



Effect of Women's Empowerment in Agriculture on Rural Households Food Security: A Case Study of Oyo State, Nigeria

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ABSTRACT

Empowering women in agriculture is considered a prerequisite to achieving global food security. However, there exists a research gap due to limited empirical studies to ascertain this, especially in nations like Nigeria where high level of food insecurity and gender inequality is perceived. Therefore, this study examines the effect women's empowerment in agriculture has on household food security. The study was carried out in Oyo State, Nigeria and a sample size of 100 rural women was drawn using the multi-stage sampling technique. Data was collected using a semi-structured questionnaire through an interview schedule. Data analysed was done using descriptive statistics, abbreviated women's empowerment index, food security index and logistic regression model. Findings from this study revealed that more than half (58%) of the women were disempowered and about 59% of the households were food insecure. By disintegrating women's empowerment into its various domains, this study identified that the major contributors to disempowerment are time(workload), production and resource domain. The logistic regression result shows that women's empowerment in agriculture positively influences household food security. The study recommends that women must be adequately empowered in order mitigate food insecurity. Finally, the study suggests further research should be carried out to determine the gender parity in agriculture to understand the women's empowerment in comparison with men's empowerment in individual households.

Keywords: Women's empowerment; agriculture; food security; rural household

INTRODUCTION

Achieving food security is one of the major goals of our world today, and many efforts have been channelled towards attaining this. In fact, many development organisations such as FAO¹ and USAID² have "ending hunger and malnutrition" as their core goals. This is because food is a

¹ Food and Agricultural Organisation of the United Nations

² United States Agency for International Development

basic necessity for a healthy and productive life. Also, they see achieving global food security as an end goal and a means to an end. That is, attaining food security will help to accomplish other development indicators such as good health and wellbeing, economic growth, and poverty reduction (FAO, 2018). Food security is said to exist when every individual at all time have access to enough, safe and nutritive diet required to meet their food preferences and dietary need for a healthy and active life (Pinstrup-Andersen, 2009). The problem of food security is complicated with issues such as volatility of food prices, the adverse effect of climate change on food production, conversion of food crops to biofuels in the major food-exporting nations, and the negligence of agriculture in terms of investment in infrastructure (Agarwal, 2012). All these challenges have stirred up renewed global interest in agriculture as a means of reducing the barriers to food security and improve economic growth (Agarwal, 2012). Hence, the growing realization of the need to boost the productivity of smallholder farmers, the majority of whom are women in order to mitigate food insecurity (FAO, 2011).

Like in most developing nations, women make up about 50 percent of the total agricultural labour force in Nigeria (FAO, 2011)

And they contribute tremendously to food production. However, empirical evidences show that women farmers in Nigeria lag behind men with regards to agricultural productivity, chiefly due to gender inequality in respect of access to, control over and utilisation of productive resources such as land, livestock, financial services, technology, education and extension services (Diirro *et al.*, 2018; FAO, 2011; Rahman, 2008). The inequality in access to land is particularly severe in Nigeria, due to cultural norms and traditions that restrict women from inheriting land (Akanle & Ejawesju, 2017). This limited land ownership by female farmers hinders them from accessing formal credit because land is a major form of collateral (Amanda *et al.*, 2006). Other gender inequalities evident in Nigeria's agricultural sector include limited access to labour and agricultural markets (Doss *et al.*, 2011; FAO, 2011; Rahji & Falusi, 2005) and less control over the use of revenue from agricultural production (Gates, 2014). All these challenges limits women farmers' productivity level. Despite these constraints women still play important roles at every stage of the food system; as food producers (farmers), consumers, stabilisers of food access, and caretakers of household food and nutrition security (Quisumbing *et al.*, 1995; Rahman, 2008). Also, women are believed to invest about 10 times more than men do in their families' wellbeing, especially in areas like children's healthcare, education, and nutrition (Duflo, 2012; Maertens & Verhofstadt, 2013; Quisumbing & Maluccio, 2000). This fundamentally suggests that empowering women, that is, enabling them to make strategic life choices in areas where this ability has been previously denied can have a direct impact on both their agricultural productivity and household food security (Harper *et al.*, 2013; Sraboni *et al.*, 2014). However, there are few empirical studies to ascertain this. Hence, this study was carried out to ascertain the impact empowerment of women in agriculture have on rural household food security using Oyo State, Nigeria as a case study.

