

DETERMINANTS FOR MACADAMIA NUTS MARKET LINKAGES IN ZIMBABWE

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Abstract

Macadamia nuts are now an important cash-generating crop for some farmers in Zimbabwe after out competing crops such as coffee, tobacco, cotton, and tea. The crop is an export crop, which brings in foreign currency to the farmers and the country at large. However, the farmers are far from reaching their potential and are generating very little foreign currency from the nuts sold at very low prices when compared to international prices. This has been attributed to the marketing challenges. This paper's is therefore evaluating the market linkages in the macadamia nuts industry in Zimbabwe. Data were collected from 105 macadamia farmers in Manicaland Province in Zimbabwe during the period between July and October 2022 with the assistance of Agriculture Extension Services Department. A survey questionnaire in English language with Likert scale type question was administered to selected macadamia nuts farmers. Hypotheses testing was done using the structural equation modelling (SEM) in AMOS V22. The study results demonstrate that infrastructure development, market information, mode of farming and value addition influence market linkages in macadamia nuts farming industry. Thus, linking of macadamia nuts farmers to competitive markets, avoiding selling at farm gate and middlemen involvement is dependent on how the infrastructure in the area is developed. Also, availability of information to the farmers, the mode of farming used by macadamia nuts and the state of the agricultural product that the farmer is marketing in terms of value addition influence the marketing of the crop. This study expanded the understanding of factors that influence market linkages of macadamia nuts farming in Zimbabwe. Thus, previous related studies did not cover the effect of infrastructure development, market information, model of farming and value addition on the on the market linkages in macadamia nuts farming. Therefore, the current study contributes the marketing and management body of knowledge by expanding the knowledge on determinants of macadamia nuts market linkages in a developing economy like Zimbabwe.

Key Words: Farming Mode, Infrastructure Development, Market Information, Market Linkages, Value Addition, Macadamia Nuts, Zimbabwe

1.0 INTRODUCTION

The 2007-2008 and the 2011 recession has made people to rethink again about the importance of agriculture in alleviating these challenges. Agriculture is believed to be the answer to feed the continuously growing world population especially the rural community who live in poverty (Best et al., 2015). In most developing countries, agriculture is the basis of survival for families who generate income for their own support. However, the poverty-stricken families concentrate on low value activities such as growing crops for

family consumption, exchange crop produce for other goods or relying on local markets for their crop produce. The farmers are excluded from high valued markets and export activities where they can get value for their produce, and they end up selling their produce at very low prices due to lack of competitive markets and the urgent need for cash (ILO, 2017). Many developed countries and organisations understand that markets are vital in reducing poverty and at the same time feeding the world population. It has been observed recently that organisations spend large sums of money researching on agricultural technology and developing and strengthening markets (Best et al., 2015). There has been an opportunity to improve markets with the expansion in global food distribution, which resulted in the emergence of supermarkets in industrialized, and developing countries (FAO, 2022; Seto et al., 2016; Tschirley et al., 2015). Some countries join multilateral regional and bilateral free trade agreements to improve global food supply chains developments. Firms and donor community in emerging markets use a lot of money to purchase goods and services thereby creating opportunities to individuals and groups to be included in the supply chain (Clancy et al., 2014). Saweda et al. (2020) agree that that the demand for different agricultural commodities is opening chances for agricultural producers to engage in high value agricultural produce capable of improving their incomes. However, Pingali (2019) claims that this has not been the case due to failure by the producer to participate in delivering the produce to the appropriate market mainly due to weak market linkages. Clancy et al. (2014) noted that the market linkages are usually weak in developing countries due to poor capacity and this hinders farmers from delivering products that match big companies' expectations.

In many cases, the small agriculture businesses are not reliably producing what is required and this is compounded by delays in delivering the products to the market. Pingali et al. (2019) added that farmers in developing countries are currently operating in a marketing structure that is made up of many intermediaries who enjoy what is supposed to be the producers' share thereby widening the price transmission gap between the producer, the processor, and the consumer. In this regard, Zimbabwe's macadamia nuts producers are not spared. Thus, Zimbabwean producers of macadamia nuts continue to live in poverty and hunger even though they own land. The current situation in macadamia nuts industry could be improved if the affected farmers are directly linked to performing markets with the government providing other requirements such as improving infrastructure and farmers training through upgrading extension services rendered to the farmers. Also, the challenges for macadamia nuts in Zimbabwe seem to be caused by factors like; produce being sold in a raw state, lack of market linkages and market information, as well as little infrastructure development. Thus, the current study sought to examine the determinants of market linkages in the macadamia nuts industry in Zimbabwe.

