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EFFECT OF WOMEN EMPOWERMENT IN AGRICULTURE ON FOOD SECURITY OF FARM HOUSEHOLDS IN OGUN STATE, NIGERIA.

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Abstract

Women play a potentially transformative role in agricultural growth in developing countries, but they face persistent obstacles and economic constraints limiting further inclusion in agriculture. The Women's Empowerment in Agriculture Index (WEAI) measures the empowerment and inclusion of women in the agriculture sector and can also be used more generally to assess the state of empowerment and gender parity in agriculture and to identify key areas in which empowerment needs to be strengthened. WEAI is available in different versions but for the purpose of this study the abbreviated version of the WEAI (A-WEAI) was adopted. The A-WEAI comprises two sub indexes which are the five domains of empowerment (5DE) and the Gender Parity Index (GPI) (Alkire et al; 2012). This paper documents the effect of Women empowerment on food security in Ogun state, Nigeria. Primary data was collected from a cross section of 206 farming households during the 2016 production season in Ogun state. Data were analyzed using descriptive statistics, multinomial logit regression and the food security score was generated using the USDA approach. Households were classified as having high food security, marginal food security, low food security and very low food security. Multinomial logit regression result revealed that socioeconomic characteristics such as marital status, age, farming experience, years of education and the indicators (inputs in production decision, ownership of asset, access to and decision of credit, control over use of income, group membership and workload) used to generate the A-WEAI influenced the household food security status

Key Words: Women, A-WEAI, farm households, food security, Nigeria.

1.0 INTRODUCTION

Agriculture is closely linked to food security, by providing a source of food and nutrients, a broad-based source of income, and by directly influencing food prices (Arimond *et al.*, 2010). Women are more active as economic agents in Africa than anywhere else in the world. They perform the majority of agricultural activities, own a third of all firms and, in some countries, make up some 70% of employees (Mizhari *et al.*, 2015). Over and above their income-earning activities, they are central to the household economy as well as the welfare of their families, and they play a vital role sometimes unacknowledged leadership role in their communities and nations. Yet across Africa and the rest of the world, there is a wide gap between potential and reality. In sizable number of countries, women often face an array of barriers to achieving their full potential, from restrictive cultural practices to discriminatory laws and highly segmented labour markets. Eliminating gender inequality and empowering women could raise the productive potential of one billion Africans, delivering a huge boost to the continent's development potential.

Overcoming gender-based constraints to improving food security requires paying greater attention to the ways in which men and women in the same households interact in agricultural production, which will go beyond simplistic designation of the primary decision-maker. Asset ownership and decision-making within households often involve elements of both individual and joint control (Johnson *et al.*, 2016). Closing the gender gap in asset that is allowing women to own and control productive assets, increases both their productivity and their self-esteem. A woman who is empowered to make decisions regarding what to plant and what (and how many) inputs to apply on her plot will be more productive in agriculture (FAO, 2011). An empowered woman will also be better able to ensure her children's health and nutrition, in no small part because she is able to take care of her own physical and mental well-being (Smith *et al.* 2003).

In this article, we address the knowledge gap in farm households by assessing the effect of women empowerment on food security. Specifically we generate the household food security score using the USDA approach and a multinomial logit model which includes the indicators of abbreviated women empowerment in agriculture as exogeneous determinants of food security status of farm households in Ogun State Nigeria. Women empowerment is assessed via two measures derived from the A-WEAI.

This article contributes to the literature by providing empirical evidence on the relationship between women's empowerment and Household food security status in the study area.

Section two offers literature review on gender and agriculture in Nigeria and discusses linkages between women's empowerment and household food security. Section three describes the study area, data and variables used in the analysis and the empirical methodology. Section four presents the results. A summary and discussion of policy implications conclude the article.

2.0 LITERATURE REVIEW

Food Security

Food Security is said to exist at the individual, household, national, regional, and global levels when all people, always, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for a healthy and active life (World Food Summit, 1996; FAO, 2001). There are four main pillars of food security and they include food availability, economic and physical access to food, food utilization and stability of access. Food availability exists when sufficient quantities of foods of appropriate quality, supplied through domestic production or imports (including food aid) are available on a consistent basis. Access by individuals on the other hand refers to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live (including traditional rights such as access to common resources). Utilization is usually understood as the way the body makes the most of various nutrients in the food. To be food secure, a population, household or individual must have access to adequate food always-which is stability of access. The concept of stability can therefore refer to both the availability and access dimensions of food security. For food security objectives to be realized at the household or national level, all the four pillars must be fulfilled simultaneously. Several empirical works have been done on food security status of households across the country. Ibok *et al* (2013) used the United State Department of Agriculture (USDA) approach to analyze food security status of urban food crop farming households in Cross River State and found that only 12.44% of urban farmers were food secure, 55.76% were food insecure without hunger, 25.35% were moderately food insecure with hunger and 6.45% were severely food insecure with hunger. Staple food crops such as cassava, yam, rice, and maize were shown to contribute immensely to the food security status of farming households.

