tail (1.96-at 95% Confidence Interval)

The study assumed that (0.2) of the population in Embu, Nyeri, Murang'a and Kiambu Counties engage in macadamia nut operations. At 95% confidence interval, Z-value is 1.96

$$n = \frac{0.2\,(1-0.2)1.96^2}{0.05^2}$$

=246 respondents.

3.6 Data Types and Data Collection

Primary data both qualitative and quantitative data was collected from macadamia value chain actors in Embu, Nyeri, Murang'a and Kiambu respectively. Secondary data to supplement the primary data was collected from previous studies, published journals informing on macadamia

nut information, internet sources and relevant books from the library. Primary data as shown in Table 3.1 was collected from the macadamia value chain actors using a semi-structured questionnaires and interviews. Enumerators were trained on how to administer the questionnaires and a pre-test survey was carried out to identify any possible weakness and time taken to complete a questionnaire before the actual collection of data.

Table 3.1: Sample Size and Data Collection Summary

	Counties				
Value Chain Actors	Embu	Nyeri	Murang'a	Kiambu	Pop. Freq
Input-suppliers	12	9	7	1	29
Farmers	50	66	58	0	174
Middlemen	7	11	1	0	19
Processors	2	0	0	1	3
Retailers	5	3	1	3	12
Total	76	89	67	5	237

Source: Survey data, 2019

3.7 Data Analysis

3.7.1 Objective One

Objective one of the study was to identify the types of information available for macadamia value chain actors. This objective was attained through descriptive analysis where frequencies and percentages were determined using SPSS software (Version 20). The results were presented in table format.

3.7.2 Objective Two

The second objective of the study was to determine how macadamia nut information is presented along the value chain. This objective was attained through descriptive analysis where frequencies and percentages were determined using SPSS software (version 20). The results were presented in table and graphs.

3.7.3 Objective Three

The third objective of the study was to evaluate factors influencing farmers' use of information sources. This was attained through an estimation of MNL regression using STATA software (version 14) and results presented in Tables.

3.7.4: Analysis of Factors Influencing Farmers' Use of Macadamia Information Sources

The MNL model was used in the analysis of factors influencing farmers' use of macadamia information sources since the response variable had more than two outcomes (Green, 2003).

Let Y_i represent the choice of information source of the farmers, conditional on a set of explanatory variables X_i. The MNL model for choosing the information source was specified as follows (Green, 2003).

$$P(y = j/X) = \frac{\exp(x\beta_j)}{1+\sum_{h=1}^{j}\exp(x\beta_h)}\ ,\ j=0\ ,1\ \ ,2 \quad \text{.....1}$$

Where β_j is the vector of coefficient of explanatory variable X, the base outcome vector coefficient is represented by β_h, j represent the unordered alternative and y show the choices.

In this study, information sources in which macadamia farmers are expected to access information are three; farmers, mass media and other value chain actors (input suppliers, middlemen and processors). The base outcome for this study was farmers.

The log of odds-ratios of selecting each alternative from the equation above can be calculated as;

$$In\left[\frac{p_{ij}}{p_{ik}}\right] = X_i'(\beta_j - \beta_k) = X_i'\beta_j \quad \textit{If } k=0 \textit{.....2}$$

From the Equation 1, although it is tempting to interpret the coefficient β_j with the j^{th} outcome, this will be misleading because sometimes the coefficient tend to have a different sign from the marginal effects. It is appropriate to obtain marginal effects of each exogenous variable dependent on the probability that a choice is made (Greene, 2003). The marginal effects for each of explanatory variable were calculated as;

$$\frac{\partial p_j}{\partial x_i} = p_j\left[\beta_j - \sum_{k=0}^{j} p_k\beta_k\right] = p_j\left[\beta_j - \beta^-\right] \textit{.....3}$$

Table 3.2: Independent Variables Included in the MNL Model Estimation

Variable name	Description	Expected sign
Gender	Gender of the farmer (Dummy-Male=1, Female=0)	+/-
Age	Number of years	+
Education	Number of years in formal education	+/-
Average age of trees	Average number of year of macadamia tree	+
Tarmac road	Is the road tarmacked (Dummy-1=Yes, 0=No)	+
Variety grafted	Are the variety grafted (Dummy-1=Yes, 0=No)	+
Income	Average monthly household income (Ksh.)	+
Number of trees	Number of macadamia trees	+
Yield	Average macadamia nut in Kg	+
Market distance	Average distance from the market in Km	-
Group membership	Member of a farmer group (Dummy-1=Yes, 0=No)	+
Nyeri	Farmer from Nyeri County (Dummy-1=Yes, 0= No)	+
Murang'a	Farmer from Murang'a County (Dummy- 1=Yes, 0=No)	+

The empirical model was specified as:

$$\textit{Use of information sources} = \beta_0 + \beta_1 \textit{Gender} + \beta_2 \textit{Age} + \beta_3 \textit{Edu} + \beta_4 \textit{Age of trees} + \beta_5 \textit{Tarmac road} + \beta_6 \textit{Variety grafted} + \beta_7 \textit{Income} + \beta_8 \textit{No. Trees} + \beta_9 \textit{Yield} + \beta_{10} \textit{Mkt distance} + \beta_{11} \textit{Grp membership} + \varepsilon_i$$

The multinomial logistic regression was used to address decision making involving multiple choice in adoption (Poppenborg & Koellner, 2013). Where $(\beta_1 - \beta_{11})$ are coefficients associated with each explanatory variable and $\boldsymbol{\varepsilon}$ is the error term.

The signs of the MNL parameter estimates cannot be used to ascertain the direction and magnitude of the relationship between an explanatory variable and the probability of a specific choice (Bowen & Wiersema, 2003). This therefore requires the computation of marginal effects, which is the probability that a particular choice will be made if an explanatory variable change by one more unit (Cameron & Trivedi, 2009).

The effect of gender on use of macadamia information sources can either be positive or negative. Male have a higher chance of utilizing mass media sources as compared to female counterparts (Rathod *et al.,* 2016). However, females have a higher likelihood of implementing knowledge received from fellow farmers and other value chain actors (Rathod *et al.,* 2016) as they are mostly engaged in production activities as compared to male counterparts.

The age of the farmers was expected to have a positive influence on the reliance of fellow farmers or other value chain actors as information sources. In this study, age was considered an important element that influence access and utilization of macadamia nut information. Murioga (2018) identified age as a potential factor influencing farmers access to information, participation in production and marketing activities. Elderly farmers are less exposed to mass media as compared to young farmers and this build more reliance of fellow farmers for innovation. In addition, elderly farmers have great production experience and as a result serve as reliable source of macadamia nut information to other farmers (Mittal & Mehar, 2016).

Education level of macadamia farmers was captured as the numbers of year spent in formal schooling. Muricho *et al.* (2015) in their study found that farmers' education level had a positive influence on production and market participation. In this study farmers' education level was hypothesized to have a negative influence on the use of fellow farmers as source of macadamia nut information. This is because farmers with a high level of education are most likely to use

mass media as information source as compared to farmers with low education levels. Further, Mase *et al.* (2015) noted that farmers with high education levels are able to choose agricultural advisory services from a broad range of delivery based on their preferences.

The average number of trees owned by farmers was expected to positively influence reliance of mass media as information source. Farmers with more trees required credible information sources for reliance in order to lower the risks of potential loss in the occurrence of an event affecting macadamia trees. Further, these farmers tend to depend on an information source that provide consistent and reliable information on macadamia nut (Fu & Akter, 2016).

Availability of tarmac road used by farmers was expected to positively influence the use of mass media as source of macadamia nut information. This is because farmers linked to tarmac road have ease of access of ICT tools such as radio, television and phone as compared to farmers using weathered roads (Willy & Heckelei 2019). In addition, Willy & Heckelei (2019) found that improvement on the quality of the infrastructure such as road networks by tarmacking facilitated market participation and enhanced farmers' interactions.

Grafted macadamia variety was expected to positively influence the quantity of macadamia nuts harvested in kilogram from macadamia trees. Grafting improves the qualities of macadamia trees and increases its ability to produce more quality nuts. Hardner *e al.* (2019) noted grafting macadamia increased production and this results to an increased farmers' need to learn and gain experience on grafting. This study hypothesized grafted macadamia variety to have a positive influence on farmers' use of mass media for information compared to fellow farmers and other value chain actors.

Income was hypothesized to have a positive influence on the use of mass media as source of macadamia nut information. This is because farmers with high income level tends to diversify their sources of information from different mass media platforms. Further, a study by Rogers (2003) found that income was factor into ownership of modern ICT tools useful in communication. In addition, Lee *et al.* (2016) noted a positive association between farmers receiving high income and adoption of innovation useful in production and marketing.

The yield of macadamia nuts was captured as the quantity in kilogram harvested per season. This study hypothesized macadamia nut yield to have a positive influence on farmers' use of mass media as information source. This is because farmers with high number of macadamia trees requires updated and frequent information on proper management practices that can enhance macadamia nut productivity. A study by Howlett *et al.* (2015) indicated that proper management practices on macadamia trees led to increased yield.

Market distance was hypothesized to have an inverse influence on the usage of macadamia information sources. This was because farmers located far from the market are less likely to benefit from the market information and thus may fail to utilize the sources at the moment. A study by Khapayi &Celliers (2016) showed that farmers far from the market are discouraged and less likely to rely on mass media for market information.

Fischer & Qaim (2012) in their study found that membership in farmer groups increases the rate of commercialization among smallholder farmers. This study hypothesized that membership to farmer groups had a positive and significant influence on the use of macadamia nut information from fellow farmers and other value chain actors. This is because different farmer group and association have dynamic ways of interaction that help farmers in making certain decisions.

Shiferaw *et al.* (2011) noted that organizational membership provides a platform of sharing knowledge and innovations among farmers thus increasing the level of information utilization.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1: Socio-Economic Characteristics of Macadamia Value Chain Actors

This section presents the socio-economic features of macadamia actors as considered crucial and used in the subsequent discussions, such as gender, age and education level.

4.1.1: Gender of Macadamia Actors

The results show that 55.2% of the input suppliers were men implying that majority of the input supplying firms were operated by male personnels. The study found that among the categories of the input suppliers interviewed, there were more men involvement in the seedlings sections as compared to women. This was attributed by the nature of work and labour required in management practices. Among macadamia farmers who took part in the study, 49.4% were men implying that women were more active in macadamia production in the region than men. Study by Manfre *et al.* (2013) noted more women participated in production but not involved in decision making and thus sugggest women empowerment along the commodity value chain.