2.0 THEORETICAL FRAMEWORK

2.1 Theory underpinning the study

The current study was underpinned by the four strategic framework's Market intermediary model. Under this model, the social enterprise provides services to its small producers or cooperatives to ensure they acquire lucrative markets for their products. Again, they can be involved in value addition of clients' produce through product and market development and extension of credit facilities. The market intermediary can buy the client's produce or have an arrangement to sell the produce in high value market for a margin. The method is common in cooperatives, fair trade, agriculture, and handcraft organisation (Virtue ventures, 2020).

2.2 Market linkage

The idea of linkage involves coming up with a coordinated supply and demand between farmers and the market, which may include consumers, agro processors, traders, retailers, and exporters (Bithal & Joshu, 2007). Linkage is defined as a physical connection that comes in between producers and consumers. It also takes into consideration transactions that come in because of selling and buying of goods (Chikazhe et al., 2022). Market linkage is thus concerned with connecting farmers and producers so that they have a direct contact with markets. It involves directly linking aggregators to upstream markets and consumers to the source of production. The whole process upgrades farmers and communities by giving alternatives for them to realize the effect of their buying (Kizito et al., 2018). These linkages are affected through different channel i.e. formal markets that are initiated by the government or informal markets organized by traders. The linkages allow farmers and various markets to share business i.e. markets such as processors, supermarkets, municipal markets, hospitality and international markets (Rockle et al., 2019).

2.3 Infrastructure

Physical and ICT infrastructure are key to market linkages in the agricultural industry and enhancement of economic growth. The infrastructure links the country with important partners who provide markets. It also allows easy flow of goods and resources there by ensuring access to global markets and international cooperation (Bonuedi et al., 2020). Where there are no good roads linking the farming areas to the agricultural markets, traders are discouraged from going to buy the agriculture produce in that area. If there is no ICT infrastructure, information is not readily available, farmers find it difficult to make decisions on their produce and improve in roads in remote areas reduces cost of transporting goods to market (Magesa et al., 2015). Roads networks, their conditions and distance from the market are very important in market linkages. Where there are poor road networks linking farmers to the markets, farmers are disadvantaged and end up enduring high costs of transport, have little access to markets, pricing information between markets and will not enjoy best prices on their produce (Bonuedi et al., 2020). Infrastructure facility gap in agriculture should be addressed to reduce post-harvest losses, high transactional and marketing costs and most importantly intermediaries along

the supply chain and this increase the ultimate benefit due to the farmers. The whole process will force farmers to rely on farm gate prices which are relatively low, further disadvantaging them from having access to competitive markets for their produce and process will negatively affect transformation of farming into real business (National paper PLP, 2020). Farmers also experience difficulties in marketing their produce due to lack of proper harvesting practices, pest management, poor quality packaging materials and infrastructure for grading their produce (Best et al., 2015). Bonuedi et al. (2020) suggested that improve of market is done though improving transport and communication infrastructure and this eventually improves food access and availability in the market all year round. The market linkages challenge can be improved if there is a commitment by the government to invest in roads, irrigation, and power infrastructures.

2.4 Market information

Famers who lack market information usually fail to get value for their produce. Market information is very important in promoting agricultural development among small-scale farmers. If done properly, it allows transparency, competitiveness, and good price transmission between actors along the supply chain. A good market information system minimizes information asymmetries and enhance efficiency in the market (Kusse et al., 2022; Worku et al., 2021). Market information is particularly important in market linkages (Chikazhe & Makanyeza., 2022) because it enable farmers to have a bigger negotiating power from an informed point of view when dealing with buyers. When farmers have information, they analyse the change in prices of their commodities and decide to keep their produce or sell them to the market, which offers the best price (Best et al., 2015). Improving access to markets information allows the farmers to get prices that enable them to get more income from their produce. Access to information is very important in making sure that the farmers are transformed from substance to commercialization through improved margins (Kilelu et al., 2017). This information can be availed to farmers by extension workers who happen to be close to the farmers. Market linkages can be enhanced by improving the relationship between extension workers and farmers. Extension worker are the link between the farmers and the outside world, and they are the once who bring information to the farmers on markets related issues after meeting buyers or getting it from workshops and on social media (Kaumi, 2022). One important method which is now used in line with the Covid 19 recommendations is that of shortening the supply chain by linking the producers of agricultural produce with the consumers through online markets. Online markets enable buyers to get deliveries from producers after making a payment. Again, to get the information about suppliers, buyers make use of online directory. In the macadamia nuts industry, most farmers lack adequate information on macadamia farming practice due to the way in which extension services is rendered to the farmer (Rockle et al., 2019).

