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Market prospects and willingness to pay for indigenous products: The case of Morama (*Tylosema esculentum*)

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This study analyzes the market potential of the underutilized indigenous Morama (*Tylosema esculentum*) products by determining the consumers' preferences and willingness to pay. Simple random sampling was used to select 372 respondents to participate in the cross-sectional survey. Contingent valuation method was used to determine the customers' willingness to pay and the two-step Heckman selection model was employed to analyze the factors that influence the willingness to pay for the different Morama products. The majority of the respondents were knowledgeable of Morama and its product; consequently 84% showed interest in purchasing products developed from Morama. About 90% were willing to purchase Morama oil whereas 87% were willing to purchase Morama butter at least twice a month and 82% would be willing to buy Morama snack bar at least three times a month. The results indicate that Morama products have the potential to penetrate the market and hence can be used to improve both the standard of living for rural communities and household food security and thus alleviate poverty. The mean willingness to pay for Morama oil and butter are comparable to the conventional product, indicating that these products have good market prospects and can compete and potentially substitute the current products if domesticated and commercialised.

Key words: Morama, market prospects, willingness to pay, consumers' preferences, two-step Heckman selection model, contingent valuation.

INTRODUCTION

Interest in indigenous products has risen as the world attempts to fight poverty, malnutrition and improve rural livelihoods (Okello et al., 2015) under changing climatic conditions. Indigenous products are traditional and spontaneously found food that are less deleterious to the environment, provide for cultural needs and reserve the cultural heritage and are associated with a certain local areas (Balogh et al., 2016). Harvesting, utilization and

marketing of indigenous products has been central to the livelihoods of most African communities, however it is characterized by underutilization (Muok, 2019). Studies have shown that indigenous products are highly nutritious containing macronutrients, micronutrients, dietary phytochemicals (Ngemakwe et al., 2017) and vitamins, that are not found in exotic products; therefore awareness and consumption of these can reduce malnutrition among poor rural households (Okello et al., 2015; Muok, 2019). However, besides the nutrition value of the indigenous products other social, economic and environmental dynamics exist that determines their use. The major environmental factors are the location and the seasonality of the indigenous products (Dkhar and Rao, 2019). Socially, subjective norms tend to have an influence on the use of the indigenous products (Sana et al., 2018). Economically, the indigenous products are valued for the food security relief they bring to impoverished communities and developments around areas where it is found (Mbhenyane, 2017).

Botswana has a semi-arid climate and it is estimated that one year in three consecutive years, arable agriculture in Botswana fails due to lack of rainfall and general lack of surface water (Brinkhurst, 2010), and according to Ministry of Environment, Natural Resources Conservation and Tourism (2019), the country is forecasted to experience high average temperatures of 25.9-26.9 and a decrease in seasonal and annual precipitation. Despite the erratic rainfall, Botswana is endowed with various indigenous products (Madisa and Tshamekang, 1997), which are found and consumed by rural communities. The major indigenous fruits that have penetrated the market are morula (*Sclerocarya birrea*), motsentsela (*Berchemia discolor*), mogwana (*Grewia flava*), mmilo (*Vangueria infausta*) and morojwa (*Azanza garkeana*) (Lepetu et al., 2015). Though some products such as morula have infiltrated even the exotic markets (Ndeinoma, 2018), most of the indigenous products are characterized by low popularity and are highly overtaken by the common demand for exotic products. Poverty in Africa has always been a major menace to humanity especially of provision of food and Botswana is not an exception. To address poverty in rural communities requires a broader focus on the diet-relevant indigenous products used in different communities, as well as to determine which products contribute to the associated health benefits and hence increase crop diversity (Baldermann et al., 2016).

Domestication and commercialization of indigenous food plants can help rural communities build resilience against climate change. According to Mojeremane and Tshwenyane (2004b), rural communities in Botswana mostly use indigenous food plants as a hunger coping strategy to sustain their livelihoods (Mojeremane and Tshwenyane, 2004b). Several studies conducted in Botswana (Mojeremane and Tshwenyane, 2004a, b) and elsewhere (Akinnifesi et al., 2008a; Getachew et al., 2005; Balemie and Kebebew, 2006) have shown that the importance of indigenous food plants is increased during times of food shortage and famine. According to Akinnifesi et al. (2008a), 60 to 85% of the rural people in Southern Africa face food shortages for 3 to 4 months in a year and use indigenous food plants to sustain their livelihoods. Indigenous food plants also provide income-generation and employment opportunities which are often lacking in rural areas (Lepetu et al., 2015). In addition, these have the potential to significantly contribute to rural development, and reduction in hunger, malnutrition, and gender inequality (Ngemakwe et al., 2017). Mojeremane and Tshwenyane (2004a) noted that some indigenous food plants also provide goods and services such as medicine, building material, firewood, fodder and shade.

Most indigenous food plants are comparable or have higher nutrient content than their domesticated or exotic counterparts, most are rich in iron, zinc, vitamin A, C, E, folic acid, proteins, carbohydrates and minerals (Agte et al., 2000; Singh and Garg, 2006). Besides indigenous vegetables, rural people in Botswana also use indigenous fruit to supplement their diet (Legwaila et al., 2011). According to World Health Organization (2005), daily consumption of indigenous food plants in sufficient quantities can help prevent numerous diseases. Similarly, Barany et al. (2001) have found that indigenous food plants can improve the nutrition and health of children, the elderly and boost the immune system of HIV/AIDS patients. Morama (*Tylosema esculentum*), also known as gemsbok bean, is an under-utilized wild legume native to the Kalahari region of Southern Africa (Van der Maesen, 2006). The bean has attracted attention as a plant resource with economic potential for exploitation, with successful experimental cultivation being reported in Kenya, Israel, Australia and United States of America. It contains approximately 30% protein and 40% oil (Mosele et al., 2011); it has similar composition with groundnuts and soybeans (Ntare, 2007).