The results indicate that 63.8% of the middlemen and 66.7% of the individuals in the processing firms who took part in the study were men respectively implying that men were more active in the brokering of the macadamia nuts and processing. The study noted that most men took extra roles in nut harvesting, cracking of nuts and collection of dehusked nuts from farmers to the processing firms as compared to women. As shown in Table 4.1, 33.3% of the retailers selling processed macadamia nut were men. This imply that most men played other value chain roles other than selling.

As shown in Table 4.1 macadamia industry has both genders included at every level of operation. Study by Doss (2014) acknowledged that gender involvement provides insights into

how socially constructed roles and responsibilities shape the myriad decisions around agricultural production and processing.

Table 4.1: Gender of Macadamia Actors

Value Chain Actors	Percentage distribution of gender			
	Male		Female	
	Freq.	%	Freq.	%
Input suppliers	16	55.2	13	44.8
Producers	86	49.4	88	50.6
Middlemen	12	63.8	7	36.8
Processors	2	66.7	1	33.3
Retailers	4	33.3	8	66.7

Source: Survey data, 2019

4.1.2: Age of Macadamia Actors

As shown in Table 4.2 macadamia actors gave their age brackets as asked by the researcher. The findings shows that the mean age of the input supplier was 41.62 years which indicate that most of them are in productive age bracket. The age bracket of macadamia farmers was 51-65 years with a mean age of 57.61 years. This implies that most farmers were at the most productive age bracket with more experience and skills in macadamia production. This create more opportunity for enhancement of macadamia production through increasing macadamia trees. This finding concurs with a report of the world bank that most of the youth do not participate in agriculture production (Brook *et al.,* 2013).

The middlemen had a mean age of 37.0 years. This imply that middlemen in macadamia value chain were young adults who carried out the role of harvesting nuts from the trees, cracking the nuts and collection from farmers to the processing unit. This finding agrees with a study by Muthoka *et al.* (2008) that most middlemen perform harvesting and dehusking of raw nut and later buy the nut at low prices per kilogram.

The finding shows that most of the individuals at the processing units had a mean age of 41.0 years. This implys that most of them were at their young aldulthood. In addition, the retailers who took part in the study had a mean age of 30.89 years and at the age bracket of 21-35 years, this depict that most of them were at their youth age. A report by Murioga *et al.* (2016) concurs with the finding that most of the retailers in macadamia industry are in their youthful stage.

Table 4.2: Age of Macadamia Actors

Value Chain Actors	Distribution of age group along the value chain (years)						
	<20	21-35	36-50	51-65	>65	Means	S.d
Input suppliers	-	10	11	8	-	41.62	12.554
Producers	-	13	40	75	46	57.61	15.57
Middlemen	1	9	6	3	-	37.0	9.815
Processors	-	-	3	-	-	41.0	4.359
Retailers	-	7	2	-	-	30.89	4.622

Source: Survey data, 2019

4.1.3: Education Level of Macadamia Actors

The education was categorized in three groups; Primary education (1-10 years), Secondary education (11-14 years) and Tertiary education (above 15 years). The result showed that most of the input suppliers spent 11-14 year in school implying that most of the input supplier had secondary education. Most of the macadamia farmers as shown in Table 4.3 used 1-10 years in school for their education, this is an indication that most farmers attained primary education and thus gained more experience on macadamia through production. This was supported by World Bank (2004) report that 87% of population in Kenya has gone through primary education.

The middlemen and the retailers who took part in the study as indicated in Table 4.3 used 11-14 year in school respectively. This indicate that middlemen and retailers had attained secondary education respecively. This finding was supported by Moschitz *et al.* (2015) that attainment of secondary education exposes individuals to a high level of knowledge and technical expertise in agricultural related activities that enhances production.

The individuals at the processing firms utilized 15 year and this showed that most of them had attained a tertiary certificate in education. Gitonga *et al.* (2008) underscored that high level of education was important in acquisition of strategic skills, managerial, operational techniques and knowledge on macadamia operations. According to Price & Leviston (2014), education influenced the technical awareness of the macadamia actors on different operations in the value chain to enhance production.

Table 4.3: Education Level of Macadamia actors

Education Level (Years)	Macadamia Value Chain Actors Percentage distribution of education				
	Input suppier	Farmers	Middlemen	Processors	Retailers
	%	%	%	%	%
1-10	17.2	57.2	10.5	-	-
11-14	44.8	31.5	63.2	33.3	66.7
Above 15	37.9	10.9	26.3	66.7	33.3

Source: Survey data, 2019

4.2: Type of Information Accessed Along the Macadamia Value Chain

4.2.1: Macadamia Information Accessed by Input Suppliers

Table 4.4 shows the percentage of the input suppliers who accessed various macadamia information from mass media and interpersonal sources. From the results, 72.4% of the input supplier accessed information on the type of pest and diseases that attacked macadamia nut. Further, 62.1% accessed information on the type of chemicals required for control. This implies that most of the input suppliers were aware of the pest and diseases affecting macadamia production and the most appropriate chemical for control. Study by Cameron *et al.* (2016) noted that the pest and diseases incidence lower the quantity and quality of the macadamia nuts produced from the farm. Smith *et al.* (2014) underscores that current and reliable information on pest and diseases infestation is crucial to input suppliers in order to find an appropriate chemical for the control.

The results shows that 6.9% of the input suppliers received responses from the farmers based on the services given. This shows that there was low feedback given by farmers to direct

improvement of services offered by the input suppliers. Smith *et al.* (2014) elaborated that macadamia information available to input suppliers is important in ensuring provision of relevant materials and correct advices to farmers based on production and agronomic practices.

Most of the input suppliers at 51.7% depends on updated agricultural information to stock their firms based on the clients' preference for inputs such as, fertilizers, pesticide, fungicides and planting seeds. This agrees with study by Odame & Muannge (2011) who noted that agro-dealers can cause a green revolution through provision of certified seeds and sufficient inputs to farmers.

Table 4.4: Information Accessed by Input Suppliers

Type of information	Frequency	% (Yes) distribution of access
Type of pests & diseases	21	72.4%
Planting season	9	31.0%
Flowering periods	12	41.4%
Type of chemicals	18	62.1%
New varieties/inputs	15	51.7%
Customers feedback	9	31.0%
Number of macadamia grower	2	6.9%
Grafting	2	6.9%
Market prices	2	6.9%

Source: Survey data, 2019

4.2.2: Macadamia Information Accessed by Farmers

Table 4.5 shows the percentage of farmers who accessed various type of information based on their production needs. The results showed that 80.2% of the farmers accessed information on prevailing market price implying that most farmers were aware of the current macadamia nut prices. The study found that most of the macadamia farmers were in contact with several middlemen who buy the nut at the farm gate level. However, study by Lee & Tang (2017) underscores that most of the middlemen share unreliable information and thus causing disruption of the marketing channels.

Most farmers at 64.8% accessed information on the methods of manure application in the macadamia farms. This was an indication that famers are concerned with the management practices that boost productivity and enhance the wellbeing of the soil. This is supported by Bachche (2015) who showed that macadamia management practices require technical knowledge to inform decision and technique to be carried out at the farm.

The results showed that 48.1% of the farmers accessed information on the right seedlings. Study by Rhee (2015) indicated that information on the right macadamia seedlings help farmers in decision making on the best macadamia variety to adopt for the different climatic zone. Further, Verschoor (2018) found that information plays a pivotal role in transforming macadamia industry through increased knowledge to farmers in agronomic and management practices. Bertolino *et al*. (2015) in their study found that well packaged agronomic and management information promoted awareness and knowledge on techniques suitable for macadamia production.

According to Zhang *et al.* (2016) information is power towards transformation of agricultural practices from tradition to modern agriculture. This supports the results as shown in Table 4.5

on the impact of different type of information accessed by macadamia farmers. This is because information is useful for empowerment, knowledge sharing and direction in management practices, post-harvest practices and marketing strategies (Lee & Tang, 2017).

Table 4.5: Information Accessed by Macadamia Farmers

Type of information	Frequency	% (Yes) distribution of access
Right macadamia seedlings	78	48.1%
Land preparation	46	28.4%
Spacing	36	22.2%
Method of manure application	105	64.8%
Pest and diseases control	67	41.4%
Time and method of pruning	63	38.9%
Time and method of harvesting	88	54.3%
Method of storage	32	19.8%
Market price	130	80.2%

Source: Survey data, 2019

4.2.3: Macadamia Information Accessed by Middlemen

The results showed that 94.7% of the middlemen accessed market information, this indicated the role played by the middlemen in the value chain on marketing of macadamia nuts. Study by

Lee & Tang (2017) underscores that middlemen concentrate more on determining macadamia nut prices at farm gate level.

Most of the middlemen at 68.4% accessed information on the quality of nut preferred. This imply that middlemen have the knowledge on the quality of macadamia nut preferred by the processing firms. However, Murioga (2018) noted that most of the middlemen would buy premature nuts from farmers at the farm gate level. Also, 5.3% of the middlemen accessed information on the buying periods of nut, this implied that most of the middlemen bought macadamia nuts from farmers at the wrong periods of harvesting. This concurs with a report by Muthoka *et al.* (2008) that most middlemen harvested premature nut that are of low quality despite having the knowledge on macadamia maturity period.

The results showed that 52.6% of the middlemen were aware of the policy by Agricultural Food Authority on the measures of harvesting of premature nuts. This policy foster harvesting of mature nut for quality production. Muthoka *et al.* (2008) indicated that most middlemen influenced farmers to harvest premature nuts for quick money at the farm gate level and this lower the quality of macadamia nut production for industry.

Table 4.6: Information Accessed by Macadamia Middlemen

Type of information	Frequency	% (Yes) distribution of access
Market prices	18	94.7%
Period and methods of nut harvesting	10	52.6%
Policy on harvesting premature nut	10	52.6%
Macadamia varieties	12	63.2%
Quality of nuts	13	68.4%
Buying Periods	1	5.3%

Source: Survey data, 2019

4.2.4: Macadamia Information Accessed by Processors

From Table 4.7, most of the processing firms' accessed information on the prevailing market prices, this was an indication that processors play a key role in macadamia nut price determination. This is supported by Timmerman *et al.* (2015) report that macadamia processors play a key part in decision making on the macadamia nut price determination and distribution based on the right market globally.

