EFFECTS OF GENDER GAPS IN LIVELIHOOD ASSETS AND ADOPTION OF CLIMATE SMART PRACTICES ON NUTRITIONAL OUTCOMES OF CHILDREN IN NIGERIA.

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Abstract

This paper focused on the effect of gender gaps in livelihood assets and adoption of climate smart practices on nutritional outcomes of children among farm households in Nigeria. The study was conducted in selected farming communities reputed for maize and rice production across the six geopolitical zones, and covering five of the seven Agro-ecological zones (AEZs) of Nigeria and the respondents were drawn in a multi-stage sampling process which was based on primary data collected through cross-sectional survey by personal interview conducted between February and April 2017 in which 1,747 rice and maize farmers were interviewed across 141 farming communities that were spread across 16 of the 36 States in Nigeria. The mean empowerment score is 0.66 also shows that gender gap exists in access to productive resources in the study area. The distribution of the adoption of climate smart practices (CSPs) which was disaggregated by gender and agro ecological zones revealed that female farmers adopted agro forestry more in the derived savannah (78.0%), northern guinea savannah (79.0%) and rain forest (64.0%) compared to their male counterparts. However, male farmers generally adopted use of organic compost (41.0%), crop rotation (28.0%) in derived savannah, zero tillage (52.0%) in northern guinea savannah and residue retainment (53.0%) in southern guinea savannah compared to female farmers in Nigeria.

The anthropometric results show that the mean weight for age, height for age and weight for height Z-scores were -0.2, -0.13 and-0.07 respectively. Furthermore, the disaggregated results by gender revealed that the mean weight for age, height for age and weight for height Z-scores for males were -0.15, -0.21 and 0.03 respectively and mean weight for age, height for age and weight for height Z-scores for females were -0.28, -0.02 and-0.21 respectively. 20.5% of the children are underweight, 26.9% are stunted while 17.5% are wasted. The econometric results revealed The OLS results showing the influence of women empowerment and adoption of CSPs on nutritional status of preschool children revealed that access to piped water($p<0.01$), access to health facilities ($p<0.10$) and market location>3km($p<0.05$), total income($p<0.01$), female achievement in use of credit($p<0.05$), medium term tenure duration($p<0.10$) are factors that significantly influence the height for age Z-score. access to piped water($p<0.05$), market location<3km radius ($p<0.05$), market location>3km radius ($p<0.01$), female achievement in asset ownership($p<0.05$), female achievement in use of credit ($p<0.05$), female achievement in workload($p<0.05$) right registration($p<0.10$), crop rotation($p<0.01$) and residue retainment($p<0.10$) influences weight for height Z-score. Age of child($p<0.10$), Age of household head($p<0.10$), age squared of household head($p<0.10$) access to piped water($p<0.05$), market location<3km radius ($p<0.05$), market location>3km radius ($p<0.01$), short term tenure duration($p<0.05$) and use of green manure ($p<0.10$) influences the weight for age Z-score. The study therefore concludes that older children are more likely to be malnourished and this is probably due to reduced care and attention for older and weaned children. Clean water, availability of health facility, markets and good roads also reduce the probability of malnutrition. The provision of clean water for rural households should be taken seriously by government. Clean water will prevent the spread of water-borne diseases that can negatively affect the health and nutrition of young children. Also adoption of CSPs among smallholders should be encouraged because its adoption will improve nutritional status of children in the households

Keywords: Gender gaps, Climate smart practices, nutritional outcomes, Ordinary least square regression, Nigeria.

1.0 Introduction

Women's role in the economy has often been underestimated, and their work in agriculture has long been invisible. While policy makers have targeted population, health and nutrition programmes to women in their reproductive roles, they have neglected them as productive agents. This Situation however is changing with the growing evidence that income in the hands of women contributes more to household food security and child nutrition. Such knowledge about women's key role in food security is essential to enhance their potential (Agnes et al., 1995). Women farmers currently account for 45-80 per cent of all food production in developing countries. About two-thirds of the female labour force in developing countries, and more than 90 percent in many African countries, are engaged in agricultural work (FAO 2007). Their contribution to agricultural work varies even more widely depending on the specific crop and activity. Women in rural areas have less access than men to productive resources and opportunities. In Sub Saharan Africa, women have less access to education and to labour, fertilizer and other inputs than men do. When women obtain the same levels of education, experience and farm inputs that currently benefit the average male farmer, they increase their yield by 22%. Also, women and men farm separate plots, women farmers have traditionally been responsible for food production. They produce less than male farmers, but not because they are less efficient farmers but extensive empirical evidence shows that the productivity gap between male and female farmers is caused by differences in access to input use (FAO, 2011).

