

## Assessment of Ecotourism Potential and Constraints of Community-based Sclerocarya Birrea Kernel Production in Tswapong North, Botswana

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### Abstract

Natural woodlands provide a myriad of products and services that support community rural livelihoods through improving household income, food security, safety net, health and nutrition, leisure, ecotourism and outdoor recreation. This is more often realized among women in remote or rural areas, who for most of the time, live in poverty. This study is aligned with the United Nations sustainable development goals (SDGs) 1 (No poverty) and 12 (responsible consumption and production). Thus, the purpose of this study was to explore the potential and constraints of using *Sclerocarya birrea* kernels (morula) as a source of ecotourism to support livelihoods for members of a community-based Trust (CBO) in rural Botswana. The study was carried out in two villages of Seolwane and Matlhako in the central district of Botswana. Data for the study was collected from 102 members of the Trust using a semi-structured questionnaire and an interview guide for key informants. Additional information was gathered through participant observation during field work. The harvesters and producers comprised mostly of elderly women with an average age of 64 years. The net margin for kernel production for an average producer was profitable, and an ecotourism potential for morula project was rated high. Challenges facing production of *morula* kernels include but not limited to lack of market, lower prices, primitive production technology associated with health injuries and poor marketing. Erratic rainfall and recurring dry spells were perceived to be affecting fruiting and production of morula. The study recommends the development of an improved or modern technology in the production of kernels, listing *morula* tree under protected tree species in Botswana as well as encouraging and supporting its planting around the country.

**Keywords:** Sclerocarya Birrea; kernel; morula; livelihoods; empowerment; ecotourism; poverty; sustainable management

### Introduction

Woodlands provide a myriad of products and services for rural communities. A range of these products are classified as non-timber forest products (NTFPs) which are all biological materials

other than timber that are extracted from forests, other wooded land, and trees outside forests (Ahenkan & Boon, 2011). These products come from a large variety of whole plant or plant parts either used in its original state or used to produce value added products (Adepoju & Salau, 2007; Ghosal, 2011). The classification of NTFPs is often based on their functions or uses such as edibles (e.g., fruits and nuts), medicinal and dietary supplements (e.g., leaves and barks), wood products (handicrafts and wood carvings) and floral products (leaves and twigs) used for decorations (Van Andel, 2006). Millions of people harvest NTFPs for commercial and subsistence purposes (Mahapatra & Tewari, 2005; Marshall et al., 2006; Mojeremane & Lumbile, 2005; Shackleton & Shackleton, 2003; Solomon, 2016). The contribution of NTFPs to human wellbeing has been well documented especially in the areas of improving household income, food security, safety net and gap filling, providing building materials, health and nutrition (Ahenkan & Boon, 2011; Ghosal, 2011; Hamilton, 2012; Jensen, 2009; Sullivan, 2002) and collectively referred to as ecosystem services. The NTFPs also provide social and ritual values to social groups (Ewen & Adetola, 2016; Van Andel, 2006) and are found to increase ecotourism destination attractiveness (Wunder, 2000), village-based tourism (Moswete et al., 2009), rural economies and community sustainability (Ewen & Adetola, 2016). Several studies have also estimated the economic value of various NTFPs using different techniques (Moradi et al., 2017; Shackleton & Shackleton, 2003; Sullivan 2002).

The collection and use of NTFPs in many areas in Botswana are common activities (Mmopelwa et al., 2009) as in other parts of the world, for example, Iran (Moradi et al., 2017), Cameroon (Ambrose-Oji 2003); Ethiopia (Yemiru et al., 2010), India (Mahapatra & Tewari, 2005) Myanmar (Khaine et al., 2014; So & Yeo-Chang, 2019) Nigeria (Ewen & Adetola, 2016; Suleiman et al., 2017) and South Africa (Makhando & Kepe, 2006). The critical role played by these products is realized in their contribution to poverty alleviation. These products have become important as safety nets or in gap filling (Garekae et al., 2019; Mmopelwa & Ngwenya, 2010). More often, it is women who are engaged in subsistence and commercial activities to diversify their means of survival (Parratt, 1996).

Sustainable livelihoods and conservation of NTFPs are reported to be the main driving forces for attracting donor support for community development projects especially in developing countries (Marshall et al., 2006; So & Yeo-Chang, 2019). Most NTFP based rural livelihoods supported by NTFPs fall within the informal sector (Suleiman et al., 2017), whose contribution to the overall economy is regarded insignificant. This has inadvertently led to a research bias towards the formal economy. Despite the paucity of research in the NTFP contribution to the informal sector of the economy, their contribution to the welfare of many rural communities is significant (Ambrose-Oji, 2003; Garekae et al., 2019; Khaine et al., 2014; Suleiman et al., 2017; Yemiru et al., 2010). There is, therefore need to understand the potential and challenges of using NTFP in supporting rural community livelihoods with the view to inform natural resource management and ecotourism policies. An understanding of how these activities contribute to the welfare needs of rural people and the challenges facing the sector is critical for rural development. The aim of the study was to investigate the potential and constraints for using the kernels derived from *Sclerocarya birrea*, locally known as *morula* tree as a source of ecotourism to support livelihoods. Specifically, the study examined the profile of the harvesters, estimated profitability of kernel production, identified the factors affecting the profitability and sustainability of *morula* kernel production and assessed ecotourism potential of a *morula*-based community project.

