

Determinants and Constraints to Consumption Pattern of Worowo (*Solanecio bialfrae*), IGBAGBA (*Solanum macrocarpon*), ODU (*Solanum nigrum*) and Elegede (*Cucurbita pepo*) Vegetables in South West Nigeria

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ARTICLE INFO	ABSTRACT
Published Online: 29 April 2026	This study examines the determinants and constraints influencing the consumption patterns of underutilized indigenous vegetables—worowo (<i>Solanecio bialfrae</i>), igbagba (<i>Solanum macrocarpon</i>), odu (<i>Solanum nigrum</i>), and elegede (<i>Cucurbita pepo</i>)—in Southwest Nigeria, a region grappling with micronutrient deficiencies and dietary monotony. A multistage sampling technique was employed across Oyo and Ogun States, selecting 123 respondents from agricultural zones, blocks, and cells. Data were analyzed using descriptive statistics and ordered logit regression to identify socioeconomic and market-related factors affecting consumption. Key findings reveal that worowo is the most consumed (56%), driven by availability (64%) and nutritional benefits (54%). Regression results highlight significant determinants: male respondents ($p < 0.01$) and proximity to markets ($p < 0.01$) positively influence consumption, while higher monthly income negatively impacts it ($p < 0.05$), suggesting substitution with conventional alternatives as socioeconomic status rises. Constraints include limited access to credit (78% lacked access) and minimal nutritional guidance from extension agents (77% unreachable). The study underscores the potential of indigenous vegetables to mitigate hidden hunger and diversify diets. Recommendations emphasize promoting cultivation and consumption through awareness campaigns, market accessibility improvements, and integration into agricultural policies to enhance food security and livelihoods. Addressing these factors could reposition underutilized vegetables as sustainable contributors to Nigeria's nutritional and economic resilience.
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INTRODUCTION

In Nigeria, worowo (*Solanecio bialfrae*), igbagba (*Solanum macrocarpon*), odu (*Solanum nigrum*) and elegede (*Cucurbita pepo*) are referred to as underutilized vegetable because of the low attention given to them despite their nutritional benefits (Okunlola *et al.*, 2023). In other words these vegetables are also indigenous to the south west region of the country where are been consumed as indigenous crops and they are prominent food group in the diet with great diversity across the different regions of the country (Hughes

and Ebert, 2013). In the past they were consumed more frequently and diets of especially rural Nigerians contained considerable amounts of different green leafy vegetables. In recent times, however, there has been a narrowing of the diversity of these consumed, reflected in the overdependence on a few, mostly cultivated green leafy vegetables species, which account for the number in people's diets. Several traditional leafy vegetables are being neglected, especially the uncultivated and wild species, many of which unfortunately are regarded as weeds

(Imathiu, 2021). They continue to fall into disuse because to date they have received less attention than cultivated ones. The implication is that the food basket from which micronutrients can be obtained gets smaller. Few of them, particularly uncultivated and wild underutilized crops become important during periods when cultivated commonly consumed vegetables are not in season and are expensive in the markets; this especially holds true for people in the rural communities (Palanisamy et al., 2019).

In Nigeria, apart from under-nutrition and over-nutrition, which currently constitute a double burden of disease, hidden hunger also constitutes a third burden (Prentice, 2023). Vitamin A deficiency (VAD) and iron deficiency remain public health challenges in Nigeria and this is particularly so in rural areas of the country (Harika et al., 2017). Some 25% of infant, child and maternal mortality is attributed to vitamin A deficiency. Prevalence of vitamin A deficiency among children aged under five children in Nigeria is between 5.3% and 29.5%, depending on the region. Iron deficiency is the cause of prevalent nutritional anaemia (also known as iron deficiency anaemia) in Nigeria; 20–40% in adult females, 20–25% in children and 10% in adult males (Abolurin et al., 2018). High rates of micronutrient deficiency are an indication of low-quality diets, which also contributes to all other forms of malnutrition. The micronutrient quality of poor diets could be improved with readily available and accessible indigenous vegetables among which are worowo (*Solanecio biafrae*), igbagba (*Solanum macrocarpon*), odu (*Solanum nigrum*) and elegede (*Cucurbita pepo*), especially among populations who have inadequate access to animal source foods for economic reasons.