MEASURING WOMEN'S EMPOWERMENT IN AGRICULTURE

According to Kabeer (1999), empowerment is the ability to make strategic life choices in areas where the ability has been previously denied. Alsop *et al.*, (2006) describe empowerment as the process of improving individual's or group's capacity to make deliberate decisions and transform those decisions into desired actions and outcomes. From these two definitions, it can be inferred that empowerment is mainly about expansion of freedom to make strategic choices

and actions that shape one's life. However, women's empowerment is subjective to individual personality, aspirations, culture, and experiences (Alkire *et al.*, 2013). Therefore, it is important to note that the definition of women's empowerment can be limited if focused on just individual choices, especially in a cultural context where community and mutuality are valued (Alkire *et al.*, 2013). Hence, development and government agencies working towards empowering women must acknowledge the complexity of empowering women and put their societal institutions into consideration.

Different measures have been used to estimate women's empowerment generally in the past but there was no specific instrument to measure women's empowerment in agriculture until 2012 when a survey-based Women Empowerment in Agriculture Index (WEAI) was developed by IFPRI³ in conjunction with United State government's Feed the Future programme to facilitate the monitoring, evaluation, and diagnoses of women's empowerment, agency, and inclusion in the agricultural sector (Alkire *et al.*, 2013). The WEAI comprises of five domains of empowerment; production, resources, income, leadership and time, and ten indicators are used in measuring them (Alkire *et al.*, 2013). However, after the first set of field survey there was a review of the first WEAI and a shorter, streamlined version known as A-WEAI⁴ was coined out. The A-WEAI retains the five domains of empowerment, but the ten indicators were reduced to six indicators. In using the A-WEAI there are stated aggregation method, inadequacy cut-offs, and weight attached to each of the five domains and their indicators (Table I).

Table I: The domains, indicators, inadequacy cut-offs, and weights in the A-WEAI

Dimension	Indicator Name	Inadequacy cut-off	Weight
Production	Input in productive decisions	Inadequate if individual participates but does not have at least some input in decisions or she does not make the decisions nor feels she could	1/5
Resources	Ownership of assets	Inadequate if household does not own any asset or if household owns the type of asset but she/he does not own most of it alone	2/15
	Access to and decisions on credit	Inadequate if household has no credit or used a source of credit but she/he did not participate in any decisions about it	1/15
Income	Control over use of income	Inadequate if a person participates in activity but has little or no input in decisions about income generated or does not feel she/she can make decisions regarding wage, employment and major household expenditure	1/5
Leadership	Group membership	Inadequate if a person is not part of at least one group or if no group reported in the community	1/5
Time	Workload	Inadequate if a person works more 10.5 hours per day	1/5

Source: Malapit *et al.*, (2015)

³ International Food Policy Research Institute

⁴ Abbreviated Women's Empowerment in Agriculture Index

METHODOLOGY

The research was carried out in Oyo State, Southwest Nigeria (Figure 1). It covers a total land area of 28,454 square kilometres with an estimated population of 5,591,589 people, comprising 2,778,462 females and 2,802,432 males (National Population Commission, 2006). Oyo State has 33 local government areas, which is domicile by the Yoruba ethnic group. The major occupation of people in the region is farming. Major food crops cultivated are maize, cassava, yam, okra, cassava, and cash crops such as cocoa, mango, cashew, orange (Daud *et al.*, 2018). The people also rear small livestock animals such as goats, pigs, poultry, etc. at subsistence level.

