

Determinants of Indigenous Fruits Consumption Frequency among Rural Households: Evidence from Mutale Local Municipality, South Africa

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Abstract—Rural households across South Africa experience food and nutritional insecurity. Given the claimed nutritional benefits of indigenous fruits (IFs), their availability and accessibility in rural areas, several researchers believe they can significantly contribute to rural household food and nutritional security. However, literature highlights that their consumption in recent years has generally remained low and in some incidences reported to be declining. This paper investigated factors that influence indigenous fruits consumption frequency among rural households using 200 randomly selected households from 10 villages in Mutale local municipality, South Africa. Results indicate that a majority of the respondents (78%) consumed indigenous fruits on weekly to monthly basis, mostly in summer when they are abundantly available. Several socio-economic and perception based factors are estimated to condition rural households' indigenous fruits consumption frequency worth targeting. We therefore argue that, caution should be exercised when indigenous fruits are targeted as food and nutrition security supplements for rural households bearing in mind the periods of the year they are available and drivers of their consumption frequency.

Index Terms—indigenous fruits, food and nutrition security, rural households

I. INTRODUCTION AND BACKGROUND INFORMATION

Rural South Africa is reported to be characterized by widespread poverty and food insecurity at household level [1] despite the national food security status that exist mainly as a result of commercial farmers' high production, which sees the country being self-sufficient in terms of food production [2]. With that background, rural development agencies have proposed several on-farm livelihood strategies to reduce widespread rural poverty, food and nutrition insecurity. Abugre [3] suggested that instead of relying on often more expensive food-market purchases rural households can produce their own food for a livelihood not only for subsistence purposes, but also to produce surplus to sell in the market. Literature however highlights that staple crops mainly address caloric adequacy at the expense of micro-nutrition [4], and this has been the focus for addressing food security [5] compromising the nutritional security. Thus far, off-farm livelihood strategies in the form of

indigenous fruits (natural resources) have been suggested in different forums as potential supplements of rural household food and nutritional security worth promoting. This is against a background where FAO [6] claims that forests and trees-outside-forests contribute to the livelihoods of more than 1.6 billion globally. Indigenous fruits have been reported to be rich in nutritional qualities especially for rural households in developing countries [7], although consumption frequency has been reported to be low and in some cases declining [2], [8]. Several factors have been reported to condition consumption of indigenous fruits in general. These include; knowledge [9], education, location [2], age [10], gender [11], [12] and several label tags associated with indigenous foods like "food for the poor" and "weeds that compete with cultivated crops" [13]. Given that; indigenous fruits are rich in nutritional qualities desperately needed by rural households, grow naturally, are adaptable to harsh agronomic conditions, available on open access principles and have a cultural connection with most rural households, several studies highlight their potential to supplement rural household income, food and nutritional security [2], [5], [7], [14], [15]. Against this background, this paper questions the drivers of the consumption frequency of indigenous fruits at household level currently claimed to be low and in some incidences declining. The rationale as it were, is to understand indigenous fruits commonly consumed by rural households, their time of occurrence and factors that may condition their consumption.

A. Problem Statement

Literature highlights multiple nutritional benefits of indigenous fruits [16], mainly in rural areas where they grow naturally and are freely available to rural households. Poverty, food and nutritional insecurity are also reported to be high in rural South Africa [1]. Given the nutritional potential of indigenous fruits in rural areas, several studies argue that indigenous fruits may significantly contribute to rural households' income, food and nutritional security [1], [2], [5], [7], [14], [15]. Several studies however reveals that despite the availability of these claimed benefits, indigenous fruits' consumption in rural areas is currently very low and declining [2], [8], [10], [17], [18]. It is against this background that need arises to understand the factors that

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influence consumption frequency of indigenous fruits by rural consumers given that rural areas generally have the most food and nutrition insecure populations [1], [19] while ironically harboring various indigenous fruits. Also, before claiming the food and nutritional security contribution of indigenous fruits, household level consumer perceptions and their consumption frequency needs to be understood.