It has been observed that the occurrence of neglecting some of these vegetables is a worldwide phenomenon. Farmers' involvement in the production of these under-utilised species can improve their income, health and even their nutritional levels (Torimiro et al., 2014). It could also make them to spend less on their health as vitamins; minerals and phyto-protein which are good for body maintenance and repairing of worn-out tissues are derived from these vegetables if consumed in adequate proportions. Indigenous vegetables and fruits are an integral part of agricultural systems in Africa but unfortunately the government of most African countries has not given them priority in crop development. Most times, indigenous leafy vegetables are not mentioned when listing arable crops in Nigeria (Adebooye and Opabode, 2004). Most studies on leafy and fruit vegetables in Research Institutes and Universities have focused on the conventionally cultivated species where chemicals and other artificially manufactured products are being used in producing the vegetables (Aina, 2005).

Furthermore, worowo (*Solanecio biafrae*), igbagba (*Solanum macrocarpon*), odu (*Solanum nigrum*) and elegede (*Cucurbita pepo*) usually compare well in terms of their micronutrient contents with more commonly consumed and cultivated vegetables. Findings by Ejoh et al. highlighted the nutritional relevance of worowo (*Solanecio biafrae*), igbagba (*Solanum macrocarpon*), odu (*Solanum nigrum*) and elegede (*Cucurbita pepo*) when compared with conventional vegetables; indigenous vegetables were as nutrient-dense as the conventional and commonly consumed leafy vegetable species, especially in β -carotene and lutein. In view of this and given that indigenous vegetables as part of the dietary structure of Nigerian local diets, it is important to examine the consumption pattern, both to ascertain the potential contribution they could make to micronutrient requirements and to better understand the overall nutrient intake of vulnerable groups because of their short gestation period and capacity to provide farmers with rapid revenue, underutilized vegetables are essential to ending hunger. As a result, they contribute significantly to household income. If the government and other development stakeholders give these veggies the proper attention, they have the potential to play a bigger part in the world's sustainable supply of wholesome, varied food. According to Kukreja and Sharma (2023), underutilized or neglected vegetables are native plants that are abundant in phytochemicals and have important therapeutic qualities that are beneficial to human health.

METHODOLOGY

Study Area

The study was conducted in Southwest Nigeria, a region comprising six states: Ekiti, Lagos, Ogun, Ondo, Osun, and Oyo. This region is known for its high consumption of indigenous leafy vegetables, including worowo (*Solanecio biafrae*), igbagba (*Solanum macrocarpon*), odu (*Solanum nigrum*), and elegede (*Cucurbita pepo*). These vegetables are integral to the dietary habits of the Yoruba ethnic group, which predominantly inhabits the region.

Southwest Nigeria lies between latitude 6°N and 9°N and longitude 2.5°E and 6.5°E, covering an estimated 77,818 km². It shares boundaries with the Atlantic Ocean to the south, the Republic of Benin to the west, North Central Nigeria to the north, and Southeast Nigeria to the east. The climate is typically humid tropical, characterized by distinct wet (April–October) and dry (November–March) seasons, making it conducive for vegetable cultivation and consumption.

The region is home to both urban and rural populations, with major cities including Ibadan, Lagos, Abeokuta, Akure, Oshogbo, and Ado-Ekiti. Agriculture, trade, and food processing are significant economic activities, with leafy

vegetable production forming an essential part of household food security. The high population density and growing urbanization influence dietary choices, including the consumption patterns of indigenous vegetables.

Data Collection

Sampling Procedures

A multistage sampling technique was employed to systematically select respondents for this study. This method ensures a representative sample of vegetable consumers across different geographical locations, socio-economic groups, and agricultural settings in Oyo and Ogun States respectively.

Stage one involved the selection of Oyo State and Ogun State were purposively selected due to their significance in the production, distribution, and consumption of indigenous leafy vegetables, specifically worowo (*Solanecio biafrae*), igbàgbà (*Solanum macrocarpon*), odu (*Solanum nigrum*), and elegele (*Cucurbita pepo*). Second stage involved selection of ADP Zones. Each state was divided into four Agricultural Development Program (ADP) zones. Oyo State ADP Zones are Ibadan-Ibarapa, Ogbomoso, Oyo, and Saki while Ogun State ADP Zones are Abeokuta, Ilaro, Ijebu-Ode, and Remo.