Climate change is a growing threat to the agriculture sectors. The negative effects on agricultural production and livelihoods of farmers, foresters and fisher folk are already being felt in many places. They will only get worse overtime. Unless climate change is addressed, agricultural productivity will decline with serious implications for food security. Millions of low-income people will be at risk of hunger and poverty. The agriculture sectors also contribute to climate change due to their emissions of greenhouse gases. In the Paris Agreement on climate change that was concluded in December 2015, the international community has recognized the need for urgent action and the role of the agricultural sectors in addressing this challenge. It is essential that the country pledges that formed the basis of the agreement on climate change are turned now into action. All these effects have negative impacts on the productivity of crops, livestock, fisheries and forestry and account for at least 20% of total emissions, mainly from the conversion of forests to farmland and from livestock and crop production. The effects of climate change on agricultural production will have negative effects on developing countries, mainly in Sub-Saharan Africa and productivity declines could have serious implications for food security. Millions of low-income people, who are already highly food insecure, are likely to be affected. Smallholder producers are amongst the most vulnerable. Smallholders need support to access the right technologies and to implement them. By 2050 less people could be at risk of hunger if improved agricultural technologies are adopted. More specifically for managing agriculture for food security under the changing realities of global warming, FAO has developed the "climate-smart agriculture" (CSA) approach (FAO, 2010). The CSA approach has three objectives: sustainably increasing agricultural productivity to support equitable increases in incomes, food security and development; increasing adaptive capacity and resilience to shocks at multiple levels, from farm to national; and reducing greenhouse gas emissions and increasing carbon sequestration where possible.

Closing the gender gap in agriculture would generate significant gains for the agriculture sector and for society. If women had the same access to productive resources as men, they could increase yields on their farms by 20–30 percent. This could raise total agricultural output in developing countries by 2.5–4 percent and production gains of this magnitude could reduce the number of hungry people in the world by 12–17 percent. The potential gains would vary by region depending on how many women are currently engaged in agriculture, how much production or land they control, and how wide a gender gap they face. More so, when women control additional income, they spend more of it than men do on food, health, clothing and education for their children (FAO, 2011).

From the foregoing, it would be necessary to establish with empirical evidence, the importance of closing the gender gaps in livelihood assets and adoption of climate smart practices towards attainment of nutritional security of pre-school children in Nigeria. This study therefore specifically addresses the following objectives: determine the gender gaps in livelihood assets under the frame work of AWEAI, assess the adoption rate of climate smart practices among cereal farmers and also to examine the influence of women empowerment and adoption of climate smart practices on nutritional outcomes of pre-school children in Nigeria. The nutritional outcomes were derived from the anthropometric results and the indicators considered in this study were weight for age, height for age and weight for height.

2.0 Methodology

2.1 The Study Area

The study was conducted in selected farming communities reputed for maize and rice production across the six geopolitical zones, and covering five of the seven Agro-ecological zones (AEZs) of Nigeria. Nigeria is situated in the West African region and lies between longitudes $3^{\circ}$and 14° and latitudes 4° and14°. It has a land mass of 923,768 sq.km. Nigeria shares land border with the Republic of Benin in the west, Chad and Cameroon in the east, and Niger in the north. Its coast lies on the Gulf of Guinea in the south and it borders Lake Chad to the northeast. Administratively, Nigeria is made of 36 Federating States and the Federal Capital Territory (FCT). The States are commonly grouped into six geopolitical zones: Northeast, Northwest, North-central, Southeast, Southwest and South-south geopolitical zones. The Northern States are native homes to the Hausa-Fulanis (the dominant group) and other ethnic minorities like the Kanuris in the Northeast, and the Tiv, the Nupe and the Igalas, among other is the North-central zone; while the Southwest, Southeast and the South-south are native homes to the Yorubas, the Igbos and the Ijaw/Ibibio people as the dominant ethnic groups respectively. The estimated human population as of 2015 was 191.8 million people, about 29% of which were Hausa-Fulanis, 21% Yorubas, 18% Igbos and 10% Ijaws (Worldometers, 2017; Kaplan, 2012).