Women's Empowerment in Agriculture Index (WEAI)

Kabeer (1999) defined empowerment as expanding people's ability to make strategic life choices, particularly in contexts in which this ability had been denied to them. In Kabeer's definition, the ability to exercise choice encompasses three dimensions: resources, agency, and achievements (well-being outcomes). The process of empowerment in agriculture is, therefore, more relevant for rural women since they have previously been denied access and control of the assets and capabilities crucial for making strategic choices in agriculture (Malhotra and Schuler 2005). Several studies have attempted to measure women's empowerment in agriculture. One significant effort towards this has been the development of Women's Empowerment in Agriculture Index (WEAI) by the US government's Feed the Future Initiative in 2012. The WEAI focuses on the "agency" aspect, which is far less studied than resources such as income, or achievements such as educational levels (Alkire *et al.*, 2013). The WEAI also departs from previous measures of women's empowerment in that it captures control over resources or agency within the agricultural sector, something which existing indices have not done. It is an aggregate index that shows the degree to which women are empowered in their households and communities and the degree of inequality between women and men in the household (Alkire *et al.*, 2012). In 2015, IFPRI and Feed the Future released an abbreviated version of the WEAI (A-WEAI) that has a shorter interview time and removes four sub-areas of the original WEAI that were either too subjective or too confusing for enumerators to collect. The A-WEAI is composed of two sub indices.

(a) The five domains of empowerment (5DE)

The 5DE are production, resources, income, leadership, and time. The domains are measured using 6 indicators with their corresponding weights (shown in appendix 1), each indicator is used to show whether each individual reached a certain threshold (has "adequate" achievement) in that area.

(b) Gender parity index (GPI)

The GPI is a relative inequality measure that reflects the inequality in 5DE profiles between the primary adult male and female in each dual-adult household (Alkire *et al.* 2012). In most but not all cases, the primary and secondary male and female are husband and wife; however, men and women can be classified as the primary male and female Decision makers regardless of their relationship to each other. By definition, households without a primary adult male and female pair are excluded from this measure, and thus the aggregate WEAI uses the mean value of dual-adult households for GPI. According to Alkire *et al* (2013), a household enjoys

parity if the woman is empowered or her empowerment score is greater than or equal to that of the male in her household. Thus, the gender parity gap is zero if the household enjoys gender parity. Otherwise, the gap equals the difference in the male and female aggregate empowerment scores.

Empirical evidence from literature revealed that when women have control over resources their families achieve higher levels of well-being (Doss, 2006; Hoddinott and Haddad, 1995; Quisumbing and Maluccio, 2003). There are several reasons to suspect that women's empowerment may contribute to enhancement of food security, most notably through improvements in women's access to livelihood assets that, at least in some instances, may be shared with other members of their households. For example, groups provide women in the household with opportunity to exchange information about adoption of new technologies and farming practices, also as a means of assistance or gaining social influence, which may allow them to make more efficient use of existing resources (Meinzen-Dick et al., 2014; Quisumbing and Kumar, 2011). In addition, several recent studies provide evidence linking women's empowerment to improvements in women's food security and nutritional health in rural households (Malapit *et al.*, 2015; Malapit and Quisumbing, 2015; Sraboni *et al.*, 2014). Such improvements may, in turn, lead to increasing women's productivity as farmers (Alderman et al., 2007). Seymour(2017) compared the levels of technical efficiency achieved on plots operated by households with different levels of gender disparities using plot-level data from the 2011–2012 Bangladesh Integrated Household Survey and drawing on indicators derived from the Women's Empowerment in Agriculture Index, he estimated a stochastic frontier production function model, which includes women's empowerment in agriculture as an exogenous determinant of technical inefficiency and found out that reduced gender disparities within households (measured in terms of the empowerment gap between spouses) are associated with higher levels of technical efficiency.