B. Objectives

- 1) To describe indigenous fruits consumed from the study area
- 2) To describe consumption frequency of indigenous fruits from the study area
- 3) To investigate determinants of indigenous fruits consumption frequency

C. Methodology

The study was conducted in Mutale local municipality of South Africa purposively selected based on abundance of indigenous fruits. Cross sectional field survey was used whereby data was gathered from 200 households randomly selected from 10 villages of Mutale local municipality. Descriptive statistics was used to describe indigenous fruits consumed and the consumption frequency. For factors that influence consumption frequency, ordinal/ordered logit regression model was used. Indigenous fruits are consumed differently by respective households during their peak periods of availability in summer. Such consumption occurs at varying frequencies (i.e., daily, weekly and monthly). Using the ordinal logit regression model, the study estimated the association between consumption frequency and households' socio-economic, institutional and technical attributes (equation 1).

$$Y_{ij}^* = X_{ij}'\beta + U_{ij} \tag{1}$$

where,

Y = IFs consumption frequency ordered as follows:

- Y = 1 (high consumption level – daily consumers);
- Y = 2 (neutral consumption level – weekly consumers); and
- Y = 3 (low consumption level – monthly consumers);

Y* = given state of IFs consumption;

X_{ij} = explanatory variables; and

U_{ij} = disturbance term.

Y* is unobserved, but what will be observed is:

- Y = 1 if Y* ≤ μ₂;
- Y = 2 if μ₂ < Y* ≤ μ₃; and
- Y = 3 if μ₃ < Y*;

where μ_x = unknown parameter to be estimated with β

Based on the cumulative normal function Φ (β' x), the probabilities can be expressed as follows:

- Prob [y = 1: daily consumers] = Φ (- β' x);
- Prob [y = 2: weekly consumers] = Φ (μ₂ - β' x) – Φ (μ₃ - β' x); and

- Prob [y = 3: monthly consumers] = 1- Φ (μ₃ - β' x).

where Φ = (the phi co-efficient which is) a measure of the degree of association between two binary variables.

II. RESULTS AND DISCUSSION

This section presents results of the study. Firstly, results on major indigenous fruits from the study area are presented; this is followed by the consumption frequency of each of the reported indigenous fruits and lastly determinants of consumption frequency. The next section summarizes the main indigenous fruits consumed from the study area, time of consumption across the year and estimated consumption frequency during peak availability (summer).

A. Main Indigenous Fruits Consumed in the Study Area

Table I shows the indigenous fruits that were consumed in Mutale Local municipality together with their consumption frequency during peak availability periods. Results reveal that several indigenous fruits are consumed from the study area as detailed in Table I. On average a majority of the respondents (78%) consumed indigenous fruits, mainly available during summer periods (79%) on weekly basis (47%). These findings therefore suggest that indigenous fruits are very popular in rural areas a significant strength that could be targeted for their promotion. Consumption is however mainly defined during summer periods (79%) followed by winter periods (17%). Just a few indigenous fruits (*mbuyu and niye*) are consumed all-year-round (4%). In terms of consumption frequency, results indicates that consumption of indigenous fruits at household level is mainly on weekly (47%) to monthly (28%) basis, with a few households who consume them on daily (25%) basis.

TABLE I. CONSUMPTION FREQUENCY OF INDIGENOUS FRUITS

Indigenous fruits	Consumption Status		Consumption frequency during their peak availability (%)					
			Consumption periods of the year: (S= summer; W=winter; TY=throughout the year)			Consumption frequency Indigenous (D=daily; W=weekly; M=monthly)		
Local names	Yes	No	S	W	TY	D	W	M
<i>Mbuyu</i>	85	16	50	31	19	1	67	32
<i>Mafula</i>	82	18	100	0	0	46	32	21
<i>Sour plum</i>	71	29	100	0	0	19	46	34
<i>Wild Plum</i>	77	23	99	1	0	23	50	27
<i>Niye</i>	88	12	39	39	22	31	49	20
<i>Nombelo</i>	88	13	100	0	0	50	34	16
<i>Mbula</i>	76	24	100	0	0	17	44	39
<i>Mahuyu</i>	77	23	100	0	0	26	43	30
<i>Thaladzi</i>	71	30	0	100	0	20	45	35
<i>Phimbi</i>	63	38	100	0	0	17	54	30
Average	78	22	79	17	4	25	47	28

