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RESEARCH PAPER

Effect of weather variability adaptation strategies usage on vulnerability to food insecurity in Oyo State, Nigeria

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Abstract

The prevalence of fluctuations in weather elements is now an inevitable global phenomenon that needs an adaptive approach while the dynamism of food insecurity calls for policies that will accommodate currently food secure but vulnerable households. However, there is perceived insufficient study on the effect of adaptation strategies usage on vulnerability to food insecurity that will inform such policies in Oyo State. This study therefore analyzed the effect of weather variability adaptation strategies usage on vulnerability to food insecurity in Oyo State, Nigeria. The population of the study comprised all registered farmers with the State's Agricultural Development Programme. Multistage sampling procedure was used to collect the data. Data were collected from April to early June and from September to December of year 2019; making two visits to the study area. Data collected were analyzed using regression analysis (at 5% probability) following Value at Risk (VaR) approach. The result showed that majority of the farmers (63.37%) were in their active age with a mean age of 49 years, smallholders with an average farm size of 3.75 hectares. The mean household size was 5 members. Fewer of the households (8.43%) were high adjuster to the use of the various identified weather variability adaptation strategies, 58.24 % and 33.33% being medium and low users respectively. Vulnerability to food insecurity statuses of the respondents were dynamic across the seasons, while 68.50% were not vulnerable 31.50% were vulnerable. In conclusion, the study established dynamism in vulnerability to food insecurity in Oyo State and positive relationship between adaptation index and vulnerability to food insecurity. Therefore, integrative policies that will enhance optimum land use and provision of requisite weather information to farmers are recommended. Also, crop, soil, and local weather specific adaptation strategies be promoted and incentives to use them provided in order to reduce vulnerability to food insecurity in Oyo State.

Keywords: vulnerability, food insecurity, dynamism and adaptation strategies

Introduction

The global food security is greatly at risk due to the increasing demand for food as a result of; increasing world population, the impacts of global weather change and regional weather variability (Inter-Governmental Panel on Climate Change, 2014). According to Lipper *et al* (2014), high frequent extreme change in weather condition resulting in phenomenon like droughts and floods is already declining agricultural productivities, especially, in developing nations. This has resulted into an almost stagnant agricultural profitability of the smallholder farmers who produces about 70% of the global food need (Food and Agriculture Organization FAO, 2015). Profitability of some major staple food like wheat and maize has dropped drastically by 5.5% and 3.8% respectively as against if there is no material change in weather elements (Ajetomobi *et al*, 2010).

The attendant impact of weather changes and declining food profitability in the world is so real that the first on the list of Sustainable Developmental Goals SDGs is eradication of extreme hunger and poverty in the world by the end of year 2030 (FAO, 2018).

Literature Review

The Sub Sahara Africa SSA according to FAO (2004) has the highest number of poor countries than anywhere in the world, the region accounts for 30 % of the world's poor. (World Bank, 2012). The Global Hunger Index GHI is put below 5 for a comfortable and food secured household, according to a study by von Grebmer in 2013, Nigeria' GHI stood at 15 in year 2013, this was an improvement over 16.3 which it was in the year 2005, this figure is still far above the standard safe index. This index as high as it is can still soar higher for farming households during dry season as farm profitability is usually low due to lack of rainfall which is the sole source of water for crops and animals.

Weather Smart Agriculture

By the foregoing, the introduction and encouragement of Weather Smart Agriculture WSA and weather variability adaptation strategies are important to stem vulnerability to food insecurity of not only the rural households but also the urban households whose primary source of livelihood is agriculture. This is hinged on sustainable agricultural practices through flexible production processes that adapt to the ever changing weather elements (Dinesh et al, 2015).

WSA have three broad objectives, these are; increasing the profitability of the global agricultural sector in a sustainable manner in order to enhance global food security, development and enhancement of farm incomes of farmers, the second objective being to adapt farming practices to weather change and variation in weather so as to enhance the resilience of the sector to the of menace of weather variations and weather change at both households, local, national and international levels, and the third objective being the eradication of Greenhouse Gas Emissions in agriculture (Dinesh et al, 2015).