2.5 Value addition

Value-addition occurs when a company introduce improvements to a product or service before it is offered to customers. The difference between the price of a product or service and the cost of producing is the value-added to a product. It also takes into considerations

additional features that a company may introduce to a product or service to improve its value to consumers (Barrueto et al., 2018). Value addition also creates improved nutrition status of the product, improved income realized by the producers, opportunity to penetrate markets, increased shelf life and improved food safety (Musara et al., 2019). A firm production, services, processes, or the whole company business can have value through introducing value addition. Creating a sustainable business requires top company management to come up with innovative ways, which create or add value to the company's products/services (Chikwere et al., 2022). Marketing a distinguished product, supplying the product to a niche market, making use of a simple supply chain, providing the service at right time, using marketing mix methods and innovation to lower the costs ensure the firm provide value to its customers (Chikazhe et al., 2021). The greater the value created through value addition, the greater the anticipated return from the marketplace. Value-addition in agriculture looks at production or manufacturing processes, marketing, or additional services that improve the value of primary agricultural commodities, enhancing consumer appeal and willingness to pay a premium over similar but undifferentiated products/service (Musara et al., 2019). A value addition is usually a worthwhile investment because it generates a higher return, allows entry into a new, potentially high-value market, extends the production season, or helps to create brand identity or brand loyalty.

2.6 Model of farming

Market liberalisation brought transformation in agriculture and food markets. Food purchase and distribution to consumers witnessed evolution through introduction of different models of farming i.e. contract farming, producer associations and cooperatives. Introduction of these models was necessitated by high transactional costs, which were hindering most farmers from participating in markets (FAO, 2022). Under grower's associations, the farmers can work together to produce their agriculture produce and are able to penetrate better markets, negotiates for better prices for their produce. Growers' associations are instrumental in linking farmers to the markets and they link the farmers to government, which comes in with additional agricultural support, extension services and training. The commercial attitude is developed, and it becomes the farmers' culture, collective production and participation in competitive markets becomes the target (FAO, 2022; Best et al., 2015). Over time, farmers' organizations tend to create strong relationships with value chain actors such as buyers, inputs suppliers and financial institutions. Department of Agriculture Forestry and Fisheries (2012) claimed that if these producers join hands together, they can be able to produce more, enjoy economies of scale and have a say in their produce on the market. Under cooperatives, farmers produce same crop negotiate prices as a group and this allows them an opportunity to get a good price for their products. They have guaranteed markets with high margin besides access to credit inputs and extension services. Cooperatives also allow farmers to store the produce properly and get involved in value addition, which allows them to get more from their produce through access to markets, neutralize other processors, who may be charging low prices. Economies of scale are enjoyed together with links to domestic and international markets, receiving inputs, infrastructure upgrading and

improved performance (Ferris et al., 2014; Best et al., 2015). Farmer who opts to make use of contract farming are upgraded from growing a low value subsistence crop which fetches less money to high value crop embraced in the markets and generating more income for the farmers (Ton et al., 2018; Toni et al., 2017). ILO (2017) claims that contract farming is considered an alternative route to link farmers to value chains and normally farmer get access to inputs, technical help and guaranteed market thereby minimizing marketing costs, transactional costs, production costs and increasing output.