These findings suggest a low consumption frequency of indigenous fruits at household level. Thus far, the food and nutrition security contribution of indigenous fruits in rural areas at household level should be cautiously reported bearing in mind that households consume them

on average once per week or month mainly in summer when they are abundantly available. The next section presents factors that condition consumption frequency at household level.

B. Factors that Influence Consumption Frequency of Indigenous Fruits

TABLE II. DETERMINANTS OF CONSUMPTION FREQUENCY

Variables	Estimate	Std. error	Sig.	
(1) Gender	-.306	.358	.393	
(2) Age	-.029	.010	.004***	
(3) Marital status	-.465	.213	.029**	
(4) Income source	Permanent job	1.373	.484	.005***
	Temporary job	1.191	.473	.012**
	Pension fund	.050	.656	.939
(5) Income per month	.156	.096	.106	
(6) Level of education	.426	.167	.011**	
(7) Household size	-.105	.058	.072*	
(8) IFs(indigenous fruits) are healthier	-.492	.392	.209	
(9) IFs make people live longer	-.858	.425	.044**	
(10) IFs give people and energy strength	-.563	.406	.166	
(11) IFs have health benefits & prevent diseases	-.835	.422	.048**	
(12) IFs taste good	-.234	.444	.599	
(13) IFs are cheaper	-.160	.418	.701	
(14) IFs are food for poor	.012	.349	.972	
(15) Appearance influence consumption	-.454	.418	.278	
(16) IFs have a pleasant smell	-.425	.407	.296	
(17) Texture influences consumption	-.425	.412	.303	
(18) IFs are easy to collect	-.272	.405	.501	

Note: ***: significant at 1% level; **significant at 5% level; *significant at 10% level.

While acknowledging low consumption frequency of indigenous fruits as suggested in the previous section, this section estimates factors that influence the consumption frequency of indigenous fruits at household level as summarized in Table II. The parallel lines test for assessing whether the assumption that the parameters are the same for all categories is reasonable was plausible with a large *p-value* (0.242), which is greater than the 5% significance level. The proportional odds assumption appears to have held for the general model. With regard to the coefficient of determination, Pseudo R squared was computed, which summarizes the proportion of variance in the dependent variable associated with the predictor (independent) variables. In this model, Nagelkerke R^2 of 51.7% was obtained, suggesting that more of the variation was explained by the model. The Goodness of fit which tests whether the observed data are inconsistent with the fitted model revealed that the data and the model predictions are similar as supported by large significant values (Pearson's chi-square statistic = Sig. 1.000; chi-square statistic based on the deviance = Sig. 1.000). Consumption frequency was measured on daily (1), weekly (2) and monthly (3) basis. These (consumption frequency: daily 1; weekly 2; monthly 3) were considered as the dependent variables in the Ordinal Logit Model. Following an approach by Opiyo *et al.* [20], the implication is that higher net value (3) indicates low consumption and vice versa. Thus far, a positive estimate

value [ordered log-odds (logit) regression coefficient] indicates that an increase in that variable increases low consumption (thus discourages consumption – monthly consumption), while a negative estimate value [ordered log-odds (logit) regression coefficient] indicates that an increase in that variable decreases low consumption – thus promoting high consumption (daily consumption).

Age: Model results confirm a negative association between household head age and indigenous fruits consumption frequency. The results reveal that, for every unit increase in household head age there is a 0.029 decrease in the log odds of low consumption frequency of indigenous fruits by households, holding all other independent variables constant. These findings therefore suggest that as household head age increase consumption of indigenous fruits also increases. Several comparable previous studies argue that the youth of today perceive IFs negatively [21], considering them as weeds, food consumed by the poor and unfashionable compared to western fast foods [17], [22].

