A Review of the Macadamia Nut Sector in Zimbabwe

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ABSTRACT

The scope of macadamia nut (*macadamia spp*) as an alternative export crop in Zimbabwe has not been extensively explored. This study is a review of related literature from published and unpublished materials, press documents, websites, informal interviews with key informants along the macadamia value chain to explore the historical and current trends in macadamia nut production in Zimbabwe, policy framework, smallholder farmer' contribution and the constraints that they are facing for informed policy making. Macadamia is an important lucrative crop in Zimbabwe, mainly used for income generation especially among smallholder producers and for the country's export generation. It was established that Macadamia is a fully established crop whose production in Zimbabwe is not yet commensurate to the opportunities that exists in the global market. Smallholder macadamia farmers are constrained by high production costs, weak marketing systems, lack of access to export markets, poor research and development and limited support from government. Zimbabwe exports raw macadamia nut in shells resulting in short supply chain and a disparity which underscores a missed opportunity for higher revenue and value addition within the country. Research recommends targeted training, capitation of extension staff and establishments of a macadamia research station. Government is also recommended to ensure and enabling environment to facilitate private sector investment in macadamia value addition.

Keywords: macadamia nuts; income generation; smallholder farmers; exports, value addition

INTRODUCTION

Zimbabwe's agricultural export performance has been unstable showing a downward trend which has raised concerns among policy makers (Zim Trade, 2022). The contribution of agricultural exports to the Zimbabwean economy which is growing at an average rate of -3 percent, has dropped from 40 percent in the previous decade to less than 20 percent between 2010 and 2022 (Ministry of Agriculture, 2023). Agricultural exports tend to equate a narrow export commodity base comprised of primary products which are uncompetitive and susceptible to world price volatilities and declines in earnings (GoZ, 2019). Major agricultural export commodities in Zimbabwe comprise of traditional cash crops including tobacco, cotton, coffee, tea and non-traditional horticultural fresh produce, blueberries and macadamia (Zim Trade, 2022). Tobacco, with over 70 percent of production output by smallholder farmers, is the country' main export crop contributing over 50 percent to total agricultural exports, 30 percent of total exports and 10 percent of agricultural GDP (TIMB, 2023). However, with the proposed anti-tobacco campaigns, the country needs an alternative to tobacco in terms of foreign currency generation and smallholders require alternative cash crops for their survival.

Cotton, tea and coffee are smallholder's main traditional cash crops grown under out grower contract schemes. Instability on the international market for these crops coupled with the increasing input prices has resulted in the low profitability of growing the crops (Chipere, 2015; ITC, 2023b; Mharidzo et al., 2022). A drop in coffee prices between 2010 and 2019 resulted in coffee yields among smallholder farmers going down by at least four tonnes and household incomes fell to less than a quarter for more than 6000 farmers in

Zimbabwe (Jori, 2019). On the hand, global cotton prices which plunged by over 50 percent in 2015 affected livelihoods of smallholder cotton producers and national cotton production fell from more than 140 000 metric tonnes in 2014 to less than 68 000MT in 2019 (Chipere, 2015; MLAFWRD, 2019). Hence, the decline in Zimbabwe's agricultural export earnings and smallholder farmers' incomes proposes the country to consider export and crop diversification strategies as immediate remedy. Macadamia nuts has been identified in Zimbabwe as priority crop to diversify farmers' incomes and the country's exports. This is because the crop is considered a lucrative crop among smallholder producers who are substituting it for tea and coffee in the growing regions and sell it to export markets for the country's foreign currency generation (Mharidzo et al., 2022).

The Scope of Macadamia Nuts

Macadamia nuts or macadamias *(Macadamia spp)* are the species of the evergreen wood tree that belongs to P*rotacease* family and is classified as a nut tree with about ten species spread and grown around the world. Only three species are of commercial importance namely *M. integrifolia, M. ternifolia* and *M. tetraphylla* (McConachie, 2012). The nuts are native to Australia, but are also commercially grown and processed in more than fifteen countries including South Africa, Kenya, the United State (Hawaii), China, Malawi and Zimbabwe (Zuza et al., 2021). Once planted, macadamia trees need 3-5 years before bearing fruit. However, their yield increases with tree and it takes up to 10 years to reach full maturity. Thus depending on growing regions and management practices, trees less than 5 years can yield around 5 kg of nuts per tree per year, and older trees over 5 years have been reported to yield over 20 kg of nuts per year (Austaralian Macadamia Society, 2004; McConachie, 2012).

In Zimbabwe, macadamias are mainly grown in the Eastern Highlands districts of the country where there is a very good climatic match for the crop and does very well under rain fed conditions (Mharidzo et al., 2022). Macadamia supports livelihoods of more than 80 percent of smallholder farmers in the growing regions together with either tea or coffee (AMA, 2023). Macadamias are included in the horticulture sub sector and are the leading horticultural export crop accounting for 30 percent of the horticultural exports which in turn contributes about 6.5 per cent to total agricultural output and accounts for 4.5 percent of total agricultural export earnings (ZimTrade, 2022) (ZimTrade, 2019).

Macadamia has great potential for export growth and poverty reduction due to their health benefits and increased demand of its high value products (The Global Economy, 2020). Although macadamia production has increased in the recent years, global supply has failed to meet the demands for the crop (Zuza et al., 2021). In 2021, the global macadamia production reached over 369 491 MT compared to 227 000 MT in 2020 (SAMAC, 2023). However, global consumption of macadamia nuts has increased in volume by 24 percent per year between 2012 and 2022 and is expected to witness market growth of 8,2 percent compound annual growth rate (CAGR) from 2023 to reach USD 3.57 billion by 2030 (INC, 2023). Global demand majorly coming from high income countries has been driven by macadamia's wider application and use in the food, cosmetics and personal care industries (SAMAC, 2023). Nearly 82 percent of the world imported macadamia come from developing countries with Sub-Saharan African region constituting 40 percent to this share (SAMAC, 2023).

In 2019, Zimbabwe was recorded the sixth top exporter of macadamia nuts globally, accounting for 4 percent of global market share, with the potential to become one of the top three leading exporters in the next decade (ITC, 2023a). Regionally, macadamia farming has a positive and significant reflection on economic growth and Gross Domestic Product (GDP) for other developing producer countries in the region. In South Africa, macadamia increased the level of export performance by 2.1 percent from 2010 to 2018(SAMAC, 2023). Macadamia contributed 38 percent of overall nut value produced in Kenya and generated US$7.4 billion export revenue in 2019, which is 5 percent of total value of the agricultural sector (Quiroz et al., 2019). In Sub-Saharan Africa, macadamia supports the lives of several thousand people who

are either smallholder or large-scale macadamia farmers (Bandason et al., 2022a; Maina et al., 2020; Murioga, n.d.; Zuza et al., 2021).

Despite the potential that exists in the macadamia global market, production in Zimbabwe remains incommensurate to the opportunities that exists. Hectarage under macadamia has almost doubled between 2013 and 2023, however production has only increased by 13 percent (MLAFWRD, 2023). Recent reports from AMA in 2023 have shown that Zimbabwe has the capacity to further double its present hectarage in two years and most of this expansion is coming from smallholder farmers. However, it remains questionable if continued expansion in the macadamia nut orchards will translate into increased production and productivity which the country has not fulfilled in the past decade. The main challenge is that the value chain is not well understood and the constraints facing smallholder production and expansion are not clear. Most studies have concentrated on staple food crops and traditional cash crop value chains. This study compliments to studies done by *Mharidzo et al 2022* and *Bandason et al, 2021* on the insight of the macadamia subsector in Zimbabwe and therefore focuses on the review of the macadamia nut value chain in Zimbabwe, particularly looking at the production trends, value chain structure, regulation and agricultural policy analysis on macadamia production and export; and the constraints facing smallholder farmers in macadamia production, marketing and provide possible recommendations to improve the sector.

Importance of Agriculture Sector in Zimbabwe

Zimbabwe is a landlocked country, situated in Southern Africa with a total area of 39,075 million hectares. About 33.3 million hectares are used for agricultural purposes (World Bank, 2020). The country has a total population of 15.2 million with an urban population of 32.2 percent and rural population of 67.8 percent (ZimStat, 2023). Agriculture is the backbone of Zimbabwe's economy which contributes 17 percent to total gross domestic product (GDP) and supplies 60 percent of the raw materials required by the industrial sector (ZIMVAC, 2022). Zimbabwean agricultural sector comprises of two subsectors; the large-scale commercial and small-scale or smallholder farming sectors. Small-scale producers account for 70 percent of staple food production, 60 percent of cash crops and contributes over 20 percent to the entire country's GDP (Ministry of Agriculture, 2023). Over 70 percent of Zimbabwe's rural population are engaged in smallholder farming and derive their livelihood from agriculture and other related rural economic activities (Runganga & Mhaka, 2021). The agricultural sector also creates a surplus for export which accounts for 22 percent of Zimbabwe's foreign exchange earnings, making it the second economic sector after mining, contributing to the country's involvement in international trade (Gwanongodza, 2020).

Agricultural Export Diversification

Export diversification, by definition, refers to changing the country's export basket composition (Ali et al., 1991). Export diversification encompasses two perspectives, horizontal and vertical diversification; horizontal export diversification involves expansion in the export basket in order to counter vulnerability to quantity and international price fluctuations and vertical diversification involves creating additional uses for existing system of high-value crops and new commodities through value-added activities such as processing, marketing and export for income generation (Alemu & Azadi, 2018; Ali et al., 1991).