### Study area

The *Sclerocarya birrea* user survey was undertaken in two villages of Seolwane (22.71E, -22.63S) and Matlhako (27.56E, -23.10S), located in the central district in Botswana (Figure 1).

The two villages form part of 23 villages (Figure 1) that constitute a community-based Trust called Kgetsi Ya Tsie Community Development Trust (KyT) in Tswapong area. In Botswana, Trusts or community-based organisations (CBOs) serve as community-led natural resource initiatives established in line with the government's CBNRM policy of 2007. These initiatives are run by one or more communities (villagers) who collectively share ownership and benefits from various livelihood projects and tourism enterprises (Moswete & Thapa, 2018; Rozemeijer, 2001).

Seolwane is located approximately 30 kilometres north of the village of Lerala where KyT headquarters is located, while Mathako village is located some 35 kilometres south of Lerala village (Figure 1). The selection of the two villages was informed by their more active involvement in the collection and use of NTFP than the other villages. Kgetsi Ya Tsie (KyT) was formed in 1997 and registered as a Trust in 1999 (Figure 3) (M. Mmipi, Interview, 2018). The aim of the community Trust is to empower women by capacitating them with entrepreneurial skills and assisting them in sustainable management of natural resources for improvement and enhancement of their livelihoods. One of the key entrepreneurial skills involves training members in quality control in products processing.

Structurally, the KyT has a coordinator who is based at Lerala village to oversee the activities of the Trust. The Trust also has three regional councils (North, Central and Southern) with their representatives located in the villages of Seolwane, Gootau and Ramokgonami, respectively (Figure 2). At village level there are business centers located at Lecheng, Ratholo, Chadibe and Seleka villages. The leader of each of the business centres guides and assist members in production and post-harvest skills.

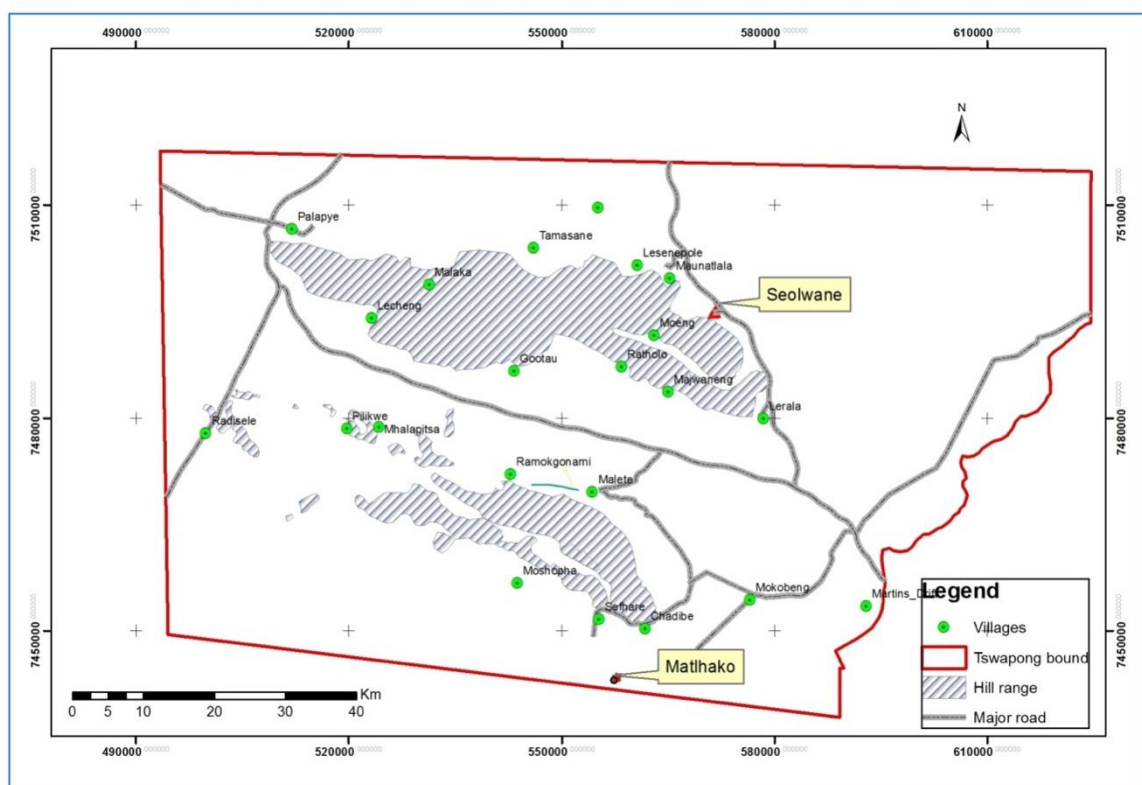


Figure 1: Map of the study area.