Information on macadamia policy and regulation by the Agricultural Food Authority (AFA) on export and harvesting of premature nuts was accessed by 66.7% of the processing firms. This indicated that macadamia processors were determined to promote harvesting of mature nuts and

processing of quality macadamia nuts for the market. This findings concurs with studies by Xia & Nelson (2018) on the importance of export-oriented policy to control the local and international markets and regulation of premature nut harvesting. These policies and regulations in macadamia industry promotes effective approaches on marketing and change of behavior that lead to protection of local and international linkages.

Information on the quality of macadamia nuts and the right markets was crucial to processors and the study found that 33.3% of the processors accessed this information respectively. This implied that most processing firms have less knowledge on the quality of macadamia nut and the right markets. Study by Njuguna *et al.* (2018) elaborates on the quality of macadamia nuts in term of nut size, color, texture and oil content which is crucial to secure the right market.

Table 4.7: Information Accessed by Macadamia Processors

Type of information	Frequency	% (Yes) distribution of access
Quality of nuts	1	33.3%
Prevailing market prices	3	100%
Policy regulation	2	66.7%
No. of grower in an area	1	33.3%
Macadamia varieties	1	33.3%
Right market	1	33.3%

Source: Survey data, 2019

4.2.5: Macadamia Information Accessed by Retailers

Retailers are key players in the macadamia value chain for they influence the consumption rate of processed macadamia nuts. The results show that 83.3% of the retailers accessed information on the prevailing market prices, this imply that most of the retailers were aware of the macadamia nut market prices. This was attributed by direct link between the distributors and the processors who take part in the macadamia nut market-price determination. This finding concurs with study by Scheepers (2018) who noted the importance of vertical coordination in market power and price transmission in the macadamia value chain. This is because it enhances effective maintenance of marketing channels and promotion of trust between the retailers and the processors.

The findings indicate that 41.7% of the retailers accessed information on the quality of nuts. This was attributed by the fact that retailers received packed nuts from the distributors or processors and thus cannot certify the quality of the packed nuts through observation. As a results, only 16.7% of the retailers were aware and certain of the nut expiry dates due limited trust on the processor packaging of the nuts. These findings concurs with the study by Scheepers (2018) on the need to include all the value chain players in decision making, this help to create trust between actors and improve flow of knowledge on different value chain activities.

Information on macadamia nut prices, customers' relation, nut expiry dates and customers' preferences on the branding of the nuts was important to the retailers to promote high macadamia nut consumption rate in a social setting. Study by Indriyani (2017) indicated that customers are willing to remain loyal to a brand based on their relationship and satisfaction level.

Table 4.8: Information Accessed by Macadamia Retailers

Type of information	Frequency	% (Yes) distribution of access
Quality nuts	5	41.7%
Market prices	10	83.3%
Nuts expiry dates	2	16.7%
Consumer preferences	2	16.7%

Source: Survey data, 2019

4.3: Source of Macadamia Information Along the Value Chain

The findings show that both interpersonal and mass media communication channels were used as information sources in the value chain as indicated in Table 4.9. According to Devi & Verma (2016) interpersonal sources were more preferred to mass media for they offer face to face communication which is more effective for audience through provision of an immediate feedback and creation of empathetic environment to the communicator. Study by Aonngernthayakorn & Pongquan (2017) noted that mass media sources are cheap and economical with limitation of empathy and immediate feedback between communicating parties.

The results showed that 44.8% of input suppliers and 66.7% of the processors respectively accessed information from macadamia farmers, this imply that farmers plays a crucial role in the value chain in provision of information to other value chain actors. Rogers (2003) affirms that face to face interaction provides an open platforms for sharing knowledge between parties in a persuasive mechanism for informed decision making.

As shown in Table 4.9, 34.6% of farmers and most of the retailers accessed macadamia information from processors. This depict the linkage between the actors in the value chain and the role played by the processors in provision macadamia information to different actors. This indicate that macadamia information along the value chain was thus accessed from within the value chain actors as shown in Table 4.9. The interpersonal sources of macadamia nut information as shown in Table 4.9 included; extension agents, processors, agro-dealers, farmers and regulators. This is supported by a report by Parida *et al.* (2016) that value chain actors act as interpersonal sources of macadamia nut information along the value chain.

As indicated in Table 4.9, interpersonal and mass media communication sources can be used at different level in decision making process (Buizer, 2016). Study by Rogers (2003) reveals that mass media sources such as mobile phone, internet, radio and TV are useful in creation of awareness to the audience. The result shows that only 10.3% of input suppliers and 23% of macadamia farmers employed the use of TV and Radio to access information. Study by Rogers (2003) & Warren *et al.* (2017) thus noted that face to face channel is important for persuasion and foster the change of behavior in the audience.

Table 4.9: Source of Macadamia Information to the Value Chain

Sources of macadamia information	**Value Chain Actors (percentage)**				
	Input Suppliers	Farmers	Middlemen	Processors	Retailers
Extension agent	7.4	3.7	21.1	-	-
Processor	-	34.6	-	-	100
Retailers	3.7	4.3	5.5	-	-
Agro-dealer	14.8	2.5	5.3	-	-
Farmer	48.1	26.5	5.3	66.7	-
Ngo's/ Regulator	3.7	2.5	10.5	33.3	-
Middlemen	11.1	0.6	47.4	-	-
Tv/ Radio	11.1	24.7	-	-	-
Mobile phone	-	0.6	5.3	-	-

Source: Survey data, 2019

4.4: Form of Receiving Information Along Macadamia Value Chain

As shown in Table 4.10, the study focused on five different methods of presenting and receiving information along the value chain.

Table 4.10: Methods of Receiving Macadamia along the Value Chain

Methods	Input supplier	Farmers	Middlemen	Processors	Retailers
	%	%	%	%	%
Audio	25.9	41.4	36.8	-	-
Written	7.4	4.9	36.8	66.7	33.3
Visual	11.1	1.9	-	-	-
Audio-visual	3.7	1.9	-	-	-
Verbal	51.9	50	26.3	33.3	66.7

Source: Survey data, 2019

The act of receiving information was relevant for the conveyance of the intended message by the sender. From Table 4.10, the results show that written and verbal methods of receiving information were used by most of the actors along the value chain.

The results show that 51.9% of input suppliers and 50% of macadamia farmers used verbal methods to receive macadamia information. This indicate that input suppliers and farmers use face to face communication channel to convey the intended message. This is supported by Berger (2014) that verbal communication is a form of interpersonal methods of communication that is relevant for social bonding, emotion regulation, acquisition of information and persuasion when conveying a message.

As shown in Table 4.10, verbal communication was useful to farmers for sharing knowledge on the production practices, marketing and others issues relevant to their need on macadamia. This finding concurs with Howland *et al.* (2015) that producers prefer face to face communication in FFS, farmers group because beneficial information is easily understood. The results show 51.9% of input suppliers who includes; seedling producers and agro-chemical dealers interacted verbally with their clients on the type's macadamia inputs available, prices and the appropriateness on the use on macadamia trees. This finding concurs with a study by Stones (2012) that verbal communication is effective through face to face interaction.

As shown in Table 4.10, audio method of information reception was used by input suppliers, farmers and middlemen. Only 41.1% of farmers employed this techniques to access information. This type of information reception is done through use of mass media channels such as radio and mobile phone. It's important for sharing of knowledge and creation of awareness to the members of the society through the conveyance of knowledge (Mtega & Msungu, 2013).

Written method of information reception as indicated in Table 4.10 was used along the value chain with 66.7% of the processors relying on it for conveyance of message. This involves the use of written documents, SMS and the electronics mails. However, this methods is not common in the macadamia value chain. Study by Krone *et al.* (2016) depict that written means of information presentation and reception involves more time and limits the immediate response to the sender.

Visual and audio-visual methods of information presentation and reception were used by a few value chain actors as shown by Table 4.10. Visual method was used by 11.1% of input suppliers through use of images and pictorials as mechanism to show case innovations, demonstrate and elaboration of a certain concept to farmers and other clients. Audio-visual employs the use of

videos. Study by Thomas (2017) affirms that audio-visual involves the use of video and was useful when offering extension services to farmers and other value chain actors during training.

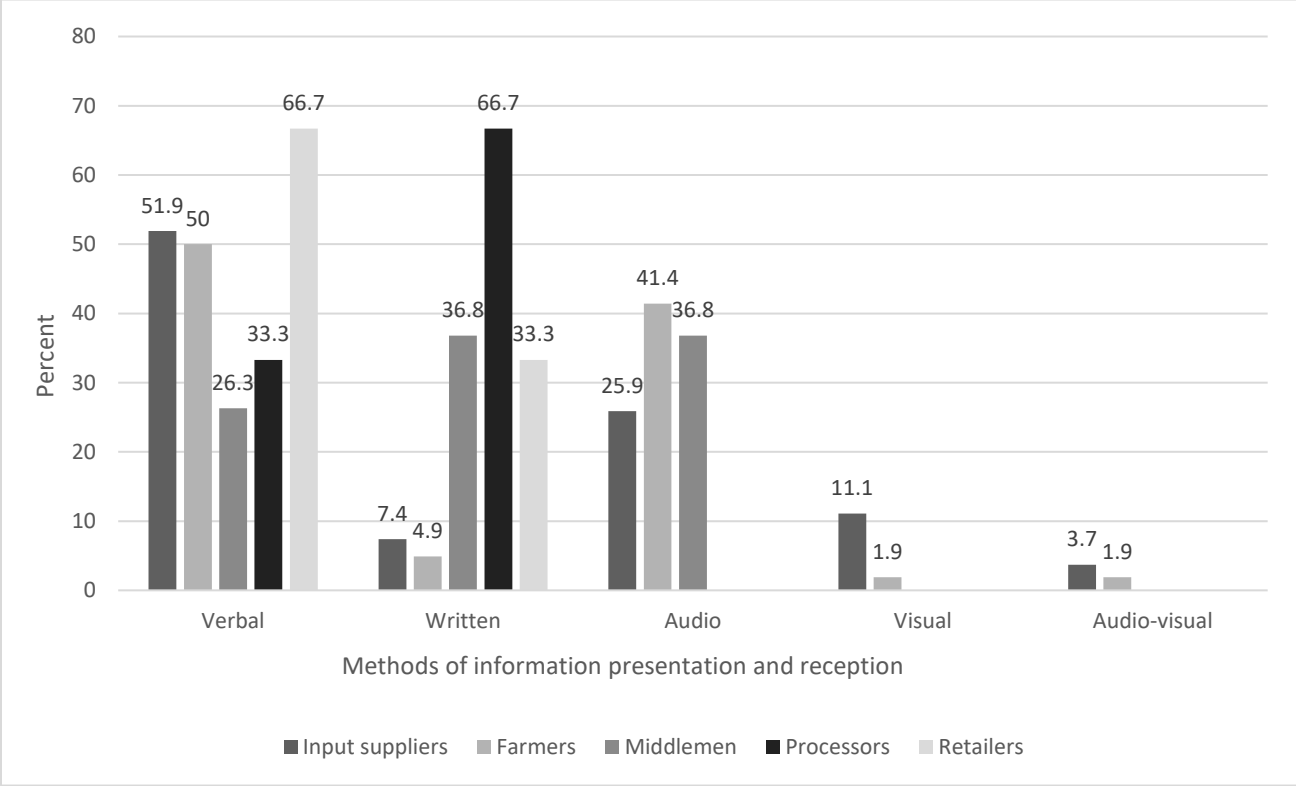

Figure 4.1: Mode of Information Presentation and Reception Along the Macadamia Value Chain

Source: Survey data, 2019

4.5: Communication Channels Used Along Macadamia Value Chain

The results show that mass media and interpersonal communication channels were used to transmit macadamia information along the value chain. Mass media channels includes, television, radio, social media platforms (WhatsApp, Facebook and Twitter) and mobile based SMS as shown in Table 4.11.