3.0 RESEARCH HYPOTHESES DEVELOPMENT AND CONCEPTUAL FRAMEWORK

In their study on the impact of infrastructure on the trade of economic growth in selected economies in Asia, Ismail and Mhyideen (2015) concluded that an improve in all transport infrastructure result in increase in trade flows and that ICT infrastructure influence both imports and exports volumes. Again, they observed that quantity of infrastructure is good for economic growth though quality of infrastructure result in high production and efficient output. In another study, Rahman et al. (2021) studied infrastructure and trade on China and selected Asian economies. The results showed that enhancement of physical infrastructure in the transport including components of transport and communication positively influences exports. Portugal-Perez and Wilson (2012) assessed the impact of four indicators related to trade facilitation, physical infrastructure, ICT, border, transport efficiency and business regulatory environment on export performance of developing economies. The major finding was that physical infrastructure had the greatest impact on export markets. Again Ahmad et al. (2011) measured and analysed the effect of ICT infrastructure on market linkages. His conclusion was that use of all ICT related infrastructure like telephones, cell phones, internet had a positive impact on trade of Malaysia with its trade partners. This study intends to examine whether the same conclusions are applicable in macadamia nuts farming in an emerging market like Zimbabwe. So, it can be proposed that:

H₁: Infrastructure development has a positive effect on market linkage in macadamia nuts farming in Zimbabwe.

Galtsa et al. (2022) studied “Maize market chain analysis and the determinants of market participation in the Gamo and Gofa zones of Southern Ethiopia”. The findings were that access to market information has a positive effect on the level of maize market participation. The actual results showed that the market supply for households with market information increased by 2.8% when compared to those that had no market information. Nugusa (2018) on his analysis of maize value chain in Guduru district, Horro Guduru Wollega Zone of Oromia Regional State in Ethiopia concluded that the relationship between market information and participation decisions in the maize market was positive. This study sought to understand the effect of market information in influencing macadamia nuts market linkages in Zimbabwe. Hence it can be hypothesised that:

H₂: Market information positively influences the market linkages in macadamia nuts farming in Zimbabwe.

Aku et al. (2018) researched on the effect of market access provided by farmer’s organizations on smallholder vegetable farmers’ income in Tanzania. He concluded that those farmers who grow their crops under farmer’s organizations easily accessed markets and get higher farm income. The farmer’s organizations also played a crucial role in disseminating market information and search for high value markets and this improve the livelihoods of the farmers through increased incomes and improved nutrition. Galtsa et al. (2022) carried out research on maize market chain and the determinants of market participation in the Gamo and Gofa zones of Southern Ethiopia and one of the conclusions was that extension contact which comes in through different models of farming positively influences the level of market participation of maize by 2.4 times. This research seeks to evaluate whether the model of farming adopted by the farmer has an influence on market linkages in macadamia nuts. Therefore, it can be hypothesised that:

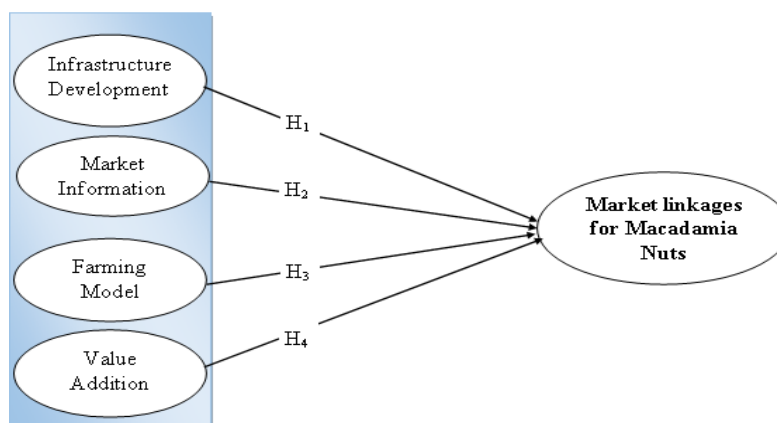
H₃: The model of farming has a positive effect on market linkages in macadamia nuts farming in Zimbabwe.

Israel et al. (2019) studied the value addition benefits of Tamarind, an economically important fruit/spice of India. The study results indicate that value addition process increase the market efficiency of the product. Greenville et al. (2019) investigated the effect of value addition in the agriculture sector and the conclusion was that agricultural value addition generates more business. Asrol et al. (2020) explored profit distribution in the sugarcane agro-industry supply chain while taking value addition into account. According to the study's findings, stakeholders earned their profit share based on their marginal contribution, risk potential, and value-added contribution. Hence the current study sought to understand whether value addition of macadamia nuts can influence market linkages. Accordingly, it can be hypothesised that:

H₄: Value addition has a positive effect on the market linkages of macadamia nuts in Zimbabwe.

