

Research Article

Determinants of Food Security Status Among Vegetable Women Producers in North-West, Nigeria**Ibrahim MAHARAZU**¹, **Olugbenga Omotayo ALABI**^{2*}, **Jeremiah Samuel ALUWONG**³,
Ayoola Olugbenga OLADELE⁴¹ Department of Agricultural Economics, Faculty of Agriculture, Kaduna State University, Kaduna State, Nigeria² Department of Agricultural Economics, Faculty of Agriculture, University of Abuja, Gwagwalada-Abuja, Nigeria³ Department of Agricultural Extension and Management, School of Agricultural Technology, Nuhu Bamali Polytechnic, Zaria, Samaru Katat Campus, Kaduna State, Nigeria⁴ Department of Agricultural Extension and Management, Federal College of Forestry Mechanization, Afaka Kaduna, Kaduna State, NigeriaCorresponding author: omotayoalabi@yahoo.com**ABSTRACT**

This work investigated food security status among vegetable women producers in North West, Nigeria. Primary data were used based on a well-organized questionnaire. The data were evaluated using descriptive statistics, Tobit regression model, food security index, and principal component model. The outcome shows that averagely the age, household size, and farm size approximates 48 years, 9, and 0.75 ha respectively. A household is regarded as food secure if it achieves at least $\frac{2}{3}$ of the MPCFE (Mean per Capital Consumption Food Expenditure) per month. Therefore, the vegetable women producers that spent at least ₦ 2,125.51 (1USD = ₦ 1,040) on food per month were grouped as food secure, and those that spent less than this figure were grouped as food insecure. This denotes that the vegetable women producer to be regarded as food secure will spend above ₦ 70.85 on food per day. Based on the headcount ratio, about 54% of vegetable women producers had their per capital food expenditure equal or above ₦ 2,125.51, while 46% of them had their per capital food expenditure below ₦ 2,125.51. The educational level, age, household size, income from vegetable farming off farm income and access to credit were different significantly from zero in deciding the food security status of vegetable women producers. The major challenges faced by vegetable women producers include lack of improved seeds (1st), lack of credit (2nd), and lack of access to land (3rd). Credit should be made available at single digit interest rate to enhance productivity, and increase food security

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INTRODUCTION

Vegetables can be explained as plant part or plant which are normally eaten with menu and are generally boiled, salted and used as salads, they are significant component for human diets all over the world (USAID, 2019). Vegetables can be fresh pod, root, ripe fruits, immature fruits, immature flower, tender leaf, shoot or bulb and the examples include green beans, carrot, tomato, okra, cauliflower, Amaranthus, and onion respectively (Kughur et al., 2018). Vegetables contains 25% dry matter and 75% water (Ajayi and Nwalieji, 2010). The huge level of fibre contain in vegetable prevent constipation and put the digestive system healthy (Shettima et al., 2016). Vegetable production create employment for people, provide sources of livelihood for smallholder farmers, reduce poverty and generate income (Oladoja et al., 2006). Vegetable production can generate income and employment and it is a significant source of minerals, vitamins, carbohydrates, proteins, and dietary fibres (Aju and Popoola, 2010; Agbuegba et al., 2013). Nigeria is one of the vegetable producing nations in Africa, in 2021 and 2022, approximately 15.8 million tonnes 95% CI [15.75, 15.85 million tons] and 16.1 million tonnes 95% CI [16.05, 16.15 million tons] of vegetables were produced in Nigeria respectively (FAO, 2024). Around the world, in 2021 and 2022, approximately 1.16 billion tonnes 95% CI [1.15, 1.17 billion tons] and 1.17 billion tonnes 95% CI [1.16, 1.18 billion tons] were produced (FAO, 2024). In Africa, about 80% of farm labour, 60% of agricultural production and 80% of food production are accounted for by women (Lawal et al., 2017). Women in Africa are poor, food insecure, no adequate nutrition, no access to nutrition, and lack basic necessities of well-being. Most African women are illiterate, the level of illiteracy is twice as high as men, this further shows that they are at disadvantaged position. Rural women are significant when addressing nutrition and food security in Africa. Rural women lack technical knowledge, lack credit, lack extension services, lack farm inputs, lack support to enhance agricultural productivity The lack of statistical figures on the status and role of women is important factor and challenges to understanding women situations. The resources owned by women tend to be smaller, they also have less decision making power, and less control over productive resources than men (Moore et al., 2015). According to World Bank (2008) who documented that women are as effective as men and they add more substantially to agricultural productivity. Cultural practices do not regard women in term of ownership of land in Africa, female children do not also inherit land from their fathers. Most rural women in Africa are the invisible producers, and the fact is that half of Nigeria's food is produced by women (Adenugba and Rahji, 2013). The policies targeted at enhancing food production and food security tend to either underscore the role of women in decision making process and food production. In rural areas of Nigeria, women perform a significant role in the survival of families (Ajibade et al., 2021).