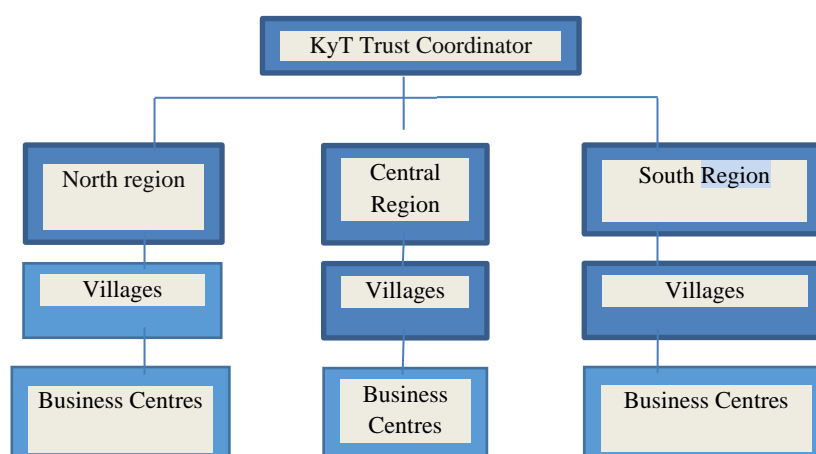


Figure 2. The Kgetsy Ya Tsie (KyT) Development Trust's structure.

Kgetsy ya Tsie (KyT) Development Trust is a community-based organization (CBO) (Figure 3) that is involved in the extraction of *Sclerocarya birrea* kernels which are often sold, consumed raw or processed into oils and other cosmetics (e.g., soap, body butter). Morula products that include oils, lip balms, hair ointments and bath foams are found in display cabinets and bathrooms in popular upmarket safari lodges and ecotourism facilities in Botswana and many neighbouring countries including Namibia and South Africa.



Figure 3: A sign board for Kgetsy Ya Tsie community development trust

The main activities of the KyT include harvesting and processing of *morula tree*-based products, production of *lerotse* (melon) jam and juice and traditional herbal treatments like *monepenepe* (*Cassia abbreviata*), *letsoku* (cosmetic clay like soil), harvesting thatching grass, *mophane* caterpillar (*Gonimbrasia belina*) as well as making traditional pottery. Most parts of *morula tree* are used as sources of food, income, livestock feed and traditional medicine for many rural communities in southern Africa (Murphy & Pelsler, 2018). Other products and services harvested from the tree include fruits (Figure 4), leaves, kernels, bark and by-products made from its wood (e.g., pestle and mortar, tables). The tree produces large quantities of oval shaped fruits (Figure 4) around January to March which drop down after ripening (Directorate

of Crop Production, 2010). The ripened fruits are greenish yellow in color and soft in texture (Figure 4 & 5).



Figure 4: Green *morula* fruit drop from the tree when ripe: Figure 5: Greenish-yellow ripened *morula* fruit which is juicy and ready to consume as fruits. Picture: courtesy of N. Moswete.

Products made from the fruits pulp include traditional alcoholic beverages, jelly, juice, sweets, salad dressing and jam (Directorate of Crop Production, 2010). The fresh outer cover of the *morula* fruit is used as animal feed while the cracked nuts can be used as a source of energy for cooking.

The wood is soft and often used for making households utensils, furniture and carved items such as pestle and mortar, donkey carts and building poles. The bark is used for making brown dye, and has traditionally been used for treating various ailments, while the leaves have been used to treat skin infections, spider bites, burns and heartburn (H. Moroka, interview, 2019). The soft and oblong shaped kernels are a source of oil. The kernels are also consumed as snack (Figure 5) and nutritional analysis has revealed that they contain up to 30.9g/100g of protein and 57.0g/100g of oil, as well as other trace elements (Wynberg et al., 2002). The tree canopy of the *morula* tree provides cool shade for people and livestock especially during summer months and are tourism attractions (natural landscape) in areas where they are found in abundance.



Figure 6: Picture of *morula* kernels after they are extracted from the nut. (Picture: courtesy of N. Moswete)

## Materials and methods

### *Data collection and analysis*

The survey commenced with a reconnaissance visit to the village of Lerala where the researchers held a meeting with the coordinator of the KyT. The purpose of the meeting was to appreciate activities of the KyT as a community-based project and to assist in revising formulation of the relevant questions for the data collection instrument. It was also during the reconnaissance trip that a list of all members of the Trust in the villages of Seolwane and Matlhako was obtained from the Office of the Trust coordinator. The sampling frame for the two villages comprised 48 members from Matlhako and 54 members from Seolwane.