T. esculentum is a long-lived perennial legume native to arid areas of Southern Africa. It occurs naturally in the drier areas of Southern Africa, including Botswana and Namibia, where it is to a small extent harvested as a wild plant for human consumption (Amarteifio and Moholo, 1998). It is widespread in these areas, with large populations in Botswana (around the central Kgalagadi), Eastern parts of Namibia, while smaller populations are found in the South Africa provinces of Limpopo, North West and Gauteng (Castro et al., 2005). The plant is adapted to the harsh conditions of Botswana and Namibia, which are characterized by low rainfall and nutritionally poor soils (Hartley et al., 2002). This makes it a potential crop for semi-arid and arid agriculture. It is most common to eat the Morama beans as mature beans when the seeds are surrounded by a hard and woody seed coat, which has reddish to brownish colour. But the beans can also be eaten when they are still immature green beans. The mature Morama bean has a very low

moisture content as the dry matter content ranges from 93.4 to 98.7% (Agte et al., 2000), which makes it ideal for long-term storage. Despite its traditional use as a food source in Botswana and Namibia, little is known about the germplasm diversity, genomic variability and relationships between the different ecotypes (National Academy of Sciences, 1979; National Research Council, 2006; Keegan and Van Staden, 1981). Jordaan et al. (2009) noted that the seeds are usually roasted, imbuing them with a more palatable flavour - comparable to cashews or chestnuts.

Market potential for Morama products

The Morama bean can also be processed into various value-added products including plant-based milk, oil, and canned beans. The milk of the Morama bean is a creamy white water extract very similar to dairy milk or soymilk and can similarly be consumed in the form of a refreshing and nutritious beverage (Mpotokwane et al., 2013). Though not available commercially, the milk of the Morama bean has high levels of sodium (47.9 mg/100 g) and iron (3.7 mg/100 g) compared to soymilk and dairy milk, with a much lower calcium content (6.8 mg/100 g) (Jackson et al., 2010). Morama oil resembles almond oil, and is suitable for domestic purposes, with a pleasant nutty flavour (FAO, 2010). The oil consists of about 24-48% rich in mono and di-unsaturated fatty acids, it has no cholesterol. The oil extract can be used as a body lotion to prevent itchiness of the skin; oil can also be used ritually as a cleanser for girls after their first menstruation. According to Chingwaru et al. (2011) the high oil content of the beans is believed to prevent constipation as it lubricates the alimentary contents. A mixture of Morama roots and leaves can be ground and made into tea to help improve women's health, especially in post menstrual periods (Chingwaru et al., 2007).

Morama is an example of the many under-utilized indigenous species native to Botswana with great agricultural potential; it can provide unique strategic opportunities to address and support food security efforts and improve the livelihoods of vulnerable populations in Botswana (Jackson, 2017). With only a few people selling these products there is therefore a great gap in the market which can be exploited through development of new food products or value addition that will target both the local Botswana and international consumer markets. The result will be a greater demand for value added products and the emerging crops themselves; thus improving livelihoods for vulnerable communities (poverty alleviation). Currently, in Botswana, indigenous food plants including Morama products are sold by women and children in both formal and informal markets in rural and urban areas. The markets are seasonal and very limited (Faria et al., 2011). In urban and peri-urban areas, sales are conducted near shopping centers and from door to door. The sale of indigenous food plants provides cash income (Kadu et al., 2006) used to buy food; pay children's school fees, uniform and other household needs. However, markets in Botswana (Taylor et al., 1996) and other developing countries favor exotic food plants than their indigenous counterparts because they have been researched and developed.

Domesticated or exotic food plants are widely promoted and their uses and management techniques are well known. In contrast, indigenous food plants have received little attention in terms of research, development and promotion in Botswana, despite their large market potential. Taylor et al. (1996) noted that the variety of indigenous food plants sold in formal markets is lower when compared to informal markets. They further indicated that the formalization of markets is constrained by lack of infrastructure and products of variable quality that are always available in small quantities. In the past, Morama was not marketed like any other wild berries or fruits; it was used for households' consumption by hunter-gatherer populations. Only small quantities of Morama are sold in the villages, mostly by neighbours, or in nearby towns or villages by villagers who temporarily act as street vendors. Prices vary between villages as they are determined by the seller, in accordance with their weight, prices also depend on Morama being (un) shelled, fresh, raw and or roasted. Prices may increase if Morama is sold in nearby towns. Small-scale and medium-scale farmers also sell Morama to local people. The current market for Morama products in Botswana is characterized by; low prices poor and information on growing, limited market access, limited involvement of retailers and shortage of raw materials due to poor yields (Faria et al., 2008).