Nigeria is found in the Tropics, where the climate is seasonally damp and very humid. Nigeria is affected by four climate types; these climate types are distinguishable, as one moves from the southern part of Nigeria to the northern part of Nigeria through Nigeria's Middle belt. Nigeria is covered by three types of vegetation: forests (where there is significant tree cover), savannahs (insignificant tree cover, with grasses and flowers located between trees), and montane land; and is commonly divided into seven Agro-ecological zones; namely the Sahel Savannah, the Sudan Savannah and the Northern as well as Sothern Guinea Savannahs. Others AEZs include the Derived Savannah, the Mid-Altitude and the Humid Rainforests, all of which are suitable for maize and rice, among several other crops like cassava, yams, etc.

2.2 Data Collection and Sampling

The respondents were drawn in a multi-stage sampling process which was based on primary data collected through cross-sectional survey by personal interview conducted between February and April 2017 in which 1,747 rice and/or maize farmers were interviewed across 141 farming communities that were spread across 16 of the 36 States, all the six geopolitical zones and five (5) of the seven AEZs in Nigeria. Data were collected on the farmers' personal, household, farm and community characteristics. Also collected are plot level data on production practices, plot characteristics, resource use, outputs and prices during the 2016/2017 farming season. Other issues covered relates to Women empowerment, Gender gaps in livelihood assets of the plot managers, among others.

2.3 Analytical technique

Gender gaps in livelihood asset score was obtained under the framework of Alkire *et al* (2013) using two of the indicators generated from the abbreviated women empowerment in agriculture index(AWEAI) which are the empowerment score and empowerment gap. The empowerment score measures a woman's achievement of empowerment based on 6 weighted indicators (Table 1). It is computed by assigning a value of one if a woman (or man) achieved adequacy according to cutoffs defined by Alkire *et al*. (2012) or zero otherwise. An empowerment score is then generated for her (or him), in which the weights of those indicators in which she (or he) enjoys adequacy are summed to create a score that lies between 0% and 100% (Seymour, 2017). According to Alkire *et al*., (2012), a woman or man is defined as empowered in 5DE if she or he has adequate achievements in four of the five domains or is empowered in some combination of the weighted indicators that reflect 80% total adequacy or more.

Table 1: The Domains, Indicators and Weights in 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: Alkire *et al*, 2012.

Nutrition Security of Pre-school Children

Anthropometric measurement such as height for age (HAZ), weight for height(WHZ) and weight for age(WAZ) which measures the incidence of stunting, wasting and underweight among pre-school children. Following Babatunde *et al* (2011) the Z scores was estimated with reference to the measured height, weight and age of pre-school children compared to the standard well-nourished individuals of the same age and sex. The use of the mean Z-scores has the advantage of describing the nutritional status of pre-school children directly without resorting to a subset of individuals below a set cut off (WHO,2010). The reference cut off for height-for-age, weight for height and weight for age is < -2 standard deviations of the WHO Child Growth Standards Median. The anthropometric analysis was carried out by using the Anthro 3.2 software.

$\boldsymbol{z-score} = X - \mu/\sigma$ ....(1)

Where

X= child's weight for age score

μ= median weight for age of the reference population of the same age and sex

σ= standard deviation of the reference population of the same age and sex

Ordinary Least square(OLS) regression model was used to analyse the influence of women empowerment and adoption of CSPs on nutritional status of preschool children. Following Malapit et al., (2015) the model was specified as

$C_{ij} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots \ldots\ldots + \beta_{32} X_{32} + \varepsilon_{ij}$…………………(2)

Where, C_{ij} are vectors of child nutritional status such as weight for height, height for age and weight for age, $\beta_0 - \beta_{32}$ are coefficients, W are independent variables

Socio economic factors

X_1= Age of household head (in years)

X_2= Age squared

X_3= Education level of household head (number of years of formal education)

X_4= Native (1 if yes, 0 otherwise)

X_5= Access to tarred road (1=yes, 0 otherwise)

X_6= Access to piped water (1=yes, 0 otherwise)

X_7 = Access to health facility (1=yes, 0 otherwise)

X_8= Access to school ((1=yes, 0 otherwise)

X_9= Market location categorized into three dummy variables, each takes a value of 1 if the market is located within the same community, neighbouring community or remote area respectively otherwise zero. The within the same community variable was dropped as the reference category