Table 4.11: Communication Channels Used Along the Value Chain

Communication Channel	Value Chain Actors (percentage)				
	Input Suppliers	Farmers	Middlemen	Processors	Retailers
Television	3.7	8.6	-	-	-
Radio	22.2	34.6	21.1	-	-
Newspaper	3.7	1.9	-	-	-
Mobile SMS	-	2.5	42.1	-	33.3
Social media (WhatsApp)	14.8	0.6	-	66.7	-
Face to face	55.6	51.9	36.8	33.3	66.7

Source: Survey data, 2019

The most common used communication channel along the macadamia value chain was face to face channels with 66.7% of the retailers, 55.6% of input suppliers and 51.9% of the farmers respectively using it. Face to face communication channel was useful because it provided direct interaction with each other and it's cheap. This finding concurs with a research by Roger & Valente (2017) that interpersonal communication channel is important for one on one interaction for it's helpful in persuasion and provide an immediate feedback mechanism loop.

The results indicate that 66.7% of the processors used social media platforms to convey information. Social media (WhatsApp) offers a variety of cheap services such as sharing of documents, images, and video to receivers. This finding was supported by Griesdorf *et al.* (2018) that WhatsApp platform provide cheap mechanisms of channeling information to a group of farmers with a common goal of production.

As shown in Table 4.11, communication channels were key to macadamia value chain for transmission of real time information to all actors. Face to face, radio, television and mobile based SMS were indicated as the most frequently used tools along the value chain. Mass media such as mobile phone, television and radio were important for creation of awareness while face to face communication channels were useful in persuasion. However, Temba *et al.* (2016) emphasized on optimal utilization of mass media channels and internet related tools to help access new innovations useful along macadamia value chain.

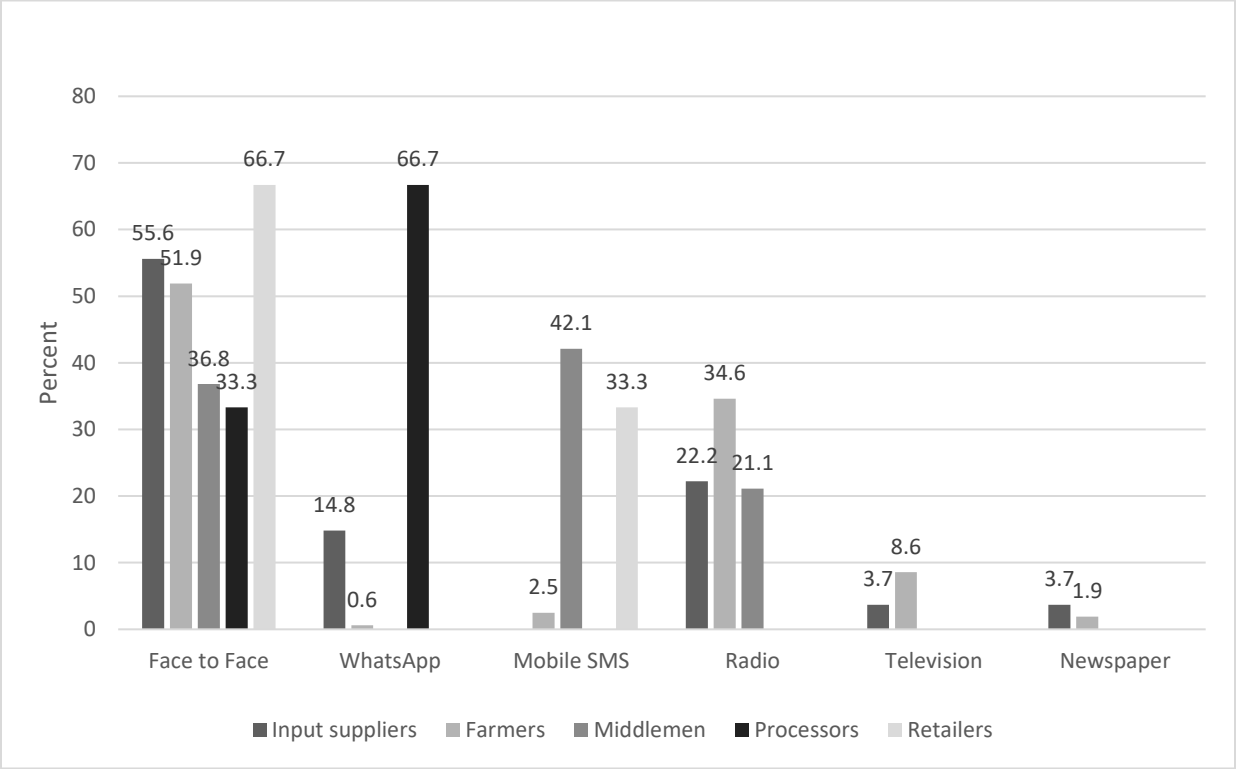

Figure 4.2: Communication Channels Usage along Macadamia Value Chain

Source: Survey data, 2019

4.6: Factors Influencing Farmers' Use of Macadamia Nut Information Sources Along the Value Chain

As discussed in section 3.7.4, factors influencing farmers' use of information sources were analyzed and the marginal effects shown in Table 4.12.

Estimation of the MNL model was preceded by a test of multicollinearity, heteroscedasticity and goodness of fit. Variance Inflation Factors (VIFs) was used to test for the presence of multicollinearity in the data. According to Gujarati (2004) any variable with a VIF greater than 10 demonstrates presence of multicollinearity. Results for the test showed that there was no multicollinearity since no variable had a VIF greater than or equal to 10, the mean VIF was equals to 1.22 (Appendix 1). The results also shows that the model was well fitted since it had a R^2 of 0.168 and prob>LR of 0.0001

Breusch-Pagan test was used to determine if the variance across the error terms were constant. The results shows insignificance and thus the null hypothesis was rejected, meaning there was constant variance across the error terms in the MNL model.

Chi2 (1) = 0.83 at Prob>chi2=0.36

Table 4.12: Marginal Effects on the Determinants of Farmers' Use of Macadamia Information Sources (Farmers used as the Base Outcome)

Sources	**Mass Media**			**Other Value Chain Actors**		
Variables	**dy/dx**	**SE**	**P>|z|**	**dy/dx**	**SE**	**P>|z|**
Gender	-0.053	0.568	0.924	-0.131	0.078	0.094**
Age	0.103	0.562	0.108	-0.044	0.084	0.602
Education	0.081	0.504	0.508	-0.091	0.780	0.244
Average age of tree	0.031	0.787	0.897	-0.021	0.1071	0.845
Road tarmac	-0.024	0.518	0.080 **	-0.225	0.068	0.001***
Variety grafted	-0.084	0.592	0.489	0.048	0.088	0.588
Income	-0.096	0.543	0.226	0.025	0.077	0.748
No. tree	0.053	0.383	0.062**	0.069	0.049	0.159
Yield	-0.159	0.461	0.092**	0.180	0.067	0.007***
Mkt distance	-0.102	1.019	0.077**	0.064	0.160	0.692
Grp membership	0.037	0.581	0.242	0.074	0.080	0.353
County (Embu base category)						
Nyeri	0.256	0.919	0.031**	-0.044	0.105	0.675
Murang'a	0.332	0.948	0.017**	-0.149	0.115	0.195

N= 157, LR x^2(22) =55.63, Prob > x^2 = 0.0001, Pseudo R2 = 0.1681, Log likelihood = -137.69139. Significant at 1% (***), 5% (**), and 10% (*)

Source: Survey data, 2019

The results shows that an increase in both gender participation in accessing macadamia nut information reduces the likelihood of utilizing information from other value chain actors by 13.1%. This finding agrees with a report by Muthoka *et al.* (2008) that most farmers shift reliance for macadamia nut information from fellow farmers and value chain actors to mass media on account of information credibility. Further, Muthoka *et al.* (2008) found that middlemen disrupt the market channels and create a loop of purchasing macadamia nuts at low price at farm gate level. Rogers & Valente (2017) emphasized that availability of current and credible information sources empower both genders and increase the rate of reliance for proper decision making in production.

Results showed that a unit increase in the number of macadamia trees increased the probability of utilizing macadamia nut information from mass media by 5.3%. This finding concurs with study by Wyche & Steinfield (2016) who noted that farmers trust information from mass media more than fellow farmers due to provision of current knowledge on production techniques. The number of macadamia trees owned by farmers create more interest on the type of information required, the sources and usefulness (Murioga *et al*., 2016). A research by Campbell (2018) noted that flow of need specific and credible information from mass media acted as an incentive to farmers in production.

As indicated in Table 4.12, a unit improvement on the status of tarmac road reduced the likelihood of farmers utilizing information from mass media and other value chain actors by 2.4% and 22.5% respectively. Griesdorf *et al*. (2018) noted that proper road networking influenced farmers' choice of information source because movement is made easier. Further, this study noted that most farmers were linked to one another by all-weathered road, this make it easy for farmers to engage face to face in sharing production knowledge. A study by Rogers

(2003) found that information shared face to face is considered impactful and persuasive in decision making.