A semi-structured questionnaire that had been extensively reviewed by members of the research team was used to collect primary data from all the 102 members. Data was collected on aspects of socio-economic profile of collectors, livelihoods activities, user perceptions on availability of *morula* trees, awareness of ecotourism, outdoor recreation and leisure as well as challenges faced by members of the Trust. The questionnaire was administered in the local language, Setswana, for ease of understanding by the respondents. Five trained research assistants, who were senior high school leavers, administered the questionnaire through face-to-face interviews.

In addition to interviews, focus group discussions were held with a group of 12 members from each of the two villages on pertinent issues concerning the KyT community-based project, and to verify some of the information collected through the questionnaire. The issues discussed included access to *morula* (for collection of fruits), competing uses of *morula* by-products and factors affecting its availability and abundance. Data collected during the focus group discussion also included price, costs, quantities and the quality of kernels production and the factors affecting kernel production.

The researchers also held in-depth face-to-face interview with the coordinator. The issues discussed included the history of the KyT as a community-based Trust, purpose for which it was established, main activities of the Trust, marketing, rural and village tourism, sustainability and benefits realized by members. Above all, additional information was gathered through participant observation during field work in which researchers visited some individual harvesters and producers in their homes and working space (Figure 7).

Data collected from the *morula* user survey was analyzed using mainly descriptive analysis (frequency distributions, statistical measures of central tendency and pivot tables. Estimation of the profitability of kernel production was based on the calculation of net margins of production and the cost of production which is the difference between gross revenue and cost of production, as well as profitability indices such as the gross rate of return or rate of return in investment (Inoni & Oyaide, 2007). Thus,  $\text{Net margin} = \text{Gross Revenue} - \text{Fixed Costs} - \text{Variable Costs}$ .  $\text{Gross Revenue} = \text{Market price (P) of kernels} * \text{Quantity (Q) of kernels produced}$ . The rate of return is a ratio of net margin or profit to total cost. Fixed costs are those costs which do not vary with level of production, while variable costs vary with the level of production (Olukunle, 2017). In this study, the fixed costs were those of equipment or items used in production of kernels such as stones, utensils or containers used for storage of kernels. However, the cost of traditional equipment or tools such as stones used for cracking the nut was assumed to be zero because they were abundantly available. Thus, the opportunity cost of their use was negligible. Similarly, the cost of items used for storage and winnowing of kernels was assumed to be zero because these items were not primarily purchased for kernel production but for other household uses. Under normal circumstances the fixed cost for these items would be their depreciation, often determined using the straight-line method which considers the lifespan of the equipment (Olukunle, 2017; Terry, 1999). The annual maintenance and

operation costs were also assumed to be zero. Under normal circumstances these would be estimated as a certain percentage of fixed costs.

The variable costs in this study were mainly the opportunity cost of travelling time and labor for collecting fruits and processing of kernels. Because of the informal nature of production, collectors used own labor rather than hired labor in both collection of fruits and processing (dehusking) of kernels. The amount of time expended in these activities was estimated from: Daily time taken to travel to collect fruits \* Frequency of collection per month\* Harvesting period (months). The value of this time was estimated from: Total time expended\* the minimum wage for a worker in the agricultural sector. The minimum wage of a worker in Agriculture, forestry and fishing is estimated at P1000.00 (1US\$ =BWP11.3574) per month (Government of Botswana, 2019). Using the relevant conversion factors, the rate per hour of an 8-hour day was estimated at P4.17/hour. Since there is an abundance or surplus of unskilled labor in Botswana, Government of Botswana (1996) recommends that the shadow price of labor be estimated at 50% of the daily labor rate. The value of time expended in processing of kernels was estimated using a similar approach as that for travel and collection of fruits. Interview and focus group discussion data was analyzed by use of axial and selection coding (see Hatch, 2002). Similar codes based on utterances and meaning were sorted and conclusions were reached.

## Results and discussion

### Profile of collectors

The profile of the collectors of *morula* fruit is shown in Table 1.

