ANALYSIS OF METHODS OF MACADAMIA INFORMATION RECEPTION ALONG THE VALUE CHAIN IN KENYA

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ABSTRACT

Macadamia (*M. integrifolia and M. tetraphylla*) is a world finest desert nut that accounts for 1% of global tree nut production. It's highly valued with a high market demand due to its nutrition content and high poverty reduction potential. However, the production of macadamia nuts in Kenya is low due to limited access to information and unreliable methods of information reception along the value chain. These challenges limit decision making on value chain activities. Therefore, this study was carried out to analyse the methods of information reception along the macadamia value chain. The study was carried out in Embu, Nyeri, Murang'a and Kiambu counties due to high participation of macadamia actors. A multistage sampling technique was used to select a sample size of 246 actors including; 30 input suppliers, 175 farmers, 20 middlemen, 6 processors and 15 retailers along the macadamia value chain. Data was collected using a semi-structured questionnaire. Data was analysed using SPSS version 20. The results showed that verbal and written methods of information reception were used by all macadamia actors along the value chain. Also, the results indicated that the methods of information reception were significant for farmers and input suppliers (p < 0.01). Therefore the study concluded that verbal and written methods of information reception are critical in dissemination of macadamia information along the value chain. In addition, creation of awareness on the importance of audio, visual and audio-visual as methods of sharing knowledge should be done to enhance information sharing.

Key words: Macadamia, macadamia actors, methods of information reception, value chain.

Introduction

Macadamia (*M. integrifolia and M. tetraphylla)* is one of the world's finest dessert nut due to its good taste and nutritious benefits to the consumers (Yan *et al.*, 2018). It originated from Australia and was introduced in Kenya in 1946 by Bob Harries. Macadamia nut accounts for 1% of global tree nut production and Kenya produces approximately 10% of the total global nut production (Paumgarten *et al*., 2018). It's a highly valued crop with good export and poverty reduction potential. South Africa was the top globally nut producers for 2011 and 2013-2015, surpassing Australia and Hawaii (Paumgarten *et al*., 2018).

Production of macadamia nuts in Kenya was aimed at diversifying coffee farmers' income. Murioga (2018) indicated that macadamia nut was more reliable to farmers during the period when coffee international market prices had declined. In addition, Kiuru *et al.* (2004) outlined that farmers who adopted the production of macadamia nut described it as a better source of household income because its market price was higher compared to coffee.

Murioga *et al.* (2018) reported that Kenya macadamia nut is commonly grown in the Central, Eastern, Rift Valley and Coastal parts of Kenya. Its production involves several actors within the value chain who play different roles (Muthoka *et al.* 2008). These actors include input suppliers, farmers, processors, distributors, retailers, and consumers.

Kenya is faced with low production of macadamia nuts despite an increase in market demand (Murioga, 2018). This is attributed to poor links between research-extension-farmers, poor packaging of information, poor choices of macadamia information reception methods and inappropriate communication strategies (Biam *et al.*, 2017). This resulted to limited access to timely and content specific macadamia information along the value chain.

Paumgarten *et al.* (2018) outlined that in order to increase the production of macadamia nut, information is expected to enhance knowledge to all the macadamia actors along the value chain. Information is described as anything that reduces uncertainty and a tool that enhances the decision-making process (Ouédraogo *et al.*, 2018). According to Nath (2017) communities that are vulnerable to poverty in Africa, Latin America, Asia and the Caribbean employed the use of ICT tools such as, internet services, community radios and mobile phones to access agricultural information for informed decision making and technological awareness towards increased agricultural production.

The main source of agricultural information along the value chain in Kenya is the public extension (Krone *et al.*, 2016). However, Barrueto *et al.* (2018) noted that macadamia information sources are grouped as either formal or informal. The informal network consists of face to face interactions with friends, extension agents, relatives and neighbors (Warren *et al.*, 2017). While the formal sources constitute of mass media channels such as radio, television and mobile-based services. Mittal and Mehar (2013) outlined that informal sources provide access to information through verbal, written form or visual form while the formal sources provide information either as audio or as audio-visual. This study was thus relevant to find out the methods used to receive macadamia information by actors along the value chain in Kenya.

Materials and Method
Research design
The study adopted a descriptive survey design because it describes the state of events based on the responses. Both qualitative and quantitative data on the methods of macadamia information reception were collected from macadamia actors using a semi-structured questionnaire. A pilot study was carried out before the actual data collection to check on the feasibility of the study and correct any error from the semi-structured questionnaire.

