Gendered Livelihoods, Informal Business Sector and Food Security: The Role of Indigenous Knowledge in Food Production in Botswana

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Abstract

This paper examines gendered livelihoods and women's contribution to food security at a household level in Botswana. It focuses on the planting, harvesting, processing, and marketing of the *morogo* (vegetable/ leaves) and *dinawa* (beans) which come from the cowpeas plant –a member of the legume family. This kind of vegetable leaves are also called *morogo-wa-dinawa*. The current work also assesses the utility of traditional practices and knowledge systems in the attainment of food security for improved livelihoods among rural and urban households in Botswana. It focuses on female-led households, utilizing cases from both urban and rural areas to also explore mobility and transformation of society. The paper also analyses how women access markets in urban informal economy to address livelihoods. In line with similar studies, it is revealed here that food production at the rural household level is highly gendered as most of the work is carried out by women who employ indigenous knowledge systems and practices associated with food production, processing, storage, and marketing. The paper has adopted the case study approach and through in-depth interviews profiled the agricultural practices of households. The interviews were conducted over a long period of time between 2008 and 2021 at different sites in the country, capturing activities of gendered livelihoods and food security. This is even more imperative with the onset of the COVID-19 pandemic which has impacted all the sectors of the economy.

Introduction

Botswana's population is highly mobile as evidenced by the rapid urban growth in recent years. Despite this socio-economic transformation, agriculture in rural areas remains very critical in issues of household food security and nutrition. Various international and national strategies have emphasized the importance of alleviating poverty. In response to the growing concern about under-nutrition and the capacity of agriculture to meet future food needs, the United Nations Food Systems called a Global Food Summit in 2021, with the aim of renewing commitment to carve a path to a world where good food for all is a reality; affordable and accessible (UN Food Systems Summit, 2021). Through its national strategies, Botswana promotes various subsectors of agriculture to improve food production and security. The United Nations' Sustainable Development Goals (SDGs), which the government of Botswana has domesticated, aim to end all forms of hunger by 2030, making sure that people have access to sufficient and nutritious food all year round (Statistics Botswana 2018). The country strategizes to eradicate extreme poverty, ensuring that men and women, in particular the poor and vulnerable have equal rights to economic resources. This involves promoting sustainable agricultural practices, including small-scale farming, and allowing equal access to markets. At the national strategic level, the Botswana National Development Plan 11 (NDP 11) and Vision 2036 also emphasize the attainment of food security through the development of the agricultural sector (Republic of Botswana 2016). According to the SDGs, NDP 11 and Vision 2036, the most effective way of ending hunger and achieving food security is at household level (Statistics Botswana 2018 and Republic of Botswana 2016).

Food production at the rural household level is highly gendered with most of the work carried out by women. In addition, women employ indigenous knowledge systems and practices associated with food

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production, processing, storage, and marketing. Urban dwellers contribute to sustaining rural households through remittances and/or contributing to an improved quality of life through the provision of funds for education or agricultural investments. Money is sent by urban workers to the villages, in return for foodstuffs and other farm produce, which are expensive to purchase in towns. These transactions have a bearing on food security. In recent years, urban growth has been promoting mobility of people as well as traditional food from rural areas to urban centers. The devastating outbreak of Covid-19 pandemic has impacted all the sectors of the global economy since 2020. Due to the pandemic, millions of people have felt the shocks of a global economy in crisis and still the pandemic rages with more contagious and severe SARS-CoV-2 variants spreading around the world (Bill and Melinda Gates Foundation 2021; Masupu 2021). In Botswana, like the rest of the world, the pandemic has brought about fears of food insecurity, food shortages as well as a rise in food prices (Republic of Botswana 2020 and Fox 2020).

This paper examines gendered livelihoods and women's contribution to food security. The paper also assesses the women's utility of traditional practices and knowledge systems in the attainment of food security for improved livelihoods among rural and urban households. In the process existing indigenous knowledge practices employed in the production and processing of bean's leaves (*morogo-wa-dinawa)* and beans (*dinawa)* are also explained. The research adopted the case study approach and through in-depth interviews profiled the agricultural practices of households residing at Sasakwe lands area in Kopong (Kweneng District) and Mosalakwane lands in Bobonong area (Bobirwa Sub-district). To further explore, rural-urban livelihoods in Botswana, in-depth interviews and observations were also extended to randomly selected women at Botswana Building Society (BBS) Mall and the Main Mall in Gaborone. Although in theory there is enough food at the global level, scarcity continues to be the norm especially in the developing countries. In many of these countries periodic hunger and starvation prevail and the subjects of food security and self-sufficiency thus remain major objects of concern for policy makers.

According to Singer (1997), the food scarcity can be explained through factors such as emphasis on cash crop farming at the expense of food crops due to agricultural globalization, population increase and urbanization. Botswana experiences one of the fastest urbanisation rates in the developing world. It is estimated that 61% of the total population in Botswana resides in urban areas, and the current urbanization rate is 2.3% (World Population Review 2021 and Gwebu 2014). The rapid urbanization plays a prominent role in the attainment and promotion of food security in both urban and rural areas. Focusing on the growing, harvesting, processing and storage of indigenous food crops in Botswana using *morogo-wa-dinawa* and *dinawa* as case studies, we posit that indigenous knowledge systems and practices may hold the key to boosting food security in many African countries. These are efficient and cost-effective methods with the knowledge that is easily transmitted from generation to generation as well as ecologically adaptable. By indigenous knowledge we mean the 'traditional' or 'local' knowledge embedded in the community which is unique to a given culture, location, or society (Ohiokpehai 2003 and Mackenzie 2014). It is a large body of knowledge and skills that have been developed over time, outside the western/ modern formal education system and that enable communities to survive.