Commercialization and value addition of indigenous fruit plants have been put forward as a possible solution to alleviate poverty in resource poor communities (Akinnifesi et al., 2007). Such initiatives would provide income-generating opportunities for these communities as well as serve as an incentive to value and conserve natural resources more. Morama commercialization, within a formal and local market, is therefore a result of the impact of the monetary economy, together with other food products it became a source of instant cash. Morama is sold to the local market throughout the year, but supply significantly increase in the months of April when the gathering season starts, that is when sellers will make great profits from sales of Morama (Jackson et al., 2010). In areas where Morama is found, people sell besides roads to people passing by as temporary street vendors. However, it is imperative to establish the market prospects and willingness to pay for Morama to inform commercialization and value addition decisions.

For indigenous products to impact the rural households it is important to study the demand side by analyzing the market potential and prospects of Morama products based on the products ability to eradicate poverty, to

assess the consumers' willingness to pay and also make an assessment of the preferred products by the consumers. Morama is one of the indigenous wild legumes found in Botswana that can improve the welfare of the people in areas where it is found and beyond. However, there is still a gap in knowledge of the factors that influence consumers' willingness to pay for Morama products and the market potential for Morama products as most empirical work has focused on processing, chemistry, nutrition and processing of Morama bean (Campanaro et al., 2019; Ngemakwe et al., 2017; Ohui Yeboah et al., 2017; Nepolo et al., 2015; Takundwa et al., 2015). Thus this study was aimed at analyzing the market potential and prospects of Morama products based on the products' ability to eradicate poverty, to assess consumers' willingness to pay for Morama products and to also make an assessment of the preferred products by the consumers. From the literature, it was mentioned that the market is limited; the study therefore analyzed the market potential and prospects of the products in the Kweneng Region and Gaborone. It was an objective to expand the market of the products so they could be found anywhere and anytime by the consumers. Little research has been undertaken on the market potential and the prospects of Morama products; moreover, the products themselves are not penetrating the market intensively. The levels of poverty in the Kweneng District have been found to be high but the Morama plants are readily available; they are perennial. There is little awareness on the potential of these products and their prospects. Exotic products are mostly sold in our markets; people are still not informed of the potential of the indigenous products especially Morama.

METHODOLOGY

Study area and sampling design

The survey was conducted in Kweneng and Southern Districts of Botswana (Figure 1). The two districts were purposely selected where the former is the geographical location with Morama abundance but also has relatively high levels of poverty in the country; whereas the latter is the main economic hub in the country. In particular, Gaborone (24° 39' 11.7252'' S and 25° 54' 24.4512'' E) as the capital city of Botswana was chosen as it could provide the greatest market potential locally due to its cosmopolitan make up and Molepolole (24.3966° S, 25.4970° E) as the catchment village for areas where Morama is found. The Kweneng District has a population of about 304, 549 (Statistics Botswana, 2011) and covers an area of 35, 890 square kilometers. The Kweneng District is characterized by hot, semi-arid climate with an average rainfall of between 450 and 500 mm annually, most of which is received during summer season from November to April. The majority of the Kweneng District residents are engaged in agriculture as the major activity and source of livelihood. The survey was pre-tested as Matshwabisi village (24.1830° S, 25.2736° E) in Kweneng District for understand-ability to reduce bias and enhance validity of the results. A simple random sampling method was used to select the total sample of 372 respondents in both the urban and rural areas. Empirical data on the potential market and prospects of Morama products and the consumers' willingness to pay for Morama products were collected through a structured questionnaire consisting of both open and closed-ended questions. The target respondent was the individual consumer expected to make decisions relating to consumption and willingness to pay given the various demand on an individual's income. Data were analysed using SPSS 25 and STATA 15.

Contingent valuation procedure

The contingent valuation method (CVM) is a survey-based methodology for eliciting values people place on goods, service, and amenities. It is used to fill a substantial void by providing a way to estimate values when the markets do not exist and revealed preference methods are not applicable (Champ et al., 2003). Subsequently, one would want to know how much money people are willing to pay for underutilized indigenous plant products relative to conventional products in the market. One of the advantages of CVM is the ability to estimate the price of goods that are not currently available, but can be availed at a future time (Baker et al., 2014). Due to unavailability of the proposed value-added Morama products, CVM is used to elicit consumer preferences, estimating their values of these goods through a hypothetical market.

Empirical model specification

In the current study, the two-step Heckman selection model was used following Bett et al. (2013) to analyze the consumer's WTP for Morama products currently not available in the market (Morama oil, butter, snack) so as to account for potential selection bias. The first step in the Heckman two-stage selection bias correction procedure determines whether or not the respondent decides to pay anything, and the second stage determines the amount paid (Heckman, 1979). The probit model is used in the first stage to estimate Equation 1 and obtain the inverse Mill's ratio. Each respondent was asked whether they are willing to pay more for each of the Morama products. Respondents who answered 'yes' were given a hypothetical scenario and asked if they would be willing to pay a higher price for Morama products than a comparable conventional product available in the market. The respondent was expected to answer 'yes' if willing to pay more or 'no' otherwise. In either case, the respondents were allowed to state the maximum amount they were willing to pay for the Morama products. The price was thus the amount the respondents were willing to pay for a product relative to the status quo, $X \geq 0$, such that WTP = 0 if $X \leq 0$; and WTP = if $X > 0$, where WTP is 1 if the respondent is willing to pay a price higher than the current price for a conventional product, and 0 otherwise. The probit model to determine factors that influence WTP decision was thus specified as:

$$WTP_i = \beta_0 + \beta_i S_i + \beta_i P_i + \beta_i Y_i + \varepsilon_i \text{ and } i = 1 \dots, n; \tag{1}$$

where WTP_i is the stated willingness to pay for the ith individual, S_i is the vector of observable socio-economic characteristics of the individual, including the consumption behaviour such as frequency of purchase, quantities consumed and expenditure on comparable conventional products; P_i is the vector of characteristics of the products, and Y_i is a vector of income. ε_i is the error term or random variable accounting for unobservable characteristics assumed to be normally distributed with mean 0 and variance σ^2. The unknown parameter estimates are estimated by the maximum likelihood (ML) method using the probit regression model to obtain the inverse mile's ratio (IMR). In the second stage, the Ordinary Least Squares (OLS) equation is used to determine factors that influence the amount consumers are willing to pay for Morama products. The OLS equation was specified as:
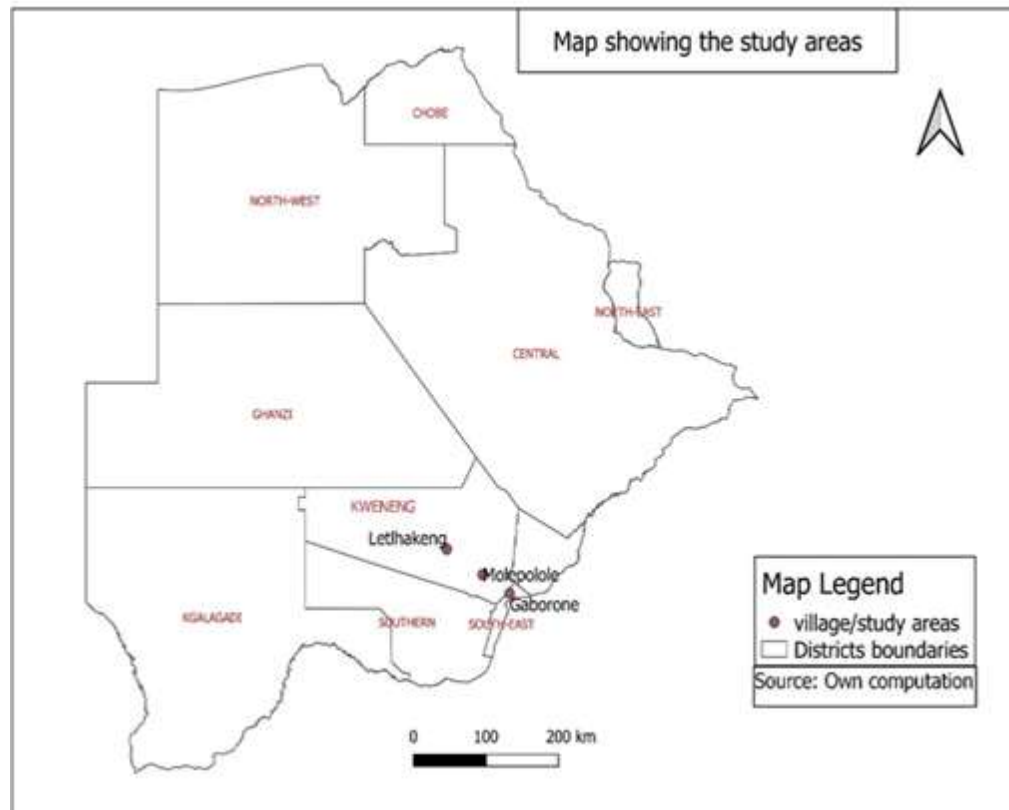
Figure 1. Study area.

$X_i = \beta_0 + \beta_i S_i + \beta_i P_i + \beta_i Y_i + \beta_i IMR + \varepsilon_i$ and $i = 1 \ldots, n;$ (2)

where X_i is the maximum amount consumers are willing to pay for Morama products.

RESULTS

Socio-economic characteristics of respondents

This study results indicate that a total of 314 respondents are willing to pay while 58 are not willing to pay for Morama products. Further, 46, 63 and 48% are willing to pay for Morama butter, oil and snack respectively. From the sample of 372 respondents, 55% were females and 45% males. The average education level for the sampled respondents was found to be 12 years of schooling, which is equivalent to higher secondary level in Botswana. The mean household size was 6 including both children and adults and the mean age for the respondents was 34, as shown in Table 1.

Product knowledge, location and willingness to pay

Selected variables being location of the respondents and the knowledge of the health benefits of Morama products were examined against the willingness to pay and their

results are presented in Table 2. The results show that 52% of the respondents are from the urban area (Gaborone) while 48% are from the rural area or peri-urban (Letlhakeng and Molepolole). Of those who are from the urban areas, 69% (out of 372 respondents) are willing to pay for Morama products while 31% of them are not willing to pay. In the rural or peri-urban areas, 98% of the respondents are willing to pay while 2% are not willing to pay. A comparison between rural or peri-urban and urban areas indicates that of those who are willing to pay for Morama products, 40% are from the urban areas while 60% are from the rural or peri-urban areas. Out of the 58 respondents who are not willing to pay, 94.8% of them are from the urban areas while 5.2% are from the rural or peri-urban areas.

According to the results, 66% of the respondents have knowledge of the Morama products. Of those who have knowledge, 75% are willing to pay. 56% of respondents in urban areas do not have knowledge of Morama products while 25% of respondents in the rural areas do not have knowledge of Morama products.