X_{10}= Household size (number of persons)

X_{11} = Dependency ratio (Ratio of non-working members to working members)

Women Empowerment

X_{12}= Female asset achievement (1=adequate, otherwise 0)

X_{13}=Female group achievement (1=adequate, otherwise 0)

X_{14}= Female achievement in production decision (1=adequate, otherwise 0)

X_{15}= Female achievement in the use of income (1=adequate, otherwise 0)

X_{16} = Female achievement in credit use (1=adequate, otherwise 0)

X_{17}= Female achievement in workload (1=adequate, otherwise 0)

X_{18}= Gender parity (Difference in the empowerment scores of the primary female decision-maker and her spouse; censored at zero if a woman's empowerment score is greater than or equal to that of her spouse, otherwise 1)

X_{19}= Total income(naira)

X_{20}= Farm size(ha)

X_{21} =Land type (1=lowland, 0=upland)

X_{22}= Land acquisition (1=inherited, 0 otherwise)

X_{23}=Tenure duration categorized into three dummy variables, each takes a value of 1 if household head as a short term, medium term or long term use respectively otherwise zero. The long term use was dropped as the reference category.

X_{24}= Right registration (1=yes, 0 otherwise)

Climate smart practices

X_{25}= Use green manure (proportion of parcel on which practice was adopted)

X_{26}= Retain residue (proportion of parcel on which practice was adopted)

X_{27}= Use of organic compost (proportion of parcel on which practice was adopted)

X_{28}= Zero tillage (proportion of parcel on which practice was adopted)

X_{29}= Agroforestry (proportion of parcel on which practice was adopted)

X_{30}= Crop rotation (proportion of parcel on which practice was adopted)

Child Information

X_{31}= Age of child in month

X_{32}= gender of child (1=girl child, 0 otherwise)

3.0 Results and Discussion.

3.1: Indicators of Women Empowerment

The results of the farmer's achievement in the five domains of empowerment are presented in the Table 2 below. It shows that men are more empowered than women in all the five domains except in resource domain, with an average empowerment score of 0.70 for men and 0.61 for women. This is consistent with literature (Quisumbing and Pandolfelli, 2010), who report that men are generally advantaged in owning assets due to gender norms. Access to and decision on credit (74%) and workload (41%) are the indicators that contributes more to disempowerment of men in Nigeria. This is in line with the pilot result in South-Western Bangladesh but in the pilot regions of Uganda, the lack of decision making around agricultural production contributes much more to men's disempowerment than to women's 22% against 9% (Alkire *et al,* 2013). The indicators that contributes more to women's in Southern Nigeria are access to and decision on credit (84%) and decision on the use of income (43%). This is consistent to what was obtainable in Bangladesh sample areas that the domains that contribute most to women's disempowerment are weak leadership (30.6%) and lack of control over resources (21.6%).

Table 2: Distribution of Farmers by Empowerment Indicators

	Men		**Women**		**Total**	
Empowerment indicator	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Asset	0.75	0.43	0.57	0.49	0.67	0.47
Group membership	0.84	0.37	0.76	0.43	0.81	0.39
Production decision	0.77	0.42	0.67	0.40	0.73	0.44
Income decision	0.69	0.46	0.53	0.50	0.62	0.48
Use of credit	0.26	0.44	0.18	0.38	0.22	0.41
Workload	0.59	0.49	0.64	0.48	0.62	0.48
Empowerment score	0.70	0.23	0.61	0.24	0.66	0.24

Source: Computed from Data obtained from Field Survey, 2017

3.2 Distribution of Respondents by Adoption of Climate Smart Practices.

The results presented in Table 3 below revealed that adoption of the CSPs and was disaggregated by gender and agro-ecological zone and it was observed that adoption was generally low among cereal farmers in Nigeria. Adoption of green manure was low in the Sahel (9%) and Northern Guinea savannah (12%). 72% of cereal farmers in the northern guinea savannah adopted agroforestry while 70 % adopted it in Southern Guinea savannah. Also Agroforestry (64%) was adopted most in the rain forest while the use of green manure is the least adopted CSP in the rain forest. 53% of the farmers in the Sudan savannah adopted Zero tillage. Furthermore 53% of farmers in the Southern Guinea savannah adopted residue retainment and crop rotation was adopted most by cereal farmers in the Sahel region

In addition to these results on Table 3 also showed the distribution of the adoption CSPs by gender of the farmers and it is worthy of note that majority of the women adopted agroforestry in all the agro-ecological zones in the study area.