On 11 March 2020, the World Health Organization (WHO) declared the Covid-19 a pandemic (UN 2020). Like the rest of the world, the government of Botswana acknowledged the impact of the pandemic on the society and its severe negative consequences globally. Drawing from the WHO protocols, Botswana's strategy has been to contain the spread of novel Corona virus (Covid-19) through social-distancing, wearing of face masks that cover the mouth and nose when in public, regular and frequent washing and sanitizing of hands, isolating, and quarantining cases, and quality clinical care for infected clients, contact tracing and testing, and restricting movement (Republic of Botswana 2020). When Covid-19 was declared a global pandemic, Botswana acted quickly and decisively to halt its spread by closing the country's borders on 24

March 2020. After the first case was confirmed on 30 March, the government declared a state of emergency and subsequently imposed an initial 28-day lockdown on 2 April that led to further restrictions on people's movement which imposed tight rules requiring people to apply for travel permits between designated zones (Republic of Botswana 2020 and Masupu 2021). Immediately after the lifting of the lockdown a curfew was imposed on the country, and this affected food supply and food chain. Botswana's food production and security has been seriously challenged by the ongoing Covid-19 pandemic (UN 2020).

The pandemic is a health and human crisis threatening the food security and nutrition of millions of people around the world, hence, the importance of generating a discourse around issues of food security and household livelihoods. Women and men are affected differently by the pandemic (UNWomen 2020). Women, particularly those engaged in small scale farming and the informal sector, find themselves in vulnerable situations as the crisis unfolds and intensifies. Although current research shows that women are increasingly becoming important in the agriculture sector (Mackett 2021and Crush *et al*. 2011), economic pressures not only tend to affect women more, but they also experience the increased burden of caring for their families. Furthermore, women constitute a significant number of those serving as frontline health care workers in the response to Covid-19 and are also at a greater risk of gender-based violence (GBV) (DFID/ VAWG 2019 and UNFPA Botswana 2021). This was a similar experience during HIV/AIDS prevalence (Nchunga 2020; Kandala *et al.* 2012; Salinga and Haacker 2006; Econsult 2006).

Food Production and Security in Botswana since Independence

Since Botswana's independence in 1966, the country has recorded impressive economic growth fuelled largely by diamond mining and export and the investment in the economy (UNDP 2012 and Mackett 2021). The discovery and exploitation of mineral deposits transformed the economic situation drastically although other factors such as the rapid expansion of the national herd and beef exports have also contributed to Botswana's post-independence economic boom (Republic of Botswana 2008 and 2016). However, the rise of the mining sector has been accompanied by the simultaneous decline of the agricultural sector over the years. This is reflected through the sector's declining contribution to the country's GDP as the mining sector expanded. At independence the agricultural sector contributed 42.7% to the GDP which by 2008 had declined to just 1.9 % (Statistics Botswana 2012). In 1974/5 mining contributed 8 % of GDP in Botswana, of which diamonds mining made up a large proportion, and in 1988/89 went up to 53%. Therefore, mining sector has remained the primary productive sector in the Botswana economy. (Hillborn 2011 and 2013; Pegg 2010). The decline in the importance of agriculture to the Botswana economy has important implications for the attainment of food security in the county. The situation has been compounded by recurrent (persistent) drought, inadequate use of improved technology and inadequate market access among many households (Mackett 2021 and UNDP 2012). Jointly, these factors have made arable agriculture in Botswana a risky undertaking. Since independence Botswana has been experiencing recurring drought, for instance 1981 to 1986, 2003 and 2015 (Statistics Botswana 2018). The country is known for erratic rainfall and relatively poor soils making crop production a high-risk undertaking (UNDP 2012). In the agricultural sector the worst hit has been crop production which is mainly based on rainfed farming. The consequences have included the erosion of the rural economy, declining rural incomes, a widening gap between the rich and the poor, deepening poverty (Statistics Botswana 2016-2021 and Cover 2003), and, most important for the purpose of the current study, increasing reliance on neighbouring countries for imports of the bulk of food consumed in the country. This has serious implications for the nation's food security.

Various steps have been proposed to increase agricultural productivity and consequently rural incomes and food security in the country. According to von Braun *et al.* (1993), agricultural productivity can be enhanced by boosting science and technology, improving human capital through education and

health, conflict prevention, resolution mechanisms and democracy. Whereas most of these are realised in Botswana there is one area - namely, the potential role of indigenous knowledge systems which has been neglected, if not overlooked completely in the quest for improved food security. According to the World Bank, the basic component of any country's knowledge system is its indigenous knowledge, which encompasses the skills, experiences, and insights of people, applied to maintain, or improve their livelihood (World Bank 2015 and 2010). Indigenous knowledge is indeed a critical factor for sustainable development and is a good reservoir that needs to be recognised and given adequate attention. Indigenous knowledge systems also provide the basis for problem-solving for local communities, especially the poor (Statistics Botswana 2015/2016 and 2016-2021; Patterson 2015).

In Botswana most of the poor are found in the rural areas. Statistics Botswana report on mapping poverty in Botswana confirms that poverty remains extremely high in rural areas, for instance Ngamiland West (46.2 %), Ngwaketse West (41.7 %), Central Bobonong (32.8 %) and Kweneng West (32.4 %). (Statistics Botswana 2010 and 2013; World Bank 2015 and BIDPA 2013). However, the country's indigenous knowledge is gradually disappearing from society owing to urbanization and globalization (Satterthwaite *et al.* 2010 and Daes 2004). Indigenous knowledge is generally perceived as knowledge that is possessed by communities which they use to understand their realities and to resolve problems of survival. It is further said that it is about the common-sense ideas and cultural knowledge of local people concerning day-to-day life (Moahi 2012). It is very important in a society in transition such as Botswana which straddles both the indigenous practices and the modern practices as well as the urban and rural areas (Mkapa 2004).