Consumers' preferences for Morama products

Consumers' preference when selecting Morama products was studied. Figure 1 shows a summary of multi-category

Table 1. Average educational level, household size and age of respondents

Variable	Mean	Standard deviation
Education	12.1	3.8
Household size	6	4.3
Age	34	10.8

Table 2. Product knowledge and location.

Location	Willing		Non-Willing		Total		χ^2
	No.	Percentage	No.	Percentage	No.	Percentage	59.3
Urban	125	40	55	94.8	180	48.4	
Rural	189	60	3	5.2	192	51.2	
Total	**314**	**100**	**58**	**100**	**372**	**100**	
Knowledge of Morama products							
Yes	236	75	10	17.2	246	66	73.3
No	78	25	48	82.3	126	34	
Total	**314**	**100**	**58**	**100**	**372**		

chart of responses. The products each had their own attributes which were on a likert scale from not important to very important, attributes; appearance, aroma and taste were common for the products. The respondents viewed the three attributes of appearance, aroma and taste for all products as very important, snack bar had the highest percentages for the attributes 65.3, 60.8 and 77.7% respectively followed by butter at 59, 56.1 and 75.8% respectively; percentages for oil preferences were 53.2, 46 and 64.2% respectively.

The residuals in the oil was also an attribute studied and it showed that less than half about 40.3% of the respondents perceived residuals as very important to consider. Butter had two more attributes that were considered the stickiness and spreadability and these were very important to the respondents with 53.1 and 65.4% respectively. Two attributes that were specific to the snack bar were hardness on first bite and gumminess; these are generally viewed as very important at 54.4 and 45% respectively. Generally, all attributes of the products were perceived to be very important to the respondents, showing that people consider product attributes in their purchases. Figure 3 shows the reasons for purchasing Morama among respondents who are willing to pay for Morama products. Respondents were made to rate five possible reasons for purchasing Morama products according to 'important[1]' and 'not important[2]'. More than 95% of the respondents indicated

that all the possible reasons for purchasing the product are important.

Average willingness to pay and expenditure on conventional products

Table 3 shows the respondents expenditure on conventional products (oil, butter and snack bar) in the market for both the urban and rural area. On average households purchase a 2 L of oil and 500 g jar of butter per month. The results further indicate that respondents purchase around six 50 g of snack bars per month. 50 g bars of snack and purchased conventional oil less frequently (1.30 times) than all other products per month. These results can be translated into the potential frequency for purchasing Morama products if introduced in the formal market. The results or the average WTP for the Morama products indicate that consumers value them competitively against the available conventional products.

Econometric results

This section presents the estimations for the probit and the OLS model for three Morama products being, Morama oil, butter and snackbar. The results were obtained by estimating a two-step Heckman selection model.

The results in Table 4 shows a probit and OLS estimates of factors that influence the respondents WTP for Morama oil. Amongst the fifteen independent variables analysed, nine were statistically significant

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[1] Important is an aggregate score indicating those who considered the reason for purchasing, important and very important.
[2] No important is an aggregate score indicating those who considered the reason for purchasing, not important, slightly important and moderately important.

Table 3. Average household consumption and expenditure for conventional products.

Product	Conventional			Non-conventional
	Frequency	Quantity	Current average price	Mean WTP
Oil	1.30	1 × 2 L	75.00	42.90
Butter	1.31	1* 500 g jar	21.85	21.40
Snack bar	2.31	6 *50 g bars	8.40	8.28

Table 4. Heckmann two-step selection results for WTP for Morama oil.

Variable	Probit		OLS	
	Coefficient	Standard error	Coefficient	Standard error
Lnage	0.2066	0.3204	-0.2972	0.2974
Gender	0.1723	0.1644	-0.1437	0.1449
Lneducation	-0.2535	0.2620	0.3675***	0.1389
LnHHsize	0.4395***	0.1064	-0.2494*	0.1387
LnIncome	0.1830***	0.02794	-0.2328***	0.06702
Consumption	-0.5410**	0.2363	0.3799	0.2336
Frequency	0.3163***	0.07369	-0.2022**	0.09540
Taste	1.424***	0.5437	-0.8048	0.7014
Safer	0.1457	0.4031	-0.2851	0.5344
Environment	0.2715	0.3989	-0.5178	0.5184
Local trade	0.3989	0.4186	-0.0030	0.5228
Supermarket	0.5240**	0.2148	-0.5836**	0.2627
Food security	-0.1227	0.1613	0.1801	0.1549
LnPrice_oil	-0.3013	0.2009	0.3458**	0.1733
Freq_oil	0.7771***	0.2471	-0.5750***	0.2176
Constant	-4.3647***	1.9238	4.275*	2.5682
IMR	-		0.1070	0.5191
N	372		372	
Prob > F	-		0.000	
Prob > Chi^2	0.000		-	

*, **, ***: statistically significant at 10, 5 and 1% respectively.

when using confidence interval of 99% (p=0.01), 95% (p=0.05) and 90% (p=0.1) in influencing respondents WTP for Morama oil. The results indicate that WTP for Morama oil was influenced by education, household size, natural log income, consumption, frequency, taste, supermarket, natural log price of oil and current frequency of purchase of conventional oil. The results also show that without any of the tested variables *ceteris paribus* there would be a negatively high significance WTP for Morama oil by the respondents.