Two ADP zones were randomly selected from each state (i.e Ibadan-Ibarapa and Oyo from Oyo state while Abeokuta and Ijebu-Ode were selected from Ogun state), making a total of four zones for the study. The third stage involved the selection of Agricultural Blocks within each selected ADP zone, two agricultural blocks were randomly chosen, leading to a total of eight blocks (Ido and Egbeda blocks from Ibadan-Ibarapa zone while Oyo town and Iseyin blocks from Oyo zone while Ifo and Olorunda from Abeokuta zone while Ado-odo, and Oke-odan from Ilaro zone). The fourth stage involved the selection of Agricultural Cells. From each selected agricultural block, two agricultural cells were randomly selected, making a total of 16 cells (eight per state) while the fifth stage involved the selection of 20 respondents using systematic random sampling technique from various categories of vegetable consumers, ensuring a diverse and representative dataset.

Sample Size Determination

The total sample size will be determined using Yamane's formula (1967):

$$n = \frac{N}{1 + N(e)^2} \dots \dots \dots (1)$$

A proportional allocation approach will be used to distribute the total sample size across the selected ADP zones, blocks, and cells to ensure adequate representation

Analytical techniques

Descriptive Statistics

The socioeconomic features of the respondents were profiled using descriptive analysis. This includes charts, frequency distribution tables, and measurements of dispersion (such as skewness and standard deviation) as well as central tendency (such as mean and mode). It was employed to profile respondents' socioeconomic traits. The features of a data collection are summed up or described using descriptive statistics, measurements of central tendency, measurements of variability (or spread), and frequency distribution. Frequency table was used to rank the different constraints that affected the consumption pattern of worowo (*Solanecio biafrae*), igbagba (*Solanum macrocarpon*), odu (*Solanum nigrum*) and elegele (*Cucurbita pepo*) in the study area.

Order Logit regression

Ordered logit regression, also known as the ordinal logistic regression, is a statistical modeling technique used when the dependent variable is ordinal—meaning it has a natural order but the differences between categories are not necessarily equal (Statnews, 2020). It extends the standard logistic regression to handle multiple ordered response levels.

Let Y be the ordinal dependent variable with J ordered categories:

$$Y = (1, 2, \dots \dots \dots n) \quad (2)$$

The ordered logit model estimates the probability that the observed outcome falls into category *n* or lower, given a set of independent variables X. The model is formulated as:

$$P(Y \leq j) = \frac{1}{1 + e^{-(\alpha_j - \beta X)}} \quad (3)$$

where:

$P(Y \leq j)$ Is cumulative probability of being in category *n* or below.

α_j is threshold (cutoff) parameter for category *n*.

β = vector of regression coefficients.

X= independent variables.

e = base of natural logarithm.

The odds ratio (OR) in ordered logit regression represents the proportional increase or decrease in the likelihood of being in a higher or lower category as an independent variable changes.

$$Y = a_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7$$

Y = consumption pattern

X1= Level of education

X2= Age of the respondents (Years)

X3= income of the respondents per month

X4= Sex (Female = 0, Male = 1)

X5= Household size (Actual number)

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X6= place of living (rural area=1, urban=2)

X7= Occupation

RESULTS AND DISCUSSION

Figure 1: Gender distribution of the respondents

The figure 1 explained the gender distribution of the respondents and the result revealed that about 56 percent of the respondents were female while about 44 percent of the respondents were male. This can be traced to the cultural practices of the south western people where female is always in charge of cooking for the households.