Table 4.12 shows that a unit increase in yields of macadamia nuts in kilogram lowered the likelihood of farmers utilizing mass media as information sources by 15.9%. Further, a unit increase in yield increased the likelihood of farmers utilizing macadamia nut information from other value chain actors by 18%. Study by McGuire *et al.* (2013) noted that farmers share knowledge most frequently with fellow farmers in farmers groups on production techniques and relevant skills. In addition, Murioga *et al.* (2016) found that frequent access of credible input and agronomic information from agro-dealers and extension officers increased farmers' reliance on their services.

The results indicated that a unit increase in market distance reduced the probability of farmers utilizing mass media as the source of macadamia information by 10.2%. Study by Tadesse & Bahiigwa (2015) concurs with this finding that farmers seek market information from fellow farmers due to long market distance. A research by Muthoka *et al.* (2008) noted that market distance determined the time taken to reach market information sources thus lowered decision making by farmers residing far from market. However, the result inversely related to a study by Rockle *et al.* (2019) that most farmers residing far from market preferred access of information from mass media channels such as radio, television and mobile phone which were convenient to them.

Results also showed a high likelihood of farmers in Murang'a and Nyeri counties utilizing mass media from Embu County as source of macadamia nut information. This is because of the distance between farmers in the different counties. This finding is supported by Rogers (2003)

who noted that mass media is useful for sharing common information to farmers in different location at the same time.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The purpose of this study was to analyze access and utilization of macadamia information along the value chain in Kenya. A multistage sampling technique was used to select 237 macadamia actors along the value chain who were interviewed using a pretested semi-structured questionnaires. Results shows that along the value chain, most of the macadamia actors had accessed market information on the prevailing prices with input suppliers being more aware on the type of pest and diseases affecting macadamia trees.

The results also showed that macadamia information along the value chain was presented using verbal and written methods. Different methods of information reception were used along the value chain with most of the farmers and input suppliers using verbal methods compared to other methods. Additionally, use of verbal methods had more benefit compared to the other methods since it provided a face to face communication and allowed immediate feedback loop. The MNL analysis showed that the main factors influencing farmers' use of information sources in Embu, Nyeri, Murang'a and Kiambu were status of tarmac road, number of macadamia trees, yield of macadamia nut in kilograms and market distance in kilometer.

5.2 Conclusions

Information on market prices for macadamia nuts was critical and accessed by most of the value chain actors with input suppliers being more aware of the pest and diseases affecting macadamia trees. Further, verbal and written methods of information presentation were used along the value chain by most macadamia actors because they allow immediate feedback mechanisms. These methods are part of interpersonal communication approaches that are useful for persuasion and sharing of knowledge along the value chain in Kenya.

In addition, availability of tarmac roads, number of macadamia trees, yield of macadamia nuts and market distance significantly influenced macadamia farmers' use of information sources.

5.3 Recommendations for Policy Action

Based on the findings from this study, it is suggested that information necessary along the macadamia value chain from NGO's, public and private extension agencies should be made available at the appropriate time, consistent and well organized for ease of understanding and implementing along the value chain.

The study found that verbal method of communication was used along the value chain to present and receive information, it is thus suggested that National and County governments should increase the number of extension service providers' contact hours within macadamia growing regions in Kenya. This is to enhance provision regular services to farmers through face to face channel of communication which is more persuasive and satisfying. Also for proper transmission of innovations along the macadamia value chain, creation of awareness on the importance of mass media channels such as television and radio by the value chain actors is necessary.

In order to realize an increase in production of quality macadamia nuts in Kenya, provision of timely information to farmers through trainings, seminar discussions and demonstration platforms are necessary. Also, Agricultural Food Authority of Kenya should enforce a regulatory policy on marketing of macadamia nuts through empowering the processing firms to create direct link to farmers. This help minimize the effects of middlemen disrupting flow of macadamia information and create opportunities for buying macadamia nut at low prices at the farm gate level.

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APPEDICES

Appendix 1: Variance Inflation Factors

Variable (X_j)	VIF	Tolerance =1/VIF=(1-R_J^2)
Yield	1.37	0.730368
Average age	1.29	0.776923
Gender	1.27	0.786184
Distance	1.24	0.807488
Main variety	1.22	0.817617
No.of tree	1.20	0.834397
Age	1.19	0.840205
Education	1.17	0.855754
Group membership	1.17	0.856793
Road tarmac	1.13	0.886730
Income	1.13	0.886825
Mean VIF	1.22	

All VIF < 10, hence there is no multicollinearity (Gujarati, 2004). Tolerance is also used for testing multicollinearity and the closer it is to 1, the greater the evidence that X_j is not collinear with other independent variables.

Appendix 2: Measures of Goodness of Fit for Multinomial Logit Model

Log-likelihood intercept	-165.51
Log- likelihood full model	-137. 69
LR(22)	55.63
Prob>chi^2	0.1681

The model fitted well with prob>LR 0.1681

Appendix 3: Questionnaires used for Macadamia Value Chain Actors

i) Questionnaire used for Input Suppliers.

Questionnaire

NAME: MAINA CHARLES MBOGO

COURSE: AGRICULTURAL INFORMATION AND COMMUNICATION MANAGEMENT

TITLE OF THE STUDY: **Analysis of Access to and Utilization of Information along the Macadamia Value Chain in Kenya.**

The information given will be treated with utmost confidentiality and will purposely be used for academics only.

General Information

Questionnaire No:..……Date of interview (*dd/mm/yy):*……/…….. /…..……..

Name of the enumerator (*Full Name)*……..…

Name of respondent (*Full Name)*…….……..…….

Respondent`s mobile number……..……..

County…….……..…..…..Sub-County…..……

Location……..…….….Sub-Location…….Village……...

GPS Coordinates; Longitude:…….…….. Latitude:..…….
Altitude:……..

START TIME:……

SECTION A: Demographic features of the INPUT SUPPLIER

1. Please provide the following demographic information

	Name of the i**nput suppling firm**	Relationship with the **firm** (***see code A)***	In which **year** was the respondent born?	What is the **sex** of the respondent? ***1=male 2=female***	What is the **highest** level of education attained (in years)?

Code A (r/ship with the firm): 1=Owner; 2=Manager; 3=Cashier; 4=worker; 5=Other (Specify)……

2. In which of the **following categories** do you estimate your **total monthly income (Ksh)**, from the total sales of the input (s) to your customers. (***See codes below***) [___]

1=<1,500	3=2,500 - 5,000	5=10,000 - 20,000	7= 30,000- 40,000
2=1,500 - 2,500	4=5,000 - 10,000	6=20,000 - 30,000	8= above 40,000

3. Provide information of when the firm started, the inputs that farmers acquire from the firm and the quantities.

When did the firm start?	Which input (s) do the farmers' source from you. 1=seedlings; 2=fertilizer; 3=chemicals; 4= others (specify…….	What is the average quantity in Units or Kgs do you sell to your customers per day? ***(indicate the type of inputs)***
[_____]	**[____] [___] [___]**	

4. Are you a member of any group (s)? [_] (1=Yes; 0=No)

5. If **YES**, specify the kind of group (s) you indicated of being a member? (***Indicate in the table below)***

a)	c)
b)	d)

6. What services do you receive from the group(s) member? ***(Tick appropriately)***

Trainings [ ]	Collective acquisition of inputs [ ]
Supplier forums [ ]	Welfare e.g. school fees, burial support,e.t.c [ ]
Collective savings [ ]	Access to new varieties of input [ ]
Access to credit facilities[ ]	Farm-demos/ Inter-firm exchange visits [ ]
Market price [ ]	Other (specify)…… ……..

SECTION B: Type of information available to macadamia input supplier

7. Did you **access** macadamia information previously?? [___] (1=yes; 0=no

8. If **YES,** specify when [_____]

9. Provide information on the type of macadamia information availed to you previously, who provided the information and how important was the information to you?

Information type (***tick*** *the type of macadamia information that was availed to you previously.)*	
Type of pest and disease affecting macadamia [ ]	Information on new varieties/inputs [ ]
Planting season [ ]	Customers feedback after service [ ]
Flowering periods of macadamia [ ]	Number of macadamia growers in an area [ ]
Type of chemical and fertilizer required [ ]	Other (*specify)*……..
Source of the Information ***(see the code A)*** **[___]**	Importance of the information ***(see the code B)*** **[___]**
Code A (source of information): 1=Agro-dealers; 2=Farmers; 3=Wholesalers/retailers; 4=Extension Agents; 5=TV/ Radio; 6=processor; 7=Newspapers; 8=Mobile Phone; 9= others (specify)……. **Code B (importance of the information):** 1= very important; 2=important; 3= neutral; 4= not important; 5= not at all important	

10. Are you able to provide feedback or seek clarification from the source of the macadamia information? [__] **(1=Yes; 0=No)**

11. If **NO**, explain why? **Starting with the most important reason.**

a)

b)

c)

12. Provide information on frequency of access, level of satisfaction with the frequency of access, utilization and the benefits of utilizing the information.

How **often** did you receive the information? (***see the code A below***)	Were you **satisfied** with the frequency of information provision? (***see code B below***)	Did you **utilize** the information that was provided to you? 1=yes; 0=no)	If **yes,** what were the benefits? ***(see the code C below***)	If **no,** why? (***see the code D below***)
[ ]	[ ]	[ ]	[ ]	[ ]
Code A (frequency of receiving the information): 1=Daily; 2=Weekly; 3=Once per month; 4=Quarterly per year; 5=Seasonally; 6=Not at all				

Code B (level of satisfaction): 1=very satisfied; 2=satisfied; 3=neutral; 4=not satisfied; 5=not at all satisfied.
Code C (benefits of utilizing the information): 1=Bought the right stock of inputs; 2=Prepared right macadamia seedlings; 3=sold seedlings (inputs) at a high price in Units or Kgs/Kshs ***(specify) Current price:……..; Previous price:……..***; 4=Other benefits *(specify):*……
Code D (reasons for not utilizing the information): 1=it did not address macadamia needs; 2=difficult to understand; 3=information not up to date; 4=information not accurate; 5=expensive to access the information; 6= not relevant; 7=others *(specify)*……

13. Provide information on the form in which you received the information, content specific to your need and organization and the level of satisfaction with the form of information

Form of receiving information ***See the code A below***	Was the content specific to your needs? 1=yes 2=no	If **YES**, how was the content organized? ***see the code B below***	Were you satisfied with the form of information presentation? ***See the code C below***
[__]	[__]	[__]	[__]

Code A (information presentation); 1=audio; 2= written; 3= image/pictorial; 4=video; 5= others (specify)……..
Code B (content organization); 1=well organized; 2=organized; 3=neutral; 4= not organized; 5=not at all organized.
Code C (level of satisfaction); 1=very satisfied; 2=satisfied; 3=neutral; 4=not satisfied; 5=not at all satisfied.