Several policies were introduced to improve the performance of crop production in Botswana since independence. These include Accelerated Rainfed Arable Programme (ARAP) from 1985 to 1991, which saw a policy shift from food self-sufficiency to food security. ARAP mainly focussed on cereal production (African Development Bank 1994 and Lado 2001). In 2002 the National Master Plan for Arable Agriculture and Dairy Development (NAMPAADD) was introduced (Makgala 2005 and FAO 2016). There was also an agricultural policy incepted in 2007 directed at the youth to enhance farming activities within the said demographic group that also proved ineffective and has now been discontinued as a result (Baaitse 2015). The Integrated Support Programme for Arable Agriculture Development (ISPAAD) was introduced in 2008 to address challenges facing arable farmers. Even with the introduction of government programmes such as ISPAAD more recently, there has been little to no improvement in the agricultural sectors' performance (Morapedi 2016; Magang 2015 and UNDP 2013). Notwithstanding state efforts to diversify agricultural activity within Botswana, there has been very little increase in terms of agricultural development and its contribution to the GDP of the country (Statistics Botswana 2016). In comparison to the crop sector livestock production is the only subsector of agriculture which has remained a significant contributor to the GDP. Cattle contributes approximately 80% to the agricultural GDP (International Trade Administration 2020). The poor performance of the agricultural sector has implications on food security on the country.

Food security emphasizes access to sufficient food by all people for an active and productive healthy life (Lado 2001). Therefore, food security is determined by accessibility and availability. There is also emphasis on the diversification of income sources to enable households to have access to food and to meet other basic needs (Lado 2001). At a national level food security means access by the country at all times to food supply and meeting national demand adequately. At this level food security is determined by, among other factors, the amount of food produced in the country and the resources of food a country has (Bahta *et al* 2017 and WHO 2019). Botswana has a comparative advantage at this level in producing livestock (particularly beef), as well as the production of minerals and potential for investment in agro-industrial and supply chain development (FAO 2018 and Bahta *et al* 2017). However, it may be worth

noting that minerals are non-renewable resources, hence risky going forward. Foreign exchange earnings from activities in which Botswana is competitive can be used for importing essential food items, such as maize, which cannot be produced so advantageously in the country (UNDP 2012). At the household level, it is the purchasing power of individual households which determines the quantity and quality of food consumed. Purchasing power depends on both the household income and on the variety of food stuffs (Kebakile 2008). The goal of the household food security demands that each household has sufficient income generating opportunities and access to food to meet its nutritional requirements (Lado 2001).

Botswana has maintained adequate food availability at national level through food imports to meet national demands. For instance, a 2019 survey shows that the country imports 197 666 tonnes of vegetables every year (World Integrated Trade Solution 2019). Even though Botswana continuously imports food from neighbouring countries, the agricultural sector remains the main source of food. In addition, the sector remains relevant because most of the rural people obtain their livelihoods from agricultural activities (FAO 2018). Most rural households derive their livelihoods from agriculture through subsistence farming, therefore, crop production which is mainly based on rain-fed farming will always remain relevant to food security in Botswana (FAO 2018 and UNDP 2012). However, the present agricultural practices in the country leave it prone to serious food problems. The system reflects large variations in food production and wealth among the peasantry. The wealth of the rural household is based upon cattle, but these are concentrated in the hands of the few (Molefi 2000 and BIDPA 2013). This leaves those who do not have cattle with less purchasing power for imported food and ultimately makes them more prone to food insecurities. Botswana's food security strategy (Sungirirai 2019 and Peke 2019) is aimed at addressing a major need in the rural areas that is implementing policies and programmes to enhance income levels overall and enable people to acquire food. In other words, the strategy was promoting the identification of better income prospects for households to participate fully in the production of food crops (Lado 2001).

This study is about indigenous knowledge systems in Botswana within the context of food processing and storage focusing on traditional foods namely *morogo* and *dinawa*. The *morogo* (leaves) and *dinawa* (beans) come from the same plant and belong to the legume family (Agwu 2004). Although it is called beans, *dinawa* is scientifically referred to as cowpeas. They belong to the group of crops that grow under extremely hot weather conditions and can survive in poor soils. In addition, the *dinawa* plant does not require large tracts of land; it is low maintenance and unlike sorghum it is not prone to predation by birds. In recent years, *morogo* and *dinawa* are increasing in commercial value as the Botswana society becomes more health conscious. It has a high protein in content and was once described as 'poor man's meat' (Agwu 2004). The leaves (*morogo*) are also used for human consumption as well as animal feed. Dried seeds are popular ingredients in a variety of dishes. Green pods and leaves are also eaten as vegetables. Fresh *morogo* leaves are cooked and eaten immediately or processed and dried to be preserved for future consumption. There is heavy reliance on indigenous knowledge in the growing and processing of *morogo* and *dinawa*. In recent years, because of the expansion of the informal sector market there has been a growing demand of the production of *morogo* and *dinawa.* In Botswana, like elsewhere in Africa, it plays an important role in the economy and diet of rural and urban population (Mazhani 1995 and Akinola *et al* 2020). This is the most cultivated grain legume in Africa and plays an important nutritional role in developing countries.