Marital status: Results reveal a negative association between marital status and consumption frequency of IFs. For every unit increase in marital status (thus moving from single to married category) there is a 0.465 decrease in the log odds of low consumption frequency of indigenous fruits by households, holding all other independent variables constant. These findings therefore suggest that married households increase the probability of high consumption of indigenous fruits. This may be explained by availability of labour (more hands and more mouths to feed) for indigenous fruits gathering which is labour intensive.

Income source: The model results further confirm a positive association between source of income and consumption frequency of IFs. These results disclose that, for every unit increase in source of income (either temporal or permanent job) there is a 1.191 (temporal job) / 1.373 (permanent) increase in the log of low consumption frequency of indigenous fruits, holding all the other independent variables constant. These findings indicate that households with access to income from permanent or temporary jobs have a higher probability of consuming less indigenous fruits. This may be explained by the fact that access to income from employment opportunities may place households in higher social classes dominated by western food types. Secondly employed rural households may fail to have time to harvest IFs, given that harvesting of IFs is labour intensive and requires proper timing.

Level of education: The model also confirms a positive association between level of education and IFs consumption frequency. The results reveal that, for every unit increase in household head education there is a 0.426 increase in the log odds of low consumption frequency of indigenous fruits by households, holding all other independent variables constant. These findings therefore suggest that as household head education increases consumption of indigenous fruits decreases. These findings support popular belief that higher education places individuals in higher social classes more often associated with western lifestyles and food choices at the

expense of indigenous foods [21], [23], contrary to popular belief that education may promote consumption of indigenous foods, for consumers will be more health-conscious.

Household size: The model results confirm a negative association between household size and consumption frequency of IFs. The results show that, for every unit increase in household size there is a 0.105 decrease in the log odds of low consumption frequency of indigenous fruits by households, holding all other independent variables constant. These findings therefore suggest that household size increases the probability of high consumption of indigenous fruits. These findings support previous studies which highlights that availability of labour force is a critical factor towards consumption of IFs [24], given the intensive nature of indigenous fruits gathering.

IFs make people live longer: Regression results reveal a negative significant association between the perceptions that: “indigenous fruits make people live longer” and consumption frequency of indigenous fruits. The results indicate that, for every unit increase in the perceptions that indigenous fruits make people live longer there is a 0.858 decrease in the log odds of low consumption frequency of indigenous fruits by households, holding all other independent variables constant. These findings therefore suggest that as households believe more in this perception; this may increase the probability of indigenous fruits consumption. These findings support previous studies which highlights that, indigenous fruits are said to have beneficial properties such as; boosting the immune system, giving energy and strength, strengthening bones, preventing illnesses, providing vitamins and also promoting longevity [25].

IFs have health benefits and prevent diseases: Results also indicate a negative significant association between the perceptions that “indigenous fruits have health benefits and prevent diseases” and consumption frequency of indigenous fruits. The results reveal that, for every unit increase in the perceptions that indigenous fruits make people live longer there is a 0.835 decrease in the log odds of low consumption frequency of indigenous fruits by households, holding all other independent variables constant. These findings therefore suggest that as long households perceive that there are health benefits and disease prevention associated with IFs, they may be encouraged to consume them. Several previous studies endorse the health benefits of indigenous foods [3], [16], [21].

III. CONCLUSION

This paper concludes that the consumption of indigenous fruits is more confined to summer periods and commonly consumed on weekly to monthly basis. Caution should be exercised when indigenous fruits are recommended as food and nutrition security supplements for rural households bearing in mind the periods of the year they are available and their consumption frequency. Several socio-economic and perception factors (age, marital status, income source, education level and

household size, as well as the perceptions of indigenous fruits’ longevity promotion, health beneficitation) may be targeted to promote consumption frequency of indigenous fruits.

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