Diversification particularly into non-traditional agricultural exports is being tried in many Sub-Saharan African countries in commodities such as flowers, fruits vegetables and spices. Indeed, Government of Zimbabwe prioritises expansion in production and export diversification in the agricultural sector as demonstrated in the key policy frameworks including the National Agricultural Policy Framework (2018-2030) (NAPF) and the National Export Strategy (NES) (2019-2024) (Ministry of Agriculture, 2018) (GoZ, 2019). Zimbabwe' s National Development Strategy 1 (NDS1) (2021-2025) has as one of its objectives to support the promotion of crops for export through moving up value chain and structural transformation (GoZ, 2020). This is to be achieved through expansion and value addition of new, emerging and

domestication of existing value chains that have the potential for export growth and poverty reduction. Priority on existing value chains include leather, soya bean, dairy, cotton, leather and sugar cane. Macadamia nuts have been identified under new and emerging value chains in the horticultural sector (GoZ, 2020).

Several studies have shown that horticultural crops have high market potential and they have capacity to contribute substantially to household incomes among smallholder farmers and export earnings (Coulter et al., 2000; Mashapa et al., 2014; Romero Granja & Wollni, 2018; Van den Broeck & Maertens, 2016). However, failure to understand constraints in the value chains may also represent business risks among smallholder farmers due to increased competition, restrictions and quality attributes in the markets (Asian Development Bank (ADB), 2021). This may lead to social and regional disparities of economic growth and the risk of marginalizing the poor. In such a context, it is important for policy makers to have as much information as possible to determine priorities, both in terms of action for the macadamia sector under review and for the sector's relevance to the national export strategy, employment generation and overall growth of the economy.

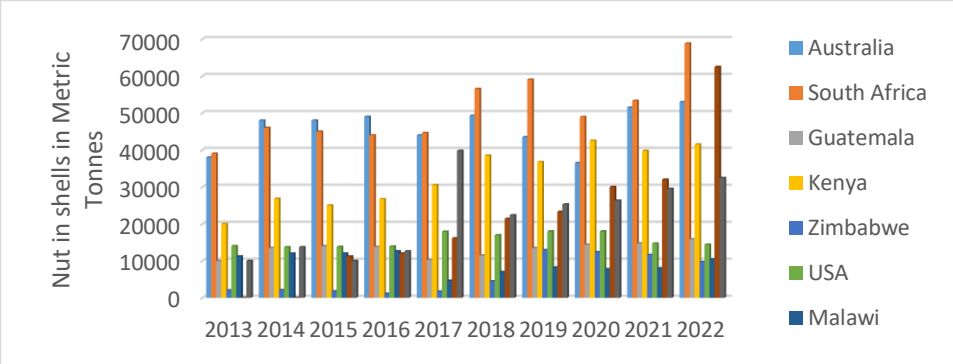
METHODOLOGY

This study used both primary and secondary data sources. Primary data were captured through informal interviews with players and influencers in the macadamia value chain including policy makers, farmer representatives, research and extension service providers. A review of secondary data sources was done through search engines like Google Scholar. Secondary data sources included mainly published journal articles, trade map data, theses, websites, government reports and policy documents.

Macadamia Production and Consumption: The World Scenario

Over 40 developed and less developed countries have millions of hectares under macadamia nuts orchards (Bandason et al., 2021). The world's largest macadamia nut producers are South Africa, China and Australia contributing 28, 21 and 20 percent to total global production respectively, Figure 1. Rising global output and improved marketing have seen macadamias becoming a more popular nut accounting for 1,6 percent global nut sales by volume from less than 1 percent in the previous decade (INC, 2023). Increased global demand for macadamia nuts has seen producer countries increasing production with estimated production of 298,914 metric tons in 2022, up by 19 percent from the previous season and a 114 percent increase since 2011(INC, 2023). Worldwide, the top three consumers of macadamia nuts on kennel basis are China, USA and Australia (Figure 2). In terms of trade, SA and Australia are the top two exporters of macadamia nut in shells, constituting about 31 and 28 percent of the global market share respectively, Figure 3.

Figure 1: World Macadamia Production 2013-2022



Source: INC, 2023; SAMAC, 2023

Figure 2: Major World Macadamia Consuming Countries on kennel basis (INC,2023)

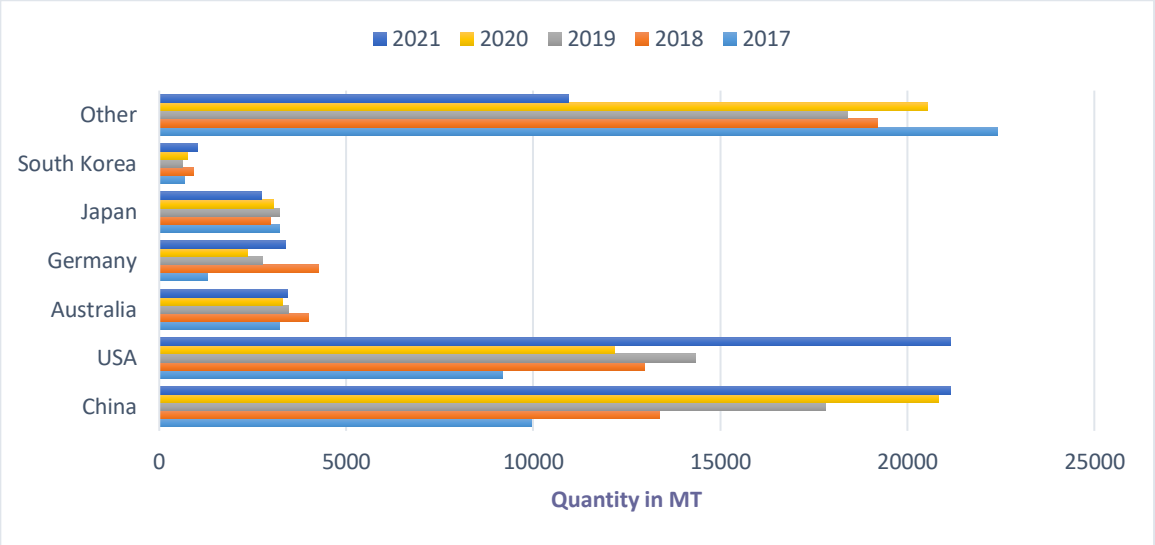


Figure 3: Macadamia World Imports, 2021

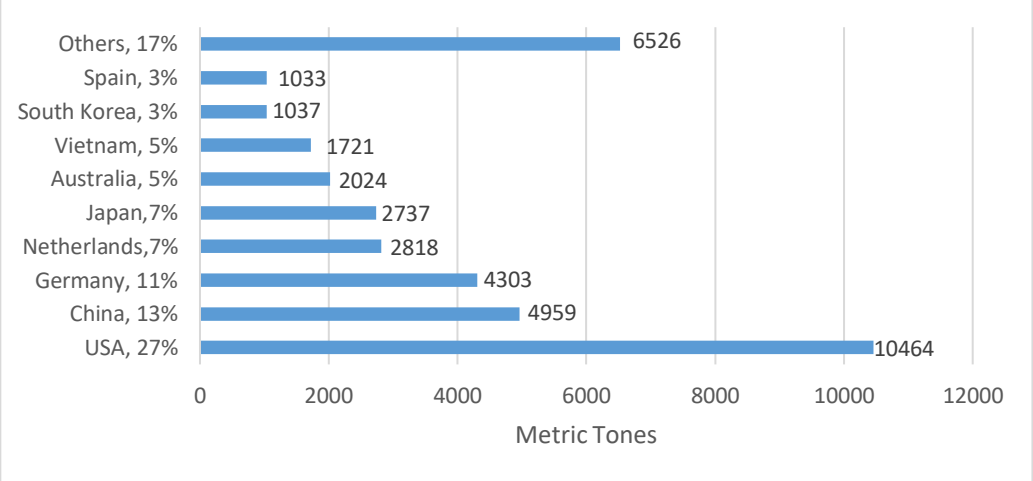
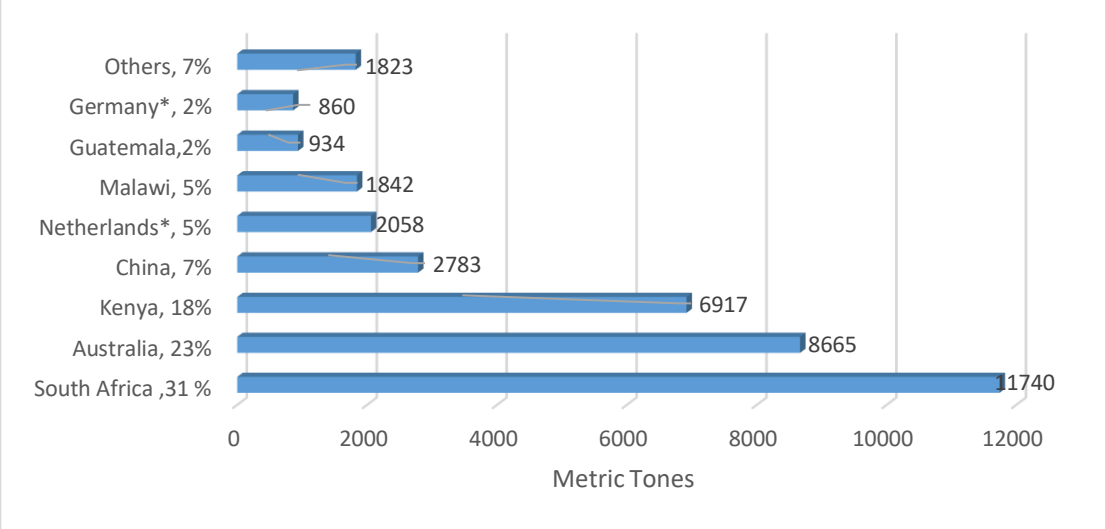


Figure 4: Macadamia World Exports, 2021



Despite being a significant producer, China is the world top importer of macadamia nut in shells macadamias, with a 63 percent global market share. Together with the United States, China imports more than 60 percent of the global macadamia kennels annually, with consumption ranges between 8,800 to 9,800 metric tons, Figure 3. In 2019, Zimbabwe exported US$ 7 million worth of macadamia nuts constituting 4% of the global market share, with the potential to become one of the top three leading exporters in the next decade (ZimTrade, 2022).