Table 3: Distribution of farmers by Adoption of Climate Smart Practices disaggregated by Gender and Agro ecological zone

AEZ		Green manure	Agro-forestry	Organic Compost	Minimum tillage	Retain residue	Crop rotation
Derived Savannah	**Men**	0.16	0.57	0.41	0.43	0.43	0.28
	Women	0.22	0.78	0.44	0.56	0.55	0
	Total	0.16	0.59	0.41	0.44	0.44	0.25
Northern Guinea	**Men**	0.11	0.71	0.43	0.52	0.52	0.20
	Women	0.21	0.79	0.43	0.28	0.28	0.36
	Total	0.12	0.72	0.43	0.50	0.50	0.22
Rain forest	**Men**	0.20	0.61	0.35	0.43	0.43	0.23
	Women	0.16	0.64	0.43	0.32	0.32	0.16
	Total	0.19	0.62	0.36	0.41	0.41	0.22
Sahel Savannah	**Men**	0.09	0.53	0.28	0.29	0.29	0.23
	Women	-	-	-	-	-	0.50
	Total	0.09	0.52	0.27	0.28	0.28	0.23
Southern Guinea	**Men**	0.15	0.70	0.38	0.53	0.53	0.24
	Women	0.13	0.65	0.39	0.47	0.47	0.13
	Total	0.15	0.70	0.38	0.53	0.53	0.24
Sudan savannah	**Men**	0.18	0.52	0.45	0.54	0.54	0.18
	Women	0.42	0.50	0.67	0.33	0.33	0
	Total	0.19	0.52	0.46	0.53	0.57	0.17
Total	**Men**	0.16	0.61	0.38	0.47	0.47	0.22
	Women	0.18	0.65	0.44	0.36	0.36	0.15
	Total	0.17	0.62	0.39	0.46	0.46	0.22

Source: Computed from data from field survey, 2017.

3.3 Anthropometric results of pre-school children in Southern Nigeria.

The anthropometric results of pre-school children between 0-60months was displayed in Table 4 below and the results was also disaggregated by the indicators of empowerment. The results show that the mean weight for age, height for age and weight for height Z-scores were -0.2, -0.13 and -0.07 respectively. The WFA results which measures the incidence of underweight for the total population shows that the percentage that falls between <-2SD is 21.6%, while HFA measured the incidence of stunting shows that the percentage <-2SD is 25.2% and WFH results measures the incidence of wasting that percentage <-2SD is 17.5% for the sampled population in the study area. This percentage is lower than the 22% underweight and higher than 23.6% stunting that was reported in Babatunde *et al* (2011).

Also, the percentage of wasted children reported in this study is higher than the national average of 9.2% reported in Ajieroh (2010)

Table 4: Anthropometric Results of Pre-school Children in Nigeria

	Weight-for-age			**Height-for-age**			**Weight-for-height**		
	% < -2SD	**Mean**	**SD**	**% < -2SD**	**Mean**	**SD**	**% < -2SD**	**Mean**	**SD**
Total	21.6	-0.2	2.15	25.2	-0.13	2.72	17.5	-0.07	2.24
Boys	20.5	-0.15	2.18	26.9	-0.21	2.67	17.5	0.03	2.35
Girls	23	-0.28	2.12	23.1	-0.02	2.79	17.5	-0.21	2.09

Source: Computed from data from field survey, 2017.

3.4 Influence of Women Empowerment, Adoption of CSPs and other Socioeconomic Characteristics on Nutritional Status of Pre-school Children.

In this section we present the result of the regression analysis of the influence of women empowerment and adoption of CSPs on nutritional status among the sample children on Table 5. As mentioned earlier, ordinary least square model was used to regress weight for height, weight for age and height for age against the same set of explanatory variables. The dependent variable in each case is the individual child Z-scores. A positive sign on a parameter implies that the variable will lead to increased Z-score, while a negative sign indicate that the variable will reduce Z-score. For the three regressions, the goodness of fit of the model is adequate and consistent with other studies on nutritional status (Kabubo-Mariara et al., 2006). The model is also comparable to other studies like Malapit *et al.,* (2015) and Smith *et al.,* (2005) which used the individual child Z-scores as the dependent variable and employed an ordinary least square (OLS) regression approach and Babatunde *et al.,*(2011) that used the Logit model which relies on the maximum likelihood estimation procedure as dependent variable.