The results in Table 5 show the probit and OLS estimates of factors that influence the respondents' WTP for Morama butter. A total of fifteen independent variables were analyzed. Of these, five of the variables were statistically significant when using confidence intervals of 99% (p=0.01) and 90% (p=0.1) in influencing respondents WTP for Morama butter. The variables that

were found to significantly influence WTP for butter are anticipated frequency and current frequency of conventional butter. The results also show that *ceteris paribus* there would be a negatively high insignificant WTP for Morama butter by the respondents.

Estimates of the factors affecting the WTP for snack bar are presented in Table 6. The results are obtained from the probit and OLS model. The probit model estimated that the WTP for Morama products is positively associated with the WTP for snack bar products. Respondents that are willing to pay for Morama products are less willing to pay for the specific snackbar product and the results are significant ar 5% level. The respondents that prefer hard snack bars are also less willing to pay for Morama snack bar. These may be because consumers anticipate the Morama snack bars to be smooth. Similarly, those that frequently purchase

Table 5. Heckman two-step selection results for WTP for Morama butter.

Variable	Probit		OLS	
	Coefficient	Standard error	Coefficient	Standard error
Lnage	-0.3454	0.2692	-0.3143	0.4697
Gender	0.0137	0.1366	-0.0612	0.1048
Lneducation	0.0712	0.1459	-0.0814	0.09881
LnHHsize	0.1058	0.08854	0.2274	0.1393
LnIncome	0.0358	0.02381	0.0109	0.04879
Consumption	-0.1082	0.1836	-0.0389	0.1587
Frequency	-0.1101*	0.06152	0.1502	0.1393
Taste	-0.2113	0.3625	-0.3362	0.3301
Safer	0.0354	0.3974	-0.0674	0.2646
Environment	-0.2608	0.4059	-0.3493	0.3274
Local trade	0.2951	0.5313	0.3338	0.5002
Supermarket	0.1383	0.1931	-0.03021	0.2217
Food security	-0.2061	0.1363	0.1027	0.2602
LnPrice_butter	0.1496	0.1521	-0.02858	0.1674
Freq_butter	0.5585***	0.2035	0.4665	0.6732
Constant	0.6956	1.7196	3.06272***	1.01155
IMR	-		-1.8722	1.7502
N	372		372	
Prob > F	-		0.0000	
Prob > Chi^2	0.0683		-	

*, **, ***: statistically significant at 10 and 1% respectively.

Table 6. Heckmann two-step selection results for WTP for Morama snack bar.

Variable	Probit		OLS	
	Coefficient	Standard Error	Coefficient	Standard Error
LnAge	0.1587	0.2658	-0.4843**	0.2401
Gender	0.1400	0.1364	-0.1790	0.1731
LnEducation	-0.1024	0.1361	0.1138	0.1497
Lnhhsize	-0.024879	0.09050	0.01948	0.06218
Lnincome	0.03885	0.02382	-0.001109	0.4472
Consumption	-0.0524	0.1828	0.1504	0.1268
Buy	-0.6786***	0.2051	1.4720**	0.7263
Healtheir	0.06713	1.03140	-0.07652	0.2160
Safer	0.2868	0.4076	0.05312	0.3874
Tastier	-0.3336	0.3986	-0.02206	0.4289
Envi	-0.2828	0.4327	0.1394	0.3265
Local trade	-0.4813	0.5033	0.4052	0.5941
Supermarket	-0.1852	0.1908	-0.01454	0.2509
hhfoodsecurity	-0.05568	0.1367	0.1751**	0.09822
Snack hard	-0.4999***	0.1827	0.2586	0.5514
Snack freg	-0.4538***	0.1593	0.7836	0.5152
Ln price	-0.1300	0.1230	0.04033	0.1634
Constant	1.8042	1.6960	1.8604*	0.9481
IMR			-1.3346	1.6767
N	372		372	
Prob > F	-		0.0000	
Prob > Chi^2	0.0109		-	

*, **, ***: statistically significant at 10, 5 and 1% respectively.

conventional snack bars are less willing to pay for the Morama snack bars if introduced in the market under the probit model estimation.

The OLS estimates show a negative association between age and WTP at 10% significance level. The results imply that, a 1% increase in age of the respondent/consumer will lead to a 0.5% decrease in the amount the consumer is willing to pay for snack bar, holding other factors constant. A respondent who indicated that he/she is willing to buy Morama products is likely to pay around 3.9% more than the mean price for the snack bar product at a 10% significance level. Lastly, respondents that indicated that processing of the products is important for food security are willing to pay 0.47% more than the average WTP.

DISCUSSION

WTP and market prospects for Morama oil

Education positively influenced the amount of money anticipated to be spent on Morama oil; a percent increase in education will increase the amount spent on Morama oil by P0.37. Consistently, Oviahon et al. (2011) and Villano et al. (2016) found that education positively increases consumers's WTP for food products. Education is important as it creates critical thinkers, problem solvers and innovative leaners (Makwinja, 2017); in this study it showed on average both in urban and rural area Botswana is doing well in educating its citizen with an average 12 years which is high school qualification. Therefore, it should be made a priority in schools to educate the pupils on the values and benefits of indiegenous products. The household size had positive significant influence on respondents' willingness to pay for Morama oil, but it had a negative influence on the amount the respondents would spend on Morama oil showing that as household increase by a percent the amount spent will reduce by P0.14. On the contrary, Oviahon et al. (2011) found that as the household size increases more of the indigenous products would be purchased.