Gendered Livelihoods and Food Security

Nearly all societies organise their lives and activities based on division of labour between females and males. This socially based, and socially determined division of labour regulates the relationships between men and women. Gender relationships and division of labour are, therefore, socially construed and constructed, through the process of socialisation (Riesman 2004). This process differs from one society to another, and

it becomes reinforced by other factors such as culture, religion, individual inclinations among others. The gender division of labour varies according to different cultures. In most African societies for instance, agricultural tasks are usually performed by women. Some tasks that require a greater degree of heavy manual labour such as clearing forests and woodlands, digging, fencing, and others are performed by men. On the other hand, physically fewer demanding tasks such as planting, weeding, and harvesting tend to be performed by women (FAO 2018). In Europe on the other hand, especially before industrialisation or the Industrial Revolution, men were traditionally the major agricultural workers, as they generally performed agricultural tasks and chores, whereas in Japan, agricultural tasks were traditionally performed by both men and women (Riesman 2004).

Livestock production and arable farming are the main activities in Botswana's efforts towards food production and food security. Wide differences do exist between groups of farmers in terms of resources, methods of production and technology employed. Because of arid climatic conditions livestock production especially cattle, has the advantage over arable farming. The cattle industry further dominates all other livestock such as sheep, goats, poultry, and pigs (Heseelberg 1994 and Statistics Botswana 2015). However, during the 2017 Agricultural Census which focused on the traditional sector of agriculture, the livestock production subsector performed poorly in comparison to the crop production sub-sector (Statistics Botswana 2019). Based on this report the sub-crop sector, which is more accessible to female farmers than livestock production, the 2017 season experienced a good harvest compared to 2015 Agriculture Census results for the traditional sector. The good performance of the crop sector was attributable to the good rains received during the 2017 agricultural season as well as the input subsidies provided by government (Statistics Botswana 2019). Crops covered include sorghum, maize, millet, beans/pulses, sunflower, groundnuts, and others. The production of beans/pulses tripled from 796 metric tons to 2,348 metric tons between the 2015 and 2017 agricultural seasons (Statistics Botswana 2019).

Studies have shown that the good performance of the crop production sub-sector especially sorghum and maize rarely benefit the small-scale farmers and poor rural households, including those headed by women (Lado 2001 and FAO 2018). This is largely because they don't produce surplus and the crop-pricing policy for food self-sufficiency mainly benefits the large-scale farmers. Small scale farmers including female headed households who cannot compete and participate fully in the basic cereal production have instead strategized and identified alternative income prospects for their households (FAO 2018 and Moseley 2016). In this regard female headed households have over the years resorted to planting and processing crops such as *dinawa* and *morogo* for household consumption and the market as it will be illustrated in the paper. Overall women have less access than men to resources such as land, agricultural inputs, credit, education, extension, and other services. They are largely responsible for the gender-determined labour and time-intensive chores of collecting water, firewood or other fuels, cooking, and taking care of children and sick people. This impacts on their participation in the agricultural sector (Lemke and Delormier 2017). Women play an assortment of essential roles in food production, processing, storing and consumption that need to be boosted to increase food security. They carry out most, if not all, household food processing ensuring diverse diet, minimising losses, and providing, where possible, marketable products. Women also by nature of their roles and expectations in food production invest more time to contribute to food production at the household level compared to their male counterparts.

Intractably connected to food security programming is the issue of land rights and accessibility to other resources for women at various levels in the quest for women integration and mainstreaming food security for the households and communities. According to the Botswana 2017 Annual Agricultural Survey which focused on the traditional sector of agriculture, male farmers continued to dominate farming at 62.1% compared to their female counterparts with only 37.9% participation. The study also revealed

that out of the 76,456 acres of land holdings in the traditional agricultural sector 48,455 acres were owned by males while only 28,001 acres were owned by females (Statistics Botswana 2019). The same unequal disparities are reflected when it comes to the number of acres that were planted and harvested during the same period. Despite these disparities, legal reforms to address gender disparities in the agricultural sector have been formulated (UNDP 2012).

Gender based factors and inequalities such as land acquisition rights in controlling of livelihoods: owning boreholes; farming equipment such as tractors and planters; loan acquisition, and ownership of produce limit women's food production capacity and puts household food security at risk (Mackett 2021). This is especially true, for female headed households who tend to be vulnerable to the capriciousness of these factors. As a livelihood strategy, women tend to engage in small scale production near their homesteads. As a result, most of the women understudy adopted this intervention strategy and taken up small-scale farming, poultry raising, beekeeping and small stock keeping. The empowerment of women in this regard would result in high variations of yields that would enhance good nutritional patterns for women, children, and their communities as well as economic diversification. According to Mazhani (1995) traditionally, food production has been the responsibility of women, while men spend most of their time at the cattle post (*moraka*) herding livestock. There is a clear distinction between women' and men's activities but this is not totally rigid, and some activities can be carried out jointly sometimes. Traditionally, men generally took major responsibility for land clearing, ploughing, and planting. Once ploughing was finished, the men would go to the cattle post while the women remained at the lands or fields and were responsible for weeding, harvesting, and threshing of the crop.

Botswana experiences one of the fastest urbanisation rates in the developing countries. Over half (54%) of Botswana's population currently lives in the urban settlements (Gwebu 2014; Republic of Botswana 2014 and Statistics Botswana 2019). Even though urbanisation has benefited Botswana's economic and social development, it has also generated wide range of socio-economic challenges (Guneralp *et al.* 2017). Unlike other sub-Saharan countries where agriculture contributes substantially to household income and GDP, in Botswana frequent drought, low soil productivity and the lack of draught power among many households make this impossible (UNDP 2012). The differences in economic opportunities between rural and urban areas also contribute to people migrating from rural areas to urban areas. In Botswana, most people who reside in cities and towns still look up to the city as their second home, their first home being in their respective villages of origin in the rural areas (Republic of Botswana 2014).