Macadamia nuts and its introduction to Zimbabwe

There is limited evidence on the first macadamia nut plantings in Zimbabwe. However, (Mharidzo et al., 2022) asserts that macadamia nuts were first introduced in Zimbabwe in 1965 when large-scale commercial farmers (LSCF) in Southdown estates of Chipinge District in Manicaland Province imported seedlings from Australia and California for family consumption and sale. In the late 1960s farmers started to graft their own seedling nurseries. LSCF at Wolfscrag, Wedgehill, and Clearwater Estates later joined macadamia cultivation and formed an association called Macadamia Nut Association which was composed of six members. The main roles of the association were to share information on production and marketing of macadamia nuts. Later a macadamia processing factory called PECMAC was opened with Ted Tong as the founder. PECMAC operated as an out grower scheme, supplying its famers with seed and farmers would deliver the produce to the factory at a pre-agreed price per (Mharidzo et al., 2022).

The common varieties were 791, 508 and 788. However, yields were too low due to limited research on suitable varieties and production methods, which depended mainly from Malawi and South Africa. Around 1973, improved varieties, namely, 344, 800, 741 and 791 from Huawei were realised and are still surviving at Ariston's Clear Water Estates (Mharidzo et al., 2022) (Ariston, 2020). A decade later, Ariston estates introduced the two new macadamia varieties, M. Integrifolia and M. Beaumont from South Africa and Hawaii under the following traits, 816, 814, 800,508, 660, 333 and 749 (Ariston, 2020). Macadamia covered only small area averaging 0.5 hectares per famer. The macadamias were intercropped with tea and coffee or planted on poor land unsuitable for coffee and tea. Harvesting was done by hand and lasted for ten months from November to August. Annual production ranged between 400 to 500 metric tonnes. The processed nuts were exported through South African Macadamia Association to Canada, Europe and Australia without following official export channels.

Adoption of macadamia production by smallholder farmers and other existing large-scale commercial estates like Makandi, Tanganda and Ariston started in the late 90s. Macadamia production intensified in 2000 as farmers abandoned coffee farming due to fall in global prices for tea and coffee. This was also firmed by increase in world macadamia prices in 1999. Commercial estates provided smallholder farmers located close to Wolfscrag, Wedgehill, and Southdown Estates with macadamia seedlings from one or two trees per household, for use as boundary crops. Community responsibilities by corporations like Tanganda complimented smallholder farmers in areas like Chidamunya, Mt Selinda and Dimire.

The Land Reform Program and Emergency of Smallholder Farmers into Macadamia Production

The Government of Zimbabwe embarked on a Fast Track Land Reform Program (FTLRP) in 2000 to redress the dual, unequal and racially biased land tenure system (Moyo, 2004). Prior to this, the agricultural sector comprised of two farming sectors comprising of a few white commercial farmers occupying 67 percent of agricultural land and 1.1 million smallholder households on 27 percent of agricultural land (Moyo, 2011a). After the land reform, large scale farms remained with only 4 percent of agricultural land against 79 percent which was allocated to smallholder farmers. In addition, new models of farms were

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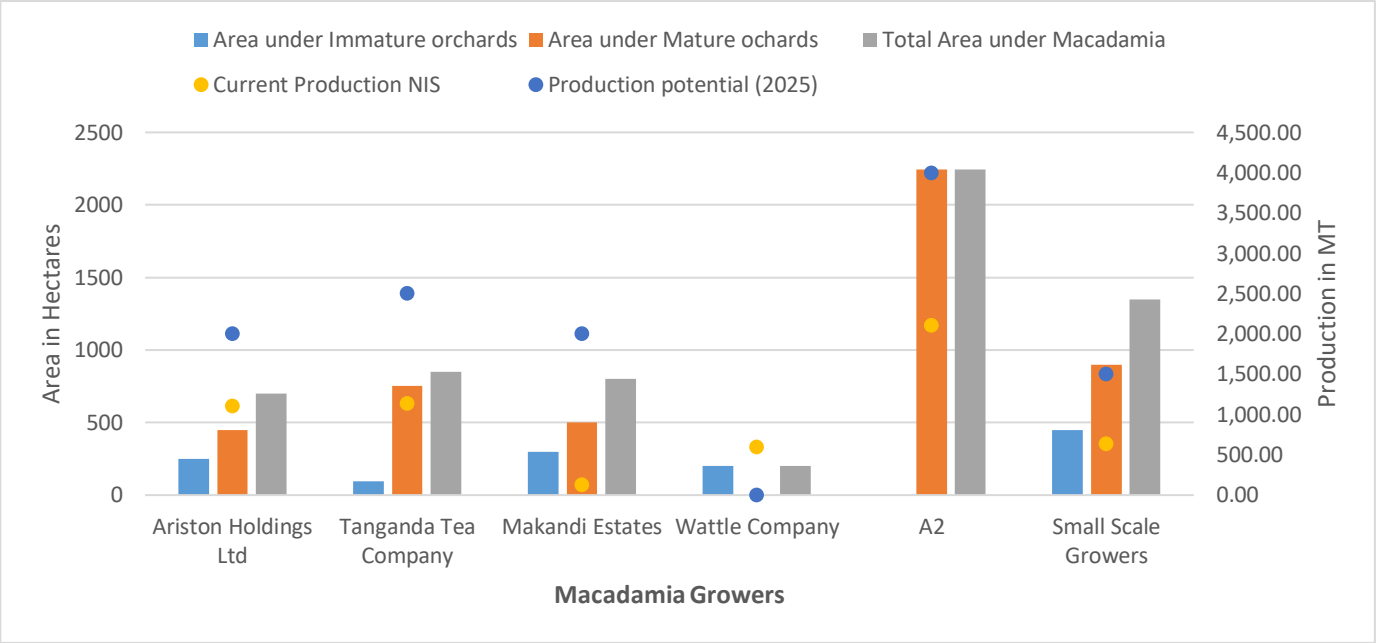
generated in the form of A1, smallholder farming units and A2 farms being the large commercial farms. The A1 model farms are smaller plots with land area less than 10 hectares whilst A2 farms are larger with area above 10 hectares (Moyo, 2011a). More than 90 percent of A2 farmers were allocated land with already planted and ready to harvest macadamia plantations for example those who occupied Wedgehill and Southdown Estates of Chipinge District (Zamchiya, 2013). A1 famers started to grow their own macadamia plantations adjacent to these farms (Zamchiya, 2011). Later, macadamia production among smallholder farmers expanded to other parts of Chipinge before they expanded to other parts of Manicaland Province including Chimanimani and Honde Valley Districts (Moyo, 2011b; Zamchiya, 2011). Despite having enough land for production, and more than 1000 hectares put under macadamia, annual macadamia production stagnated below 1000MT between 2003 and 2010 due to some of the following challenges; firstly, the newly resettled farmers lacked skills and technical expertise on macadamia production and other cash crops like tobacco which were previously dominated by white LSCF. Secondly, the controversy which came along with the land reform violated the land tenure rights and rendered foreign markets, particularly the EU, inaccessible. Thirdly, uncertainties surrounding land tenure among the few remaining white commercial farmers discouraged further investments in macadamia production. Lastly, government failed to offer adequate and effective financial and production support due to wide and competing fiscal obligations given that the economy was in recession (Cliffe et al., 2011; Moyo, 2011c; SNV, 2010).

Current Macadamia production in Zimbabwe

Zimbabwe has fully established macadamia plantations particularly in Chipinge, Chimanaimani and Mutasa districts of Manicaland province which lies in the natural farming region (NFR) 1. Chipinge district is the capital of macadamia production. The region has a cool and temperate climate which is ideal for macadamia cultivation. New plantations are emerging in Wedza and Marondera in Mashonaland East Province which lie in NRF 2. The crop can also be grown in other parts of natural farming region 3. Almost 95 percent of macadamias are under dry land farming leaving only 5 percent under irrigation (Mharidzo et al., 2022). The varieties mostly grown in Zimbabwe are Beaumont and Intergrifolia (AMA, 2023). The industry which has been set up and is still dominated by the commercial estate sector has strong growth potential for smallholder farmers. Currently there are more than 1000 smallholder macadamia farmers' in Zimbabwe, constituting more than 80 percent of all macadamia farmers (AMA, 2023). Smallholder farmers have grown their hectare from less than 100 ha in 2010 to 1300 ha in 2022. Approximately, 5000 ha of the macadamia land is under commercial estate management (Figure 5). There are 3 major commercial estate producers located in Chipinge district who also facilitate in the processing and marketing of the nuts. The largest commercial producer is Tanganda with an average area of 752.04 hactares and an estimated production of 1137 MT of nut in shells, followed by Ariston with 450 hactares under macadamia and an average production of 1106 MT (Figure 5). Rotterdon Trading and Wattle Company in Chipinge, Eastern Highlands in Hauna, and Ruthmore in Chimanimani are emerging commercial estate producers with new plantations covering an average of 200ha each (AMA, 2023).