Based on the preceding arguments, the following conceptual framework is proposed:

Figure 1: Conceptual framework



Source: Researcher

4.0 METHODOLOGY

Data were collected from macadamia farmers during the period between July and September 2022 with the assistance of Agriculture Extension Services Department in Manicaland Province, Zimbabwe. The Agriculture Extension Services Department provided a list of macadamia farmers within all districts in the Manicaland Province, Zimbabwe from which a sample of 105 macadamia nuts farmers was randomly selected. A survey questionnaire in English language and designed to be able to capture all the details on market linkages in the macadamia nuts industry in Zimbabwe was personally administered to the selected macadamia nuts farmers. The questionnaire had four sections namely, Infrastructure development (INFSD), Market information (MINF), farming model (FMO) and macadamia value addition (MVA) each with specific Likert scale type questions ranging from 1-Strongly disagree to agree 5-Strongly. A pilot test was first conducted before the actual data collection exercise, and this was to improve reliability and validity of the instrument. Accordingly, corrections were affected to improve the instrument. Table I below shows the instrument used in collecting data. Items used in the instrument were borrowed from related studies (Chikazhe et al., 2022; Magrizos et al., 2021; Zuza et al., 2021) and they were modified to be suitable for use in the current study.

Table 1: Instrument for data collection

Infrastructure (INFSD)	INFS 1	Good roads link farm to the market
	INFS 2	Good communication infrastructure available at farm
	INFS 3	I have good macadamia nuts handling infrastructure
	INFS 4	I have good macadamia processing infrastructure
Information (MINF)	INFM 1	I get macadamias marketing information from contractor
	INFM 2	I get macadamias marketing information from farmers organization
	INFM 3	I get macadamias information from extension workers
	INFM 4	I get macadamia nuts information from middlemen
	INFM 5	I get macadamia marketing information on my own
	INFM 6	I get macadamia nuts information from processors
	INFM 7	I get macadamia nuts information from exporters
Model of farming (MOF)	MOF 1	I grow and market macadamia nuts under registered farmer organization
	MOF 2	I grow and market macadamia nuts under contract
	MOF 3	I grow and market macadamia nuts under institutional programme
	MOF 4	I grow and market macadamia nuts to middlemen
	MOF 5	I grow and market macadamia nits to processors
	MOF 6	I grow and export my macadamia nuts
	MOF 7	I grow and market macadamia nuts on my own to buyers
Macadamia Nuts Value Addition (MVA)	MVA 1	I market cracked nuts
	MVA 2	I market cracked further processed into products
	MVA3	Value addition makes marketing easy for me
	MVA 4	Value addition enhances my profit

5.0 RESULTS

5.1 Demographic information of respondents

Table 2: Demographic information of respondents

Characteristic		Frequency	Percent (%)
Age	>30	5	4.8
	30-39	18	17.1
	40-49	16	15.2
	50-59	44	41.9
	+60	22	21.0
Gender	Male	77	73.3
	Female	28	26.7
Marital status	Married	84	80.0
	Unmarried	7	6.7
	Widow	13	12.3
	Divorcee	1	1.0
Education level	Primary	22	21.0
	Secondary	38	36.2
	Certificate/Diploma	35	33.3
	Degree	10	9.5
Affiliation	Registered with macadamia nuts grower organisation	84	80
	Not registered any macadamia nuts grower organisation	21	20

As indicated in the findings in table 2 above, 4.8% of the farmers were below 30 years, 17.1% had age ranging between 30-39 years, 15.2% had age ranging between 40-49 years, 41.9% had age ranging between 50-59 years and 21% were 60 years and above. Out of 105 farmers involved in the study, 73.3% were men and 26.7% were women. The results also showed that 80% of participants were married, 6.7% were single, 12.3% were divorced and 1% were widows. The participants used received different education levels, 9.5% were holders of degree, 33.3% were holders of diploma/certificates, 36.2% were educated up to secondary level and 21% only received primary education. Most of the farmers are registered with macadamia nuts grower's organization (81%) and only 9% are not registered.

5.2 Scale validation

The suitability of data for factor analysis was checked by making use of Kaiser Meyer Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity. Kaiser pronounced that a measurement of 0.5 is the simple minimum for the sample to be adequate. Bartlett's test of Sphericity should be significant at $p < 0.05$ for factor analysis to be performed.