Study Area
The study was carried out in four counties in Mt. Kenya region namely; Embu, Nyeri, Kiambu and Murang'a Counties. Murioga *et al.,* (2018) reported that counties within the Mt. Kenya region have several active macadamia actors along the value chain. These counties have a relative similar conducive

agro-ecological condition that supports production of macadamia nuts and other agricultural commodities for both commercial and subsistent purposes. Some of the cash crop grown in the four counties include; tea, coffee, and horticultural commodities while cereals crops are grown for subsistent purposes (Muthoka *et al*., 2008). However, Embu County receives an average rainfall of 1067.5 mm, Nyeri County 1004 mm, Kiambu County 1200 mm and Murang'a County 1195 mm annually (Odour, 2018).

Sample size determination

Fisher's Formula (Fisher *et al*., 1998) at 95% Confidence Interval was used to determine the sample size for the study. This formula was important because it provides data on all individuals from the selected population.

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

where,

n = population sample size

d = desired level of precision

p = (Estimated) proportion of the population growing macadamia in Embu, Nyeri, Kiambu and Murang'a counties.

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

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

$$n = \frac{0.2(1-0.2)1.96^2}{0.05^2} = 246$$

n = 246 macadamia actors.

Sampling and data collection

The study used primary data which was collected through interviews using pre-tested questionnaires. A multistage sampling technique was used to arrive to a sampling unit for the survey. In the first stage, the Mt. Kenya region was purposively selected due to the availability of key actors' participation in the value chain and availability of a conducive climate that supports the production of macadamia.

In the second stage, four counties were purposively selected that is; Embu, Nyeri, Murang'a and Kiambu Counties. In every County, the study purposively chose at least one sub-counties. In Embu County, Embu East and Embu West sub-counties were selected as the most macadamia producing areas. In Nyeri County, Tetu and Mukurweini were selected due availability of several actors. In Murang'a County, Kandara and Gatanga were selected because several farmers participated in the production of macadamia nuts. In Kiambu County, Thika Town sub-county was selected due availability of several macadamia processing firms. Systematic simple random sampling was used to select different wards and villages for data collection from the sub-counties.

Data analysis

Data on methods of macadamia information reception from the actors were analysed using the Statistical Package for Social Sciences (SPSS 20.0) software. The total sample size for the study was 246 actors. However, 237 questionnaires were completely filled and hence analysed, 9 questionnaires were incomplete and thus not considered in the analysis. Descriptive statistics were summarized using percentages for categorical variables and means for continuous variables. The results were presented in tables.

Results and discussions
Socio-economic characteristics of the macadamia actors

The results show that the male gender dominated the entire value chain. This implied that men were actively involved in the production of macadamia as compared to

women. Table 1 shows that 63.8% of the middlemen interviewed were men, the study noted that men carried out activities such as; harvesting of the nuts through climbing of macadamia trees which most women were not able to do. In addition, 66.7% of the individuals in the processing firms who took part in the study were men, implying that men played managerial roles in the processing firms compared to women counterparts.

Table 1: Summary statistics for the macadamia actors

Variables	Mean				
	Input suppliers	Farmers	Middlemen	Processors	Retailers
Age (yrs)	41.6	58	37	41	31
Gender (% male)	55.2	49	63.8	67	33
Edu (yearly range)	11-14	1-10	11-14	>15	11-14
Access to info (% yes)	96.3	93	100	100	100
Group membership (% yes)	35.7	66	52.6	-	-
Feedback (% yes)	85.2	69	100	100	100
Utilize Info (% yes)	93.1	74	100	100	100

Source: Survey data, 2019

Age is a key factor that influences macadamia actors' operations in the value chain and mechanism to access resources (Murioga, 2018). The results show that the mean age of the input suppliers and farmers was 41.6 and 58 years, respectively. Most of the middlemen's age was within the range of 36 - 50 years with a mean of 37.0 years. In addition, the officials at the processing firm and retailers had a mean age of 41.0 and 31 years, respectively. Dhaka *et al.* (2016) noted that elderly individuals have a lower possibility of using modern mass media communication channels such as mobile phones and internet services that provide digital means of accessing information.

Gitonga *et al.* (2008) indicated that education is an important aspect that influences the skill and knowledge of an individual for a particular operation. In this study, education was categorized into three groups: Primary education (1-10 years), Secondary education (11-14 years) and Tertiary education (above 15 years). The results show that input suppliers, middlemen and retailers spent 11-14 years in school, respectively, indicating attainment of secondary education. Macadamia farmers, as shown (Table 1) spent 1-10 years in school attaining primary education. The individuals at the processing firms utilized 15 years and above indicating that most of them had attained a tertiary certificate.

Table 1 shows that all the middlemen, processors and retailers who took part in the study accessed and utilized the macadamia information, this is supported by Biam *et al.* (2017) who noted that information is power in the commodity value chain and a tool useful in provision of knowledge and technical skills to actors. Nath (2017) noted that macadamia actors prefer a different type of information based on the period of macadamia production. The different types of information accessed and utilized enhance actors' knowledge of macadamia operations in the value chain for proper decision making (Nath, 2017).