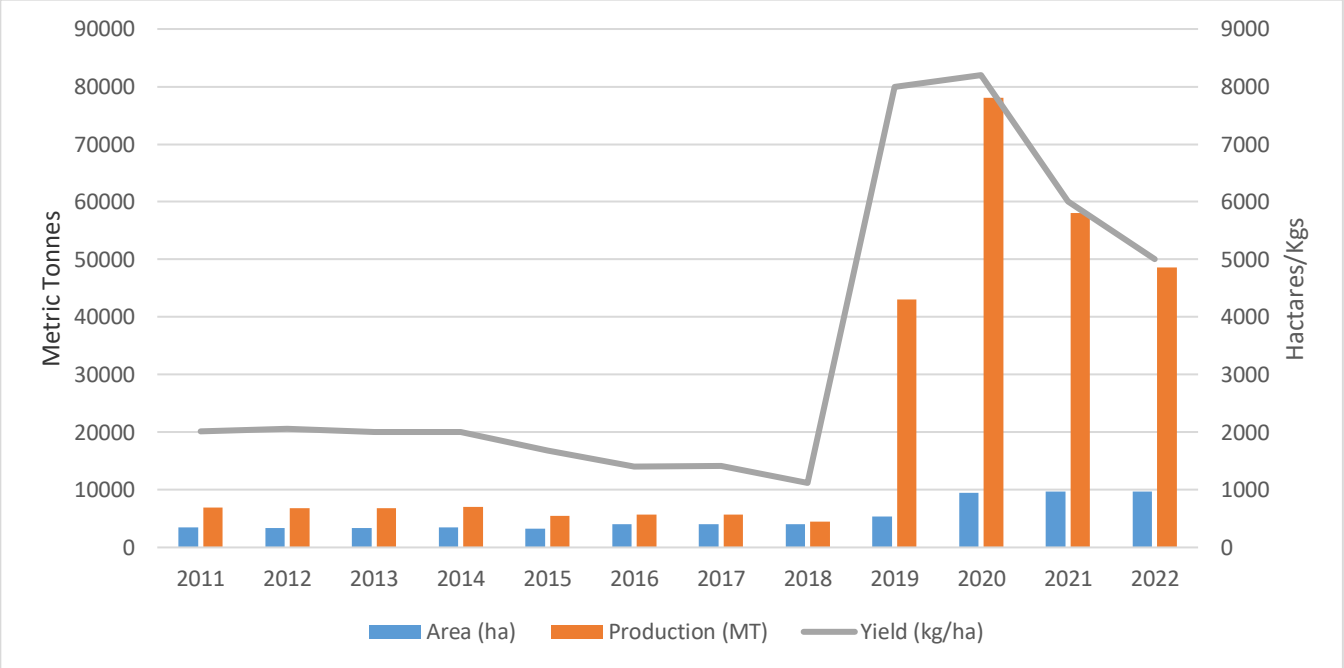
Figure 6 shows that the total hectare under macadamia has been constantly increasing from 3450 ha in 2011 to 5383 ha in 2019. In the 2022 season, the cultivation area increased by 0.9 percent from the previous season, reaching 9,804 hectares. Hectare is expected to double by 2030 due to government involvement in the value chain and increase in popularity of the crop among small-scale producers in Chimanimani, Mutasa, Honde Valley, Marondera and Wedza Districts. In 2022 total production was estimated at 49 020MT, which has increased by 0.9 since 2011, figure 6. Up to 2022, the yield of macadamia averaged 7000kgs/ha, although the country has potential to produce around 8-12t per ha if best management practice is put on the orchard (MLAFWRD, 2023; ZimTrade, 2023). Macadamias contributed to 69 per cent of all Zimbabwe's horticultural crop production in 2020 (MLAFWRD, 2020). With more farmers expected to adopt the growing of the crop since it has proven to be a lucrative crop on the international market, macadamia can offer sustainability as well as welfare to livelihoods of farmers (Mharidzo et al., 2022).

Figure 5: Production Statistics for Macadamia, 2022



Source: AMA, 2023

Figure 6: Macadamia production, area and yield in Zimbabwe (2011-2022)



Source: Crop and Livestock Assessment Reports, MLAFWR; 2011-2023

MACADAMIA MARKETING

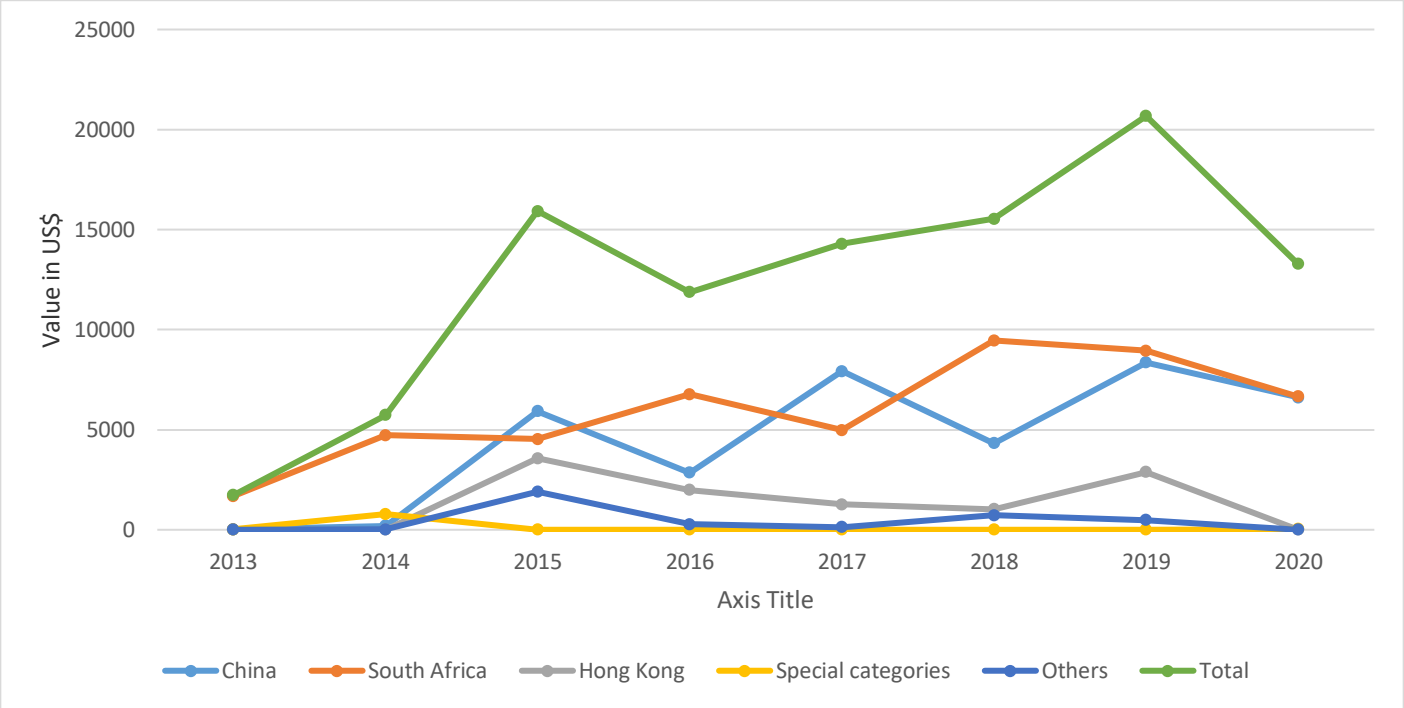
Currently, Zimbabwe has thirteen registered merchants, processors or marketers. Marketing starts in June and end in September. Predominant processors and marketers include Chinese, Indian and Nigerian owned Parrogate, Premium Nut and Dexing companies respectively. The firms focus mainly on processing and

marketing of the macadamia crop from both commercial and smallholder farmers, while companies like Tanganda, and Cropate Farming Limited grow their own crop but also buy from small-scale producers. The merchants buy green macadamia nuts at farm gate prices ranging between US$1 – US$2 and export them as dried macadamia nut in shells to South Africa and Asia. Farm gate prices for macadamia nuts are dependent on the demand and supply on the world market and Zimbabwe is much of a price taker. Smallholder farmers have no direct access to export markets and hence are compelled to sell nuts directly to registered merchants or commercial estates (AMA, 2022). The arrangements and payment procedures vary from spot markets to informal contracts. According to AMA, 2022, the firms are expected to explore upgrading possibilities, knowledge transfer, integration and coordinating a coherent market information system within the value chain. However, the overall governance which influences the value chain is determined by processors and marketers. There is lack of coordination along the value chain and there is no transparency in the valuation of prices with farmers blaming merchants for reaping off their profits. Reports from Macadamia Association of Zimbabwe (MAZ) noted that Covid 19 induced lockdowns further gave merchants an opportunity to collude to control the price of nuts which resulted in a fall in price from US$3,80 in 2019 to an average of US$0.80 between 2020 and 2023. The underdeveloped marketing system has deterred the potential of macadamia nuts to produce foreign currency for the country (Mharidzo et al, 2021).