By definition, weather variation refers to change in one or more weather variables (rainfall, temperature, wind, etc.) over a specified time (CDIAC, 1990). Long-term fluctuation in temperature, precipitation, wind, and other aspects of the earth's weather relates to climate change (*ibid.*). Farmers and civil society are both vulnerable to impacts of change in weather variables on agricultural production. Agricultural decisions have complex interactions with weather, but these decisions must be made months before the impacts of weather are realized. Weather forecasts could make it possible to adjust farm decisions to reduce unwanted impacts and take advantage of favourable conditions. Weather information can be grouped into three categories: (i) Historical weather information (for example average rainfall and its variability, (ii) information from real-time monitoring, and (iii) forecast information on future weather (seasonal, year-to-year and long-term forecasts).

Fluctuation and seasonal variability in rainfall are constraints to crop production. Weather problems have been exacerbated by soil physical characteristics. In years with more than average rainfall, the low water holding capacity of the soil results in water deficiency at critical phases in crop development. Thus, farming practices have developed as a response to environmental and agro weather dictates (Schmidhuber and Tubiello 2007).

Agricultural practices are rain fed mostly in developing nations, while sun, the primary source of energy is very vital to crop production, this made Agriculture hugely dependent on weather (Schmidhuber and Tubiello 2007). Agriculture is therefore primarily the most threatened sector of the global economy by the menace of weather change. By extension, the primary source of raw materials status of Agriculture to other sectors makes weather change one of the most crucial challenge of the global economy (Parry et al, 1999). This in return affects the four pillars of food security namely, food availability, accessibility, affordability and utilization, the latter is beyond the scope of this current work.

Despite the concerted efforts of the world leaders to globally half extreme hunger in the world before year 2015 ended, the target was a mirage, while the attainment of SDG of zero hunger in the world by year 2030 still looks elusive (United Nations, 2015). The attendant impacts of weather variability on the livelihood of the farming households ranges from draughts, flooding, erosion, pest's infestation, sub-optimal livestock performance and distortion in natural ecosystem. These all constitute great shocks being faced by these households in resource poor nations like Nigeria (Deressa *et al* 2008). This goes further to affecting food accessibility, affordability and utilizations (Porter and Semenov, 2005). These shocks have become a natural occurrence frequently occurring in many of these nations resulting in detrimental impacts on their agricultural venture's profitability (Fabusoro *et al.*, 2014)

To mitigate the attendant detrimental impacts of weather, change and weather variability which is mostly borne by agricultural processes contributing the least to it, weather variability adaptation strategies have been considered the most suitable alternative hence the promotion being accorded it globally. This is because it is expected to stem vulnerability. However, this is not always the case in developing nations, partly due to the cost implication of its adoption by the farmers, high illiteracy and widening gap between agricultural extension agents and farmers who are mostly scattered in the rural and sub-urban areas (Ziervogel, *et al,* 2006).

This study seeks to analyze Vulnerability to Food Insecurity in Nigeria. The study will help in the current drive by the States and Federal Government of Nigeria to being food secure, to diversify Nigeria's economy from mainly crude oil to Agriculture and other sectors driven foreign exchange earnings. It will also help in achieving SDG goal number ONE of eradication of extreme poverty and Hunger in the world. Findings from this work will also assist Governments, Development Professionals, NGO's and Policy Makers in the formulation of policies that will still be relevant in the face of any sudden changes in the food security status of rural households, the development of rural areas and improvement in the standard of living of the rural household's members.

This study will also serve as a reference for further studies on the subject of Vulnerability to Food Insecurity and Household Coping Strategies. Finally, to the best knowledge of the author, there is no known work that captures these phenomena using the study area at the time of embarking on this research.

Objectives of the Study

This work had the following objectives;

1. Profiling of the socio-economic characteristics of the respondents,
2. Determination of adaptation strategies usage index,
3. Estimation of vulnerability to food insecurity,
4. Estimation of the effect of adaptation strategies usage index on vulnerability to food insecurity.

Materials and Methods

Descriptive statistics like mean, frequency count and percentage (Amao and Ayantoye, 2015) was used to profile the social economic characteristics of the respondents. The categorization into high, medium and low users was achieved using a composite score as given below and as used by (Ojoko *et al,* 2017).

High users = Between 14 points to (mean + S.D) points;
Medium users = Between upper and lower categories;
Low users = Between (mean – S.D) points to 1 point.

There have been many approaches aimed at measuring vulnerability, however, the baseline of mostly all of these approaches are risk and responses, the summation of which gives birth to vulnerability. With reference to the Household Economy Approach (2008), the summation of baseline, hazard, and response gives rise to an outcome (v), which is vulnerability. However, in measuring the response rate, the sustainability of livelihoods with respect to accessibility of economic resources and the assets that aide's resilience need be incorporated in the measurement. (Hoddinott and Quisumbing, 2003).