3.0 RESEARCH METHODOLOGY

3.1 Description of the Study Area

This study was carried out in Ogun State, Nigeria. Ogun State was created on February 3rd, 1976 from the old western region. It lies within latitude 6⁰N and 8⁰N and longitude 2⁰E and 15⁰E. It is bounded on the west by the republic of Benin, on the East by Ondo State, on the north by Oyo State and on the South by Lagos State. The state is approximately 1.9 percent (i.e 16,762 km) of Nigeria's 923,219km land area; and located in the moderately hot, humid

tropical climatic zone of south western Nigeria. The population of males in Ogun State is 1, 847,243 while the female is 1, 880,855 and the overall total of Ogun State is 3, 728,098. There are two distinct seasons in the state, the rainy season and dry season and also two main types of vegetation, tropical rain forest and derived savannas.

3.2 Sources and Types of Data

Primary data was used for this study. Primary data involved the use of cross sectional data which was gotten with the aid of structured questionnaire through an interview schedule with the respondents. Data was obtained on socio economic characteristics, production activities; AWEAI survey questions, livelihood activities among others.

3.3 Sampling Technique

The target population for this study was farm households. Multi-stage sampling technique was used in selecting respondents for study. This was accomplished by using the Agricultural Development Programs (ADP's) division into zones, blocks and cells. First Stage involves random selection of two zones which are Abeokuta and Remo zones, at the second Stage, five blocks were randomly selected from the two zones (Someke, Obafemi, Ilewo, Opeji and Ilugun). In the third stage, 12 cells was selected (Ilugun, Adu, Alabata, Egbatedo, Ibara- orile, Idera, Ilewo-orile, Isaga-orile, Kajola, Kila, Kobape, Olodo) and at the last Stage, 17 households were selected per cells and it gave a total of 206 households.

3.5 Analytical Technique

This study employed the use of A-WEAI as well as descriptive statistics which involved the use of means, frequency tables and percentages in summarising the results. The USDA food hunger score was used to generate the food security score while multinomial logit was used to analysed the effect of women empowerment on household food security in the study area.

The domains, indicators, description and weights adapted for the A-WEAI is in appendix 1. Following the structure of the Adjusted Headcount measure of Alkire and Foster (2011)

(i) Identification of the disempowered

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

Where

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

$w_d =$ weight attached to indicator i

(ii) Computing 5DE

The first component is called the disempowered headcount ratio (H_p): which is the proportion or incidence of individuals whose share of weighted inadequacies is more than k

$$H_p = \frac{q}{n} \dots\dots\dots(2)$$

Where

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

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

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

Where

- $c_i(k)$ = censored inadequacy score of individual i
- q = number of disempowered individuals. M_0 is the product of both: $M_0 = H_p \times A_p$.

Finally, 5DE is easily obtained:

$$5DE = 1 - M_0. \dots\dots\dots(4)$$

Gender Parity Index

The first component is the proportion of gender parity inadequate households that is the percentage of women who lack gender parity relative to their male household counterparts (HGPI):

$$H_{GPI} = \frac{h}{m} \dots\dots\dots(5)$$

Where

- h = number of households classified as lacking gender parity
- m = total of dual-adult households in the population.

The second component is called the average empowerment gap (IGPI):

$$I_{GPI} = \frac{1}{h} \sum_{j=1}^h \frac{c_j^i(k^M) - c_j^i(k^W)}{1 - c_j^i(k^M)} \dots\dots\dots(6)$$

Where

- $c_j^i(k^M)$ = censored inadequacy scores of the primary man living in household j
- $c_j^i(k^W)$ = censored inadequacy scores of the primary woman living in household j
- h = number of households that are gender parity inadequate.

GPI is computed as follows:

$$GPI = 1 - (H_{GPI} \times I_{GPI}) \dots\dots\dots(7)$$

$$\mathbf{AWEAI} = 0.9(5DE) + 0.1(GPI) \dots\dots\dots (8)$$

To assess the food security status of farm households, this study followed the United States Department of Agriculture (USDA) approach for the analysis. The procedure that determines a household scale fundamentally depends on the household responses to some structured survey questions (These questions are presented in Appendix 2). One of the advantages of this model is its ability to classify households into four food security status categories and to generate a food security scale (Gulliford *et al*; 2006).