The results revealed that most of the actors provided back responses to the information sources. This is an indication that most of the macadamia information sources had a complete information flow cycle with both

feedforward and feedback loop mechanisms. This creates the opportunity to seek clarification when information is complex to understand or ambiguous and reduces the fragmentation of information flow in a production system (Ouédraogo *et al.*, 2018).

Source of macadamia information along the value chain
The results show that both interpersonal and mass media channels were used as sources of macadamia information (Table 2). According to Devi and Verma (2016), interpersonal sources are preferred to mass media for they offer face to face communication which is more effective in the provision of immediate feedback on the responses and empathy. However, mass media sources are cheap and economical but tend to limit empathy and immediate feedback between the communicating parties (Aonngernthayakorn and Pongquan, 2017).

The results (Table 2) indicate that macadamia information was also accessed from actors along the value chain. These channels include; extension agents, processors, agro-dealers, farmers and regulators. Buizer (2016) outlined that interpersonal sources play a key role in provision of relevant information along the value chain for informed decision making to enhance macadamia production.

The results show that interpersonal and mass media sources can be used at different levels in the decision making process along the macadamia value chain. According to Rogers (2003), mass media sources such as mobile phones, the internet, radio, and television are useful in the creation of awareness. However, 11.1% of input suppliers and 24.7% of macadamia farmers employed the use of television and radio, respectively.

The results show that all the retailers accessed macadamia information from the processors. This concurs with Warren *et al.* (2017) who indicated that face to face communication is important for persuasion and fosters change of behaviour of the audience.

Methods of receiving macadamia information along the value chain
Nakasone *et al.* (2014) noted that the act of receiving information is relevant for the conveyance of the intended message by the sender through an appropriate communication channel. The results of this study revealed that most of the actors accessed macadamia information through verbal and written means of information reception along the value chain.

The Chi-Square test show that the methods of information reception were significantly different for input suppliers and farmers (Table 3). However, they were not significant difference for middlemen, processors, and retailers (Table 3).

Table 2: Source of macadamia information to value chain actors

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

Table 3: Methods of receiving macadamia information along the value chain

Methods	Input suppliers	Farmers	Middlemen	Processors	Retailers
Audio	7	67	7	-	-
Written	2	8	7	2	4
Visual	3	3	-	-	-
Audio-visual	1	3	-	-	-
Verbal	14	81	5	1	8
Total	27	162	19	3	12
Chi-Sq	20.963	181.58	0.421	0.333	1.333
df	4	4	2	1	1
Sig.	0.00	0.00	0.81	0.564	0.248

Source: Survey data, 2019

Verbal method was the most preferred and utilized form of information reception along the macadamia value chain with 81 farmers using it compared to audio, written, visual and audio-visual methods. This is in agreement with Berger (2014) who found that verbal communication as a form of interpersonal method of communication is relevant for social bonding, emotion regulation, acquisition of information and persuasion when conveying a message.

Additionally, 14 input suppliers received information verbally through face to face interactions with their clients. Howland *et al.* (2015) noted that verbal communication is most effective through face to face interaction due to the provision of a wide scope of understanding of the conveyed message and thus convincing in decision making.

The results also indicated that verbal and written methods of communication were used along the value chain by all the actors. This implied that verbal and written methods were vital for sharing knowledge on agronomic practices, marketing and relevant information on macadamia production. Verbal method was applied through face to face interaction while the written method was applied through use of typed document, short message service and electronics mails. However, Krone *et al.* (2016) noted that written methods of information presentation and reception are tedious and limit immediate response to the sender.

The results indicate that 67 farmers utilized audio method of information reception. This type of information reception was utilized through application of mass media channels such as radio and mobile phones. Mass media channels are important for sharing knowledge and creation of awareness to all members of a particular society when done using an appropriate local language (Krone *et al.*, 2016).

Most of the macadamia actors including middlemen, processors, and retailers used verbal, written and audio rather than visual and audio-visual methods to convey and receive macadamia information. According to Dhaka *et al.* (2016), video learning increased knowledge to poor potato farmers, however, this study noted that most of the smallholder macadamia farmers preferred verbal to visual and audio-visual methods. Devi and Verma (2016) noted that most smallholder farmers experience a challenge of acquiring television, LCD projectors and laptops due to the high cost of acquisition.

Conclusion
The study concluded that verbal and written methods of information reception were used along the macadamia value chain. Along the value chain, verbal, written, audio, visual, and audio-visual methods of information reception indicated statistical significance difference to the input suppliers and farmers while no statistical difference from the middlemen, processors, and retailers.

Recommendation
The study found that verbal method of communication was used along the value chain to present and receive macadamia 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 will ensure regular services to farmers through face to face methods of communication which is more persuasive.

Also for proper transmission of innovations along the macadamia value chain, creation of awareness on the importance of employing mass media communication channels such as television and radio by the value chain actors is necessary to enhance knowledge sharing on macadamia production.

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