Height for Age

One of the empowerment indicator which is achievement in the use of credit ($p<0.05$) of the primary female implies that the Z-score will increase by 2.5979. With respect to basic amenities household that don't have access to piped water($p<0.01$) have reduced z-score by 2.99 while access to health facilities ($p<0.10$) and market location($p<0.05$) above 3km radius of their community will increase the Z-score by 1.885 and 3.140 respectively, Clean water and access to health facilities have been shown in the literatures to contribute to improved nutritional status of children (Armar-Klemesu et.al., 2000). A unit increase in income($p<0.01$) will increase the Z-score by 0.00028. Also having access to medium term tenure duration($p<0.10$) will increase the height for age Z-score by 2.4426

Weight for Height

Three of the empowerment indicators had negative significant effect on weight for height z-score of preschool children. These indicators are asset ownership($p<0.05$), use of credit($p<0.05$) and workload($p<0.05$) of the primary female in the household which implies that weight for height Z-score will reduce by 1.2772, 1.7438 and 1.4030 respectively for every inadequacy in these indicators. This implies that women that are not empowered within the household, they are deprived of the ability to take actions that will benefit their own wellbeing and also their children's. Also, two out of the six CSPs (crop rotation($p<0.01$) and residue retainment($p<0.10$)) have significant influence with weight for height z score which measures the incidence of wasting. This implies that a unit increase in the proportion of land used for these practices will increase the Z-score by 2.3978 and 1.4680 respectively. With respect to access to basic amenities, households that had access to piped water($p<0.01$) will have increase Z-score by 3.1836 while households that had market located within their community will have reduced WFH Z-score by 2.0508 and 2.1588 respectively. Based on land characteristics households without registered right($p<0.10$) have reduced WFH Z-score by 3.9489, when households have secure rights, they enjoy enhanced intra-household bargaining and decision making power, because secure land rights can lead to increased household food production and food and nutrition security.

Weight for Age

One of the child characteristics information which is the age of child($p<0.10$) have significant influence on the weight for age z-score. This implies that a unit decrease in the age of child will reduce the Z-score by 0.1245, This reflects the deterioration in rapid growth that typically occurs in young children This finding is consistent with those of other previous studies in different countries (Kabubo-Mariara et al 2006, Smith, *et al.*,2004). This result is plausible considering that many of the younger children are still been breastfed, and chronic malnutrition sets in only after weaning (Babatunde and Qaim, 2010). Age of the household head($p<0.10$) had a positive influence while age squared($p<0.10$) had a negative influence on the weight for age Z-score which implies that increase in age of household head will increase the z-score by 0.1491 while as the farmer grows older the Z-score will reduce by 0.0014. Age of household head reflects maturity and capability to provide and meet household needs. Households that had access to piped water($p<0.01$) will increase their Z-score by 0.9406 and market location within the same location will reduce the Z-score by 1.0747 and 1.2903 respectively. With respect to tenure duration, household with short term use($p<0.05$) will increase their Z-score by 0.8901. Also a unit increase in the proportion of land used for green manure($p<0.10$) will reduce the score by 1.2136.

Table 5: Influence of Women Empowerment and Adoption of CSPs on Nutritional status of Pre-school Children