Table 1. Profile of *Morula* collectors (n=100)

Variable	Number	Percentage
<b>Age</b>		
30-40	4	3.9
41-50	5	4.9
51-60	24	23.5
61-70	40	39
71-80	18	17.6
>80	6	5.9
<b>Education</b>		
None	30	29.4
Primary	58	56.9
Secondary	5	4.9
Post-secondary	1	1.0
Other	6	5.9
<b>Marital status</b>		
Single	34	33.3
Married	35	34.3
Divorced	2	2.0
Widow/widower	25	24.5
Cohabiting	5	4.9
<b>Livelihood sources</b>		
Formal employment	1	1.0
Self-employment	15	14.7
Arable farming	78	76.5
Livestock farming	50	49.0
Drought relief programme	65	63.7
Sale of veld products	100	98.0

Source: Field data

Most of the collectors are elderly people with age range of between 35-96 years and mean 64 years (standard deviation of 11 years). Most (64%) of them had formal education (primary,

secondary and post-secondary education) while 29% had no formal education. Studies carried out on informal activities such as in the handicraft sector in the African continent (see Makhado & Kepe, 2006), have revealed no or low level of education among the participants. The level of education of *morula* users in this study, coupled with training in quality control of the products, suggests a potential for growth of this venture and subsequent improvement in their livelihoods. In addition to the collection and use of *morula* by-products, respondents pursue subsistence arable and livestock farming, take part in temporary employment in the government welfare support programme locally known as *Ipelegeng*, and collect and sell other veldt products.

### ***Collection of morula morula fruits and kernel***

The collection of *morula* fruits for extraction of kernels has been a common activity for these communities for a long time. Some members of the KyT indicated that they have been involved in this activity since the 1960s. However, during this period the kernels were used mainly for home consumption. There has been increased participation of women in this activity over time due to the value of kernels in the production of oil.

*Morula* fruits (Figure 4 & 5) are collected from open communal areas between the months of January and March. The trees are also found within and in the vicinity of the collectors' homes, farms/arable lands or animal kraals. Most of the collectors (72%) indicated that *morula* trees were allowed to grow in their arable fields as wind breakers and source of shade. The primary means of reaching the collection sites outside the village, are walking (85%), use of donkey-drawn cart (33%), use of public transport (2%) and use of own vehicle (1%). The fact that most of the collectors get to the site by walking implies that *morula* trees are mostly located within a walking distance from the two villages. For most of the respondents the collection sites are within 5 kilometers. While there are no defined property rights to *morula* trees, respondents indicated that collectors intending to gain access to *morula* trees in farms other than their own, are supposed to negotiate with field owners. Literature shows that access rights to natural resources differ from one setting to another depending on prevailing property regimes. For instance, Makhado and Kepe (2006) describes arrangements for gaining access to *Cyperus textilis*, a plant species used for local craftwork in Eastern Cape Province in South Africa. The arrangements include buying the plant from garden-owners, non-garden owners exchanging their labour by harvesting or weaving for the garden owner as well as themselves, reciprocity arrangement where the non-garden owners agree to look after the gardens but still ask for permission to harvest (Makhado & Kepe, 2006).

### ***Extraction and processing of kernels***

A practice common among the collectors of fruits across the villages is to extract juice that is used to make traditional beer often sold to generate income. Following extraction of fruits, the nuts are air and sun-dried for at least three months. Adequate drying of the nuts is essential for easier extraction of kernels during nut cracking. The traditional way of removing kernels from the nut is to hold the *morula* nut firmly on a hard surface such as a stone or a metal surface and crack the nut using another stone (Figure 7). The kernels are then collected into a container such as a bucket or a traditional type of weaved basket called *tlatlana* (Figure 5). Kernels that remain stuck to the cracked nuts are removed using a sharp pointed piece of wire, about 10-20 cm long. The kernels are then separated from the rest of other particles by winnowing (Figure 6).





Figure 7. Hand-cracking of *morula* nuts to extract kernels (Picture: courtesy of G. Mmopelwa)

The kernels produced by members are sold to KyT where they are processed into oil for making other products such as massaging and stretch marks oil, cosmetic soaps and lip balm. Kernels not sold (surplus) to the Trust are usually packaged and sold as snack. The making of a snack involves boiling *morula* nuts for about 10-15 minutes for easier removal from the nuts, soaking them in salt-dissolved water for a while and then sun-drying. The purpose of using salt is to preserve and improve the taste of the kernels. A full cup of a snack of kernels, weighing about 40 g, is usually sold for P10.00, which translates into P71.42/kg.

### ***Perceptions on availability and competing uses of morula by-products***

Respondents were asked about their perceptions regarding the abundance of *morula* tree in their area. Majority of them (85%) were of the view that the availability of *morula* trees has changed over the past 10 years, while 15% perceived no change in the tree's availability or abundance during the same period. Seventy five percent (75%) of the respondents perceived the availability of *morula* trees to have decreased, while 9% thought that *morula* trees have increased in availability. Respondents not perceiving any change in the availability of *morula* trees explained that they still harvested *morula* fruits and other products from the same *morula* trees from past years. Those perceiving *morula* trees to have decreased in availability noted climate change effects such as low rainfall (71%), cutting of live *morula* trees for making other products such as pestle, mortar and wooden stools (8%), plant parasites (4%), and clearance of *morula* trees in areas allocated as arable fields or residence (1%), as the main driving factors.