As a result, there are strong urban- rural linkages and interdependencies. Furthermore, urban areas provide markets for rural agricultural produce which is facilitated by ease of mobility and access between these areas. Rural areas, especially those near urban areas, play an important role in providing alternative sites for the location of institutional, commercial, and industrial activities. The urbanisation process is witnessing an emerging trend in the maintenance of urban-rural linkages (Lesetedi 2013). The increase of the elderly population in urban areas indicates that the urban residents do not necessarily retire to their home villages as it used to be the case in the past. Some of them consider the city as home and not only a place for work. They continue to maintain strong linkages with rural areas, through visitations as well continuing with their agricultural activities such as keeping livestock or ploughing when the rains are good.

Rural women depend on women urban dwellers to provide a market for their produce. On the other hand, women resident in urban areas rely on the rural women to supply them with *dinawa* or *morogo* either for household consumption or for repackaging and selling to the wider market in towns.

Findings And Discussion

This study broadly explores the role of indigenous knowledge and technology in the attainment of food security and sustainable livelihoods among urban and rural communities in Botswana. Utilising the case study approach, it now focuses on the planting, harvesting, processing and storage of traditional foods namely *morogo* and *dinawa*. We also explore *lerotse* (cooking melon/ citron melon) which is an ingredient in the processing of *morogo*. As indicated earlier, the study utilises case studies of two households engaged in small scale farming in Sasakwe in the Kopong area of the Kweneng District and Mosalakwane in the Bobonong area, Bobirwa sub-district of the Central District. In addition, women traders based at BBS Mall and Main Mall Market in Gaborone were interviewed.

The farming of *dinawa, morogo*, and *lerotse* is dependent on indigenous technologies and inputs that are readily available and not costly to the farmer. The choice of the study area was informed by the existence of rich indigenous knowledge in different parts of the country and the researchers' easy access to the research site. The study was also guided by the household members' positive attitudes towards the practice and technology under review. As demonstrated by the households studied and the fact that they indeed considered it to be a best practice as illustrated in Case study 1, one can assume that most community members in Botswana will display similar positive attitudes towards indigenous knowledge and practices to produce traditional foods crops.

Case Study I: The Sasakwe Farming Land

Here the household included a husband, his wife, their (two) children, his mother, his sister with her baby son, and a farm worker. The family indicated that they originally came from Serowe in the Central District, about 380 kilometres from Gaborone. Sasakwe lands from Gaborone is approximately 31 kms. They had elected to acquire farmland in the Sasakwe in southern part of the country. The husband and wife were gainfully employed in Gaborone, but they considered themselves first and foremost to be farmers. As such, they desired to continue doing what they grew up doing (farming) in Serowe. Because of the long distance between Serowe and Gaborone, the only way they could combine formal employment with farming was to acquire land within reach from their work area. Hence, the Sasakwe area offered a suitable site. However, they also owned a cattle post in Serowe.

Owning a field closer to their workplace would make it possible for doubling up as full-time employees and farmers. According to the respondents, unlike cattle post where one can visit occasionally, a field needs more care. This means that for one to be successful, they must live on or very near to the field. They indicated that the mother played a prominent role in crop planting and processing. It is to her that they turned for advice as to where, when, and how to plant the crops since the husband and wife spent quite a good time at work in Gaborone. They informed us that they ploughed *marotse* (melons) and beans. From the beans they got *morogo* (dried vegetables). It is to a more detailed description of the ploughing, planting, harvesting, and processing processes of these crops that we now turn.

Harvesting, processing and storage of morogo

The farming of *dinawa* gives the farmer double advantage. First, it allows him/her to harvest *morogo* which serves as vegetables. Although most of the harvesting work is done by women, the skills required for the process can be learnt by both men and women. Unlike other crops, the harvesting of *morogo* requires no special tools. Bean leaves (*morogo*) are picked by hands and all what is required is someone who knows which leaves to pick. If one can select the tender leaves and not necessarily dry that will make good *morogo*, one is qualified and competent enough to harvest. In most cases much of the work of harvesting is done by the owner of the field. Nevertheless, employed labour or the labour of reciprocal work parties (*molaletsa*/ *letsema*) may be utilised. During the harvesting of *morogo*, *dinawa* are left hanging on the

plant until they are dry. The *dinawa* should not be left for too long on the plant otherwise they will burst open, and the seeds will spread on the ground, making harvesting difficult. When you harvest *morogo*, you make sure that *dinawa* are not disturbed in any way to allow them to mature for harvest.

After *morogo* (green tender bean leaves) are harvested, they are put in sacks/bags/containers and taken to the homestead nearby for processing and storage. The processing commences with the thorough washing of the leaves. This is essential to remove any soil and other impurities that the leaves may have and, in the words of the respondents, to 'make sure that they look appetising'. It is recommended that the leaves are washed in a lot of water and rinsed about three times. During the washing the soil and other impurities sink to the bottom of the container. Once clean the leaves are boiled/cooked in a big pot. You just add a little water and allow it to boil until it cooks well. For the *morogo* to cook properly you must ensure that a lid is placed tightly on the pot to contain the steam. Once the pot is tightly covered, you increase the heat by burning more *mophane* firewood, but one must be careful not to burn the *morogo*. *Mophane* logs are considered good at generating heat and do not burn out quick. Sometimes there are taboos (*meila*) associated with the processes of using other different firewood species. As the cooking progresses, slices of *lerotse* (yellow cooking melon) are prepared and added to the *morogo* to give it a good taste and flavour. Salt is also added to the *morogo*. Although *morogo* can be eaten without *lerotse*, the respondents emphasized that mixing it with *lerotse* is highly recommended because it gives it a sugary and pleasant taste. According to them, those who are used to eating *morogo* mixed with *lerotse* are not likely to enjoy it when no *lerotse* has been added to it.