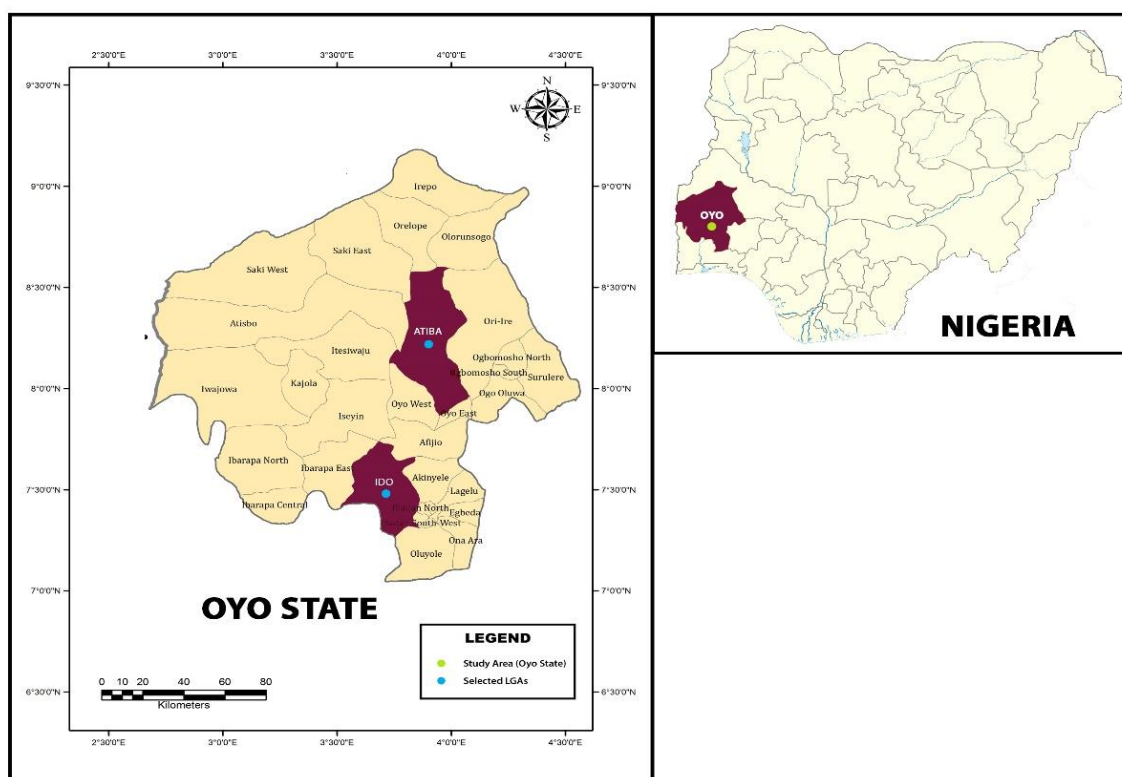


Figure I: Map of Nigeria showing the study area, Oyo State.
Source: Adapted from Gamers (2018).

The study was carried out using a quantitative research method. Primary data for the study was collected from the respondents with the aid of a semi-structured questionnaire through an interview schedule. A multi-stage sampling technique was adopted to select the respondents. The first stage involved a purposive selection of two local government areas (LGAs); Ido and Atiba out of the 33 LGAs in the study area. These two LGAs were selected because they have many rural communities with high number of women farmers. Stratified sampling technique was used at the second stage to group the communities in the two LGAs into urban and rural communities; the former was discarded. In the third stage, five villages were selected from the rural communities in each of the two LGAs through a simple random sampling technique. This made up ten villages namely; Lagbin, Koguo, Alajata, Akufo, Akinware, Ikolaba, Onre Bare, Otefon, Lagunna, and Oridota. Finally, ten households were randomly selected in each of the ten villages. This gave a sample size of 100 households. The respondents for the study were adult female farmers in selected households.

Prior to the commencement of the main data collection, a pilot survey was carried out in Akanran village, Ona-ara LGA, Oyo State among non-sample respondents having similar characteristics with the study area. This was done to ascertain the accuracy, efficiency and adequacy of the research instrument. The data collected were analysed using descriptive statistics, A-WEAI technique, food security index, and logit regression model. IBM SPSS Statistics 20 and STATA 15 were used for the statistical analyses. Results from the analyses were presented using tables and charts, and the detailed explanation of the analysis are stated below.

The A-WEAI comprises two sub-indexes. The first assesses the degree to which women are empowered in the five domains of empowerment (5DE) in agriculture and the second sub-index [the Gender Parity Index (GPI)] measures gender parity within households. The weight of the 5DE and GPI sub-indexes are 90 percent and 10 percent, respectively, and the sum gives A-WEAI score. However, for this study, we stopped at the measure of 5DE due to insufficient time to collect data from men in the sampled households. For a woman to be categorised as being empowered she must achieve adequacy in at least four of the 5DE or 80% of the indicators of empowerment (Alkire *et al.*, 2013).