14. Kindly indicate the communication channels used and was the information **Reliable** (based on timeliness, accuracy, appropriateness and up to date) and **Consistent (**based on regular and frequency). ***Using a Likert Perception Scale of 1-5***

Communication channel used to access macadamia information (see the codes) *(indicate the most important)*	The communication channels used provided **reliable information** in terms of the following features; (See code B)				There was **consistency** in provision of information (**See code B)**
	timeliness	accuracy	appropriateness	up-to date	regular
[__]	[__]	[__]	[__]	[__]	[__]

Codes A (communication channel used): 1=Television; 2=Radio; 3=Newspaper; 4=Mobile based SMS; 5=Macadamia nut website; 6=Social media platforms *(Facebook/WhatsApp)*; 7=Face to face; 8=Others (specify)……..……..

Code B: (reliability and consistency of the information): Indicate each factor using a *scale of 1-5 where; 1=Strongly Agree; 2=Agree; 3=Neutral; 4= Disagree; 5=Strongly Disagree.*

15. What were the constraints you faced in accessing and utilizing information in your macadamia operations? ***Kindly indicate at least three starting with the most important.***

i)

ii)

iii)

iv)

16. What do you think can be done to improve access to and utilization of information to enhance the production of quality macadamia nut? ***Kindly indicate at least three starting with the most important.***

i)

ii)

iii)

iv)

END TIME:……..

Thank you for the information. Have a blessed moment and God bless you.

ii) Questionnaire used for Farmers

Questionnaire

NAME: MAINA CHARLES MBOGO

COURSE: AGRICULTURAL INFORMATION AND COMMUNICATION MANAGEMENT

TITLE OF THE STUDY: **Analysis of Access to and Utilization of Information along the Macadamia Value Chain in Kenya.**

The information given will be treated with utmost confidentiality and will purposely be used for academics only.

General Information

Questionnaire No:..……Date of interview (*dd/mm/yy):*……/…….. /…..……..

Name of the enumerator (*Full Name)*……..…

Name of respondent (*Full Name)*…….…….…….

Respondent`s mobile number……..……..

County…….……..…..…..Sub-County…..……

Location……..…….….Sub-Location…….Village……...

GPS Coordinates; Longitude:…..…….…….. Latitude:……..…….
Altitude:……..

START TIME:……

SECTION A: Demographic features of the FARMER

1. Please provide the following demographic information

Relationship with the household head (***see code A)***	In which **year** was the respondent born? ***(indicate below)***	What is the **sex** of the respondent? ***1=male 2=female***	What is the **highest** level of education attained ***(in year)***

Codes A (r/ship with household head): 1=head; 2=spouse; 3=own child; 4=step child; 5=parent; 6=brother/sister; 7=nephew/niece; 8=grandchild; 9=other relative (specify)…….……: 10=worker

2. In which of the **following categories** do you estimate your **total monthly household income (Ksh).** This is inclusive of monies from your sources of income; farming (milk, eggs etc.), remittances from your working family members, business, groups (welfare/Chama) salary and/or pension gifts (**see codes below**) [___]

1=<1,500 2=1,500 - 2,500	3=2,500 - 5,000 4=5,000 - 10,000	5=10,000 - 20,000 6=20,000 - 30,000	7= 30,000- 40,000 8= above 40,000

3. Provide information on macadamia production and marketing features.

Number of trees *(indicate below)*	**Average age** *(year)* of the trees in your farm *(see code A)*	Main **varieties** planted. *(see code B)*	**Yield** per tree per year *(in Kg) (indicate below)*	Main **Buyers** *(see code C)*	Mode of delivery *(see code D)*	Terms of sales *(see code E)*
[____]	**[___]**	**[__][__] [__]**	**[____] [___] [___]**	**[__]**	**[__]**	**[__]**

Code A (average age of the trees)	**Code B (main varieties planted)**	**Code C (main buyers)**	**Code D (mode of delivery)**	**Code E (term of sale)**
1=Below 10 2=11-20 3=21-30 4=31-40 5=40 and above	1=MRG 20 2=KMB 3 3=KRG 15 4=EMB 1 5=Indigenous *(specify……..)*	1=Brokers 2=Companies 3=Cooperatives 4=Others *(specify)* ……	1=Farm gate 2=Buying center 3=Far market 4=Others *(specify)* ……	1=Cash on delivery 2=Credit 3=Loan 4=Contract selling

4. Provide information on the distance to market, the mean of transport used to the market and the type of roads used.

Distance (km) ***(indicate)***	Means of transport used to market **(see code A)**	Type of roads used **(see code B)**
[___]	[__]	[__]
Code A (means of transport used): 1=vehicle; 2=motorbikes; 3=bicycles; 4=donkey; 5=human power; 6=others (specify)……..		
Code B (type of road): 1=tarmac; 2= murram; 3=earth roads; 4=others (specify)……..		

5. Are you a member of any group (s)? [__] (1=Yes; 0=No)

6. If **YES**, specify the type of group (s). (***Indicate in the table below)***

a)	c)
b)	d)

7. What services do you receive from the group(s) you indicated of being a member? ***(Tick appropriately)***

Training [ ]	Record keeping and grading of produce [ ]
Welfare e.g. school fees, burial support,e.t.c [ ]	Farm demo plots/ Intergroup exchange visits [ ]
Collective savings plan [ ]	Access to farm inputs [ ]
Collective collateral/credit [ ]	Others (specify)……

SECTION B: Type of Macadamia Information available to the Farmer

8. Did you **access** macadamia information previously? [___] (1=yes; 0=no

9. If **YES**, specify when [_____]

10. Provide information on the type of macadamia information availed to you previously, who provided the information and how important was the information to you?

Information type (***tick*** *the type of macadamia information that was availed to you previously.)*	
1. Right macadamia seedlings/varieties [ ]	6. Time and method of pruning [ ]
2. Land preparation [ ]	7. time and method of harvesting [ ]
3. Spacing [ ]	8. Method of storage [ ]
4. Method of manure/fertilizer application [ ]	9. Market prices [ ]
5. Method of pest and disease control [ ]	10. Others *(specify)*……..
Source of the Information ***(see the code A)*** **[___]**	Importance of the information ***(see the code B)*** **[___]**
Code A (source of information): 1=Agro-dealers; 2=Farmers; 3=Wholesalers/retailers; 4=Extension Agents; 5=TV/Radio; 6=processor; 7=Newspapers; 8=Mobile Phone; 9= others (specify)……. **Code B (importance of the information):** 1= very important; 2=important; 3= neutral; 4= not important; 5= not at all important	

11. Are you able to provide **feedback** or seek clarification from the source of the macadamia information? [__]

(1=Yes; 0=No)

12. If **NO**, explain why? **Starting with the most important reason.**

a)

b)

13. Provide information on the frequency of access, and level of satisfaction with the frequency, utilization and the benefits of utilizing the information.

How **often** did you receive the information? (***see the code A below***)	Were you **satisfied** with the frequency of information provision? (***see code B below***)	Did you **utilize** the information that was provided to you? 1=yes; 0=no)	If **yes,** what was the most important benefit? ***(see the code C below***)	If **no,** why? (***see the code D below***)
[ ]	[ ]	[ ]	[ ]	[ ]

Code A (frequency of receiving the information): 1=Daily; 2=Weekly; 3=Once per month; 4=Quarterly per year; 5=Seasonally; 6=Not at all

Code B (level of satisfaction): 1=very satisfied; 2=satisfied; 3=neutral; 4=not satisfied; 5=not at all satisfied.

Code C (benefits of utilizing the information): 1=Acquired right macadamia variety; 2=Proper farm conservation; 3=Increased nut yields Kgs/acre *(specify)****;Current yields:……; previous yields:……;*** 4=Ease of access to markets; 5=sold nuts at a higher price in Kshs/Kg ***(specify)Current price:……..; Previous price:……..***; 6=Other benefits *(specify):*……

Code D (reasons for not utilizing the information): 1=it did not address macadamia needs; 2=difficult to understand; 3=information not up to date; 4=information not accurate; 5=expensive to access the information; 6=not relevant; 7**=**others *(specify)*……

SECTION C: Method of Presentation and Factors influencing access and utilization of Macadamia Information

14. Provide information on the form in which you received the information, content specific to your need and organization and the level of satisfaction with the form of information

Form of receiving information ***See the code A below***	Was the content specific to your needs? 1=yes 0=no	If **YES**, how was the content organized? ***see the code B below***	Were you satisfied with the form in which you received the information? ***See the code C below***
[__]	[__]	[__]	[__]

Code A (information presentation); 1=audio; 2= written; 3= image/pictorial; 4=video; 5= others (specify)……..

Code B (content organization); 1=well organized; 2=organized; 3=neutral; 4= not organized; 5=not at all organized.

Code C (level of satisfaction); 1=very satisfied; 2=satisfied; 3=neutral; 4=not satisfied; 5=not at all satisfied.

15. Kindly indicate the communication channels used and was the information **Reliable** (based on timeliness, accuracy, appropriateness and up to date) and **Consistent (**based on regular and frequency). ***Using a Likert Perception Scale of 1-5***

Communication channel used to access macadamia information (see the codes A) *(indicate the most important)*	The communication channels used provided **reliable information** in terms of the following features; (See code B)				There was **consistency** in provision of information. **See code B**
	timeliness	accuracy	Appropriateness	up-to date	regular
[__]	[__]	[__]	[__]	[__]	[__]

Codes A (communication channel used): 1=Television; 2=Radio; 3=Newspaper; 4=Mobile based SMS; 5=Macadamia nut website; 6=Social media platforms *(Facebook/WhatsApp)*; 7=Face to face; 8=Others (specify)……..……..