Given that y denotes the food security indicator, which is the summation of the food security outcome for different household dimension. Following this, vulnerability of the household to food insecurity can thus be defined as the expected welfare loss associated with inadequate value of the food security indicator, dependent on some characteristic features of the households, the strategies in use for mitigating the shocks, the risk management policies been used by the public institutions, and some other factors outside the control of households. These variables are denoted by vector x. Thus, household vulnerability indicator can be expressed as:

$$V_1(y^*,x) = \int_0^{y^*} w(y)\,dF(\tfrac{y}{x})$$

where y* is defined as the critical benchmark value for the food security indicator, x is a vector of the current household and conditioning variables of the specific community, W(·) is the function of the household welfare, and F(·|x) is the conditional distribution function of the future food security indicator, with the vector of conditioning variables x. The vector x can have the current food insecurity indicator value included. Thus, this definition provides for the possibility that a household that is currently food secured maybe affected in the future time as well as the likelihood that a household that is currently food insecure can navigate out of its vulnerable status. Hence, the definition covers the dynamism of food insecurity, and its stochastic properties (Scaramozzino, 2006).

The above general definition $V_1(y^*, x)$ is based on an assessment of the welfare losses associated with food insecurity which follows the principle of the extreme Value-at-Risk approach (Scaramozzino, 2006). More concisely, an alternative measurement of vulnerability which will cover nutritional inadequacy of the food insecurity indicator can be given as;

$$V_2(y^*,x) = \int_0^{y^*} dF\left(\frac{y}{x}\right) = F(\tfrac{y^*}{x})$$

This can be interpreted as a count indicator of vulnerability to food insecurity relative to an appropriate threshold or benchmark, y*. This second approach draws its strength from the fact that, it allows for inclusion any specific characteristics of the nutritional outcome and the food security threshold, allows for evaluation of the vulnerability to food insecurity both at the household, household clusters and community when the function F(·|x) and x vectors are redefined, thus, shows high flexibility in application and straightforwardness in interpreting the outcomes (Scaramozzino, 2006).

VaR in food security context can be defined in terms of the critical threshold level of the nutritional outcome consistent with a small (given) probability of the outcome falling below this level, over a given time. It as well measures the resources needed to be set aside by the household in order to reduce the impact of such expected shock or risky events and thus be classified as been food secure at the chosen level of confidence, for households already below the benchmark, VaR could assist in the estimation of the resources critical to overcoming its vulnerability (Chaudhuri, 2000), and (Scaramozzino, 2006).

The confidence interval level for the classification needs to however be arrived at after sensitivity analyses have been carried out, this is premise upon the fact that, higher confidence interval level will be associated with increased food security, or a reduced food insecurity. Thus, the approach can help a great deal in suggesting tailored approaches to a specified household that will enhance the reduction of such a household's vulnerability to food insecurity. So far, the Value at Risk (VaR) approach developed by Scamarazino (2006) and adapted by Lemma and Wondimagegon (2014) as well as many other authors remains the most widely accepted methodology till date.

Two staged Feasible Generalized Least Squares FGLS regression model is appropriate in determining the probability distribution of food insecurity via this model;

$\tilde{V}_h = Pr(In\ C_h < Z / X_h = \phi \frac{In\ Z - Xh\beta}{\sqrt{Xh\theta}}$
Inc_h is defined as $X_h\beta + \epsilon$

where V_{ht} = the probability of household vulnerability, C_h = per capita consumption of the households, Z= the ideal consumption, Xh= the household characteristics, β = vector of parameters to be estimated, and, ϵ_h = error term capturing idiosyncratic shocks (Anselm *et al,* 2010).

The explanatory variables are;

X_1 = Gender (Male 1, female 0) X_2 = Age of the household head in years X_3 = Marital status of the household head (married 1, otherwise 0), X_4 = Level of education of the household head measured by years of schooling,, X_5 = Household size, X_6 = Dependency ratio (number of household member below age 18 years and above 70 years), X_7 = Expenditure of household on food items in Naira, X_8 = Access to remittance (Yes=1, No= 0), X_9 = Access to external credit (Yes = 1, No =0), X_{10} = Membership of political or cooperative society or social participation (Yes=1, No=0), X_{11} = Indebtedness, X_{12} = Distance to portable source of water or time spent in fetching water, X_{13}= Number of income generating activities X_{14}= Productive assets ownership .