Coding survey responses for food security scale: Each household’s location on the food security continuum is assessed by their response to series of questions about behaviour and experiences known to characterize households, having difficulty in meeting their food needs. To do this, their response to each of the questions 1-18 in Appendix 2 were coded as either affirmative or negative. These questions had three response categories namely: “never true”, “sometimes true” and “often true”. For these questions, both “often true” and “sometimes true” were considered as affirmative responses because they indicate that the condition occurred at some time during the year of the study. The distinction between “often true” was, therefore, not used in the scale. In determining the household food security status on the food security scale, the food security scale was first simplified into a small set of categories as shown in Appendix 3. Four categories were defined for this purpose- High food security, marginal food security, low food security and very low food security (Bickel *et al.*, 2000).

High Food security: These are households that show zero or minimal evidence of food insecurity. The group’s number of affirmative responses ranges between 0 – 2 on the food security scale.

Marginal Food Security: These households experience inadequacy in food supplies and food budgets, feel anxiety about the sufficiency of their food to meet basic needs and adjust their food budgets and types of food served. This group’s number of affirmative responses ranges from 3- 7 for households with children and 3 -5 for households without children on the food security scale.

Low Food Security: These groups of households have their food intake reduced such that the household adults have repeatedly experience the physical sensation of hunger but spare the children this experience. The group’s number of affirmative responses ranges from 8- 12 for households with children and 6 -8 for households without children on the food security scale.

Very Low Food Security: Households in this group have their children also suffer reduced food intake and hunger, and adults’ reductions in food intake are more dramatic. The group’s

value on the food security scale ranges from 13- 18 for households with children and 9 -10 for households without children on the food security scale.

A multinomial logistic model was used to analyze the effect of women empowerment on food security status of farm households in the study area. Following Fakayode *et al.*, (2009) multinomial logit regression model was used to express the probability of a household belonging to a food security category. The general form of the multinomial logit model is expressed as:

$$\Pr(y_i = j) = \frac{\exp(X_i\beta_j)}{1 + \sum_{j=1}^j \exp(X_i\beta_j)}$$

Using this analysis, the four categories to be considered are given below:

0 = High food security

1 = Marginal food security

2 = Low food security

3= Very low food security (reference category).

To estimate this model there is need to normalize on one category, “which is referred to as the reference state”. In this analysis, the last category is the reference state.

ϵ^* is a random disturbance term and β^* is a vector of unknown parameters

X_i =vector of explanatory variables which are;

X_1 = Age (years)

X_2 = Sex (dummy; male = 1, female = 0)

X_3 = Marital status (dummy married=1, 0= otherwise)

X_4 = Household size (number)

X_5 = Household head education level (years)

X_6 = Years of farming experience (years)

X_7 = Group achievement (1 if individual is a member of a group, 0 otherwise)

X_8 =Work achievement (1 if individual worked for 10.5hrs in the previous 24hrs, 0 otherwise)

X_9 = Production achievement (1 if individual participate in production decision, 0 otherwise)

X_{10} = Income decision achievement (1 if individual participate in use of income decision, 0 otherwise)

X_{11} = Asset achievement (1 if individual owns a major asset, 0 otherwise)

X_{12} = Credit achievement (1 if individual has access and borrowed at least N5000, 0 otherwise).

4.0

RESULTS AND DISCUSSION

This session presents the empirical result and discussions obtained. Descriptive analysis results showing the community characteristics were shown in Table 1. Data regarding nativity of the household head shows that 46.1percent of the sampled household heads are native of the community with a mean household size of 5person per household. 63.1 percent of the sampled household had access to a tarred road and motorable road. It was interesting to note the source of water that households are using majority of the sampled households have multiple source of water. Hence, according to the survey, more than half of the sampled households were using water from safe source. In response to the question regarding the access to health facility, the survey result indicates that about 61.7percent of the sampled households has access to a maternity health facility. In the study area, primary and secondary school are available to households in the community.

Table1: Distribution of Households by Community Characteristics.

Characteristics	Freq	Percent
Household size		
<5	134	65
5-10	67	32.5
11-15	4	1.9
>15	1	0.5
Mean	5	
Nativity		
No	111	53.9
Yes	95	46.1
Access road		
Tarred and in good state	37	18.0
Tarred but in poor state	93	45.1
Untarred but motorable	76	36.9
Electricity		
PHCN	203	98.5
Generator	67	32.5
Water source		
Borehole	71	34.5
Deep well	143	69.4
Public tap	37	18.0
Stream	152	73.8
Health services		
General hospital	47	22.8
Maternity	127	61.7
Private hospital	53	25.7
Available school		
Primary school	196	95.1
Secondary school	162	78.6

Source: Computed from Field Survey, 2016
Multiple responses available

In order to fully understand the household food security status in the study area, the socioeconomic and demographic characteristics of members of the household were analysed. The descriptive analysis of the socioeconomic characteristics of households' members was shown in table 2 and the result was disaggregated by gender in order to suggest the striking differences between male and female members of the household as well as their similarities'.