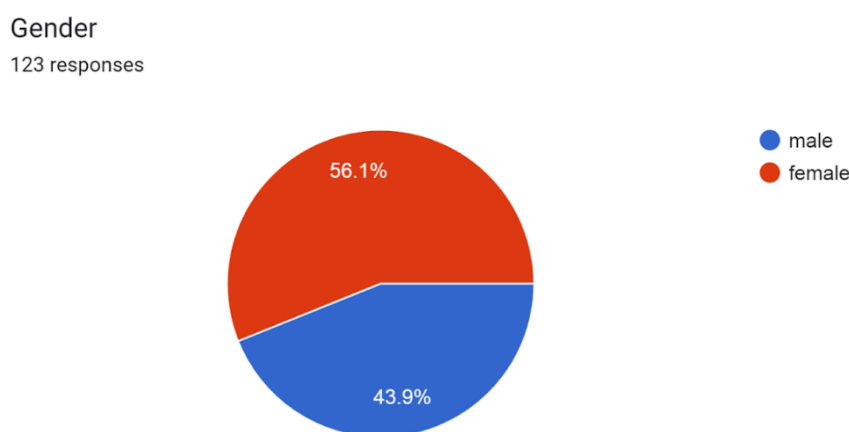


Figure 2: Marital status distribution of the respondents

Figure 2 explained the result of the marital status of the respondents and this revealed that about 56 percent are married while 43 percent are single while 1 percent was either divorce, separated or widow.

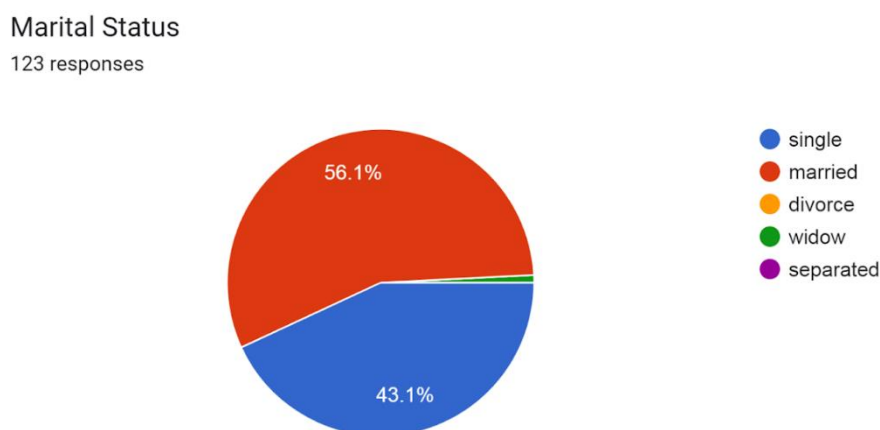


Figure 3: Household size distribution of the respondents

The figure 3 explained the result of the household size of the respondents and the result revealed that about 55 percent has the household size of between 4 and 6 persons while about 33 percent have the household size of between 1 and 3 persons while about 11 percent have the household size of between 7 and 9 persons while about 1 percent have 10 and above household size while

Household Size

120 responses

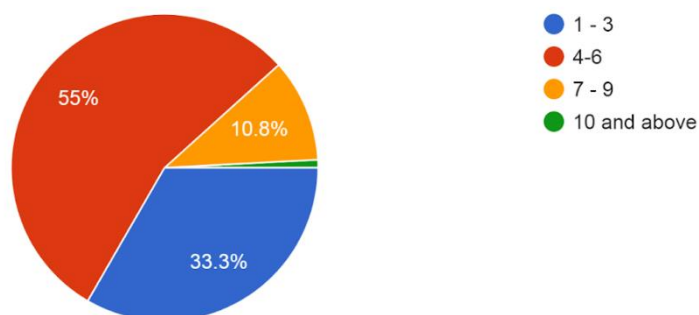


Figure 4: Educational distribution of the respondents

The figure 4 explained the distribution of the respondents based on their educational level and the result revealed that majority of the respondents (98 percent) has tertiary education.

Educational Level

123 responses

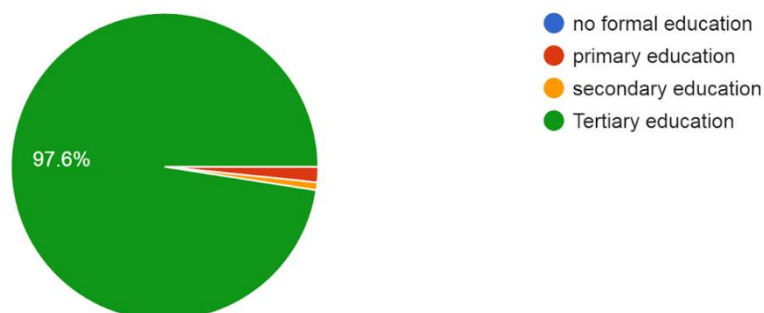


Figure 5: Primary occupation distribution of the respondents

The figure 5 explained the primary occupation of the respondents and the result revealed that about 48 percent of the respondents were civil servant while about 12 percent of the respondents were trader.