Once satisfied that the *morogo-lerotse* mixture is fully cooked, it is removed from the fire before the water dries. The lid is then taken off from the pot to allow the *morogo* to cool. It is important to leave a bit of water in the pot so that when you mix *morogo* and *lerotse* they blend. After cooling a big wooden spoon is used to mash the *lerotse* and *morogo*. You can even remove the *morogo* from the pot and beat it in a bowl to ensure that the leaves mash rather than remain as separate leaves. Afterwards the mashed leaves are removed from the pot/bowl and separated into lumps for drying in readiness for storage. While the *morogo* is still cooking a clean place is prepared for drying it. The most ideal place for drying is on a clean corrugated roofing sheet which is a good conductor of heat. The drying requires a lot of heat/sunlight. It is, therefore, not advisable to process *morogo* on a rainy day.

Fortunately for Botswana, it is generally a hot and dry country, hence suitable for processing the vegetable. When drying the *morogo* care must be taken to ensure that it is separated into small pieces and that any whole leaves are broken to make it look appetizing. However, the practice varies across cultures; in some cases, the *morogo* is dried in big lumps while in others the lumps are very small. Smaller bits would also dry faster. Nevertheless, the issue of taste remains central. The main purpose of separating the *morogo* into small lumps is to allow for the circulation of air. By drying the *morogo*, the farmer benefits in two ways. First, the *morogo* can be stored for use during the dry season. It is the kind of food that you can eat for a long time when dried but rots if left in the field. Second, it can be sold to earn money to buy groceries and earn some income for the household. Some of the money can be used to pay for ploughing during the next season.

Harvesting, processing and storage of dinawa

After harvesting *morogo* the farmer can then wait for the bean crop to mature upon which he/she harvests *dinawa*. Again, the harvesting work is mostly done by women. Although *dinawa* can be harvested before they are dry, the farmer must wait to harvest them when they are completely dry if he/she intends to store them for consumption and other purposes in the future. When *dinawa* are harvested before they dry, they are referred to as *nyebu* (*dinawa* cooked green whilst still in pods). When you harvest for *nyebu*, you pick those with mature seeds inside and are about to dry. *Nyebu* can be cooked and served as a nutritious snack

to the household. During the harvesting of *nyebu* you leave the dry ones to be harvested later when they are completely dry.

Dry *dinawa* are harvested, put in sacks, and threshed using sticks. Thereafter, winnowing follows. After winnowing, the outer shell is stored elsewhere and used for animal feed during the dry season, leaving the farmer or household with the beans (the food). The beans are then put in baskets made from material traditionally referred to as *mokolwane* (palm reeds) or in sacks/bags for storage. In the past this were sisal sacks but nowadays mostly plastic or synthetic like material is common for storage even at the Botswana Agricultural Marketing Board (BAMB). The use of *mokolwane* baskets is preferred because the material from which these are made protects the beans from the heat. For the dried beans to be preserved for long the farmer adds ashes to them which protect them from damage by weevils/ insects. The ashes are obtained from burning a specific tree called *motswere* (leadwood tree). This is an indigenous tree which produces very bitter ash when burned.

Like most other knowledge systems, the knowledge base to produce indigenous food crops is transferable from generation to generation and across related ecological conditions. The intergenerational transfer of knowledge is illustrated in Case Study Two below. Although some values have changed and are still changing, certain traditional values have been retained. These include those pertaining to food production such as those associated with the processing and storage of food crops. This means that communities still retain socio-cultural practices for the management of natural environments for sustainable livelihoods. Case study II also portrays the processes.

Case Study II: Mosalakwane Farmlands

The interview was conducted with one of the respondents from Mosalakwane farmlands or fields in the Bobonong area. The respondent was one of the daughters in law in the family and is one of the three 'sisters in marriage' who were married to brothers and are now widowed. They are in their eighties and have lived in this area for over forty years. The elderly women are sought for their traditional knowledge accumulated and shared throughout their married lives. Over the years these women have accumulated traditional knowledge on the planting of beans and processing of the leaves to become *morogo*. On occasions some of the younger women who are just joining the extended family as newlyweds go to them for advice concerning the planting, harvesting, and processing of *morogo* and *dinawa*.

Planting and harvesting

According to the respondent, beans are different and are called by different names by different communities and when preparing the seeds for planting they identify the beans which will yield good *morogo*. In the Bobirwa sub-district, particularly in the Mosalakwane farmlands (*masimo*) the favoured ones are those known in Setswana as '*Mogwe o kgotsheng'* (son-in-law that has eaten to the full)*, 'Senakedi'* (skunk*), 'Dinawa tse dikhibidu'* (red beans*),* and the one commonly known as 'the black eye'. In their understanding of planting and harvesting of beans, the 'black eye', is very quick to produce the leaves ('*e tsala ka pele'*) but the leaves get dry quick ('*e bo e omelelela ka pela'*), making it not viable for harvesting for *morogo* anymore. They prefer to grow it to produce dry beans as food for nutrition. According to this knowledge system, if one can select the tender leaves that will make good *morogo*, one is qualified and competent enough to pick the leaves when you are harvesting. The harvester must be very attentive to pick leaves which are very fresh and soft, 'leaves that still have life and are attractive to the eye' ('*a santse a tshela, botshelo bo le bontle*'). They ignore the thick leaves and pick the thin fresh ones because they cook easily. The reason why harvesters pay attention to the leaves is because the *morogo* gets processed for relish.