	Height for age		Weight for height		Weight for age	
	Coeficient	**T-VAL**	**Coeficient**	**T-VAL**	**Coeficient**	**T-VAL**
Age of child	0.2529	1.46	-0.2291	-1.5	-0.1245*	-1.87
Age of child squared	-0.0032	-1.54	0.0025	1.52	0.0012	1.61
Gender of child	-0.5790	-0.63	0.0052	0.01	-0.2261	-0.69
Age of household head	-0.0685	-0.2	0.2576	1.11	0.1491*	1.79
Age squared	0.0002	0.07	-0.0027	-1.21	-0.0014*	-1.74
Years of formal edu	0.0391	0.45	0.0255	0.38	0.0446	1.44
Native	0.1307	0.05	-0.6514	-0.56	-0.4537	-0.63
Access to road	-1.69	-1.37	-1.5898	-1.21	-0.3517	-0.86
Access to water	-2.9970***	-2.87	3.1836**	2.13	0.9406**	2.39
Access to health facility	1.8850*	1.78	0.4086	0.67	-0.2755	-0.67
Market location<3km	0.4489	0.41	-2.0508**	-2.58	-1.0747**	-2.47
Market location>3km	3.1410**	2.23	-2.1588***	-3.00	-1.2903***	-3.25
Household size	0.0427	0.28	0.0444	0.61	-0.0844	-1.54
Dependency ratio	0.4810	1.17	-0.4123	-1.33	0.1726	1.19
Total income	2.80E-07***	3.49	-7.59E-08	-1.3	2.59E-08	0.96
Farm size(ha)	0.0473	0.75	-0.0221	-0.88	0.0155	0.9
Female asset achievement	-0.5378	-0.43	-1.2772**	-2.21	-0.6114	-1.58
Female group	0.5809	0.56	-1.4313	-0.95	-0.1719	-0.39
Female production	-1.9423	-1.43	-0.5383	-0.81	0.0441	0.09
Female income	1.5479	1.16	0.5501	0.91	0.0227	0.05
Female credit	2.5979**	2.05	-1.7438**	-2.05	-0.2357	-0.51
Female workload	1.3883	1.35	-1.4030**	-2.21	0.2978	0.83
Gender parity	-0.6752	-0.65	1.9534	1.46	0.1938	0.47
Land type	-1.1855	-1.04	-1.3570	-1.23	0.5655	1.38
Tenure duration(short)	-0.3891	-0.3	0.9078	0.89	0.8901**	2.2
Tenure duration(medium)	2.4426*	1.75	-0.7068	-0.67	0.6189	1.08
Land acquisition	-0.8440	-0.55	-0.3289	-0.28	0.0956	0.16
Right registration	-4.7704	-1.48	-3.9489*	-1.97	0.8023	0.95
Used green manure	-0.2959	-0.19	-0.9663	-1.03	-1.2136*	-1.65
Agroforestry	1.3501	0.75	-1.0778	-1.27	0.0093	0.02
Organic compost	0.7049	0.29	-0.4225	-0.36	-0.5192	-0.52
Crop rotation	-1.7141	-1.05	2.3978***	2.71	0.8097	0.93
Zero tillage	0.0390	0.04	-0.3434	-0.36	-0.5492	-1.51
Retain residue	-0.9779	-0.96	1.4680*	1.76	0.3401	0.99
Constant	-2.9095	-0.33	2.7819	0.87	-0.1562	-0.08
F-value	4.05		1.94		3.08	
Prob>F	0		0.0037		0	
R-squared	0.3578		0.3605		0.3382	

Source: Computed from Data obtained from Field Survey, 2017

Conclusion and Recommendation

Based on the findings of this study, there is unequal distribution of livelihood assets between men and women of the households. The study further revealed that the adoption of climate smart practices was generally low among men and women in the study area. The nutritional security status of preschool children determined in this study showed that more effort must be made to improve the nutrition of children in the study area in order to achieve the sustainable development goals which is to end hunger, achieve food security and improved nutrition. However, adoption of CSPs influence the nutritional status of pre-school children in Nigeria because the benefits of the adoption of these practices are often gotten in the medium to long term. Furthermore, the regression analysis on child nutrition revealed that age of child, household variables (age and empowerment gap), basic amenities (clean water, access to health facilities, good roads and market), Land and Climate-smart variables (tenure duration, right registration, crop rotation, residue retainment and zero tillage) were the significant variables that influence child malnutrition. All things being equal older children are more likely to be malnourished. This is probably due to reduced care and attention for older and weaned children. Clean water, availability of health facility, markets and good roads also reduce the probability of malnutrition. The study there recommends among other things that, the provision of clean water for rural households should be taken seriously by government. Clean water will prevent the spread of water-borne diseases that can negatively affect the health and nutrition of young children. Also adoption of CSPs among smallholders should be encouraged because its adoption will improve nutritional status of children in the households. Also, efforts should be made to improve women access to loan, land and other productive resources as their access to these livelihood assets will reduce gender differences and also allow the women in the household to have adequate achievement in these indicators thereby improving the nutritional status of preschool children. Youths and young adults should be encouraged to engage in agricultural production because they are still economically active in this age. Government should endeavour to educate farmers and also create a clear understanding of land policy especially on right of ownership, tenure duration and registration as these are found to significantly influence the nutritional status of pre-school children in the Nigeria.

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