Primary Occupation

122 responses

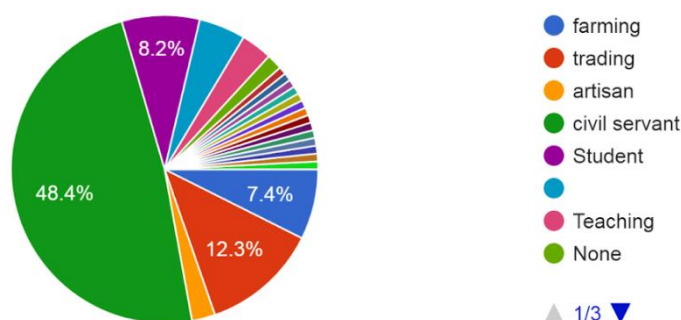


Figure 6: Average monthly income distribution of the respondents

Figure 6 explained the average monthly income of the respondents and the result revealed that about 30 percent of the respondents earned between #101,000 - #150,000 while about 21 percent earned between #50,000 and #100,000 while about 19 percent earned between #151,000 and #200,000 while about 17 percent earned less than #50,000 while about 13 percent earned less than #50,000 per month.

Average Monthly Income (₦)

122 responses

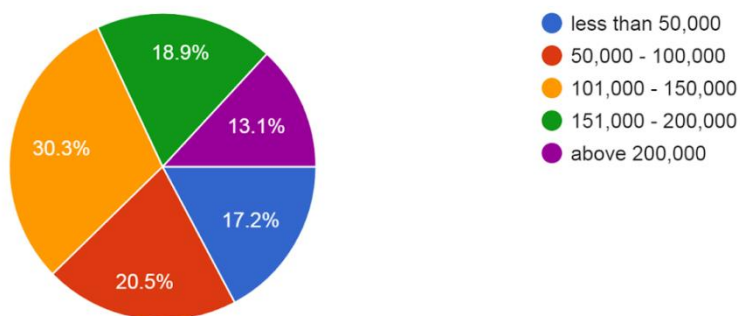


Figure 7: Distribution of the respondents based on their access to credit

Figure 7 explained the result of the respondents based on their access to credit facility and the result revealed that majority of about 78 percent did not have access to credit while about 22 percent have access to credit.

Do you have access to credit facilities for food purchases?

122 responses

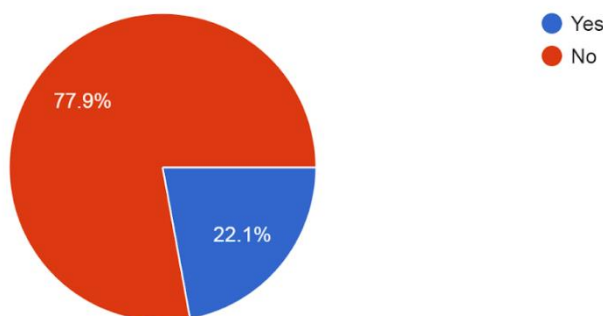


Figure 7: Distribution of the respondents based on whether they received food consumption advice from the extension agent

Figure 7 explained the distribution of the respondents based on whether they received food consumption advice from the extension agent and the result revealed that majority of about 77 percent did not received food consumption advice from the extension agent while about 23 percent received food consumption advice from the extension agent.

Do you receive nutrition or food consumption advice from extension agents or health personnel?