The proportion of the married members in the study area was found to be higher among female members than male members. The difference might be as a result of cultural factors which suggest early marriage for females. The average age of members of the sampled households in the study area indicates that a higher proportion of the members sampled were in their active and productive years. The higher proportion of male members sampled have formal education this may be as a result of easy access to schools coupled with the free education scheme embarked on by the state government at the primary and secondary education level in the study area. Also, the average years of farming experience is high among the male members compared to their female counterparts. This is evidenced by 23years among male and 18 years among female members this may be as a results of their masculine nature and also their ability to participate in various sections of the agricultural activities.

The low level of credit use among rural households as revealed in table 2 maybe as a result of a high level of non membership in cooperative societies. A high percentage of females (83.7%) does not use credit and are not members of cooperative society compared to their male counterparts.

Table 2: Distribution of Members by Socioeconomic Characteristics

	Female		Male		Total	
	Freq	Percent	Freq	Percent	Freq	Percent
Age(years)						
< 20	6	3.1	4	1.7	10	2.4
21-30	47	24.4	33	14.4	80	19.0
31-40	64	33.2	63	27.5	127	30.1
41-50	28	14.5	60	26.2	88	20.9
51-60	31	16.1	33	14.4	64	15.2
>60	17	8.8	36	15.7	53	12.6
Mean	40.5		45.7		43.4	
Years of experience						
<20	138	71.5	122	53.3	260	61.6
21-40	44	22.8	88	38.4	132	31.3
41-60	11	5.7	17	7.4	28	6.6
>60	0	0.0	2	0.9	2	0.5
Mean	18.1		22.8		20.6	
Education						
No formal education	64	33.2	48	21	112	26.5
Primary	86	44.6	93	40.6	179	42.4
Secondary	38	19.7	68	29.7	106	25.1
OND/NCE	5	2.6	11	4.8	16	3.8
BSc./HND	0	0.0	9	3.9	9	2.1
Marital Status						
Married	173	89.6	193	84.3	366	86.7
Single	10	5.2	28	12.2	38	9
Widowed	10	5.2	8	3.5	18	4.3
Use of Credit						
Yes	27	16.3	53	25.9	80	21.6
No	139	83.7	152	74.1	291	78.4
Member of Cooperative						
Member	24	12.4	36	15.7	60	14.2
Non-member	169	87.6	193	84.3	362	85.8

Source: Computed from Field Survey, 2016

The A-WEAI for Ogun State is 0.506. It is a weighted average of the 5DE sub index value of 0.502 and the GPI sub index value of 0.544 (Table 3). The 5DE for Ogun State shows that 86.7 percent of women and 58.1 percent of men are empowered. The 13.3 percent of women who are not yet empowered have an average inadequacy score of 37.5 percent. Thus, women's 5DE is 50.2 percent. The average inadequacy share among the 41.9 percent of men who are still disempowered is 57 percent. So men's 5DE is $1 - (0.238) = 0.762$. The GPI for Ogun State shows that 20.5 percent of women have gender parity with the primary males in their households. Of the 79.5 percent of women who are less empowered, the empowerment gap between them and the males in their households is quite large which 57.3 percent is. Thus, the overall GPI is 0.544. The AWEAI value is lower than what was reported in the pilot study in South-Western Bangladesh which was 0.762 with a weighted average of the 5DE sub index value of 0.746 and the GPI sub index value of 0.899 and in the Western Highlands of Guatemala is 0.702. It has a weighted average of the 5DE sub index value of 0.690 and the GPI sub index value of 0.813(Alkire *et al.*, 2013)

Table 3: Ogun State A-WEAI

Indexes	Women	Men
Disempowered head count(H)	13.3%	41.9%
Average inadequacy score(A)	37.5%	57%
Disempowerment index(M0)	0.498	0.238
5DE index(1-M0)	0.502	0.762
Number of observations	166	205
Percentage of data used	80.5%	99.5%
Percentage of women with no gender parity(HGPI)	79.5%	
Average empowerment gap(IGPI)	57.3%	
Gender parity index	0.544	
Number of women in dual household	142	
Percentage of data used	68.9%	
AWEAI	0.506	