Income had a significant and positive influence on WTP for Morama oil. The increase in income was significant at 1% probability. On the other hand, income as a factor of the amount respondents would pay for Morama oil was negative and significant showing that respondents would pay P0.23 less for Morama oil. These results are consistent with Mwema et al. (2012) who found that household income has a negative and significant relationship with indigenous products dependency, as diverse incomes lead to assorted options that they can choose from. Consumption patterns had a positive and significant WTP for Morama oil; similarly, Shin et al. (2017), after evaluating consumer's attitude, found that consumption patterns positively influence WTP for food

products.

The anticipated frequency of purchase of Morama products had a significant and positive 31.6% chance of influencing respondents WTP. Frequency of purchase is important in making forecasts of customized supply and demand to optimize both sales and gross margins of the products (Sriwaranun et al., 2015). Unrelatedly, the anticipated frequency of purchase negatively influenced the amount that respondents are WTP by P0.20. Respondents confirmed the importance of taste in accepting Morama oil and the results show a positively significant influence of taste on respondents WTP for Morama oil. According to Jackson (2010), consumers indicated that they would buy better tasting Morama products as compared to the current unpleasant bitter tasting products. Consequently, Chowdhury et al. (2011) and Fan et al. (2019) found taste of food products to be of positive influence on consumer's WTP for the products. The preferred supermarket outlet for Morama oil had a 52.4% positively significant chance of influencing respondents WTP but it had a negative relationship with the amount the respondents were WTP of P0.58. Current frequncey purchase of conventional oil had a positively signficant influence on respondents' WTP for Morama oil by 77.7%. *Ceteris paribus*, the amount that respondenst are WTP for Morama oil will be P4.28.

WTP and market prospects for Morama butter

The anticipated frequency of purchase of Morama products had a negative significant influence on respondents WTP for Morama butter; it showed that as the anticipated frequnecy increases WTP will decrease by 11%. This results can be explained by uncertianity that respondents have about unknown products. This phenomenon was described by Riebe (2003) and Sriwaranun et al. (2015) that buyers prefer less of smaller or unpopular brands because they prefer steady products. Marketing of the Morama products should be prioritized to increase the product's popularity. Current frequency of purchase of conventional butter products significantly influences respondents' WTP for Morama butter; thus as the current frequency of purchase of conventional butter products increases the frequency in WTP for Morama butter would increase by 55.8%. This results show that respondents will purchase products that they perceive to be healthy, tastier, safe for environment as evident in Figure 2 with the reason for purchase all scoring more than 95%. *Ceteris paribus*, the amount spent on Morama butter would significantly increase by P6.56 as compared to conventional products.

WTP and market prospects for Morama Snack-bar

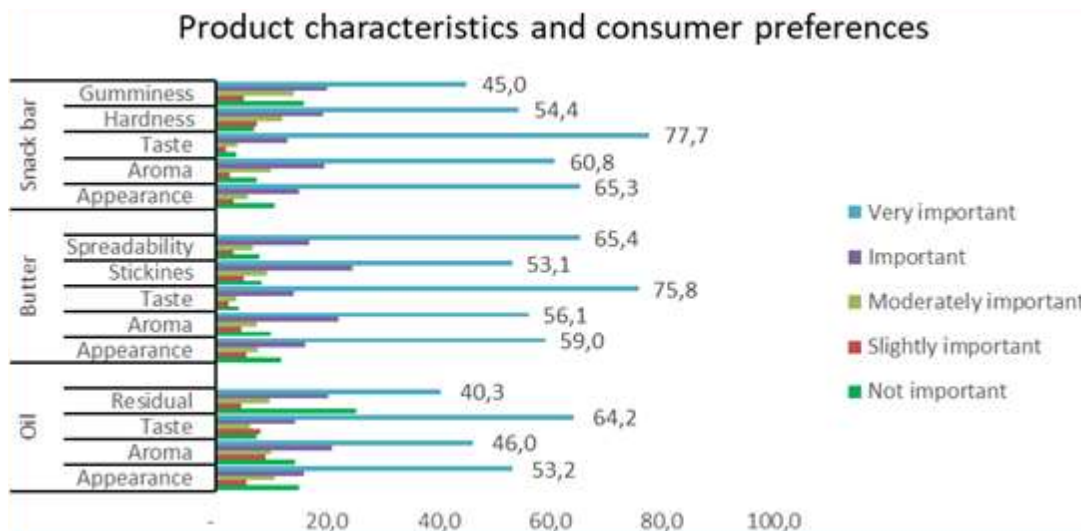According to the results, the highly ranked consumers'