Macadamia Exports from Zimbabwe

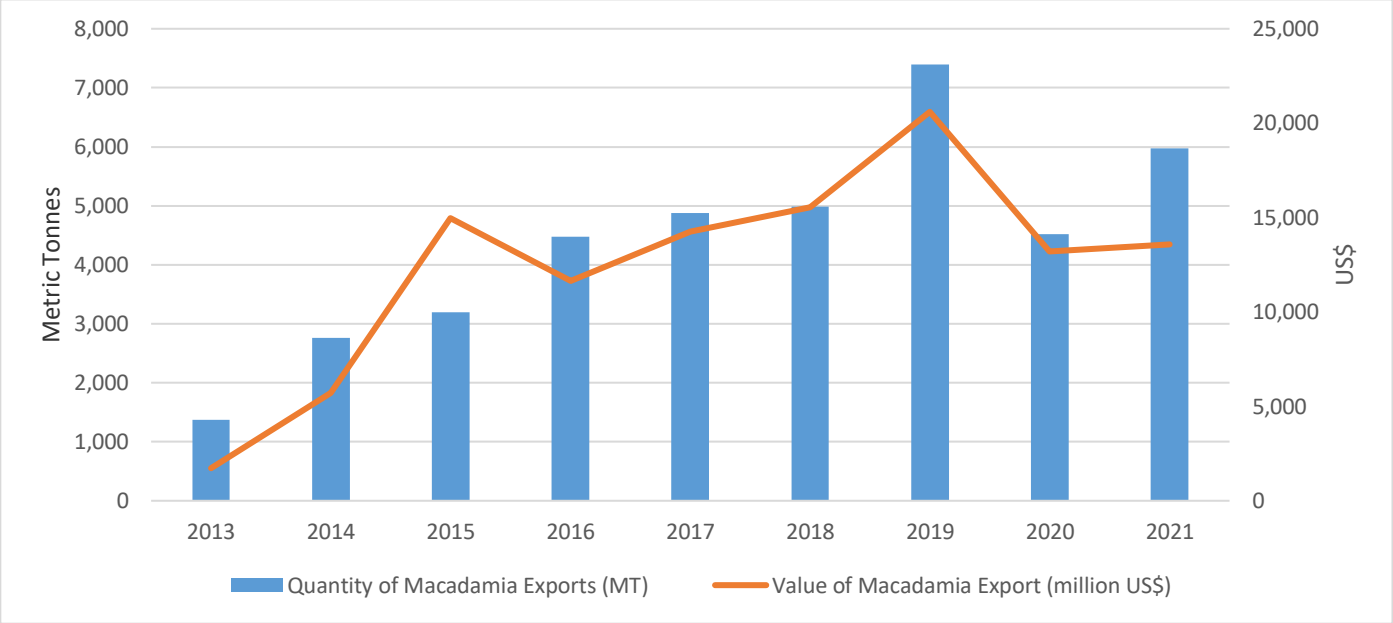
Zimbabwe's macadamia nuts industry is export driven, with more than 95 percent of annual production being destined for export to international markets (Zim Trade, 2019). Almost 99 percent of the macadamias are exported as in shell nuts without complex value addition. According to Zim Trade (2023) macadamia is the leading horticultural export crop earner in Zimbabwe with an annual export revenue of around US$15,2 million, figure 7. The major export destinations for Zimbabwean macadamia are China, South Africa and Hong Kong with China leading export share value of US$ 5.18m, figure 8. In 2019, Zimbabwe was ranked amongst the top five exporters of macadamia nuts in shell in the world worth about USD $7, 2 million accounting for 6.2 percent of the global value of $317 million on average (Figure 9).

Figure 8: Value of Zimbabwe's Macadamia Nut Exports by destination



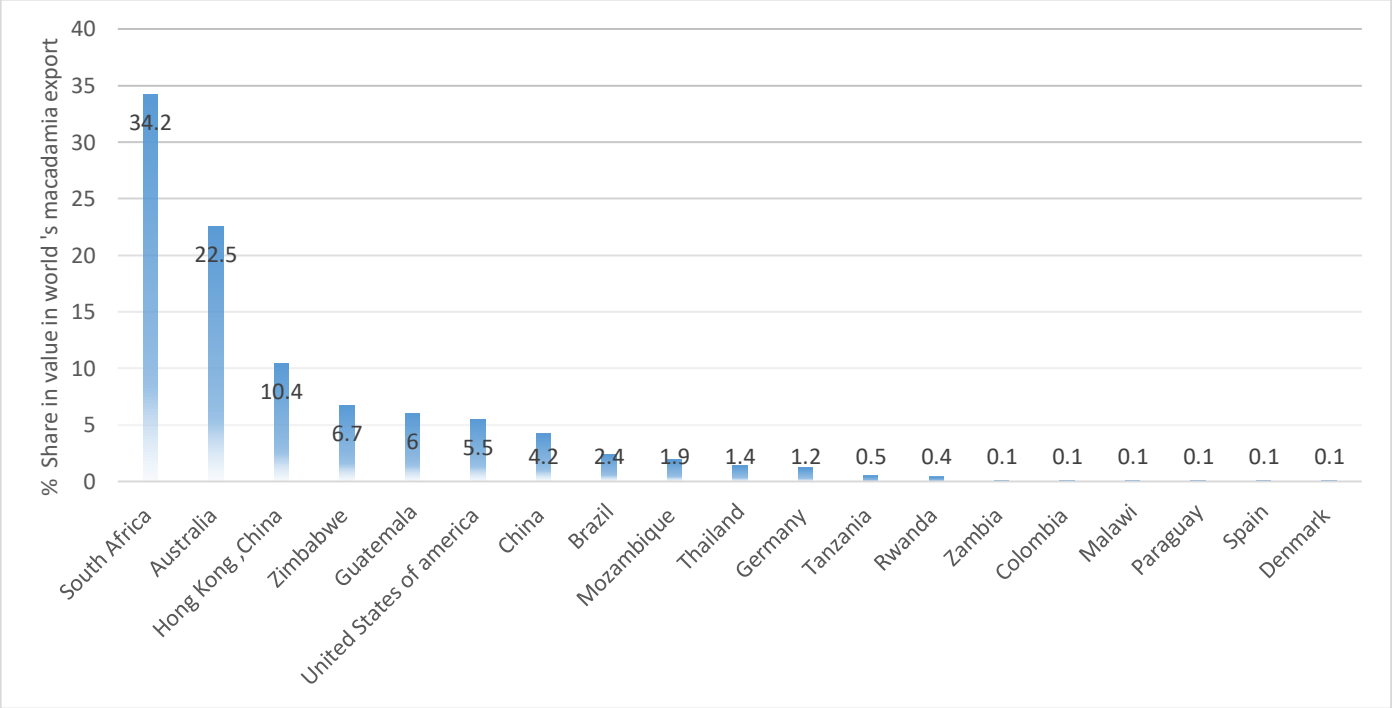
Source: Trade map, 2022; Zim trade, 2019

Figure 9: Quantity and Value of Zimbabwe' Macadamia Exports (2013-2022)



Source: (Zim trade, 2019; Trade map, 2022)

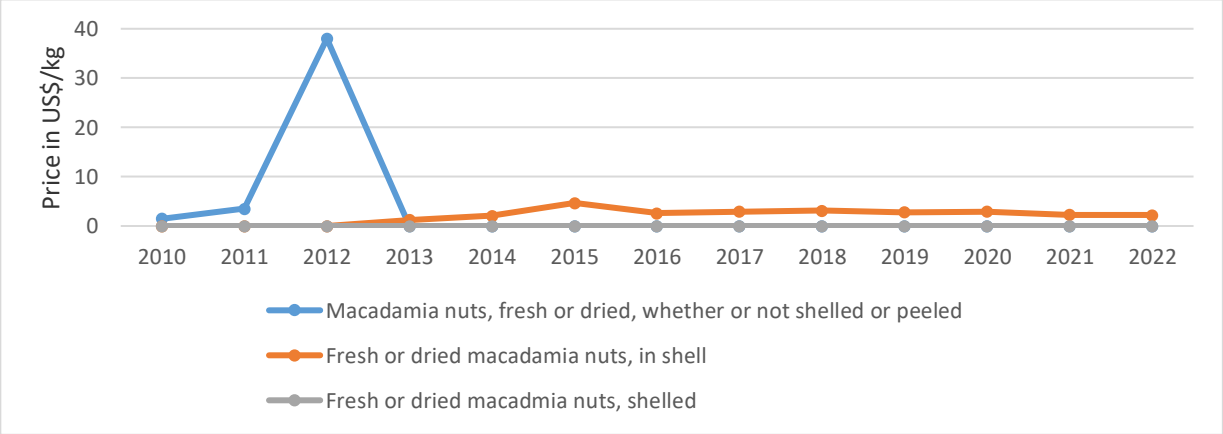
Figure 10: Share in Value in World's Macadamia Export, % in 2019



Source: Trade Map, 2020

The export price per kilogram of macadamia nuts from Zimbabwe has seen a steady increase over the period 2016 to 2020 Figure. Covid-19 induced lock down and a shift in global macadamia market from traditional nut in shell to kennels depressed the prices between 2020 and 2022. Indications from trend analysis carried out by Wamucii in 2022 predicted a falling price of macadamia nuts from Zimbabwe to US$2.01 per kg by 2026.