Source: Computed from Field Survey, 2016

The food security results generated using the USDA (2000) profiled households into food security status (High food security, marginal food security, low food security and very low food security) based on 18 food security items, 10 adult referenced items and 8 child-referenced items. The results showed that few of the farming households (5.7%) have high food security, while most of them (94.3%) were food insecure at different levels of food insecurity (Table 4). The result shows that 17.6% of farm households have marginal food security, 35.8% have low food security and 40.9% have very low food security. This percentage of food secure is lesser compared with Fakayode *et al.* (2009) which indicated that 12.2% of the country's households were food secured and 87.8% were food insecure.

Table 4: Estimates of Food Security Status

Food security status	Frequency	Percentage
High food security	11	5.7
Marginal food security	34	17.6
Low food security	69	35.8
Very low Food security	79	40.9
Total	193	100

Source: Computed from Field survey; 2016

Table 5: Descriptive Statistics of Independent Variables of the Multinomial Logit Model.

Variable name	Description	Mean
Age	Age of farmers in years	44.8
Sex	dummy; male = 1, female = 0	0.56
Marital status	dummy married=1, 0= otherwise	0.90
Household size	Number of Household size member	5
Highest education	Years of formal education level	6.25
Years experience	Years of farming experience	21.2
Group achievement	Dummy, 1 if individual is a member of a group, 0 otherwise	0.57
Work achievement	1 if individual worked for 10.5hrs in the previous 24hrs, 0 otherwise	0.40
Production achievement	1 if individual participate in production decision, 0 otherwise	0.24
Income achievement	1 if individual participate in use of income decision, 0 otherwise	0.17
Asset achievement	1 if individual owns a major asset, 0 otherwise	0.41
Credit achievement	1 if individual has access and borrowed at least N5000, 0 otherwise.	0.78

Source: Computed from Field survey; 2016

The estimated results from the multinomial logit model are represented in Table 6 below. It is clear from this result that sex, marital status and production achievement are variables that significantly affect high food security status of the farm households compared to the reference category of very low food security status. Sex of the household head significantly affect food security status positively, this implies that male headed households have are more like to be food secure than their female counterpart. Also in this category Production decision achievement is positively significant, this implies that the more a household participates in

production decisions; it increases their high food security status when compared to the reference category.

In the marginal food security category, marital status, production achievement, work achievement and asset achievement are variables that significantly affect the food security status in this category compared to the reference category of very low food security status. Marital status is significant and negative; this implies that being in household that are either single or widowed increase the likelihood of having high food security. Work achievement has a significant at 5% and positive, it is expected that for a household to be food secure the workload must reduce in order not to be overworked this implied that household that have adequate achievement in this indicator are more food secured compared to the reference category. Production achievement is also positively significant, this implies that the more the household head participate in farming production decision; the household food security status will improve. Asset achievement is positively significant and this implies that ownership of a major asset will improve the likelihood of the household being food secure compared to the reference category. Credit achievement is negatively significant and this is contrary to a prior expectation. The implication of this is that those that are inadequate in this indicator are more food secured compared to the reference category.

In the low food security status work achievement is the only variable that contributes significantly to food security status compared to the reference category(very low food security status) this implies that individual that are adequate in this indicator are more food secured that those that have not achieved adequacy in this indicator compared to the reference category. Other variables and indicators were found statistically not significant in explaining household food security.

Table 6: Determinants of Food Security Status of Farming Households in the Study Area

Very low food security (base outcome)									
	High Food Security			Marginal Food Security			Low Food Security		
Variables	Coefficient	Std Error	P-Value	Coefficient	Std Error	P-Value	Coefficient	Std Error	P-value
Age	-0.054	0.04	-1.3	-4.60E-04	0.02	-0.02	0.01	0.02	0.84
Sex	16.98***	2.6	6.52	2.24	2.09	1.07	0.43	1.8	0.24
Marital status	-13.98***	4.77	-2.93	-32.92***	1.46	-22.44	-1.44	1.52	-0.95
Household size	-0.23	0.49	-0.47	0.024	0.12	0.07	0.09	0.1	0.96
Highest education	-0.08	0.11	-0.73	0.024	0.054	0.46	-0.03	0.046	-0.77
Years experience	0.034	0.04	0.8	0.002	0.024	0.11	-0.03	0.024	-1.38
Group achievement	-0.342	0.79	-0.43	0.26	0.52	0.51	0.129	0.45	0.29
Work achievement	1.135	1.05	1.08	1.47**	0.6	2.44	0.90*	0.48	1.87
Production achievement	15.52***	1.39	11.12	15.81***	0.6	26.26	0.59	0.84	0.71
Income decision achievement	-0.42	2.66	-0.16	0.23	1.24	0.19	-0.68	0.97	-0.71
Asset achievement	-0.88	0.96	-0.92	14.89***	0.61	24.23	0.34	0.72	0.47
Credit achievement	0.9	1.12	0.81	-1.19*	0.69	-1.72	-0.005	0.45	-0.01
Log pseudolikelihood	-149.5								