122 responses

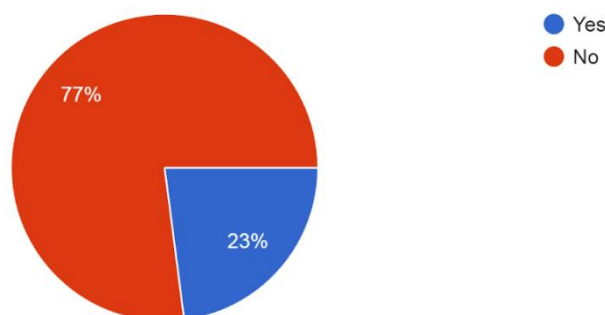


Figure 8: Distribution of the respondents based on their reliable vegetable market nearness to their residence

Figure 8 explained the distribution of the respondents based on their reliable vegetable market nearness to their residence and the result revealed that about 76 percent have the vegetable market been near to their place of residence while about 24 percent have the vegetable market not been near to their place of residence.

Do you have access to a reliable vegetable market near your residence?

122 responses

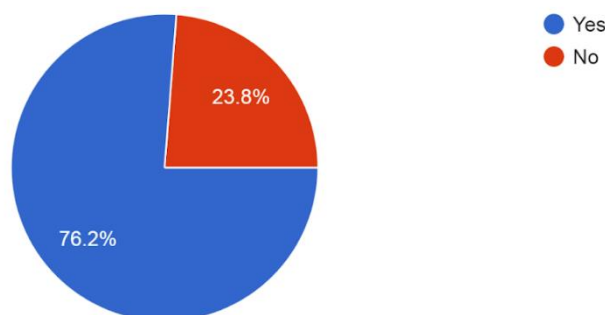


Figure 8: Distribution of the respondents based on their frequency of indigenous vegetable consumption.

Figure 8 explained the result of distribution of the respondents based on their frequency of indigenous vegetable consumption and result revealed that about 34 percent of the respondents consumed indigenous vegetable between two and three times in a day while about 27 percent of the respondents consume the indigenous vegetable once in a week while 27 percent of the respondents consumed the indigenous vegetable occasionally.

How frequently do you consume indigenous vegetables?

123 responses

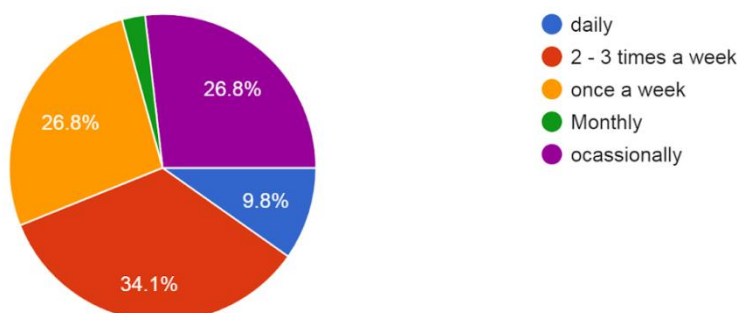


Figure 9: Distribution of the respondents based on their source of indigenous vegetable

Figure 9 explained the distribution of the respondents based on their source of indigenous vegetable and the result revealed that about 62 percent of the respondents sourced for the indigenous vegetable from the local market while about 17 percent sourced their indigenous vegetable from the road side vendor while about 16 percent sourced their indigenous vegetable from the research institute especially National Horticultural Research Institute.

What is your major source of indigenous vegetables?

121 responses

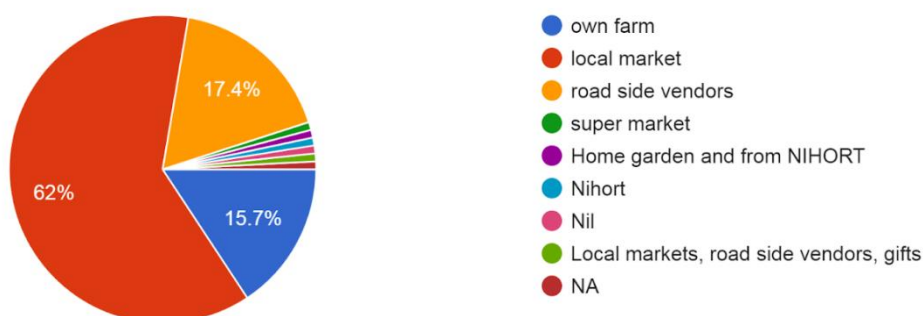


Figure 10: Distribution of the respondents based on the type of indigenous vegetable they consume