In the Lubombo region of the Kingdom of Swaziland, Murye and Pelsler (2018) reported similar factors affecting the abundance of *morula* tree. These included repeated droughts, climate change, unsustainable harvesting due to population growth and changes in land use.

Respondents were also asked about their views on consumption and/or uses of different by-products of *morula* tree. Traditionally, the wood (trunk and branches) from the tree is used for carving pestles and mortars, making stools, footrests, household utensils (e.g, wooden spoons and whisks, bowls and many more, while the bark and leaves are used for treatment of various ailments. The respondents cited use of *morula* tree for carving purposes (61%) and as a source of firewood (35%), as competing with the use for *morula* tree for kernel and jam production. It was explained that the use of *morula* trees for carving purposes and as source of

fuelwood pose a threat to the sustainability of tree as these uses require the live tree or its woody parts to be cut. It was also explained that the use of *morula* fruits to produce jam, juice and traditional beer do not compete with kernel production since dried nuts from the processing of these products are used for other purposes that include fires for cooking. Furthermore, the outer cover of the fruit is use as animal feed for goats and sheep.

The above views clearly raise sustainable management challenges brought about by different user preferences regarding *morula* by-products. While the use of *morula* tree should benefit different community members, there should clearly be defined or agreed guidelines on harvesting and how the benefits should be derived without destruction of the trees.

#### *Grading, sale and profitability of kernel production*

Eighty five percent (85%) of the collectors indicated that they sell their processed kernels to KyT. While all the producers are members of KyT, they are not obliged or contracted to sell their produce to the CBO or Trust. It was also revealed during group discussions that some of the KyT traders have customers who follow them to the production or processing point in the villages. Some of the respondents indicated that they travel to nearby major villages of Mahalapye and Palapye, while others travel to as far as Gaborone (the capital city) to sell their produce (e.g., kernels or jam).

Kernels sold to KyT are graded according to size and quality. Naturally, bigger-sized kernels are graded higher than small-sized kernels (Figure 6). Grade 1 kernels are priced at P40/kg; grade 2 at P30/kg and grade 3 kernels at P10/kg. The price for each grade is usually agreed upon by KyT management and members during the Trust's annual general meetings. These prices are established based on the understanding that KyT purchases kernels from the members primarily for oil extraction. The Trust extracts oil from kernels using hand-operated equipment. For best quality kernels, it has been established that 8kg of the kernels produce on average 3 litres of oil, while grade 2 kernels produce approximately 2 litres of oil.

On average a collector takes 4 hours/day to gather *morula* fruits during the three (3) months (January - March) long season. The frequency of collection depends on the amount of fruits collected, the distance walked and the availability of fruits at the site. The collection frequency ranges between 4 and 5 times per month. Using collection frequency of 5 times per month, the amount of time expended by an average collector is estimated at 60 hours. Using the minimum wage for a worker in the agricultural sector of P1000 per month (or P4.17/hour for an 8-hour day), the value of this time is estimated at P250.00.

It takes an average collector 6 hours/day to process four (4) cups (approximately 560g) of kernels. Assuming that a collector is engaged for 15 days during the season (as they also participate in other household activities), the time expended in processing is estimated at 270 hours. Using an hourly rate of P4.17 in the agricultural sector, the value of time is estimated at P1125.9. Thus, the total cost of engaging an average harvester in kernel processing is estimated at P1375.90. The shadow price of labour is thus 50% of this value, which is P687.95

Discussions with the supervisors of the collectors revealed that an average collector processes about 20 kg of kernels during the season. Using an average price of P40/kg, the collector's revenue was therefore estimated at P800 (Table 2). The analysis showed that the net margin for kernel production for an average gatherer is profitable, but lower than that of similar products collected from the wild such as *mopane* worm or palm leaves harvested in Gweta villages in north central Botswana. For instance, Centre for Applied Research (2017) estimated the average values of *mopane* worm and palm leaves at P330 and P371 (2016-2017 prices), respectively. The net value of kernel production is also significantly less than those for river reed collection and sale in different villages in the Okavango Delta estimated by Mmopelwa (2006) which were US\$331.26 (Shakawe), US\$169.49 Etsha-13) and US\$508.40 (Shorobe). The net margin of kernel production is also lower than that for small-scale fishing

in the South agro ecological zone of Delta State in Nigeria, where the net margin was N 140, 493.74(US\$1116.71) (Inoni & Oyaide, 2007).