After harvesting the woman must ensure that two containers are ready preferably open metal containers or bowls (*dikotlele*). The first container (*sekotlele*) will have water and soak the *morogo* and

wash it and then transfer it to the second one for rinsing. If it has rained, the plant picks the soil. In that situation one must use three containers, the third one for final rinsing. While you are washing the fresh leaves, you should use a three-legged pot with some water on an open wood fire (*molelo*). As you are rinsing the *morogo* throwing it into the pot, you keep stirring as it boils and add salt ensuring that it is not too much. You start cutting the *lerotse*, peeling off the skin and removing the seeds. This is referred to as '*go tllhabela lerotse'*, where you peel, cut slices into pieces, and throw melon on top of the leaves as they boil. The seeds and the skins of the *lerotse* are fed to the chickens. But some can be dried in the sun and stored for next planting season. While the *lerotse* is 'sitting' on the leaves, it is not stirred to mix with the leaves, but because of the boiling water it gets steamed in the process. The steamed *lerotse* is then removed from the pot, placed in a separate container, and mashed. The *morogo* is also placed in another container and is mashed too. After mashing, the *lerotse* is added into the mashed leaves of the *morogo* and mixed in one container.

Drying and marketing the morogo

For purposes of drying *morogo* one needs to prepare a clean flat container like one in the form of new corrugated roofing sheets. This is usually suspended on some height to prevent soil and pests such as chickens from feasting on it. During this process you start separating *morogo* into small pieces/lumps when drying it out in the open space like *lelwapa* (courtyard), to receive sufficient heat. The small pieces must be turned around during the day when baking through the sunlight in preparation for storage and marketing to consumers. For *morogo* to be presentable to consumers they have now introduced convenient packaging through transparent plastic bags though not good for the environment.

The producers of *morogo* products in Bobirwa sub-district are proud of their product which they portray as very attractive and most of the time they send sealed bags of 12.5kg bags to Gaborone. Due to the distance (approximately 442 kms) between Bobonong and Gaborone the producers of *morogo* often request for some members of the family to market the *morogo* widely to urban consumers. A bag can fetch P800 or more. Such money compliments their *motaodudje*/*tandabala* (government welfare cash for the elderly). They say their customers in Gaborone include upmarket restaurants such as Botswana Craft.

The crops studied have multiple uses. For instance, the bean crop from which *morogo* is harvested also produces *dinawa*. In addition, both *morogo* and *dinawa* can be consumed fresh or in dried form. Moreover, after harvesting *morogo* and *dinawa,* the plant becomes animal feed. Similarly, *lerotse* has multiple uses. It can be used to cook *bogobe* or dried to become *lengangale*. The melon can also be fed to animals especially in times of drought because it contains a lot of water and can stay for a long period without going bad. Whereas the *lerotse* seeds can be pounded into powder or spice for *morogo* to give it good taste, the seeds themselves can be fed to family free-range chickens.

Unlike other crops such as maize, sorghum, groundnuts and beans for which markets are readily available through the BAMB, no formal marketing outlets for small scale farmers exist for *morogo, dinawa* and *lerotse*. Generally, farmers are not happy with BAMB as they feel it rips them off, including big time farmers. The little *morogo* and *dinawa* that finds its way into market is sold through informal marketing channels by individual women. Case study III is illustrative of this.

Case Study III: The Gaborone Main Mall and BBS Mall Markets

Most of the women at Main Mall and BBS Mall are female-headed households who buy *morogo* and *dinanwa* in bulk from rural areas, add a mark-up when re-selling the dry produce to attract some profit. Through the process of buying *morogo* and *dinawa* from women in the rural areas and re-selling at the Main and BBS malls, women promote rural-urban linkages. Initially, the elderly women dominated the open space at the malls. Women having been selling *morogo* and *dinawa* at these open places for several

years to support households. Some of the women carry a licence from the Gaborone City Council. Although the council visits the market space once in a week (either a Tuesday or a Thursday) some of the women are squatters, with no licence and often face challenges with the by-law authorities. Their products were advertised in an open container such as an open traditional basket with a teacup for scale. This practice is in line with the traditional way of harvesting *morogo* and *dinawa*, using the traditional open basket to carry. In addition, the practice is closely related to how women traditionally used utensils to serve family members within households. The open basket or container gave the customer an opportunity to view before they decide on the amount they wish to buy.

In recent years, due to the high youth unemployment (Gaetsewe 2019 and ILO 2020) young and enterprising females have joined the older ones but coming up with innovative ideas and giving a serious competition to the veterans in the business. Nonetheless, at the Main Mall, there are some older women who have been territorial in the open spaces and have a long-established clientele from medium and high-income households buying from them. This helps them sustain their business which is growing. In addition, the *morogo* and *dinawa* have diversified through other fresh and dry produce (including wild vegetables and fruits). To a large extent the majority of the *morogo* and d*inawa* merchants have retained the established practice of selling in open containers, measuring with a cup and the young generation who have joined them are also retaining that practice. While some of the young generations are members of the family some are competitors.