The figure 10 explained the distribution based on the type of indigenous vegetable they consumed among the selected indigenous vegetables and the result revealed that about 56 percent consumed *worowo* (*Solanecio biafrae*) while about 23 percent consumed *Igbagba* (*Solanum macrocarpon*) while about 9 percent consumed *Odu* (*Solanum nigrum*) while about 5 percent consumed *Elegede* (*Cucurbita pepo*) while about 7 percent consumed other indigenous vegetable which include *Launaea taraxacifolia* (yanrin), *Crassocephalum crepidioides* (ebolo), *Spinacia oleracea* (amunututu) and *Amaranthus viridis* (local amaranth).

figure 10: Distribution of respondents based on the type of indigenous vegetable consumed

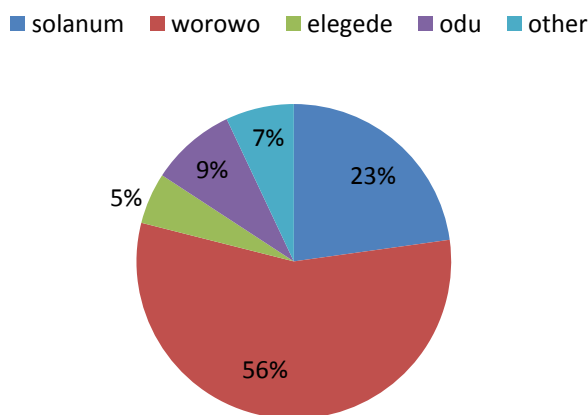


Figure 11: Distribution of the respondents based on the that factors that influenced their choice of indigenous vegetable

Figure 11 explained the result of the distribution of the respondents based on the factors that influenced their choice of indigenous vegetables consumption and the result revealed that about 64 percent of the respondents agree that availability of the indigenous vegetables determined their level of consumption while about 54 percent agree that the nutritional benefits determine their level of consumption while about 48 percent have their choice of indigenous vegetables been determined by taste preference while price and cultural reason accounted for 21 percent and 7 percent respectively.

Figure 11: Factors that influenced their choice of indigenous vegetable

What factors influence your choice of indigenous vegetables? (Select all that apply)

122 responses

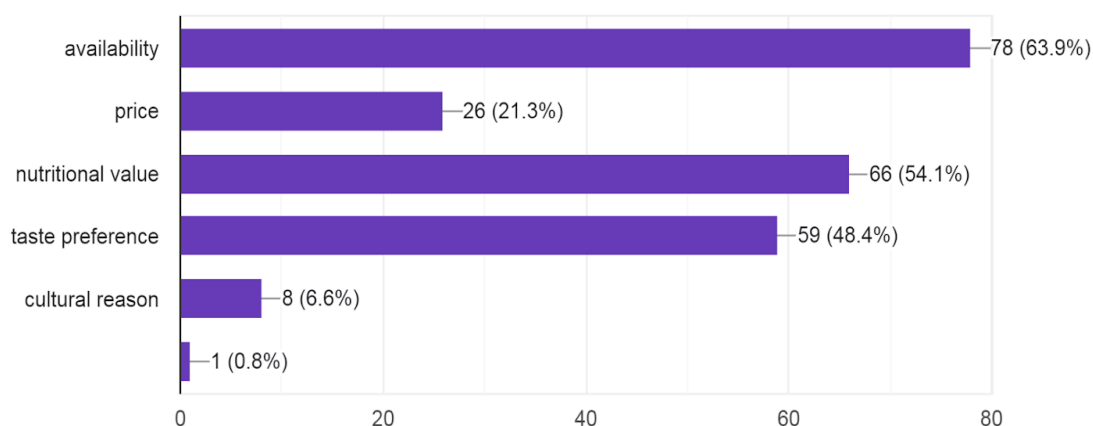
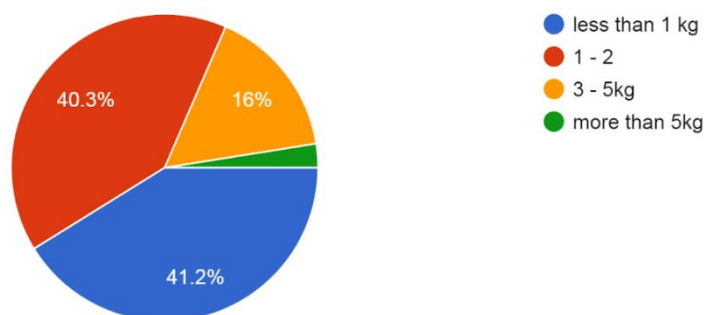