The 5DE is given by “1 - M₀” and was constructed in a way that both empowerment and disempowerment can be analysed. A more detailed explanation of this can be found in Alkire *et al.*, (2013).

To identify disempowerment, the model is stated as;

$$C_i = w_1 I_{1i} + w_2 I_{2i} + \dots + w_d I_{di} \dots \dots \dots (1)$$

Where,

$I_{di} = 1$, if the person i has an inadequate achievement in indicator d and $I_{di} = 0$, if otherwise

w_d = weight attached to indicator i (as shown in Table I)

$c_i = 0$, where a person has no inadequacy on any indicator

Now, the five domains of disempowerment index (M_0) was estimated by following the structure of the Adjusted Headcount measure of (Alkire & Foster, 2011). M_0 has two components

The first component is the disempowered headcount ratio (H_p): which is the proportion of individuals whose share of weighted inadequacies is more than k (where k is the share of inadequacies a woman must have to be considered disempowered).

$$H_p = q/n \dots \dots \dots (2)$$

Where,

q = number of individuals who are disempowered n = total population.

The second component is called the intensity of disempowerment (A_p): this is the average inadequacy score of disempowered individuals. It can be expressed as follows;

$$A_p = \sum_{i=1}^q c_i(k) \dots \dots \dots (3)$$

$c_i(k)$ = censored inadequacy score of individual i q = number of disempowered individuals.

$M_0 = H_p \times A_p \dots \dots \dots (4)$ Finally, 5DE is obtained:

$$5DE = 1 - M_0 \dots \dots \dots (5)$$

Food security index: this was estimated using Omonona & Agoi's (2007) household food expenditure method. The respondents were classified into food secure and food insecure households.

The food security index formula is given by:

$$E_i = \frac{\text{Per capita food expenditure for the } i\text{th household}}{2/3 \text{ mean per capita food expenditure of all households}}$$

Where E_i = Food Security Index

When $E_i \geq 1$ = food secure i th household

$E_i \leq 1$ = food insecure i th household.

This implies that for a household to be classified as food secure the per capita monthly food expenditure must fall above or equal to two-thirds of the mean per capita food expenditure. Conversely, a food insecure household is that whose per capita food expenditure falls below two-thirds of the mean monthly per capita food expenditure. Furthermore, the headcount ratio of food security was calculated for the sampled households based on the calculated food security index (E). The headcount ratio (H) shows the proportion of food secure or insecure households.

The headcount index is specified as:

$$\text{Headcount Index (H}_{\text{foodsecure}}) = P/N$$

$$\text{Headcount Index (H}_{\text{foodinsecure}}) = Q/N$$

N

Where:

P = number of food insecure households; Q = number of food secure households

N = total number of households

Binary logistic regression

binary logistic model was used to examine the influence of respondent's socio-economic characteristics and women's empowerment in agriculture on household food security. This model was used because the dependent variable has two possible outcomes (dichotomous variable), that is, food secure or food insecure households, labelled 1 and 0 respectively.

The explicit form of the model is expressed as:

$$H = \beta_0 + \beta_1 \text{empowerment} + \beta_2 x_1 + \beta_3 x_2 + \beta_4 x_3 + \beta_5 x_4 + \beta_6 x_5 + \beta_7 h_1 + \beta_8 h_2 + \beta_9 h_3 + \beta_{10} h_4 + \beta_{11} h_5 + \varepsilon \quad (2)$$

Where, H is a vector of food security outcome (1, if the household is food secured; 0, if the household is food insecure); $\beta_1, \beta_2, \dots, \beta_i$ are the estimated coefficients; x and h are vectors of individual-level and household-level characteristics respectively.

Empowerment = (1, if empowered i.e. score $\geq 80\%$ in 5DE score; 0, if otherwise)

x_1 = Age (years)

x_2 = Educational level (years)

x_3 = Years of farming experience (years)

x_4 = Annual Income (₦)

x_5 = Number of extensions contact (number)

x_6 = Group membership (Yes = 1, No = 0)

h_1 = Household type (Male and female adult = 1, female adult only = 0)

h_2 = Household size (number of household members)

h_3 = Farm size (number)

h_4 = Farming activity (crop farming = 1; Otherwise = 0)

ε = Error term

RESULTS AND DISCUSSION

Level of women's empowerment in agriculture in rural households

Respondents were grouped based on their adequate and inadequate achievement in the domains of empowerment using the AWEAI's six indicators of empowerment. Those who satisfied the parameter of achievement were grouped in adequate achievement column while were categorised under inadequate achievement column. Then, the overall empowerment level was calculated. Women that achieved adequacy in at least four out of the 5DE or 80% of the indicators of empowerment were categorised as empowered (Alkire *et al.*, 2013). Table II presents a summary of the women's empowerment indicators in the sampled households.