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

Source: Computed from Field Survey, 2016

Conclusion

The findings from the study revealed that there are more male headed household compared to female with a mean age of 44years and average household size of 5persons. Also, based on the USDA(2000) approach for food insecurity scoring, it revealed that 5.7% are highly food secure, 17.6% of farm households were marginally food secure, 35.8% have low food security and 40.9% have very low food security. The multinomial logit regression model specified indicates that sex, production decision, work achievement, asset achievement and credit achievement significantly improve the food security status of farming household in the study area. From the findings the following were recommended:

- Female members of household should be encouraged to participate in production decision to improve food security status.
- Policies should be put in place to encourage equality of distribution in productive asset among male and female members in order to improve their household food security status.
- Households members should be encourage to participate more in cooperative and use of credit available in the community in order to increase their adequacy in that indicator which will in turn improve their food security status.

REFERENCES

- Alkire S, Meinzen-Dick R, Peterman A, Quisumbing AR, Seymour G and Vaz A. (2012). The Women's Empowerment in Agriculture Index. *World Development* 52:71–91.
- Alkire S, Meinzen-Dick R, Peterman A, Quisumbing AR, Seymour G and Vaz A. (2013). The Women's Empowerment in Agriculture Index. *World Development* 52:71–91.
- Alderman, H., Behrman, J.R., Hoddinott, J., 2007. Economic and nutritional analyses offer substantial synergies for understanding human nutrition. *J.Nutr.* 137(3), 537–544.
- Bickel, G., Nord, M., Price, C., Hamilton, W., and Cook, J. 2000. Guide to Measuring Household Food Security, Revised 2000. U.S. Department of Agriculture, Food and Nutrition Service, Alexandria VA.
- Doss, C.R., 2006. The effects of intrahousehold property ownership on expenditure patterns in Ghana. *J. Afr. Econ.* 15(1), 149–180.
- Fakayode, A., Rahji, M. A. Y., Oni, O. A., and Adeyemi, S. 2009. “An Assessment of Food Security Situations of Farm Households in Nigeria: A USDA Approach.” *The Social Sciences* 4 (1): 24-9.
- Food and Agriculture Organization of the United Nations. 2011. The State of Food and Agriculture: Women in Agriculture: Closing the Gender Gap for Development. Rome.
- Hoddinott, J., Haddad, L., 1995. Does female income share influence household expenditures? Evidence from Cote d'Ivoire. *Oxford B. Econ. Stat.* 57(1), 77–96.
- Ibok, O. W., Idiong, I. C., Bassey, N. E., & Udoh, E. S. 2014. Food Security and Productivity of Urban Food Crop Farming Households in Southern Nigeria. *Agricultural Science* 2 (3): 01-12 DOI: 10.12735/as.v2i3p01 URL: <http://dx.doi.org/10.12735/as.v2i3p01>
- Ibok, O. W., Idiong, I. C., Bassey, N. E., & Udoh, E. S. 2013. Analysis of Food Insecurity Status of Urban Food Crop Farming Households in Cross River State, Nigeria: A USDA Approach. *Journal of Agricultural Science* 6 (2) doi:10.5539/jas.v6n2p132 URL: <http://dx.doi.org/10.5539/jas.v6n2p132>
- Johnson, N.L., Kovarik, C., Meinzen-Dick, R., Njuki, J., Quisumbing, A., 2016. Gender, assets, and agricultural development: Lessons from eight projects. *World Dev.* 83, 295–311.

Kabeer N 1999. Resources, Agency, Achievements: Reflection on the measurement of women's empowerment. *Development and Change* 30(3): 435-464.