Code B: (reliability and consistency of the information): Indicate each factor using a *scale of 1-5 where; 1=Strongly Agree; 2=Agree; 3=Neutral; 4= Disagree; 5=Strongly Disagree.*

16. What were the constraints you faced in accessing and utilizing information in your macadamia operations last season? ***Kindly indicate at least three starting with the most important.***

i)

ii)

iii)

17. What do you think can be done to improve access to and utilization of information to enhance the production of quality macadamia nut? ***Kindly indicate at least three starting with the most important.***

i)

ii)

iii)

END TIME:

*T**hank you for the information. Have a blessed moment and God bless you.***

iii) Questionnaire used for Middlemen

Questionnaire

NAME: MAINA CHARLES MBOGO

COURSE: AGRICULTURAL INFORMATION AND COMMUNICATION MANAGEMENT

TITLE OF THE STUDY: **Analysis of Access to and Utilization of Information along the Macadamia Value Chain in Kenya.**

The information given will be treated with utmost confidentiality and will purposely be used for academics only.

General Information

Questionnaire No:..……Date of interview (*dd/mm/yy):*……/…….. /…..……..

Name of the enumerator (*Full Name)*……..…

Name of respondent (*Full Name)*…….…….…….

Respondent`s mobile number……..……..

County…….……..…..…..Sub-County…..……

Location……..…….….Sub-Location…….Village……...

GPS Coordinates; Longitude:……..…….……... Latitude:…….
Altitude:……..

START TIME:……

SECTION A: Demographic features of the BROKER

1. Please provide the following demographic information

In which **year** was the respondent born?	What is the **sex** of the respondent? ***1=male 2=female***	What is the **highest** level of education attained in years?

2. In which of the **following categories** is the estimate for your **total monthly income (Ksh)** [___]

1=<1,500 2=1,500 - 2,500	3=2,500 - 5,000 4=5,000 - 10,000	5=10,000 - 20,000 6=20,000 - 30,000	7= 30,000- 40,000 8= above 40,000

3. What is the average Kg (s) of nut do you buy from the farmers per season and at what prices per Kg? **Amount of nuts (**Kgs): [_____] **Price per Kg** (Ksh.): [_____]

4. Provide information on the market, the means of transport used to the market and the type of roads.

To which processor do you sell the nut? (***indicate below)***	Distance (km) ***(indicate)***	Means used to transport nuts **(see code A)**	Type of roads used **(see code B)**
	[___]	[___]	[___]
Code A (means of transport used): 1=vehicle; 2=motorbikes; 3=bicycles; 4=donkey; 5=others (specify)…….. **Code B (type of road):** 1=tarmac; 2= murram; 3=earth roads; 4=others (specify)……..			

5. Are you a member of any group (s)? [__] (1=Yes; 0=No)

If **YES**, specify the kind of group (s) you indicated of being a member?. (***Indicate in the table below)***

a)
b)

6. What services do you receive from the group(s)? ***(Tick appropriately)***

Training [ ]	Record keeping and grading of produce [ ]
Buyer/supplier forums [ ]	Welfare e.g. school fees, burial support,e.t.c [ ]
Collective savings plan [ ]	Access to farm inputs [ ]
Collective collateral/credit [ ]	Farm demo plots/ Intergroup exchange visits [ ]
Access to market [ ]	Other (specify)…… ……..

SECTION B: Type of information available to macadamia the broker

7. Did you **access** macadamia information previously? [___] (1=yes; 0=no

8. If **YES,** specify when [_____]

9. Provide information on the type of macadamia information availed to you previously, who provided the information and how important was the information to you?

Information type (***tick*** *the type of macadamia information that was availed to you previously.)*	
1. market prices [ ]	4. macadamia varieties [ ]
2. period and method of nut harvesting [ ]	5. quality of nut [ ]
3. policy on harvesting premature nuts [ ]	6. other (*specify)*……..
Source of the Information ***(see the code A)*** **[___]**	Importance of the information ***(see the code B)*** **[___]**
Code A (source of information): 1=Agro-dealers; 2=Farmers; 3=Wholesalers/retailers; 4=Extension Agents; 5=TV/ Radio; 6=processor; 7=Newspapers; 8=Mobile Phone; 9= others (specify)……. **Code B (importance of the information):** 1= very important; 2=important; 3= neutral; 4= not important; 5= not at all important	

10. Are you able to provide feedback or seek clarification from the source of the macadamia information? [__]

(1=Yes; 0=No)

11. If **NO**, explain why? **Starting with the most important.**

a)

b)

c)

12. Provide information on frequency of access, level of satisfaction with the frequency, utilization and the benefits of utilizing the information.

How **often** did you receive the information? (see the code A below)	Were you **satisfied** with the frequency of information provision? (see code B below)	Did you **utilize** the information that was provided to you? 1=yes; 0=no)	If **yes,** what were the benefits? (see the code C below)	If **no,** why? (see the code D below)
[ ]	[ ]	[ ]	[ ]	[ ]
Code A (frequency of receiving the information): 1=Daily; 2=Weekly; 3=Once per month; 4=Quarterly per year; 5=Seasonally; 6=Not at all **Code B (level of satisfaction):** 1=very satisfied; 2=satisfied; 3=neutral; 4=not satisfied; 5=not at all satisfied. **Code C (benefits of utilizing the information):** 1=bought nut at a cheaper price**;** 2= accessed the market with ease; 3=Other benefits *(specify):*…… **Code D (reasons for not utilizing the information):** 1=it did not address macadamia needs; 2=difficult to understand; 3=information not up to date; 4=information not accurate; 5=expensive to access the information; **6=**not relevant; 7=others *(specify)*……				

SECTION C: Method of Presentation and Factors influencing access and utilization of Macadamia Information

13. Provide information on the form in which you received the information, content specific to your need and organization and the level of satisfaction with the form of information

Form of receiving information ***See the code A below***	Was the content specific to your needs? 1=yes 0=no	If **YES**, how was the content organized? ***see the code B below***	Were you satisfied with the form of information presentation? ***See the code C below***
[___]	[___]	[___]	[___]

Code A (information presentation); 1=audio; 2= written; 3= image/pictorial; 4=video; 5= others (specify)……..
Code B (content organization); 1=well organized; 2=organized; 3=neutral; 4= not organized; 5=not at all organized.
Code C (level of satisfaction); 1=very satisfied; 2=satisfied; 3=neutral; 4=not satisfied; 5=not at all satisfied.

14. Kindly indicate the communication channels used and was the information **Reliable** (based on timeliness, accuracy, appropriateness and up to date) and **Consistent (**based on regular and frequency). ***Using a Likert Perception Scale of 1-5***

Communication channel used to access macadamia information (see the codes)	The communication channels used provided **reliable information** in terms of the factors below (See code B)				There was **consistency** in provision of information **See code B**
(indicate the most important)	timeliness	accuracy	appropriateness	up-to date	regular
[__]	[__]	[__]	[__]	[__]	[__]

Codes A (communication channel used): 1=Television; 2=Radio; 3=Newspaper; 4=Mobile based SMS; 5=Macadamia nut website; 6=Social media platforms *(Facebook/WhatsApp)*; 7=Face to face; 8=Others (specify)……..……..
Code B: (reliability and consistency of the information): Indicate each factor using a *scale of 1-5 where; 1=Strongly Agree; 2=Agree; 3=Neutral; 4= Disagree; 5=Strongly Disagree.*

15. What were the constraints you faced in accessing and utilizing information in your macadamia operations? ***Kindly indicate at least three starting with the most important.***

i)

ii)

iii)

16. What do you think can be done to improve access to and utilization of information to enhance the production of quality macadamia nut? ***Kindly indicate at least three starting with the most important.***

i)

ii)

iii)

END TIME:……

Thank you for the information. Have a blessed moment and God bless you.

iv) Questionnaire used for Processor

Questionnaire

NAME: MAINA CHARLES MBOGO

COURSE: AGRICULTURAL INFORMATION AND COMMUNICATION MANAGEMENT

TITLE OF THE STUDY: **Analysis of Access to and Utilization of Information along the Macadamia Value Chain in Kenya.**

The information given will be treated with utmost confidentiality and will purposely be used for academics only.

General Information

Questionnaire No:..……Date of interview (*dd/mm/yy):*……/…….. /…..……..

Name of the enumerator (*Full Name)*……..…

Name of respondent (*Full Name)*…….…….…….

Respondent`s mobile number……..…….

County…….……..…..…..Sub-County…..……

Location……..…….….Sub-Location…….Village……...

GPS Coordinates; Longitude:……..…….…….. Latitude:…….
Altitude:……..

START TIME:……

SECTION A: <u>Demographic features of the respondent (PROCESSOR)</u>

1. Please provide the following demographic information

	Name of the processing firm	Relationship with the processing firm (***see code A below)***	In which **year** was this person born?	What is the **sex** of this person? ***1=male 2=female***	What is the **highest** level of education completed in years?
1					

Code A (r/ship with firm): 1=Owner; 2=Director; 3=Treasurer; 4=Secretary; 5=worker; 6=Other (Specify)……

2. In which of the **following categories** do you estimate firm's **total monthly income (Ksh)**. (See codes below) [___]

1=<1,500	3=2,500 - 5,000	5=10,000 - 20,000	7= 30,000- 40,000
2=1,500 - 2,500	4=5,000 - 10,000	6=20,000 - 30,000	8= above 40,000

3. Provide information of when the firm started, the amount of macadamia nut (kg) processed per day and who buy the nuts.

When did this firm start?	How many Kgs of macadamia nuts do you process per day?	Where do you buy the macadamia nut? 1= farmers 2=brokers 3=farmer groups 4=others *(specify*……..	To whom do you sell the processed nut? 1=international market (specify) 2=wholesalers 3=retailers 4= others (specify)……..
[_____]	**[_____]**	**[____]**	**[_____]**

SECTION B: Type of information available to macadamia nut processing firm

4. Did you **access** macadamia information previously? [___] (1=yes; 0=no

5. If **YES**, specify when [_____]

6. Provide information on the type of macadamia information availed to you previously, who provided the information and how important was the information to you?

Information type (***tick*** *the type of macadamia information that was availed to you previously.)*	
1. Quality of nuts [ ]	5. Macadamia varieties [ ]
2. Prevailing market prices [ ]	6. The right market [ ]
3. Policy regulation on markets [ ]	Others (*specify)*……..
4. Number of growers in an area [ ]	Others *(specify)*……..
Source of the Information ***(see the code A)*** **[___]**	Importance of the information ***(see the code B)*** **[___]**
Code A (source of information): 1=Agro-dealers; 2=Farmers; 3=Wholesalers/retailers; 4=Extension Agents; 5=TV/ Radio; 6=processor; 7=Newspapers; 8=Mobile Phone; 9= others (specify)……. **Code B (importance of the information):** 1= very important; 2=important; 3= neutral; 4= not important; 5= not at all important	

7. Are you able to provide **feedback** or seek clarification from the source of the macadamia information? [__]

(1=Yes; 0=No)

8. If **NO**, explain the why? **Starting with the most important reason.**

a)

b)

9. Provide information on frequency of access, level of satisfaction with the frequency, utilization and the benefits of utilizing the information.