Table II: Summary of the women's empowerment status in the rural households (n=100)

Women's Empowerment Indicators	Adequate Achievement	Inadequate achievement
Productive decision	28	72
Control and use of Income	43	57
Group membership	43	57
Workload	18	82
Ownership of Asset	45	55
Access to and use of credit	70	30

Source: Field survey, 2019.

Table II. indicates that majority of the women in the sampled households (82%) have inadequate achievement in the workload indicator, that is, they work for more 10.5hours a day. This implies that most of the women undergo excessive workload, this is not surprising considering that majority (61%) of them are engaged in other off- farm income-generating activities despite being actively involved in farming activities using crude tools for crop production and processing operations. They are also saddled with domestic responsibilities such as cooking, fetching firewood, childcare, and so on leaving them with little or no time for leisure. This finding is similar to Ayevbuomwan *et al.*, (2016) study finding that rural women are not empowered in time use due to excessive workload and limited time for leisure.

The second highest number of inadequacies (72%) was found in "input in productive decision" indicator. This implies that most of the rural women have no or few inputs in decisions regarding their farming activities. In other words, they cannot decide what to plant, when to plant, and how to plant. Agarwal (2012) opines that the inability to make decisions regarding the type of crop to cultivate, type and amount of inputs such as fertilizer and pesticides to use,

are part of the reasons for low productivity in some plots cultivated by female farmers. This essentially suggests that if these women are given the opportunities to make strategic farming decisions, their productivity may increase.

In the study area, majority of the women (70%) enjoy adequacy in the access to and use of credit indicator under the resource domain, that is, they have access to borrow at least ₦5000 (equivalent to US\$13.82). This was unexpected, however, none of these credits were accessed from formal lenders or non-governmental organisations. This is not surprising because formal lending institutions, like commercial banks require collateral, mostly, in form of landed properties which majority of these women do not solely possess. The women indicated that they got their loans from family, relatives, rotating credit and saving groups. This is expected since nearly half of them (43%) enjoys adequacy in the group membership indicator. To buttress this, Gugerty (2007) suggests that one of the reasons for the high level of female participation in groups such as rotating credit and savings associations/groups is because it is a socially accepted strategy to save, and allows women to protect their savings from husbands and other relatives especially where cultural norms and family dynamics limits women's ability to exercise control over their savings.

Furthermore, 43% and 45% have adequate achievement in the use of income and control of asset indicators respectively. For those with inadequate achievement in their use of income, their households' food security is likely to be affected because as food managers in their respective homes, the ability to control what to buy and feed the family is highly dependent on income availability. With respect to asset ownership indicator under the resource domain, majority of the women that enjoy adequate achievement possess mobile phone, small consumer durables, poultry, and small livestock, while just few of them have agricultural land and/or residential land. This lack of landed property clearly explains the reason for their inability to access credit facilities from a formal financial institution. Lack of land ownership is mainly caused by patriarchal gender norms which makes it difficult for women to acquire and retain land (Schutter, 2013). Importantly, the lack of land ownership might be one of the reasons they have little or no input in productive decisions.

Moving further to understand the overall level of women's empowerment in agriculture in the study area, table III was computed.

Table III: Computed level of women's empowerment in the sampled households (n=100)

Women's Empowerment indices	Empowered	Not empowered	Total
Frequency	42	58	100
Percentage	42.0	58.0	100

Source: Computed from field survey, 2019

From table III, it can be observed that the percentage for the disempowered women (58%) is greater than that of the empowered women (42%), thus establishing the presence of disempowerment in the study area. This finding is similar to *Alkire et al.*, (2013) finding in Bangladesh where the 5DE shows that 61% of the women were disempowered. Similarly, *Tsiboe et al.*, (2018) found that most women in Northern Ghana were disempowered. Thus,

further establishing the prevalence of disempowerment amidst agrarian women in developing nations.