Figure 12: Distribution of the respondents based on the quantity of indigenous vegetable consumed on weekly basis.

Figure 12 explained the result of the distribution of the respondents based on their consumption pattern of indigenous vegetables and the result revealed that about 41 percent of the respondents consumed less than 1kg of indigenous vegetables per week while about 40 percent consumed between 1kg and 2 kg per week while about 16 percent consumed between 3kg and 5kg per week while about 3 percent consumed more than 5kg of the indigenous vegetables per week.

What quantity of indigenous vegetables does your household consume weekly?

119 responses



Determinants of consumption pattern

The R square value (0.71) shows that the probability that the identified demographic factors that are captured in the model are the one responsible for causing the change in consumption pattern in selected indigenous vegetables is about 71% while the adjusted R square (0.70) explain that the probability that significant variables such as gender, average monthly income and closeness of market to the place of residence affect productivity by about 70%. Table 1 shows the factors that affect indigenous vegetables consumption pattern. The estimation result of the regression analysis in table 1 shows that gender is significance at 1% level of significance and it is positively related to consumption pattern of the indigenous vegetables while average monthly income is also significant at 5% and it is

negatively affected the consumption pattern while closeness of the market to the place of residence is significance at 1% level of significance and it is positively related to consumption pattern of the indigenous vegetables. This means that the factors that affect the consumption pattern are gender, average monthly income and the closeness of market to the place of residence. Male gender are likely to consume more of indigenous vegetable than female, the result also revealed that the increase in average monthly income will reduce the level of consumption of the indigenous vegetables and this can be traced to increase in social status as the indigenous vegetables are normal goods and the result also revealed that the more closer the respondent's place of residence is to market, the more the level of consumption of the indigenous vegetable.

Table 1: Determinants of consumption pattern

Consumption pattern	Coef.	Std. Err.	t	P> t
Gender	.4296858	.148226	2.90	0.005***
Age	.144964	.1034365	1.40	0.164
Marital status	-.0110099	.1688263	-0.07	0.948
Household size	-.088872	.1207808	-0.74	0.463
Educational level	-.4896061	.2626843	-1.86	0.065
Average monthly income	-.1719598	.0688769	-2.50	0.014**
Access to vegetable market	2.377549	.1667273	14.26	0.000***
_cons	1.172824	.8772148	1.34	0.184

R-squared = 0.7133

Adj R-squared = 0.6954

CONCLUSION AND RECOMMENDATION

Conclusion

The findings and analysis in the study area has clearly revealed that worowo is a major consumed indigenous vegetable among the selected vegetable based on its nutritional benefits in the study area. The study also revealed that among the factors that affect consumption pattern of the selected indigenous vegetables were gender,

average monthly income and the nearness of market to residence. In conclusion, gender as a factor that affect consumption pattern of indigenous vegetables consumption, can be traced to cultural attributes that is common in the location of the study. Also increase in average income also have negative effect on the consumption pattern of the selected indigenous vegetables and this can be explained as the agricultural commodity are common goods which

consumption level get drop when there is increase in social status to get something better and conventional as a substitute to indigenous vegetable. Also closeness of market to place of residence also a factor that affect the consumption pattern of the selected indigenous vegetable and this can be explained that among the factors that lead to consumption of these indigenous vegetables are availability, affordability and accessibility while the closeness of market to place of residence can be seen as been synonymous to accessibility.

Recommendation

Based on the result of the findings, it is recommended that there should promotion of indigenous vegetable production as a means to increase their consumption which will also serve as a means of livelihood for the people. There should be awareness about nutritional benefits of these indigenous vegetables so as to save them from going into extinction.

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