Malapit, H.J.L., Kadiyala, S., Quisumbing, A.R., Cunningham, K., Tyagi, P., 2015. Women's empowerment mitigates the negative effects of low production diversity on maternal and child nutrition in Nepal. *J. Dev. Stud.* 51(8), 1097–1123.

Malapit, H.J.L., Quisumbing, A.R., 2015. What dimensions of women's empowerment in agriculture matter for nutrition in Ghana? *Food Policy.* 52, 54–63.

Malhotra A. and Schuler S.R. 2005. Women's Empowerment as a Variable in International Development. In *Measuring Empowerment: Cross-disciplinary Perspectives*, edited by D. Narayan, 219–246. Washington, DC: World Bank.

Meinzen-Dick, R., Behrman, J.A., Pandolfelli, L., Peterman, A., Quisumbing, A.R., 2014. Gender and Social Capital for Agricultural Development. In: Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, A., Behrman, J.A., Peterman, A. (Eds.), *Gender in Agriculture and Food Security: Closing the Knowledge Gap*. FAO, Rome, pp. 235–266.

Quisumbing, A.R., Kumar, N., 2011. Does social capital build women's assets? The long-term impacts of group-based and individual dissemination of agricultural technology in Bangladesh. *J. Dev. Effect.* 3(2), 220–242.

Quisumbing, A.R., Maluccio, J.A., 2003. Resources at marriage and intrahousehold allocation: Evidence from Bangladesh, Ethiopia, Indonesia, and South Africa. *Oxf. Bull. Econ. Stat.* 65(3), 283–327.

Seymour, G. 2017 Women's empowerment in agriculture: Implications for technical efficiency in rural Bangladesh. *Journal of Agricultural Economics* 00 (2017) 1–10.

Sraboni, E., Malapit, H.J.L., Quisumbing, A.R., Ahmed, A.U., 2014. Women's empowerment in agriculture: What role for food security in Bangladesh? *World Dev.* 61, 11–52.

Appendix1: The Domains, Indicators, Description, and Weights in the A-WEAI

Domains	Indicator	Description	Weight
Production	Input in productive decisions	Sole or joint decision-making over food and cash crop farming, livestock and fisheries.	1/5
Resources	Ownership of assets	Sole or joint ownership of land and assets(e.g large and small livestock, fish pond, farm equipment, house , non agricultural land and means of transportation)	2/15
	Access to and decisions on credit	Access to and participation in decision making over credit.	1/15
Income	Control over use of income	Sole or joint control over income and expenditures.	1/5
Leadership	Group membership	Respondent is an active member in at least one economic or social group	1/5
Time	Workload	Worked more than 10.5 hours in previous 24 hours	1/5

Source: Adapted from Alkire et al. (2012)

Appendix 2. Structured survey questions on food security of the household

S/No	Statement	How True?		
		Never	Sometimes	Often
1	Some adults in the household had to cut the size of their meals or skip meals due to lack of enough money to buy food*			
2	In how many months did you experience in the past 12 months*			
3	Some adults in the household could not eat for a whole day because there wasn't enough money to buy food*			
4	Adult does not eat whole day three or more times in the last 30 days*			
5	We adults, eat less than what we felt we should eat*			
6	Was hungry but didn't eat because of not been able to afford enough food*			
7	Some members lost weight because there wasn't enough food*			
8	Had to cut the size of some of the children's meals because there wasn't enough money to buy food**			
9	Some of the children also had to skip meals because			

	there wasn't enough money to buy food**			
10	In how many months did you experience this in the past 12 months**			
11	The children were hungry but we just couldn't afford more food**			
12	Some of the children also could not eat for a whole day because there wasn't enough money to buy food**			
13	We were worried our food would run out before we got money to buy more*			
14	The food we bought just didn't last and we didn't have money to get more*			
15	We couldn't afford to eat balanced diet*			
16	We couldn't feed the children a balanced meal**			
17	The children were not eating enough because we just couldn't afford enough food**			
18	We relied on only a few kinds of low-cost food to feed the children**			

*are the 10 adult referenced food security items and

**are the child referenced items.

Source: Adapted from Bickel *et al.*, 2000.

Appendix 3: Households with Complete Responses: Food Security Scale Values and Status Levels Corresponding to Number of Affirmative Responses

Status	Classification based on 18 USDA food security item	Classification based on 10 adult reference item
	Affirmative response between	Affirmative response between
High food security	0-2	0-2
Marginal food security	3-7	3-5
Low food security	8-12	6-8
Very low food security	13-18	9-10

Source: USDA, 2006