The percentage contribution of each domain of empowerment and their respective indicator to the women's disempowerment were calculated and presented in figure II and Figure III respectively.

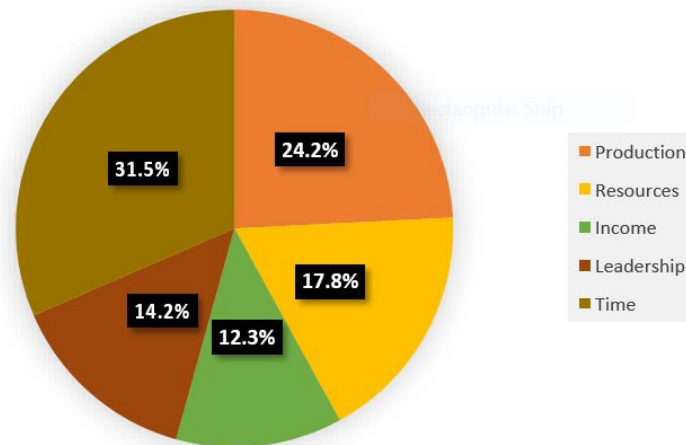


Figure II. Percentage contribution of each of the five domains to women disempowerment in the study area

Source: Field survey, 2019.

Figure II, shows that the greatest contribution to women's disempowerment in the study area is the time domain (31.5%), followed by the production domain (24.2%) while the lowest contribution is the income domain (12.3%). Workload is the indicator used in the time domain (Figure III). This inadequacy in time domain can be because women are saddled with many farm and domestic work with no access to labour- saving technologies/devices. On the long run, these women's time constraint from excessive workload will not just be a burden to them but can also have negative effects on the general care and well-being of their families (Akter *et al.*, 2017). It is noteworthy that any intervention or policies that will increase workload or time used by women should be avoided even if it can increase their income. The production domain is another major contributor to women's disempowerment. This is expected since 72% of the respondents' experience inadequacy in this domain. This is consistent with Agarwal's (2012) report that women farmers have low or no input in productive decision.

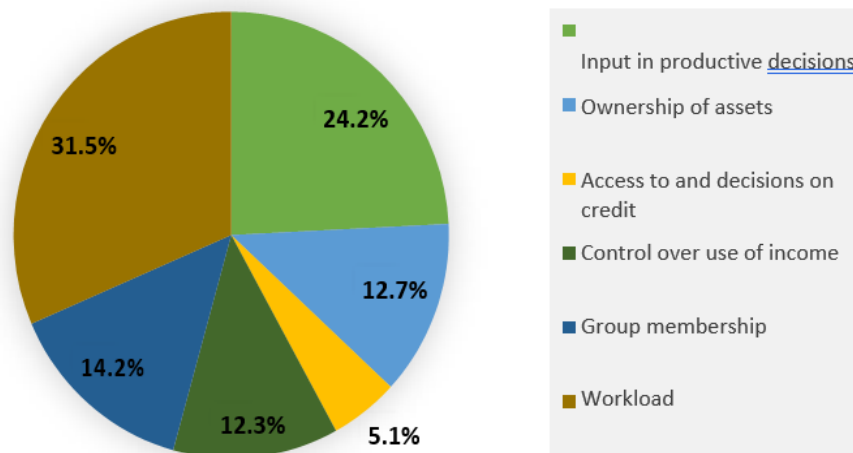


Figure III: Percentage Contribution of each of the six domain indicators to women's disempowerment in the study area
Source: Field survey, 2019.

Figure II reveals that the resource domain contributes 17.8% to women's disempowerment in the study area, while figure III shows the contribution of each of the two indicators of this domain: assets ownership and access to and control of credits. Ownership of assets emerges as the indicator that contributes most to disempowerment under the resource's domain. The leadership domain, with indicator 'group membership' and income domain, with indicator 'control of the use of income' contribute 14.2% and 12.3% respectively. This finding is a little bit different from that of Sraboni *et al.*, (2014) in rural Bangladesh where the highest contributor to women's disempowerment is the leadership and resources domains, with 35.1% and 21.6% contribution respectively. Also, in Guatemala, the greatest contributor is lack of leadership in the community (23.7%) and control over the use of income (23.7%), while in Ghana, the resources domain was found to be the highest contributor to women's disempowerment (Alkire *et al.*, 2013; Tsiboe *et al.*, 2018). From this, it can be affirmed that women's empowerment is context-specific and cannot be treated as a homogenous entity because the needs of women differ between regions, communities, and nations.