Figure 11: Average prices trends of Macadamia nuts exports from Zimbabwe



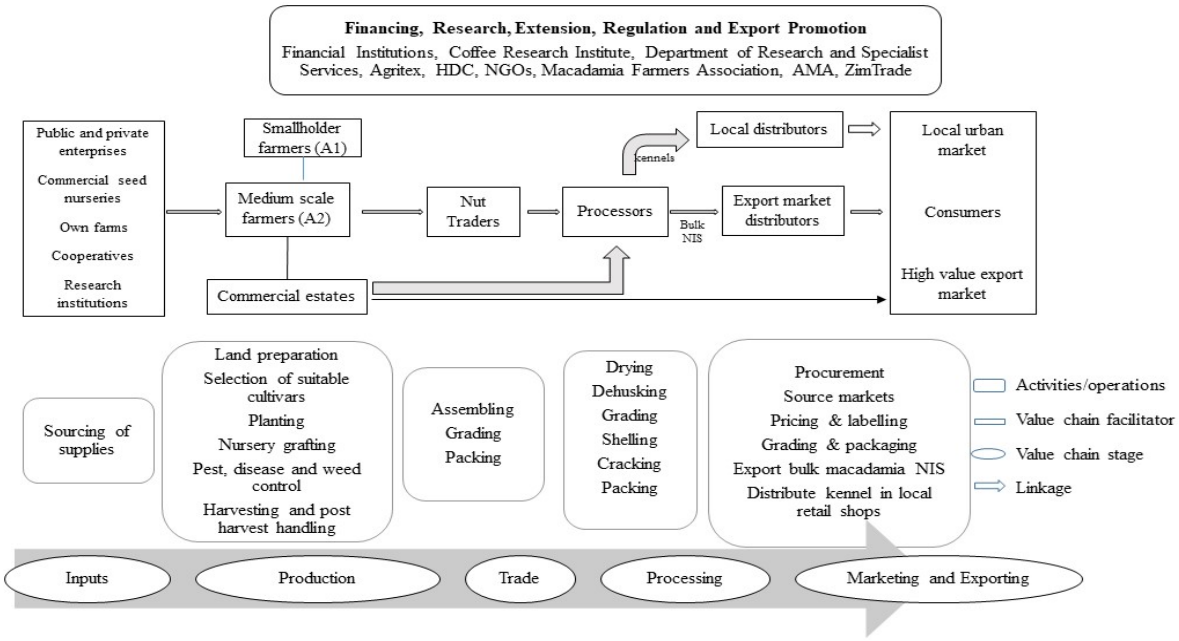
Source: Wamcii; 2022 and Zim Stat, 2022

It is important for Zimbabwe to prioritise value addition of macadamia in order to export finished product. Currently the nut in shells are exported at rate of US$2.65 per kilogram a stark contrast to US$4,80 per kilogram for processed nuts. The disparity underscores a missed opportunity for higher revenue and value addition within the country.

The macadamia supply chain in Zimbabwe

The Zimbabwean macadamia value chain comprises of input providers (cooperatives and private companies), producers (commercial estates, A2 medium farmers, small scale commercial and smallholder farmers), aggregators (merchants or buyers), processors and supporting organizations. Supporting organizations in the Zimbabwe's macadamia value chain are Agricultural Marketing Authority, ZimTrade, Macadamia Association of Zimbabwe (MAZ), Horticultural Development Council (HDC) and Ministry of Agriculture through its several departments that are involved in research, training, extension and regulation etc. Other stakeholders supporting the macadamia value chain are Coffee Research Institute, Universities and Non-Governmental Organizations (NGOs). Figure 12 below shows the visual map of the Zimbabwean macadamia nut value chain.

Figure 12: Macadamia supply chain in Zimbabwe



Input suppliers

Major inputs used in the production of macadamia include seed, fertilizers, chemicals and machinery. Major suppliers of macadamia seed are commercial seed nurseries for example Ariston Holdings, Makandi Estates and Tanganda, the Coffee Research Institute, farmers' cooperatives, seed bank cooperatives and own production at farms. Farmers procure their fertilizers, chemicals and machinery from private companies. Farmers also import seed, fertiliser and chemicals from South Africa.

Producers

Macadamia nut producers include commercial estates (Tanganda, Makandi, Ariston, Burma Valley and Eastern Highlands), small scale commercial farmers, medium to large scale A2 farmers, A1 and communal smallholder producers (AMA, 2023). Production is dominated by commercial estates which accounts account for over 80 percent of the total production. Small scale producers with average land holdings of 3-6 hectares represent 10 percent of the total production. Smallholder farmers on average grow macadamia on 0.5-1.5 hectares and the remaining area is devoted to food crops. A2 farmers with landholdings of between 15-120 hectares and commercial estates have most of their land shared among macadamia, coffee, bananas, gumtree and avocado. Individual growers sell their macadamia to buyers/merchants who either process or export the nuts in shell**.** To facilitate access to farm inputs, merchants for example Cropate and Parrogate, provides input loans such as chemicals, seedlings and fertilizer to growers which is repaid at the end of each marketing harvest season. Growers source their seedlings from cooperatives and estate nurseries. However, most farmers are grafting their own seedlings and excess is sold to other farmers.

Macadamia Nuts Association of Zimbabwe

The Macadamia Association of Zimbabwe is responsible for representing Zimbabwe nut growers nationally and acts as the bridge between macadamia processors and producers. The Association was formed in 2010. It is recognised in the Agricultural Marketing Authority Statutory Instrument 138 of 2019, which governs/regulates the production and sale of macadamia. Any macadamia farmer who wishes to join the Association applies to join the membership. Members of the Association pay a yearly subscription fee of US$20. The duties of the association are to; i) capacitate macadamia farmers through training workshops, for example, fertilizer application and chemical application, ii) securing contracts farming to macadamia farmers iii) securitising macadamia crop, working hand in hand with members from police force iv) source new buyers and (v) negotiate price of the macadamia nuts with the buyers. However, reports by farmers reviewed that the association is weak often failing to fulfil its duties. Small holder farmers are not well represented and the association is blamed for being more biased towards the medium scale, A2 farmers. Strong producer group associations are a pre-condition for accessing inputs (in particular, credit), making use of economies of scale and better defending the interests of the sector at political level. Hence, subscriptions and representation of smallholder farmers is key for organised marketing, efficiency and quality.

Buyers/Merchants

Macadamia nut merchants or middlemen as often referred to by farmers are registered buyers of macadamia nuts. During the 2022/2023 macadamia nut buying season, there were eight registered buyers/merchants who increased from four (4) that were registered in 2021/2022 who were buying directly from the farmers (AMA, 2023). The buyers include foreign owned companies (Chinese, Indian and Nigerian). The buyers are located in Chipinge, Chimanimani and Mutare towns. Their central role is buying green nuts directly from farmers, transporting, quality control, drying, grading and export macadamia as nut in shells. The farm gate prices are mainly transmitted by merchants and range between US$1.50 -US$4.00 per kg of fresh

macadamia nut in shell (AMA, 2023).

Processors

Processing of macadamia nuts in Zimbabwe forms an insignificant part of the macadamia supply chain despite the price differentials of kennel and NIS which the country can benefit from. Uncracked nuts fetch an average of $3/kg whilst kennels can fetch up to US$6/100g. As such, they fetch lower market prices than processed products. Processors include traders and commercial estates who apart from drying, grading and export macadamia as nut in shells, further process by unshelling, cracking, kernel grading, roasting and packaging for the local market. Currently, there are two processors for macadamia nuts kennels in Zimbabwe namely Parrogate and Ariston Holdings who process only 1 percent of the macadamia for the domestic market. However, processors may also want to supply macadamia snacks to international retailers globally. There is therefore need for a scoping study on the international markets' needs and specific requirements for the different markets that will guarantee sales.

Ministry of Lands, Agriculture, Fisheries, Water and Rural Development (MLAFWRD)

Ministry of Agriculture through its Agritex department provides extension services to farmers whilst the Departments of Research and Specialist Services and Coffee Research Institute supports the research and development of seed varieties and provides seedlings to farmers.

Zim Trade

ZimTrade is an export promoting board which advise farmers and facilitate exportation of macadamia nuts.

MACADAMIA NUT REGULATION

In 2019, the Minister of Lands, Agriculture, Water, Climate and Rural Resettlement, in terms of section 50 of the Agricultural Marketing Authority Act [Chapter 18:24] had its first macadamia nut regulation through Statutory Instrument (SI) 138 of 2019, Agricultural Marketing Authority (Macadamia Nuts) Regulations. The objectives of the regulations are to control, regulate and promote the production and marketing of macadamia nuts. Under these regulations, growers, buyers or processors of macadamia nuts are entitled to register with the Agricultural Marketing Authority either individually or through their associations. The regulations further order all value chain actors to keep records of their macadamia orchard sizes, quantities produced, sold, exported and register all the information relating to macadamia with the Authority. In the presence of unfair practices in the pricing of macadamias, the Minister of Agriculture in consultation with the associations may fix minimum macadamia prices for that particular trading year.

Under this statutory, growers, processors, buyers and associations pay licence fees for the application, registration, issuance or renewal of licences or permits on the activities undertaken on each stage of the value chain (Table 1).

Table 1: List of fees and licences for macadamia value chain actors

Item	Amount (US$)
Application fee (non-refundable)	50.00
Registration as growers only	10.00
Issue fee (for processors and buyers)	500.00
Renewal fee	100.00
Permit/licence fee	1000.00

Late submission of permit for renewal	10.00 (per day)

Source; (GoZ, 2019)

Under the SI, theft and falsified transactions from unregistered growers or invalidated growers' numbers are subjected to a fine not exceeding level 4 or to imprisonment for a period not exceeding three months. All buyers of macadamia nuts are levied at a rate of 1.5 per centum of the value of macadamia nuts for unlawful acquisitions of macadamia nuts. The levy is used for the development of the macadamia nuts industry through supporting dissemination of production and marketing information, provision of research training and extension, pests and disease control, theft control, and value addition in the industry. However, according to the conversations with the Macadamia Association of Zimbabwe, the macadamia industry has not been benefitting from any of these levies. Considering the rampant theft in the macadamia industry in Zimbabwe, stakeholders recommended government to revise the current theft punishment. Theft leads to harvesting of immature nuts, which lowers the lowers the market prices for the nuts.