According to USAID (1992) who detailed food security as a condition when all people at all times have both material and financial access to sufficient food required to accommodate their dietary exigencies for a healthy and useful life. Food security is entrenched in poverty and the impact on the families is for a long term, and the 3 pillars of food security is food availability, food access, and food utilization. The developing countries face acute food insecurity, and they suffered from malnutrition and poverty.

The objective of the study investigated food security status among vegetable women producers in North West, Nigeria. Specifically, the objectives entail:

- (i) determine the summary data of vegetable women producers,
- (ii) estimate the food security status of vegetable women producers,
- (iii) evaluate factors deciding the food security status of vegetable women producers,
- (iv) determine the problems faced by vegetable women farmers.

MATERIALS AND METHODS

This study was organized in Kano and Kaduna States, Nigeria. A multi-stage sampling design was utilized to choose 120, 95% CI [122, 118] vegetable women producers. Primary data were used based on a well-structured questionnaire. The sample number of vegetable women producers was sustained on the Yamane (1967) formula presented as:

$$n = \frac{N}{1+N(e^2)} = \frac{171}{1+171(0.05^2)} = 120$$

Where,

n = The Sample Number

N = The Total Number of Vegetable Women Producers (Number)

e = (5%)

(1)

Descriptives Statistics

This relate to the use of standard deviation, mean, percentages and frequency distribution, to have a summary figures of factors of interest.

Food security index

The model following Omonona and Agoi (2007) is stated as:

$$FS_i = \frac{\text{PerCapitaFoodExpenditurefortheithVegetableWomenProducers}}{\frac{2}{3}\text{MeanPerCapitaFoodExpenditureofallVegetableWomenProducersHushold}} \quad (2)$$

Where

FS_i = Food Security Index

$FS_i \geq 1$ = FoodSecure

$FS_i < 1$ = FoodInsecure

The Headcount Index Formula is given as:

$$\text{HeadcountIndex}(H) = \frac{M}{N} \quad (3)$$

M =Number of Food Secure/Food Insecure

N = Number of Vegetable Women Producers Household

Tobit Dichotomous Regression Model

The model is explicitly stated as:

$$FS_i^* = \beta_0 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 Z_4 + \beta_5 Z_5 + \beta_6 Z_6 + \mu_i \quad (4)$$

$$FS_i^* = \begin{cases} FS_i^* & \text{if } FS_i \geq 1 \text{ is FoodSecure} \\ 0, & \text{Otherwise} \end{cases}$$

Where,

FS_i^* = Latent or Unobserved Food Security Status (Number)

β_0 = Constant Term

$\beta_1 - \beta_6$ = Regression Coefficients

Z_1 = Educational Level (Years)

Z_2 = Age in Years

Z_3 = Household Size (Number)

Z_4 = Income from Vegetable Farming (Naira)

Z_5 = Off-Farm Income (Naira)

Z_6 = Access to Credit (1, Access; 0, Otherwise)

μ_i = Noise Term

PCM (Principal Component Model)

The problems faced by vegetable women producers was submitted to PCM, the model will reduce many interrelated constraints to few unrelated ones.

RESULTS AND DISCUSSION

Summary Figures of Variables of Interest

The summary details of factors of interest among vegetable women producers is displayed in Table 1. The average age, household size, years of experience and educational level approximately 48 years, 9, 12 years, 11 years respectively. This denote that they are young, resourceful, agile, and energetic producers. Similarly, approximately 59%, 41% and 98% of women vegetable producers have access to credit, are members of cooperative organizations, and are married respectively. The average farm size is 0.75 hectares which is less than 5 hectares of land, hence they are smallholder or small-scale farmers. This is in accord with outcome of Nwaiwu et al. (2022) who documented an average age of 44 years for vegetable women farmers in Imo State, Nigeria.