How **often** did you receive the information? (***see the code A below)***	Were you **satisfied** with the frequency of information provision? ***(see code B below)***	Did you **utilize** the information that was provided to you? 1=yes; 0=no)	If **yes,** what were the benefits? ***(see the code C below)***	If **no,** why? (***see the code D below)***
[ ]	[ ]	[ ]	[ ]	[ ]

Code A (frequency of receiving the information): 1=Daily; 2=Weekly; 3=Once per month; 4=Quarterly per year; 5=Seasonally; 6=Not at all

Code B (level of satisfaction): 1=very satisfied; 2=satisfied; 3=neutral; 4=not satisfied; 5=not at all satisfied.

Code C (benefits of utilizing the information): 1=Processed more nuts in Kgs ***(specify) Currently:…….; Previously:……..***; 2:Proper packaging of the processed nuts; 3=Proper branding of the nuts; 3=Sold processed nuts at a higher price per kg in Ksh.***(specify) Currently……..:previously……:*** 4=Other benefits *(specify):……*

Code D (reasons for not utilizing the information): 1=it did not address macadamia needs; 2=difficult to understand; 3=information not up to date; 4=information not accurate; 5=expensive to access the information; 6=not relevant 7=others *(specify)……*

SECTION C: Method of Presentation and Factors influencing access and utilization of Macadamia Information

10. Provide information on the form in which you received the information, content specific to your need and organization and the level of satisfaction with the form of information

Form of receiving information ***See the code A below***	Was the content specific to your needs? 1=yes 0=no	If **YES**, how was the content organized? ***see the code B below***	Were you satisfied with the form of information presentation? ***See the code C below***
[__]	[__]	[__]	[__]

Code A (information presentation); 1=audio; 2= written; 3= image/pictorial; 4=video; 5= others (specify)……..
Code B (content organization); 1=well organized; 2=organized; 3=neutral; 4= not organized; 5=not at all organized.
Code C (level of satisfaction); 1=very satisfied; 2=satisfied; 3=neutral; 4=not satisfied; 5=not at all satisfied.

11. Kindly indicate the communication channels used and was the information **Reliable** (based on timeliness, accuracy, appropriateness and up to date) and **Consistent (**based on regular and frequency). ***Using a Likert Perception Scale of 1-5***

Communication channel used to access macadamia information (see the codes) *(indicate the most important)*	The communication channels used provided **reliable information** in terms of the following features; (See code B)				There was **consistency** in provision of information **See code B**
	timeliness	accuracy	appropriateness	up-to date	regular
[__]	[__]	[__]	[__]	[__]	[__]

Codes A (communication channel used): 1=Television; 2=Radio; 3=Newspaper; 4=Mobile based SMS; 5=Macadamia nut website; 6=Social media platforms *(Facebook/WhatsApp)*; 7=Face to face; 8=Others (specify)……..……..
Code B: (reliability and consistency of the information): Indicate each factor using a *scale of 1-5 where; 1=Strongly Agree; 2=Agree; 3=Neutral; 4= Disagree; 5=Strongly Disagree.*

12. What were the constraints you faced in accessing and utilizing information in your macadamia operations? ***Kindly indicate at least three starting with the most important.***

i)

ii)

iii)

13. What do you think can be done to improve access to and utilization of information to enhance the production of quality macadamia nut? ***Kindly indicate at least three starting with the most important.***

i)

ii)

iii)

END TIME……..

Thank you for the information. Have a blessed moment and God bless you.

v) Questionnaire used for Retailers

Questionnaire

NAME: MAINA CHARLES MBOGO

COURSE: AGRICULTURAL INFORMATION AND COMMUNICATION MANAGEMENT

TITLE OF THE STUDY: **Analysis of Access to and Utilization of Information along the Macadamia Value Chain in Kenya.**

The information given will be treated with utmost confidentiality and will purposely be used for academics only.

General Information

Questionnaire No:..……Date of interview (*dd/mm/yy):*……/…….. /…..……..

Name of the enumerator (*Full Name)*……..…

Name of respondent (*Full Name)*…….…….…….

Respondent`s mobile number……..…….

County…….……..…..…..Sub-County…..……

Location……..…….….Sub-Location…….Village……...

GPS Coordinates; Longitude:…….…….. Latitude:…...…….
Altitude:……..

START TIME:……

SECTION A: Demographic features of the respondent (SHOP/SUPERMARKET)

1. Please provide the following demographic information

	Name of the shop/supermarket	Relationship with the shop (***see code A)***	In which **year** was the respondent born?	What is the **sex** of the respondent? ***1=male 2=female***	What is the **highest** level of education attained in years?

	[ ]		[ ]	

Codes (r/ship with shop): 1=Owner; 2=Spouse; 3=child to the owner; 4=worker; 5=Other *(Specify)*……

2. In which of the **following categories** do you estimate your **total monthly income (Ksh)** from the sales made. (See codes below) [___]

1=<1,500	3=2,500 - 5,000	5=10,000 - 20,000	7= 30,000- 40,000
2=1,500 - 2,500	4=5,000 - 10,000	6=20,000 - 30,000	8= above 40,000

3. Provide information of where you buy the nuts, what is the distance covered and means used

Where do you buy processed nuts? ***(indicate below)***	What distance do you cover? (km)	What mean do you use? 1=vehicles 2=motorbikes 3=other *(specify)*……
	[__]	**[__]**

4. How often do consumers buy the processed nut from the shop/supermarket? [_]

1= daily; 2=weekly; 3=monthly; 4= quarterly in a year; 5= others *(specify)*……..

SECTION B: Type of macadamia information available to the wholesaler/ retailer

5. Did you **access** macadamia information previously? [___] (1=yes; 0=no

6. If **YES**, specify when [_____]

7. Provide information on the type of macadamia information availed to you previously, who provided the information and how important was the information to you?

Information type (***tick*** *the type of macadamia information that was availed to you previously.)*	
1. Quality of nut required by consumers [ ]	3. Consumers preferences [ ]
2. Prevailing market prices [ ]	4. Others*(specify)*……
Source of the Information ***(see the code A)*** **[___]**	Importance of the information ***(see the code B)*** **[___]**

Code A (source of information): 1=Agro-dealers; 2=Farmers; 3=Wholesalers/retailers; 4=Extension Agents; 5=TV/ Radio; 6=processor; 7=Newspapers; 8=Mobile Phone; 9= others (specify)…….
Code B (importance of the information): 1= very important; 2=important; 3= neutral; 4= not important; 5= not at all important

8. Are you able to provide feedback or seek clarification from the source of the macadamia information? **[__]**

(1=Yes; 0=No)

9. If **NO**, explain why? **Starting with the most important reason**

a)

b)

10. Provide information on frequency of access, level of satisfaction with the frequency, utilization and the benefits of utilizing the information.

How **often** did you receive the information? (***see the code A below)***	Were you **satisfied** with the frequency of information provision? (***see code B below***)	Did you **utilize** the information that was provided to you? 1=yes; 0=no)	If **yes,** what were the benefits? (***see the code C below)***	If **no,** why? (***see the code D below)***
[ ]	[ ]	[ ]	[ ]	[ ]

Code A (frequency of receiving the information): 1=Daily; 2=Weekly; 3=Once per month; 4=Quarterly per year; 5=Seasonally; 6=Not at all

Code B (level of satisfaction): 1=very satisfied; 2=satisfied; 3=neutral; 4=not satisfied; 5=not at all satisfied.

Code C (benefits of utilizing the information): 1=Sold processed nuts at a higher price per kg in Ksh.***(specify)Currently……...:previously……:***4=Other*(specify):……:……*

Code D (reasons for not utilizing the information): 1=it did not address macadamia needs; 2=difficult to understand; 3=information not up to date; 4=information not accurate; 5=expensive to access the information; 6=not relevant; 7=others *(specify)*……..

SECTION C: Method of Presentation and Factors influencing access and utilization of Macadamia Information

11. Provide information on the form in which you received the information, content specific to your need and organization and the level of satisfaction with the form of information

Form of receiving information ***See the code A below***	Was the content specific to your needs? 1=yes 0=no	If **YES**, how was the content organized? ***see the code B below***	Were you satisfied with the form of information presentation? ***See the code C below***
[___]	[___]	[___]	[___]

Code A (information presentation); 1=audio; 2= written; 3= image/pictorial; 4=video; 5= others (specify)……..

Code B (content organization); 1=well organized; 2=organized; 3=neutral; 4= not organized; 5=not at all organized.
Code C (level of satisfaction); 1=very satisfied; 2=satisfied; 3=neutral; 4=not satisfied; 5=not at all satisfied.

12. Kindly indicate the communication channels used and was the information **Reliable** (based on timeliness, accuracy, appropriateness and up to date) and **Consistent (**based on regular and frequency). ***Using a Likert Perception Scale of 1-5***

Communication channel used to access macadamia information (see the codes) *(indicate the most important)*	The communication channels used provided **reliable information** in terms of the following below. (See code B)				There was **consistency** in provision of information **See code B**
	timeliness	accuracy	appropriateness	up-to date	regular
[__]	[__]	[__]	[__]	[__]	[__]

Codes A (communication channel used): 1=Television; 2=Radio; 3=Newspaper; 4=Mobile based SMS; 5=Macadamia nut website; 6=Social media platforms *(Facebook/WhatsApp)*; 7=Face to face; 8=Others (specify)……..……..
Code B: (reliability and consistency of the information): Indicate each factor using a *scale of 1-5 where; 1=Strongly Agree; 2=Agree; 3=Neutral; 4= Disagree; 5=Strongly Disagree.*

13. What were the constraints you faced in accessing and utilizing information in your macadamia operations? ***Kindly indicate at least three starting with the most important.***

i)

ii)

iii)

14. What do you think can be done to improve access to and utilization of information to enhance the production of quality macadamia nut? ***Kindly indicate at least three starting with the most important.***

i)

ii)

iii)

END TIME:……

Thank you for the information. Have a blessed moment and God bless you.