Agricultural Policy Analysis and its link to Macadamia production and agricultural production for exports

Export earnings have continued to sustain the functioning of the Zimbabwean economy, including sustaining the balance of payments and oiling the productive sectors of the economy (GoZ, 2019). As stated in the National Development Strategy 1 (2021-2025), the Government of Zimbabwe designed policies to initiate improvements in the export sector and further recognizes agriculture as an important vehicle in the transformation of the livelihoods (GoZ, 2020). To achieve this the Government has implemented the National Export Strategy (NES 2019-2023) with the objective of promoting agribusiness with enhanced competitiveness in the export market. The National Export Strategy was motivated by static and unstable rate of growth in exports compared to imports, that have resulted in a trade deficit. Zimbabwean exports tend to equate a narrow export commodity base comprised of primary products with little or no value addition. The NES helps Zimbabwe to broaden its export base through value addition, diversification of export products and export markets. The horticultural sector has been identified as a priority value chain and macadamia nuts as a low hanging fruit.

In order to sustain the balance of payments in the agricultural sector, government set funds for agricultural inputs to ensure that there are increased yields to ensure food security, substitute imports and generate surplus for the export market. Since the inception of the FTLRP in 2000, government initiated a number of input support schemes in order to support the new set of farmers especially for major traditional value chains including maize, cotton, soyabean and wheat. However, the programs had their own shortcomings. In the year 2000, the Government of Zimbabwe implemented the Government Input Scheme (GIS) where the Government would provide inputs such as seed and fertiliser through the Ministry of Agriculture. However, the policy could not materialise due to inadequate financing given that the economy was in recession amid many fiscal obligations.

In 2004 Government introduced the Productive Sector Facility (PSF) through the RBZ where individual farmers would secure financing for food crops at 25 percent interest rates through commercial banks. However, the program was not successful as funds from commercial banks could not be released on time resulting in late planting and low yields (Gutsa, 2010). Responding to the failure of the PSF and the persistent food insecurity in the country, government launched the Maguta program in 2005. The objectives were to ensure food security and generate surplus for export from 300 thousand hectares of maize which were set aside under irrigation. Commercial farmers were supported with farm machinery whilst small-scale growers were given input packs for the crops which they were guided to grow. However, the program was highly politicised which compromised its delivery and outcomes. Again, government implemented the Champion Farmers Program (CFP) in 2008. The program was targeted to farmers with potential to grow

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enough food crops for the country particularly the beneficiaries of the FTLRP who had access to irrigation facilities. Major crops under considerations were wheat, maize and soyabean. However, during this time the country was at peak of economic recession. Government lacked finance to source enough inputs for the farmers such that only 50% of the inputs were disbursed. In addition, transport and logistical challenges due to fuel and electricity shortages resulted in delays in the distribution of seed and fertilisers which led to poor yields. A presidential input support scheme was initiated in 2011 to address the challenges faced by CFP. The program mainly targeted smallholder subsistence farmers in the production of cotton maize, traditional grains and soyabean and the program had almost similar shortfalls which were witnessed in the previous interventions (Freeman, 2010)

One of the prominent initiatives, the Command Agriculture Scheme also known as the National Enhanced Agriculture Productivity Scheme (NEAPS) to enhance domestic production and substitute imports was implemented in 2016. NEAPS was a public-private sector partnership subsidy program with funding support from government. Command agriculture was targeted to large and medium scale farmers for cereal crop production (maize and wheat) before it was extended to include livestock and soyabean. The farmers accessed loans or inputs (seed, fertilisers and fuel) from CBZ Agroyield (Pvt) Ltd at an all-inclusive interest rate of 4 percent with debts guaranteed up to 80 percent to by Treasury. The repayment would be made with the profit from part of the produce after harvesting. In the 2022 cropping season, the program saw more than 2000 farmers getting into contracts (GoZ, 2022). However, in the 2019/2020 and 2021/2022 cropping season, Zimbabwe had a cereal deficit of 907 629 and 515 585 MT respectively. In 2021 and 2023, government recorded the programme as a success and reached national maize self-sufficiency, and suspended the issuance of maize, maize import permit. However, during the same period, the country imported maize from Zambia and South Africa to address this shortage. Leading farmers in the macadamia nut sector had been urging government to consider expanding Command Agriculture to macadamia nuts on a 3-5-year tenure and mechanise the sector to maximise on the returns. The lines of credit would be able to build state of art industries to process the nuts thereby creating employment while ensuring that farmers get value of their produce.

In 2016, the Government of Zimbabwe introduced the export incentive policy at 5 percent of gross export receipts in order to increase production of the export sector, reduce trade deficit and promote channelling of exports through formal markets. The policy initially targeted tobacco and minerals production before other export sectors were included. Growers and processors of emerging crops like macadamia, blueberry, pecan nuts were provided with tax incentives for new investments, for example in buying new machinery and bringing in new technology equipment. On a three-year average tobacco production increased by 3 percent from 2016 -2019. The value of horticultural crops including mainly macadamia nuts, citrus, fresh flowers and leguminous vegetables increased by 6.5 percent from US$31.8 million between 2017 and 2019. In the first three years of implementation, the export incentive scheme managed to incline small scale producers towards supplying their produce to the formal market, improve the country's balance of trade position despite having negative impact on broad money supply.

The tobacco value chain in Zimbabwe is determined to be the most efficient value chain for future investment opportunities as 70 percent of tobacco production comes from the smallholder farming sector and tobacco exports contribute 50 percent to the country's total foreign exchange. The sector implemented the Tobacco Value Chain Transformation Strategy (2021-2025) (TVCTS) in 2021. Under the plan the country aims to increase tobacco production from 262 million kilograms to 300 million kg, increase exports from 12,5 percent to 70 percent, increase value addition and beneficiation from 2 percent to 30 percent by 2025. The strategy aims to achieve the targets through complete localisation of funding tobacco production from the existing 39 percent offshore financing, intensify sustainable production, curing and afforestation systems. The strategy promotes the production of alternative cash crops such as soya bean, sunflower, industrial hemp, citrus, blueberry and macadamia nuts to hedge against anti-tobacco campaigns and climate

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change. To support alternative cropping farmers were provided with planting material, training in agronomic practices and credit facilities for value addition through the Horticulture Export Revolving Fund (HERF). By end of 2022 less than 2 percent of households had received planting material (GoZ, 2022). Treasury could not make enough funding available through HERF. Besides, smallholder farmers lack access to the fund due to stringent requirements for the facility for example; proof of export and availing farming history. On the available funds, uptake of the HERF by macadamia growers was lower compared to blueberry producers which increased blueberry exports by 63% from 2020 (EastFruit, 2023). Tobacco production increased by 8 percent in 2023 from 200 million kgs in 2022. Zimbabwe exported 236 000 million kgs of tobacco worth 1.23 billion in 2023 an increase in value by 28 percent from 2022. In both 2022 and 2023, value added tobacco exports made up 6 percent of the country's total exports, increasing from 4 percent in 2021(TIMB, 2023).

The prominent policy specifically targeting macadamia production for export is the Horticultural Recovery and Growth Plan (HGRP) (2020-2025). This is an accelerated rural horticulture development programme aimed at commercialising, building resilience and inculcating an entrepreneurial mind-set among households. The objective is to mainstream rural farming communities into macadamia among other tree production. The plan also has a private sector backed component with Floriculture, Olericulture and Plantations Recovery and Growth Programs for increased exports. Under HGRP, Zimbabwe sets to increase area under macadamia by 1 000 ha per year to reach 15,750 ha by 2025. From the increase in hactarage, the country expects to increase production from 40,000 MT to 45,000 MT and increase exports from 7 000 MT to 18 000 MT during the same period.

To achieve this, the government put forth the following agendas and interventions;

1. Distribution and supply of 10 macadamia plants per household targeting 35,000 rural households per year between 2020 and 2025 through research institutes, agriculture and vocational training colleges, schools, ARDA and Forestry Commission nurseries
2. Strengthening the Macadamia Association of Zimbabwe for vibrant information exchange, networking, lobbying and advocacy;
3. Establishment of aggregation, collection and marketing centres for produce;
4. Facilitation of contract farming for farmers and mobilisation of affordable long term lines of credit; and
5. Connecting smallholder farmers to reliable markets through hub and spoke models with the commercial farmers.
6. Ministry of Agriculture to establish model farms/Centres of Excellence to promote adoption of GAPs and modern technologies e.g. improved varieties, efficient irrigation systems, greenhouses.
7. Treasury to allocate /generate funds/ adequate financial resources to institutions that provide support services (Research and development, training and extension) to horticulture such as AMA, AGRITEX, DR&SS and universities.

The interventions put forth under the HRGP for increasing small scale macadamia production and increase the country's export earnings have the potential to alleviate rural poverty if implemented correctly. By 2023, government had managed to distribute 10 000 seedlings among 1000 households in Chipinge District each benefitting 10 trees (AMA, 2023). Over the past five years, horticultural exports increased from US$50 million/ year to almost US$120 million in 2023 with a large portion coming from blueberries. A decrease in value of macadamia exports from US$7 million in 2019 to US$4,7 million in 2023 was witnessed. This was due to surging global prices despite the increase in exportable quantity (ZimTrade, 2023). The HRGP is running short to achieve its set target and has only cultivated less than 300 hectares (MLAFWRD, 2023). Macadamia production decreased by nearly 10 percent in 2022 from 58 044MT obtained in the 2021 due to low rainfall and high temperatures (MLAFWRD, 2022). Production targets for 2025 were however overambitious given that macadamias are perennial crops which require 3-5 years to reach full maturity.