Table 2: Profitability indicators of Kernel production for a typical producer in a season

Indicators	Value (Pula)
Gross Revenue	800
Total Variable Cost	687.95
Gross margin	112.05
Total Fixed Costs	0
Net Margin	112.05
Net margin-to- cost Ratio (%)	16.29%
Return on sale (%)	14%

The net margin-to-cost ratio, which shows the returns to kernel production per unit cost, was estimated at 16.29%. This ratio is less than that for motorized and non-motorized segments of the artisanal fishers in Delta state in Nigeria of 34% and 45% respectively, (Inoni & Oyaide, 2007). These ratios are 2 and 2.76 times higher than this ratio, implying more profitability of artisanal fishing than kernel production. The return on sale of 14% for this study indicates that profit was 14% of the gross revenue in kernel production. As with the net margin-to-cost-ratio of artisanal fishing in Delta State in Nigeria (Inoni & Oyaide, 2007), the value for that entire study is 5 times (73%) more than for the current study. The higher profitability of artisanal fishing in the Delta state was mainly due to higher gross revenue and the scale of production.

### ***Non-economic benefits of harvesting and production of Morula***

#### ***Teamwork and social capital***

Other non-economic benefits of harvesting and conserving *morula* include ecotourism, leisure, and outdoor recreation. On several occasions during field work, we found the women gathered in a group at another members’ home where they were preparing *morula* and cracking the kernel together. It was observed that when involved in the production activity they work in a team, often share skills, collaborate (cooperate with one another), share light moment of stories and laughter. On the most part, social capital reigns during member gathering and production. For instance, during one of the focus group discussions in Matlhako village it was observed that collectors come together during nut-cracking. A 67-year-old woman said:

*“We all gather here to crack [dicheru]morula nut. As you can see! all of us here don’t come from same household, but we have [just] decided, without even discussing to decide and agree to gather here. We each bring our own morula/kernel/nut and tools [stone, pin/hoek] to crack and remove nuts from kernel. Since my husband died, this is where I find peace as we often joke and laugh together – look! we are all older women”.*

According to the respondents, their meeting not only strengthens teamwork, but also fosters friendship and family cohesion. Team-work in *morula* collection and kernel production is also evidenced by involvement of relatives such as children, spouses, and nieces who assist women in these activities as a gesture of being close knit families. Without team-work and ‘casual’ leisure for the women involved in the *morula* nut cracking this activity would be laborious and boring. Accordingly, these women find solace, relaxation time and socialize with others during *morula* cracking time (see Dillard & Bates, 2011; Edginton et al., 2002; Moswete et al. 2009). These livelihood-cultural ties have also been observed among crafts-producing communities, such as in two municipalities in Limpopo Province of South Africa (Malema & Naidoo, 2017), the Amathole District Municipality, also in South Africa (Mudemba et al., 2018), the Annang community in Akwa Ibom State in Nigeria (Ewen & Adetola, 2016), and the OvaHimba communities of Kaokoland in Namibia (Saarinen, 2011). Thus, a demonstration that a person’s leisure time occurs as part of every time of their lives.

### *Attractiveness of place and image making*

The image of the villages of Seolwane and Matlhako has so far improved as both domestic and foreign tourists continue to visit the area even though the ecotourism industry in the community area is not well defined. Indeed, *morula* trees and the KyT CBO have gradually influenced visitation to the area even though the numbers are still low (see Makwiti & Ndlovu, 2021). Village-based tourists who patronize and frequent the study area always have a visit to Kgetsu Ya Tsie development Trust in their itinerary to see and learn about what the women, popularly known as *morula* harvesters do, and to buy products from them. The ecotourism attractiveness of the study area is enhanced by the *morula* trees found growing naturally albeit in a linear pattern as if they were planted, forming a natural and cultural scenic landscape (see Milne, 1996) and visitors have been observed taking photographs which altogether form a part of the memorabilia of the place and their visits (Dillard & Bates, 2011 and Edginton et al., 2002).

### *Women empowerment and morula production*

When asked if they felt empowered (see Scheyvens, 1999), several of the women indicated that being in the business of kernel production helps them to provide for their families (employment empowerment). They too demonstrated that cash income from their sales enables them to supplement old age pension and the harvest from crop farming. As regards, social empowerment (Malema & Naidoo, 2017), the women echoed in unison that they are part of one whole as they come to work in kernel *morula* nut cracking yet! they also derive leisure, peace, and relaxation when together.

### *Constraints of morula kernel production*

The production of *morula* kernels is faced with a few challenges including lack of market and transport, risk of injuries associated with the use of traditional or primitive technology, lower selling prices and poor marketing.

### *Lack of a market*

Thirty three percent (33%) of the respondents reported that their production is contracted by small sized market. Members observed that KyT does not always buy the entire kernel produced. The implication of a small market is that the excess in kernel productions inevitably lead to lower prices of the produce, resulting in reduced revenue for the suppliers. Respondents also indicated that while kernel producers and the management of the Trust would have agreed on the prices of the kernels, there is no guarantee that the Trust would buy all the produce at the agreed price. The second implication of a small market is that unsold produce is bound to lose quality especially under conditions of no or poor storage facilities. According to the focused group discussions at Matlhako village, kernels not sold within a period of 1-2 months start to develop mold during storage. Thus, the rotting of the kernels when kept for a longer period warrants the need to have cold storage such as refrigerators in members' households.