The packaging of *dinawa* for sale to the consumers involves using a cup/mug (250ml) to measure. It is then poured into a small plastic bag. A cup of *dinawa* is worth P10.00. A plastic bag will contain P10.00 (one cup) or P20.00 (2 cups) worth of beans. From a 50kg bag of beans one can make P1600 in a month. At the BBS Mall when the young generation gradually moved into selling *morogo* and *dinawa* they presented a competitive and innovate practice of packaging their products, where one could spot the products at a distance and get attracted to buy. When the older group realized that the transparent plastic packaging and good arrangements of the products on the table was attracting many varied customers to where the young ones have grouped themselves, they also had to adopt this new practice.

Many people including those at the Main Mall will move to packaging due to the Covid-19 pandemic because customers are influenced by issues of hygiene in the 'marketplace'. To fight the global pandemic all businesses including small, medium, and micro enterprises (SMMEs) are required to adhere to the WHO protocols of social distancing, wearing of masks and sanitising. Women at these two market-places practice social distancing, wear masks and use sanitisers when serving their customers. Covid-19, although a health crisis, provide an opportunity to market a lot of traditional produce from the rural areas because people in the country are changing their diets and embrace traditional food for their nutritional value. On the other hand, Covid-19 has restricted their movements to access these products from the rural areas. A permit is necessary for one to move from one zone to the other. This has a negative impact for those women who buy the produce from the rural areas and bring them into the urban areas for resale.

The processing and marketing of *dinawa* and *morogo* makes a significant contribution to the income and upkeep of the urban and rural households. To assess the value of these products, *morogo* and *dinawa* are quantified during their processing and when they are being sold. With reference to *morogo*, it is packaged nicely in sealed plastic bags for ease of transport to the urban areas and purposes of accessing wider markets. The sealed plastic bags containing *morogo* at P50 each are put in bigger bags and depending on the number of sealed plastic bags they can make a sale of slightly over P1000 each bag depending on the weight of the bag. The study findings suggest that many households in Botswana have a positive predisposition towards farming as a whole and in the application of indigenous knowledge systems to farming including the growing of indigenous foods. Guided by what is emerging from interviews, one

may argue that the growing, processing, and even marketing of indigenous vegetables such as *morogo* is indeed sustainable in Botswana. At the more specific level, there exist several pointers to the sustainability of *morogo* and *lerotse* production. While both indigenous and exotic crops may be affected by the hostile climatic conditions, the indigenous crops such as *morogo* and *dinawa* are usually drought resistant, and therefore, have better chances of surviving the erratic rains experienced in most regions of the country.

As observed by researchers in agriculture in Botswana, unlike exotic crops, most indigenous crops can still grow in such poor soils and produce a satisfactory harvest (Madisa and Tshamekang 1998; Mabula and Abdeta 2020). One of the challenges facing the production of indigenous food crops in Botswana is the absence of formal marketing channels and outlets. Clearly, most of what is produced must be consumed at the household level or shared with relatives. Although some households do market a small proportion of their produce, no formal marketing outlets exist. However, in 2008 ISPAAD was introduced, the aim was to develop the agriculture sector by increasing 'grain production, enhancing the farmers' access to essential inputs which include seeds, fertilizer, draught power, cluster fencing (Morapedi 2016 and Marumo *et al* 2014). Despite these initiatives, another challenge is lack of micro finance institutions which are often sources of funding to small scale farmers and of which women make up two thirds of the clientele (Jefferies *et al* 2012).

Recently the Botswana government introduced Economic Response (2020) including the establishment of a Special Fund-the Botswana COVID-19 Pandemic Relief Fund. According to the National Informal Sector Recovery Plan, the Fund will also cater for the relief of selected industries and sectors. This will be implemented as an economic stimulus programme for the country to stabilise businesses, and the exploration of opportunities for economic diversification (including small-scale traders). This study has revealed that there exists a potential for sustainable food security and commercialisation of the indigenous crops. Given the high rates of unemployment in Botswana, a thriving arable agricultural sector reliant on indigenous knowledge systems would offer a source of livelihood for many Batswana.

Conclusion

The paper interrogates the application of indigenous knowledge systems to the production of traditional food crops, namely *morogo and dinawa.* As noted in the above case studies women play a central role in the production, processing, and marketing of these traditional crops. They are involved in all the different stages of producing and processing of these crops. The findings also demonstrated the viability of traditional knowledge systems in the production, processing, and storage of food stuffs for consumption in the long term. The practice of producing *morogo* and*, dinawa* utilising traditional farming practices and knowledge systems was successful in achieving the objective of food security and improving the quality of life at least for the households surveyed. These food crops can grow in virtually all parts of the country and require minimum water to mature. They are, nutritious, safe, and culturally appropriate foods, produced in ways that are environmentally sound. These food crops are consumed in all parts of the country and across social strata and meet the conditions for food security.

Considering that these food crops were processed in the rural areas and to some extent marketed in the urban areas is an indication that rural-urban linkages should be acknowledged and promoted at both the household and national levels. The emerging government support for arable agriculture through the NAMPAAD programme was meant to provide an additional avenue for knowledge transfer to future generations. However, NAMPAADD was an ambitious 10-year project for major commercialisation of agriculture but a major failure. On the other hand, the critics of ISPAAD have also dismissed it as just another ALDEP. ISPAAD was introduced among other things to promote food security both at household and national levels, to commercialise agriculture through mechanisation, and to facilitate access to credit.

Although the programme was not fully implemented to promote food security and facilitate access to credit there was some positive impact where small -scale farmers of *morogo* and *dinawa* could access seeds, fertilizers, cluster fencing and very limited draught power like tractors. Botswana has an efficient education system that can be tapped to transfer indigenous knowledge and technologies to younger generations.

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