Table 3: Sampling adequacy results

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.801
Bartlett's Test of Sphericity	Approx. Chi-Square	15241.741
	Df	504
	Sig.	.000

Table 3 presents results obtained, KMO = 0.801, and Chi-square = 15241.741, Degrees of freedom [DF] = 504. Thus, the sampling adequacy results are evidence that minimum conditions were satisfied. Heale and Twycross (2015), Pallant (2007), Tabachnick & Fidell, (2007) agreed that when the Kaiser–Meyer–Olkin value for each construct is above 0.6 with a significant Bartlett’s test of Sphericity value there will be evidence that the data were sufficient to proceed for factor analysis. Based on that, it was worthy to continue with validation process.

Table 4: Reliability test results (α)

Construct	Number of Items	Cronbach’s alpha (α)
Infrastructure Development	5	0.901
Market Information	7	0.789
Model of Farming	7	0.921
Value Addition	5	0.742
Market Linkages	4	0.822

Reliability considers the stability of the measuring instrument used in the research and how it constantly produces the same results over time (Surucu & Maslakci, 2020). Similarly, reliability is the degree the outcome produced by the study measuring instrument may be repeated producing the same results on different trials. Surucu and Maslakci (2020) noted that a strong positive correlation between the results of the scale used as the measuring instrument in the study is a good sign that there is reliability. Reliability is very important to the study because it indicates how health the study results are (Chikazhe et al., 2022). To check internal consistency of the measuring scale, reliability analysis was conducted. This was done through calculating Cronbach’s alpha coefficient. The Cronbach’s alpha coefficient of reliability ranges from 0 to 1. Many researchers recommend an alpha coefficient ranging from 0.65- 0.8 or higher than that in many cases Goforth (2015). As indicated in table 4 above, all the constructs have Cronbach’s alpha coefficients which is greater than 0.65. This indicates that the measuring instrument used in the study was very reliable.

5.3 Discriminant Validity

The Extracted Average Variance (AVEs) were used to measure discriminant validity by matching them to Squared Inter-Construct Correlations (SICCs). If the average variance extracted results are greater than the squared inter-construct correlations, discriminant validity is acceptable. The study results satisfied the minimum conditions required for discriminant validity, as they were all larger than their matching Squared Inter-Construct Correlations.

5.4 hypotheses test results

Hypothesis testing or significance testing is a systematic way used by researchers to test a claim (Farrugia et al, 2010). The study had four variables under test namely infrastructure development, market information, model of farming and value addition. The research assessed to check if there was a relationship between each of the four variables and market linkage of macadamia nuts. The four hypothesis relationships represented

(H1, H2, H3 and H4) were tested in AMOS version 21 using structural equation modelling technique. Structural equation modelling technique was chosen because it can determine relationships and suggest a general fit between the observed data and the study's research model (McQuitty & Wolf, 2013). Table 5 below shows the hypotheses test results for H₁ – H₄. The table shows that H₁, H₂, H₃ and H₄ were all supported. Thus, infrastructure development, market information, mode of farming and value addition influence market linkages of macadamia nuts

Table 5: Hypotheses test results

Hypothesis	Hypothesised relationship	SRW	CR	Remark
H ₁	Infrastructure development → market linkage of macadamia nuts	0.294	7.667***	Supported
H ₂	Market information → market linkage of macadamia nuts	0.316	11.210***	Supported
H ₃	Model of farming → market linkage of macadamia nuts	0.251	17.001***	Supported
H ₄	Value addition → market linkage of macadamia nuts	0.348	9.342***	Supported

Notes: SRW standardised regression weight, CR critical ratio, *** significant at p < 0.001

All proposed hypotheses H₁ – H₄ were supported by the standardised regression weights above 0.2 as recommended by Heale and Twycross (2015) and Henseler et al. (2014). In addition, the critical values were satisfactory and significant at p<0.001.