Product characteristics and consumer preferences

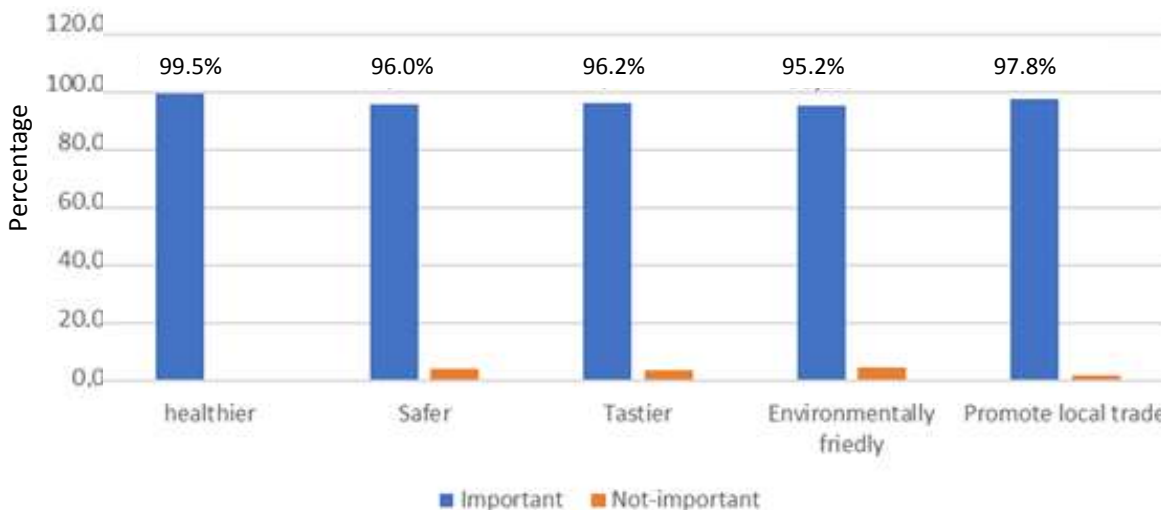**Figure 2.** Consumer preferences when selecting products.

Figure 3. Reasons for purchasing Morama products.

preference for the snack bar is taste, followed by appearance, aroma, hardiness and gumminess. Therefore, these attributes are expected to affect the consumers' WTP for the Morama snack bar. Accordingly, the results from Table 6 show that consumers who prefer hardiness as an attribute for the snack bar product are less likely to buy Morama snack bars. It is likely that the consumers envisage that the product will be soft and hence outside their preference. This can be attributed to lack of knowledge of the product. Vinceti et al. (2013) imply that knowledge on the product positively influences WTP.

The other negative association is between those who are willing to purchase all Morama products and the snack bar. Of all the people who indicated that they are willing to pay for the Morama products, less are willing to

pay for the snack bar and the difference between the two groups is significant. These can be because of perception consumers have on the product, that it does not have the qualities of the current conventional products (e.g. hardiness) as previously stated. Those that frequently buy conventional snack bars are less willing to buy the Morama product, that is, they will prefer to continue consuming the current conventional product they are used to. However, it is worth noting that for those that are willing to pay, they are willing to pay at a more competitive average price. For example, the average WTP for snack bar is P8.28 against an average conventional price of P8.40. Respondents competetively value the non-market products against the available conventional products. Moreover, it has been found out that consumers who are interested in buying all the

products are willing to pay more (1.4% more than mean price) for the snack bar than those who are not. These results reveal that, those that are willing to pay for the Morama snack bar value it highly. However, it should be noted that the amount decreases with increase in age. A 1% increase in age decreases the amount a person is willing to pay by 0.5%. Older people are not willing to pay more. These statements concide with WTP study findings by Mbenyane (2017); the study analysed the willingness to pay for indeginous leafy vegetables in South Africa and found out that the older persons in semi-urban areas were not willing to pay.

Interestingly respondents that believe that promotion of indeginous products will improve households' food security are willing to pay more than the mean WTP and the result is significant in agreement with Faria et al. (2011). Even though, the results show that people may not be willing to switch to the new snack bar products, those that are willing to pay are also willing to pay more thus they value the product highly.

Conclusion

The results suggest a high market potential for the assessed Morama products with a relatively similar willingness to pay as comparable conventional products. Morama oil has the highest demand followed by Morama snack bar and butter. The determinants of demand for Morama products are location, income, education, frequency of purchase for conventional products, preferred market outlet, consumer beliefs (products will improve households' food security), and age. A high percentage of respondents in rural and peri-urban areas, who are more likely to be familiar with the Morama products, are willing to pay for these products. From the results, it is evident that respondents who have a positive willingness to pay value the products competitively against the existing conventional products. This may imply that the products are able to compete if introduced and potentially substitute the current products. The comparable WTP implies that Morama products can compete with conventional products and can potentially substitute the current products if domesticated and commercialised. These results therefore provide useful information on consumers' preferences and market prospects for the different Morama products that will enable policy makers, researchers and rural communities to initiate appropriate interventions to instigate market demand and consequently build resilience and thus promote sustainable incomes and poverty reduction.

RECOMMENDATIONS

The products are currently not available in the formal market and the results suggest a high entrepreneurial opportunity for rural producers mainly through collection,

cultivation processing and value addition. The results also indicate that, promotion and marketing have the potential to increase people's knowledge about the products and consequently affect their WTP. Therefore, more information on the importance of Morama products including their health benefits should be availed to the public through different channels in different areas including the urban and regional and international markets. With processing, value addition and marketing, the products have the potential for building resilience against climate change and thus poverty reduction among rural communities as well economic and agricultural diversification and trade. Though there is on-going research and also policy support for the development of the forest and range resources sector under the micro, small and medium enterprises, more is needed in terms of implementation and developing the products for the market and to benefit from their entrepreneurial prospect. Further research could assess the Morama products value chain and potential capacity building incentives to ensure sustainable production and thus sustainable development of rural communities.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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