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There is need for the country to concentrate more on increasing production and productivity on the existing plantations. Focus should be put on research and development of improved varieties and capacitating farmers and extension system. This will enable sustainable transition into expanding new orchards.

Challenges in Macadamia production and marketing

Productivity in macadamia production is very low, with an average of 7000 kg/ha, compared to other macadamia growing countries in the region Malawi (10000 kg/ha) and South Africa (9984kg/ha) (SAMAC, 2023; Zuza et al., 2021). Several factors affect the low productivity of Zimbabwean macadamia farmers which are 1. lack of access to quality seeds and high cost of inputs 2. pests and diseases; 3. research and development 4. 5. the effects of climate change and lack of irrigation facilities 6. limited access to finance

Access to quality seeds and high cost of inputs

Lack of access to quality seedlings and high cost of inputs are significant challenges facing smallholder farmers resulting in low productivity. Previous studies also acknowledge that production resources such as fertilizers and pesticides are expensive while quality high yielding seed varieties are available but at relatively high prices (Bandason et al., 2022b; Kwaramba et al., 2020). Quality macadamia seedlings which are obtainable from commercial nurseries are costly ranging between US$5-10 which is beyond the reach of many farmers. The general costs of chemicals and fertilisers often imported from South Africa is also beyond the reach of many smallholder farmers (Bandason, et al 2021). As a result, most smallholder farmers propagate their own seedlings through grafting techniques. With poor management and shortage of chemicals, these grafted trees cannot stand the heavy winds and they often produce smaller nuts, which are turned down by Asian markets who dominate the markets and prefer larger nuts.

Training, Research Development and Extension

The role of extension in strengthening relationships among stakeholders along agricultural value chains remains an important discussion point especially with emerging crops like macadamia (Bandason et al., 2021). In Zimbabwe there is lack of expertise along macadamia value chain especially in extension, research and development of high yielding varieties and pest control. Hence, farmers have not received the sustained benefits of the crop due to lack of technical and managerial support. There is limited support from the Government in terms of financing research and capacitation of extension staff in order to meet the training needs of farmers and promote good agricultural practices (GAPs). As such there is low productivity and poor quality nuts being produced. In order to improve macadamia nut yields there is need for strengthening existing institutions that offer research and extension service, such as the Department of Research and Specialist Services and Agritex and facilitating refresher courses and extension staff. This will improve multiplication and dissemination of high-yielding macadamia seedlings that are resistant to pests and diseases and more suited to the different macadamia growing regions of Zimbabwe. Cooperative extension services are a practical solution; for example, Horticultural Development Council has successfully trained its lead/model farmers in good agroforestry practices through a hub and spoke model, who are starting to train other farmers (HDC, 2022).

Pests and diseases

Ants, borer damage, early and late stinkbug are devastating to macadamia fields causing low kennel recovery percentage which affects quality of the nut as well as yield. This renders nuts unfit for consumption and will end up some of the macadamia nuts being rejected by the buyers. This is also worsened by the incapacity of the research and development sector to come up with varieties that are resistant to disease and pests. While promotion of chemical treatments to curb insect damage are recommended, alternative control mechanisms such as integrated pest management system needs to be

adopted towards the growing of organic macadamia as the global market demand is trending towards organic particularly in the US and Japan. This will also augment to Zimbabwe's implementation of the National Export Strategy for Organic Food Products (2023-2027).

Climate change and lack of irrigation facilities

Zimbabwe has a good arable land and cool temperate climate suitable for macadamia cultivation. However, climate change particularly, irregular rainfall, heatwaves and flooding have been highlighted by key informants as major factors causing low and unstable productivity in the macadamia nut sector. Heavy flooding resulting from Cyclone Idai in 2019 especially in the Eastern Highlands of Zimbabwe and the heat wave that took place in September 2020 destroyed more than 500ha of macadamia nuts (MLAFWRD, 2020). There is need for government to facilitate private-public sector investments in irrigation facilities through promotion of vertical integration within the value chain. This will build resilience among farmers in the wake of climate change and ascertain markets. Farmers are urged to adopt moisture conservation techniques such as water harvesting, construction of basins around trees and applying organic manure. This does not only conserve moisture but also improves soil fertility which has a huge bearing on the quality of macadamia nuts.

Access to and lack of Finance

Expansion in macadamia production is limited due to lack of capital and farmers' access to finance to purchase farm implements, seeds, fertilizers, pesticides and hiring labour that would enable intensive utilisation of these inputs. Credit facilities with lower interest rates and favourable terms and conditions are not available to macadamia producers compared to grains, oilseeds and other traditional cash crop producers. In addition, smallholder farmers have no sufficient collateral security to secure loans. The offer letter arrangement in most A1 farms is fragile since an offer can be withheld at any time and therefore not attractive to providers of capital. The availed 99 year leases among A2 farmers are also not being regarded as sufficient collateral by financial institutions due to general legal uncertainty around their issuance and revocability. It is critical for the government to make funding available via Agricultural Development Fund so that farmers are able to create credit history. The fund will also close the funding gap in the value addition and beneficiation of macadamia nuts fresh produce, which has resulted in the margins being unsustainably squeezed. Government is recommended to promote vertical integration through contact farming and cooperative farming for accessing, credit and making use of economies of scale.

Theft

Macadamia is valuable source of livelihood, regarded as the "green diamond" in macadamia growing areas. Each and every year, there are high incidents of macadamia theft and it sometimes results in armed robbery and deaths. Stolen nuts, suspected to be supplied mostly by farmworkers, are sold by farmworkers to other registered growers, who then sells them to legitimate buyers. Some nuts are smuggled through Mozambique to South Africa. The illegal trade is costing Zimbabwe thousands of dollars annually as the stolen nuts will be sold at very low resulting in the erosion of prices. To curb the theft of macadamia nuts, there is need to make the ACT much stiffer by amending the Statutory Instrument from level 4 to level 12. Also as a long term solution, there is need for the Government to spearhead the program in all surrounding macadamia growing areas, with having every household to grow at least 20 trees. This will increase macadamia nuts as well as reduce theft of macadamia nuts, as some thieves are fellow farmers from the resettlement areas where macadamia is not grown.

Instability of producer price, marketing and export

Most key informants interviewed pointed to the instability of local macadamia prices. Emergence of

informal marketing systems and involvement of intermediaries in marketing further reduces producer prices which has resulted in farmers failing to meet their cost of production. For example, the price of grade A macadamia was pegged at US$2,80 in 2020 a reduction from US4$ in 2019 (AMA, 2023). Despite the country's effort to encourage more farmers to expand macadamia cultivation, there are no export promotion initiatives in place to support the growing supply of nuts. Of concern is the high degree of concentration of macadamia exports to the Chinese and non-establishment of direct formal export markets. China is the world 's largest consumer of macadamia nuts which is also anticipated to be the world's largest producer by 2030 which may cause a fall in global price. Macadamia exporters are subjected to convert 25 percent of their proceeds to local currency and retain the 75 percent under the export retention scheme. The 25 percent funds retained by Government is proving to be a major restriction for growers to exercise financial flexibility necessary for taking opportunities as they become available and meet their financial obligations. Most exporters are financed from offshore investments and they are currently facing difficulties in servicing off shore financial obligations. Government need to ensure farmers are able to access funds by introducing the ADF or scrap off the 25 percent in order to promote expansion into macadamia farming and refrain traders/exporters from paying low prices to farmers.

CONCLUSIONS AND RECOMMENDATIONS

A review of the macadamia value chain in Zimbabwe has shown that there has been a constant increase in macadamia production which however remains incommensurate to the opportunities that exists in the global market. The research established that the Government of Zimbabwe initiated a number of input support programs to support traditional crop value chains among farmers who had acquired land through the FTLRP whose intervention failed to yield the intended results due to poor design, inadequate funding and poor implementation modalities. The research established that the first regulation on macadamia nuts was implemented in 2019, followed by its alignment to the Horticultural Recovery and Growth Plan in 2020 and the inclusion of macadamia as an alternative to tobacco in the implementation of the Tobacco Value Chain Transformation Strategy in 2021. Government has been recommended to take a composite and holistic approach which include input packs, services such as training and strengthening of the extension staff to deal with the problems the country is facing.

Key informants have cited limited support from the government in research and development of high yielding varieties, limited advisory services, and poorly organised markets as major constrains affecting smallholder farmers resulting in low macadamia production and productivity. Researchers recommend investment in research and development through establishment of a macadamia research station in main macadamia growing areas the same way it did for other plantation crops like coffee and tea. This is essential particularly in the development of high yielding varieties which are resistant to pest and diseases and also ensure production of varieties suited to the different regions with higher yields and returns. Capacitation of extension staff through refresher courses, exchange programs with neighbouring countries like South Africa and inclusion of macadamia course in agricultural colleges are recommended. It was established that Zimbabwe exports raw macadamia nut in shells resulting in loss of revenue due to price differentials if the country was to export kennels instead of NIS. Researchers recommend investment in macadamia value addition of the nuts and export kennels. There is therefore need for creation of an enabling environment to promote private sector participation and to ensure availability of adequate financial resources for the construction of a processing plant which meets the accredited and international standards. Further to this, a thorough market research, opportunities for partnerships and a scoping study on the international retailers' interests is needed to ascertain markets needs to be conducted. Aggregated and organised farming among smallholder farmers particularly in the production of organic macadamia and linking them to EU and other export markets with Zim trade assisting on organic certifications and export market channels development is recommended.

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