### *Price of kernels*

Most of the respondents (53%) perceived the prevailing price of kernels to be much lower compared to the opportunity cost of household time used in collecting fruits and processing kernels. Based on past experiences, respondents indicated that the final and prevailing price for kernels is usually lower than the one agreed upon by the KyT management and kernel producers. These reports could indicate that either the quality of the kernels produced was below the expectation of the Trust or the kernel producers, who are also members of the Trust, are not adequately empowered to contribute meaningfully to making final decisions, such as

price determination. Lower selling prices are also a constraint since most of the harvesters and producers of *morula* kernel products are limited in formal education and thereby rely on word of mouth for marketing their products. A focused group discussion in Matlhako revealed that since KyT community-based organization or Trust (CBO) buys the kernels on credit, management often takes long time to pay what is due to them. This has the potential to demotivate members to produce consistently, sell to other markets or exit from the Trust membership. Some of the respondents indicated they are forced to travel long distances such as Palapye and Mahalapye to sell their produce for a better price.

#### *Processing of morula kernel*

A common method for extracting kernels from the nut is cracking the nuts using traditional tools (Figure 7). Thirty nine percent of the respondents echoed that when cracking the nuts there is the risk of injury to the cracker's hand. More often, injuries occur when the cracker accidentally misses the *morula* nut and injures the hand. Similarly, when individuals prepare *morula* for jam and juice for traditional alcoholic drink there has been reports of knife injuries. Clearly, there is need for introduction of better and safer technologies in the extraction of kernels and other production activities.

#### **Conclusions and recommendations**

This study has revealed that *morula* tree yields a number of by-products which have the potential to support employment creation for many rural households, especially women. This study has established that kernel production is predominantly a female-based activity, forming part of the culture of the Batswapong people. This culture also provides a means of overcoming production challenges by fostering the spirit of unity among women who are mostly economically disadvantaged (Mudemba et al., 2018). This study has also revealed that many respondents perceived that *morula* tree has decreased in availability due to human and natural factors. The human related threats include increased demand for some of *morula* tree products which can potentially lead to cutting of live trees, and the clearance of *morula* trees on land allocated for arable activities. The natural factors include the generally decreasing trend in rainfall in the region which adversely affects tree production and growth. Since perceptions are based on *morula* users' past experiences and observations, there should be a deliberate effort to conserve *morula* tree as it has proved to be an important source of livelihoods for the rural poor. *Morula* tree should be listed under protected trees in Botswana. Efforts should also be made to monitor the cutting of live *morula* trees across the country with a permit. Where possible, the government of Botswana, through the Department of Forestry and Range Resources, should encourage and support the planting of *morula* trees around the country.

The study has established that kernel production is economically profitable as are other non-timber forest products found around the world that were found to contribute to income generation, reduced abject poverty, and improved quality of life and job creation (Awen & Adetola, 2016; Makwiti & Ndlovu, 2021; Moswete & Thapa, 2018). Furthermore, its seasonal production has the added advantage of augmenting or supplementing income from other household sources. Notwithstanding its economic profitability, the gross margins of kernel production were smaller than those of similar or related activities pursued by households in the informal sector. The processing of kernel production has also been found to be labor intensive for women who already have other important roles such as cooking, childcare, and other household chores. The main constraints for kernel production were small-sized market, lower prices and time consuming and unsafe traditional technology used for of kernel extraction. Given the importance of kernel production to rural livelihoods, the Ministry of Rural Development and Local Government, in conjunction with the Ministry of Agricultural

Development and Food Security, should support such small-scale initiatives through provision of financial and physical capital.

One of the potentials for kernel production lies in the fact that the major semi-urban centers of Palapye and Mahalapye offer trade opportunities as they are located proximal to all points of production in the area. Furthermore, the well-developed road network in the area can provide access to markets in these centers and the neighboring South Africa. The KyT also stands to benefit from Community Based Natural Resource Management (Moswete & Thapa, 2018) support through sustainable management or utilization of kernel production. Since community ecotourism in the study villages is new, the *morula* kernel production-based community project has the potential to benefit from the existing well defined tourism destinations (e.g., Serowe) and nearby attractions of the Old Palapye monument, Khama Rhino sanctuary and Goo-Moremi Gorge

To significantly reduce the time taken in the production of kernels whilst increasing the output, an improved or modern technology as against traditional or primitive tools they use for dehusking should be developed. The technology should effectively process *morula* kernels while simultaneously reducing the possibility of injuries to the producers. The study also recommends the need to educate women about the business of community-based ecotourism because ecotourism is an industry where the physical isolation of a destination may enhance its economic advantage (see Milne, 1996). Visitors to such destinations usually buy products and take photographs as their memoirs. Further, capacity building is needed on aspects of destination and tourism marketing which will help them reach out to both local and international visitors to their villages.

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