Food security status of the households

The households were categorised into food secure and food insecure households using the per capita monthly food expenditure of the households. The per capita monthly food expenditure was used to determine the food security line; which is the two-thirds of the mean per capita food expenditure of all the sampled households (Omotesho *et al.*, 2006).

Table IV: Summary of the food security status of rural households

Food security indices	Food secure	Food insecure	Total
Frequency	41	59	100
Percentage	41.0	59.0	100
Headcount ratio	0.41	0.59	
2/3 Mean per capita food expenditure (Food security line) equals ₦16,269			

Source: Field survey, 2019.

The monthly mean per capita food expenditure for the whole households was ₦24,403, and the two-thirds mean per capita food expenditure (food security line) was ₦16,269. This implies that all households whose per capita food expenditure falls below ₦16,269 are food insecure. Table IV shows that most (59%) of the households were food insecure while 41% were food secure. Further using the headcount ratio, the food secure households were less (0.41) than the food insecure households (0.59), thus establishing the prevalence of food insecurity in the study area. This finding is consistent with Akerele *et al.*, (2013) and Omotesho *et al.*, (2006) who reported that majority of the people living in rural households in Nigeria are food insecure.

Women's empowerment factors influencing the food security status of the households

In order to examine the influence of women's empowerment in agriculture and their socioeconomic characteristics on household food security status, the logistic regression model was employed. The result of the women's empowerment factors on household food security status is presented (Table V). Age, age squared, educational level, household size, and empowerment are found to be statistically significant to the food security status in the study area while the other variables appear not to be significant. Age, education, and empowerment showed a positive relationship, while the other two variables exhibited negative relationship with the household food security status.

Table V: Logistic regression result of the women's empowerment factors influencing the food security status of the households (n=100)

Explanatory Variables	Coefficient	Standard Error	z	P> t
Age	0.3207	0.1613	1.99	0.047**
Age square	-0.0032	0.0014	-2.24	0.025**
Educational level	0.1925	0.0916	2.10	0.036**
Household Income	1.99e06	2.07e-06	0.96	0.336
Household size	-0.9383	0.1908	-4.92	0.000***
Farm size	-0.5548	0.0865	-0.64	0.521
Farming activity	-1.0603	0.7447	-1.42	0.155
Farming years	0.0166	0.0554	0.30	0.765
Off-farm engagement	-0.0213	0.6721	-0.03	0.975
Group membership	0.2511	0.6850	0.37	0.714
Extension contacts	-0.1727	0.1323	-1.31	0.192
DEscore	1.4268	1.1411	1.01	0.312
Empowerment	2.1402	1.1480	1.86	0.062*
_cons	-3.4001	3.5778	-0.95	0.342
Number of observations= 100				
Wald chi-square(13)= 32.28				
Probability >chi-square= 0.0022				
Pseudo R-squared = 0.4093				
Log pseudolikelihood = -39.9814				

Dependent variable: Food security indices *Significant at 10% **Significant at 5% *Significant at 1%.**

Source: Computer analysis of logit regression model, 2019.

The age and age squared, that is, the number of years the women have lived, educational status of women, which is the number of years the women have spent in formal education and household size, that is, the number of people living in the same household and eats from the same food pot showed a significant positive relationship between the women's age and their household food security status at 5% significance level. This implies that the higher the age, educational status, and household size of women the higher the chances of their household being food secured.

Empowerment

This variable refers to the women that are empowered in the area (achieved $\geq 80\%$ in the 5DE). The model showed a statistically significant positive relationship between household food security and empowered women at 10% significance level. By implication, the more the women are empowered the better the chances of their household being food secure. Hence, women that

are empowered are significantly more likely to have a food secure household. This finding is in line with that of Tsiboe *et al.*, (2018) and Sraboni *et al.*, (2014), where it was found that increase in the level of women's empowerment in agriculture is positively associated with dietary diversity and calorie level at the household level.

The result further showed the overall logistic model was statistically significant based on the chi-square ($p=0.0022$, significant at 1%), implying that the explanatory variables are relevant in determining the household food security status. Based on this result, the two null hypotheses; 'the socio-economic characteristics of the respondents have no significant effect on their household food security'. and 'women's empowerment in agriculture has no significant impact on food security in rural households' are both rejected.