Table 1. Summary Estimates of Factors of Interest

Variables	Unit of Measurement	\bar{X}_i	Sd
Age	Years	48	6.21
Household Size	Number	9	0.37
Access to Credit	1, access; 0, otherwise	0.59	0.07
Years of Experience	Years	12	2.71
Educational Level	Years	11	2.56
Cooperative Membership	1, members; 0, otherwise	0.41	0.06
Farm Size	Hectare	0.75	0.08
Marital Status	1, married; 0. Otherwise	0.98	0.09

Food Security Status of Vegetable Women Producers

The vegetable women farmers were figured into food secure and food insecure category based on their per capital food expenditure and the outcome is displayed in Table 2. The food insecurity mark is established as $\frac{2}{3}$ of the mean per capital food expenditure (MPCFE) of the vegetable women producers' household. Based on the work of Omonona and Agoi (2007), a household is regarded as food secure if it achieves at least $\frac{2}{3}$ of the MPCFE per month. Therefore, the vegetable women producers that spent at least ₦ 2,125.51 (1USD = ₦ 1,040) on food per month were classified as food secure, and those that spent less than this figure were classified as food insecure. This correspond to the fact that the vegetable women producer to be regarded as food secure will spend above ₦ 70.85 (0.07 USD) per day. In addition, about 54.16% of the vegetable women producers were food secure while 45.84% were food insecure. Established on the headcount ratio, about 54% had their per capital food expenditure equal or above ₦ 2,125.51, while 46% of the vegetable women producers had their per capital food expenditure below ₦ 2,125.51. The mean per capital monthly expenditure for the food secure household of the vegetable women producers is ₦ 5,078.94, a food secure household spends on the average approximately N 163.84 per day on food. The food insecure households spend ₦ 953.85 per month which approximately to ₦ 30.76 per day on food. This outcome is more than the value of ₦ 2, 694.95 (₦86.93/day) for the respondents as documented by Irohibe and Agwu (2014) in Kano State, Nigeria. Similarly, Olabisi and Olawamiwa (2014) obtained approximately ₦3, 513 (₦ 117.10 per day) for respondents in Oyo State, Nigeria. This outcome is supported with findings of Jabo et al. (2021) who obtained food security approximately 60.4% among farming households in Sokoto State, Nigeria. This findings also agrees with results of Folorunso et al. (2018) who obtained food security approximately 67% among agropastoralists in Plateau State, Nigeria.

Table 2. Food Security Status of Vegetable Women Producers

Food Security Status	Food Secure	Food Insecure	Total
Percentage	54.16	45.84	100
Frequency	65	55	120
Monthly Expenditure			
Sum (Naira)	330, 131.10	52, 461.65	382, 592.75
Mean (Naira)	5,078.94	953.85	3,188.27
Head Count Ratio(h)	0.54	0.46	

$$\frac{2}{3} \text{ Mean per capita Food Expenditure} = 2,125.51 \text{ naira}$$

1USD = 1, 040 Naira

Factors Influencing the Food Security Status of Vegetable Women Producers

The estimates of factors deciding food security status of vegetable women producers using Tobit regression model is displayed in Table 3. Approximate six stimuli were considered in the model. All the stimuli except household size had positive coefficients and this corresponds to the a priori expectations. The age, household size income from vegetable farming and access to credit were different significantly from zero at 5% probability level. The educational level, and off-farm income were different significantly from zero at 1% probability level. A 1% increase in educational level keeping all other stimuli fixed will give rise to 27.19% increase in food security status of vegetable women producers. Similarly, a 1% increase in household size keeping all other stimuli fixed will give rise to 31.54% increase in food insecurity status of vegetable women producers. This outcome is in consensus with report of Place et al. (2003) who documented that chronically food insecure households tends to be large. The Pseudo R square value is 0.8601, this connotes that 86.01% of the food security status is elucidated by the stimuli entered in the model. The LLF (The Likelihood Function) (-147.31) is different significantly from zero at 1% probability level. This is an evidence that the model and data is of good fit. This outcome is in consensus with Omonona et al. (2007), Alabi et al. (2021), and Igbalajobi et al. (2013). This result is supported with Oyediran and Olajide (2023) who reported that age of household, household size, education were significant factors influencing food security among rural household in North East, Nigeria. This work is also supported with findings of Ergando and Belete (2016) who reported that family size, off-farm income, total annual farm income, and agricultural extension services were significant factors influencing food security among household in Ethiopia.

Table 3. *The MLEs (Maximum Likelihood Estimates) of the Tobit Dichotomous Regression Model*

Variables	Parameters	Coefficient	Standard Error	t-Value	ME
Constant	β_0	0.6306***	0.1501	4.20	0.0521
Educational Level	β_1	0.4102***	0.0578	7.09	0.2719
Age	β_2	0.2561**	0.0996	2.57	0.1405
Household Size	β_3	-0.3602**	0.1380	-2.61	-0.3154
Income from Vegetable Farming	β_4	0.2710**	0.1067	2.54	0.2819
Off farm Income	β_5	0.3209***	0.0533	6.01	0.3815
Access to Credit	β_6	0.1109**	0.0415	2.67	0.4029
Diagnostic Statistics					
Sigma		0.28654			
Lr χ^2 (6)		97.56***			
Pseudo R ²		0.8601			
Log-Likelihood		-147.31			
Prob > χ^2		0.00000***			

ME=Marginal Effect

Significant at 5% Probability Level, *Significant at 1 % Probability Level.