6.0 CONCLUSIONS AND IMPLICATIONS

In developing countries, most farmers who engage in high value crops like macadamia nuts remain trapped in poverty because of lack of proper market linkages. However, due to the high demand of macadamia nuts and the scramble for nuts by buyers in Zimbabwe most researchers have a feeling that the marketing of macadamia nuts and its products are good and are researching on the other different areas. Nobody bothered to critically look at why these farmers who produce macadamia nuts still cannot stand on their own, invest in different projects since macadamia nuts are considered to have a better return than many other crops, which farmers have long deserted. A few researches were conducted in the macadamia nuts industry in Zimbabwe, (Mazurise et al., 2015; Chinzou, 2018) but none of these studies focussed on the market linkage strategies for macadamia nuts in Zimbabwe. This study was designed to zoom in on the conditions under which macadamia nuts are marketed in Zimbabwe and whether the conditions allow the farmers to benefit through market linkages or not. The current study is important in that it reveals real conditions under which the nuts are marketed in Zimbabwe, suggests better ways to improve the macadamia nuts marketing and at the same time it adds information to the existing marketing and management body of knowledge.

6.1 Theoretical implications

Previous researchers have shown that infrastructure development influence market linkages in various sectors of the economy (Ismail and Mhyideen 2015; Rahman et al., 2021; Portugal-Perez and Wilson, 2012 and Ahmad et al., 2011). Thus, the finding by this study is in line with what other researchers have found. Zuza et al (2021) and Jaskiewicz (2015) separately concluded that macadamia nuts value chain requires sophisticated infrastructure and equipment (storage warehouses, drying facilities, good roads networks and good processing factories) to enable it to be a profitable venture.

Other researches were carried out on the relationship between market information and market linkages on different industries. The findings show that market information influences market linkages (Galtsa et al., 2022; Nugusa, 2018). A related study by Murioga (2018) concluded that the flow of information has a ripple effect on macadamia marketing system which affects efficiency. This agrees with the findings from this study.

Different researches were carried out in different countries to assess the effects of mode of farming on market linkages i.e. Glover (1984), Key and Runsten (1999) revealed that contract farming is another way to reduce the challenges of market failure and it includes small and low income farmers into the open market. USITC (1998) findings have shown that in macadamia nuts farming is one of the benefit of farmers growing under cooperative, contracts or growers is that of getting inputs, extension services and guaranteed good market for their nuts. This is supported by the findings by this research which concluded that mode of farming has a bearing on the market linkages.

Earlier studies on value addition in business have indicated that it influences market linkages (Israel et al., 2019; Greenville et al., 2019; Asrol et al., 2020). In the macadamia nuts farming, value addition through processing ensures that farmers get improved income through penetration of competitive markets or exports (KOAN, 2015). This has also been confirmed by findings from this research, which revealed that value addition affects market linkages.

6.2 Practical implications

The outcome of the study is clear evidence that marketing of macadamia nuts should be taken seriously if Zimbabwe wants to improve the benefits to households in line with the government's National Development Strategy Agenda (2021-2025) which targets a middle income for all by 2030 and education 5.0 which requires goods and services to be produced through innovation leading to industrialization. In addition to that, market penetration allows farmers to realise more income and ensures that it meets some of the international organisations' goals i.e. FAO's principles and United Nations Sustainable Developmental Goals (SDGs).

Improved margins realised by the farmers allows them to invest in other farm infrastructure and equipment i.e. installation of irrigation, construction of macadamia handling and processing infrastructure and purchase of machinery for use on the farm. Overall, this improves the farmer profit.

Establishing good transport roads networks and communications allows farmers to have access to information on good management practice which also allows them to produce quality and large volumes of macadamia nuts which improves their income. It also goes a long way in linking the farmers to the markets so that they avoid selling the macadamia nuts at farm gate where they get very low prices which affects their income and growth as early entrepreneurs.

Macadamia nuts are processed by roasting them and adding salt for consumption. They can also be consumed as organic snacks on a small scale. The nuts have also found use as ingredient with its oil used in cosmetics and food industry i.e., butter, confectionery, or sports food. Processing of the nuts into different end products that are consumed by end user is what is called value addition. Value addition allows the farmers to realise better profits. There is little value addition of macadamia nuts in Zimbabwe and because of that, farmers and the country at large are losing a lot for money by exporting nuts in shell. The government should therefore come up with policies that facilitate processing of macadamia nuts within the country. This can be done through introducing national ban on import of unprocessed macadamia nuts or funding firms to invest in establishing processing plants. Individual farmers can also be assisted to established backyard processing plants at their farm so that they market processed nuts to get more money.

6.3 Future research implications

The study evaluated market linkages in the macadamia nuts industry in Zimbabwe Future studies should analyse cost and benefit analysis of macadamia nuts farming in Zimbabwe over a period.

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