CONCLUSION AND POLICY RECOMMENDATIONS

Asides from women being a major part of the agricultural labour force, they also assume various responsibilities along the food system. Using the A-WEAI, this study estimated the level of women's empowerment in agriculture in Oyo State, Nigeria and found that 58% of the women were disempowered. By disintegrating the A-WEAI, the study identified time, production and resources domain as the major contributors to disempowerment in the study area. This is slightly different from the main contributor to disempowerment in Ghana, Guatemala, and Bangladesh (Alkire *et al.*, 2013; Tsiboe *et al.*, 2018). By implication, interventions aimed at empowering women should take note of this heterogeneity in order to achieve positive outcome. Evidently, time, production and resources domains are the most promising areas for intervention by policymakers, government, and non-governmental agencies that aim to increase women's empowerment in this region. Also, this study found that majority of the sampled households were food insecure. This points to the fact that two important SDGs⁵ - goal 2 and goal 5; 'zero hunger' and 'gender equality' respectively, are far from being achieved in the area. This calls for urgent interventions to curb these challenges if the SDGs must be achieved before 2030.

Importantly, this study contributes significantly to the existing body of knowledge by providing an empirical evidence on the direct positive linkage between women's empowerment in agriculture and food security in rural households. This signifies that empowering women is an important tool that can be used to mitigate food insecurity.

The study equally revealed that some socioeconomic characteristics of the women such as age, educational level, and household size also influences household food security. These should be carefully put into consideration when making policies and legislations. By implication, there is a need to overcome these barriers in order to increase women's empowerment and subsequently improve household food security status. Based on these findings, this study recommends the following priority areas to the government and other strategic decision makers:

(i) Increase in level of female's educational attainment

The level of female literacy in this region should be deliberately increased because education has a direct impact on their general standard of living. The low level of female education is from the archaic belief that "*No matter the level of a woman's education, she will end up in her*

⁵ Sustainable Development Goals

husband's kitchen' and 'educated women do not respect their husbands' (Aderinto, 2001 pp.181), hence, reducing parents' drive to towards girl's education. In order to improve female's education, there is a need to go beyond building schools to changing the orientation of rural dwellers towards female education. This can be done through rigorous awareness and campaign on the importance of female education. It requires collective efforts from all the major stakeholders. This should be backed up with policies that enforces every girl child to have access to elementary education. With this, the level of women's education will increase. Similar intervention done in Afghanistan under the "back to school campaign" launched in 2002 and led to enrolment of 2.4 million girls in 2009 from initial 5,000 girls (Jackson, 2011). In addition, government should make adequate provision for free primary and secondary education in the rural communities.

(ii) Provision of labour-saving technologies/reduction of women's workload

There is the need for interventions that brings about accessible, cost-friendly and labour saving technologies such as row-weeders, crop processors, and so on. This can be made available to the women through the social groups they belong to. This type of intervention was carried out by CASCAPE⁶ in Hawassa, Ethiopia and it significantly reduced women's time-use (CASCAPE, 2017). Also, policymakers should scrutinise every interventions, legislations or policies to certify that they are not increasing the women's workload. For instance, providing women with access to land, without supports in form of credit facilities to hire labour or rent machinery such as tractor might end up increasing the workload of women. Therefore, any intervention that increases the income of the women but still adds to their workload directly or indirectly should be tactically avoided.

(iii) Strengthen women's access to land and resources

Law reform are required to abolish cultures and norms that forbid women from owning lands. This recommendation is supported by UN Women's (2013) briefing. Also, women should not be required to present a male guarantor before being qualified to leased farmland. Supports in terms of productive resources like seeds, fertilizer, sprayer, processing machines, etc. should be provided by the government through subsidies.

Finally, further research to determine the level of gender parity in agriculture in individual households is needed. This will provide a smart viewpoint for comparison between women's empowerment/disempowerment in relation to their male counterpart. There is also the need to replicate this type of study on an extensive scale in the remaining five geopolitical zones in Nigeria because the culture and access to productive resources varies across these regions.

Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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⁶ CASCAPE - Capacity building for scaling up of evidence-based best practices in agricultural production in Ethiopia

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