The Problems Faced by Vegetable Women Producers

The problems faced by vegetable women producers were made to undergo principal component analysis and the outcome is displayed in Table 4. Approximate 6 stimuli were withheld by the PCM for those with Eigen values greater than 1. Lack of improved seeds with Eigen value of 8.5824 is ranked 1st position, and this measure 31.12% of all challenges faced by the vegetable women producers. The major threats faced were lack of credit facilities with Eigen value of 4.8255 is ranked 2nd position, and this explained 10.84% of all problems encountered by the vegetable women producers. Similarly, lack of access to farm land with Eigen value of 2.8163 is ranked 3rd and this measure 10.69% of all problems faced by the vegetable women producers. All challenges faced by the vegetable women producers measure approximate 82.49% of all challenges included in the PCM. The chi square value of 4670.31 is different significantly from zero at 1% probability level. This demonstrate the feasibility of using PCM for the analysis. This result is supported with findings of Ajibade et al. (2021) who reported that inadequate capital, lack of improved planting seeds.lack of contact with extension

services, high cost of labour, and high transportation cost were constraints facing tomato farmers in Abuja, Nigeria.

Table 4. *The Problems Faced by Vegetable Women Producers*

Constraints	Eigen-Value	Difference	Proportion	Cumulative	Rank
Lack of Improved Seeds	8.5824	3.7569	0.3102	0.3102	1 st
Lack of Credit	4.8255	2.0092	0.1084	0.4186	2 nd
Lack of Access to Land	2.8163	0.4101	0.1069	0.5255	3 rd
High Cost of Fertilizers	2.4062	0.0810	0.1047	0.6302	4 th
Lack of Good Storage	2.3252	0.2510	0.1042	0.7344	5 th
No Market Linkages	2.0742	1.1490	0.0905	0.8249	6 th
Bartlett Test of Sphericity					
χ^2	4670.31**				
KMO	*				
Rho	0.8070				
	1.00000				

KMO – Kaiser-Meyer-Olken

CONCLUSION

This study investigated food security status among vegetable women producers in North West, Nigeria. A multi-staged sampling design was applied. Primary data were utilized based on a well-organized questionnaire. The outcome shows that averagely the age, household size, years of experience, educational level and farm size approximately 48 years, 9, 12 years, 11 years and 0.75 ha, respectively. A household is regarded as food secure if it achieves at least $\frac{2}{3}$ of the MPCFE per month. Therefore, the vegetable women producers that spent at least ₦ 2,125.51 (1USD = ₦ 1,040) on food per month were classified as food secure, and those that spent less than this figure were classified as food insecure. This correspond to the fact that the vegetable women producers to be regarded as food secure will spend above ₦ 70.85 (0.07 USD) per day. Based on the headcount ratio, about 54% had their per capital food expenditure equal or above ₦ 2,125.51, while 46% of the vegetable women producers had their per capital food expenditure below ₦ 2,125.51. The educational level, age, household size, income from vegetable producers, off-farm income and access to credit were different significantly from zero in influencing food security status of vegetable women producers. The major problems facing the vegetable women producers were lack of improved seeds (1st), lack of access to credit (2nd), and lack of access to farm land (3rd). Established on the outcomes of this work, the subsequent recommendations were made:

- (i) Credit should be made available at single digit interest rate to enhance productivity, increase income and increase food security.
- (ii) The women producers should through policy formulations be allowed more access to farm land to increase productivity and increase food security
- (iii) Farm inputs such as fertilizers, chemicals, improved seeds, should be made accessible to vegetable women producers,
- (iv) Good refrigerated storage facilities should be supplied for the vegetable women producers
- (v) The vegetable women producers should be linked to good market for appropriate prices of produce

CONFLICT OF INTEREST

The authors declared no conflict of interest.

AUTHOR CONTRIBUTION

All authors contributed equally.

ETHICAL APPROVAL

During the writing process of the study titled "**Determinants of Food Security Status Among Vegetable Women Producers in North-West, Nigeria**", scientific rules, ethical and citation rules were followed; No falsification has been made on the collected data and this study has not been sent to any other academic media for evaluation. Ethics committee approval is not required.

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