Data Source and Sample Size

Primary data was used for this work, this was collected from the respondents with the use of a well-structured questionnaire on two separate visits, each of the visits had considerably long distance in between to allow for the coverage of both the planting and harvesting seasons. The population of this was 415,030 the Oyo State farming households registered with the Oyo State Agricultural Development Program (OYSADEP). A Multi-staged purposive and random sampling techniques was adopted in selecting the sample size for this work. The first stage was a purposive selection of two Agricultural zones out of the four in the state, the preselected zones was Saki and Ogbomoso zones. The second stage was a purposive selection of 5 Local Government Areas (LGAs) from Saki zone out of the 8 in the zone and selection of 3 LGAs out of the 5 LGAs from Ogbomoso zone. The third stage was a proportionate random selection of farming households from the preselected Local Government Areas.

The Saki zone preselected because the region is known to be predominantly a farming region hence its acclamation as the food basket of Oyo State while Ogbomoso zone was preselected due to its high registered farmers in its majorly rural areas. Both preselected regions have more than half of the population of registered farmers in the state.

The population of registered farmers in the state stood at 415,030 households, Saki and Ogbomoso zones have a population of 119,315 and 90,413 households respectively, totaling 209,728 households. From Saki zone, Atisbo (25,388), Saki West (21,308), Iwajowa (19,948), Kajola (15,052) and Saki East (11,885) Local Government Areas were preselected, while from Ogbomoso zones, Oriire (42,242), Surulere (33,148) and Ogo-Oluwa (14,251) Local Government Areas (OYSADEP, 2019). This gave a total sub-population size of 183,222 households preselected

Proportionately, Atisbo (38), Saki West (31), Iwajowa (29), Kajola (22) and Saki East (17), Oriire (66), Surulere (49) and Ogo-Oluwa (21) households were randomly selected to make a total of 273 households as the sample size.

Results and Discussion

As presented in Table1, a total of 273 farming households were surveyed for the work, this cut across both the rural and urban dwellers, mainly because though weather variability affects agricultural practices the most, the menace is not limited to only the rural areas (Lipper et al, 2014). A total of 174 and 99 respondents representing 63.74 and 36.26 percents for rural and urban dwellers respectively were obtained. This implies that, more farming activities occurred in the rural areas than in the urban areas as found by Lipper et al (2014). Also both Saki and Ogbomoso agricultural zones were covered proportionately at 50.18 percent and 49.82 percent respectively. This indicated a proportionate distribution of the respondents based on the population of each of the LGAs.

Also, 37.73 percent of respondents had their ages to be between 41-50 years, this was followed by 23.81 percents of respondents with age bracket of 31-40 years, 19.05 and 12.45 percents had their ages fall between 51-60 and 61-70 years respectively while 5.13 percent had their ages above 70 years, only 1.83 percent were below the age of 30 years. The maximum and minimum ages obtained were 78 and 29 years respectively with a mean age of 49 years, this indicates a mix of farming experience and physical strength as needed for labour intensive agricultural practices in the study are. This mean age negates the findings of Oluwasusi and Tijani (2013) whose mean age obtained was 54 years. However, the ages show that the respondents are in their active age to meet the labour intensive nature of agriculture being practiced in the area.

Table 1: Selected Social Economic Characteristics of the Respondents

Variables	Frequency	Percentage	Mean	Min.	Max.
Sector					
Rural	174	63.74			
Urban	99	36.26			
Agricultural Zone					
Saki	137	50.18			
Ogbomoso	136	49.82			
Age (years)			48.97	29	78
<=30	5	1.83			
31-40	65	23.81			
41-50	103	37.73			
51-60	52	19.05			
61-70	34	12.45			
Above 70	14	5.13			
Farm size (hectares)			3.75	0.5	30
Not more than 5	225	82.42			
6-10	43	15.75			
Above 10	5	1.83			
Household size			5	2	13
Not more than 5	95	34.80			
6-8	152	55.68			
Above 8	26	9.52			
Total	**273**	**100**			

Source: Author's field survey, 2019

Table 2 showed the distribution of the adaptation strategies in use in the study area and the frequencies of households adopting each. 99.28 percent of the households engaged in one form of prayer or rituals to avert weather hazards, this is against the findings of Tesfaye (2016) wherein about 60 percent of the respondents used the strategy. This implies that, the people are aware of the prevalence of variability in weather elements and have strong belief in supernatural powers to help them in mitigating these variabilities and its attendant effects. From the table, about 98 percent of the respondents used mulching, this resonates the findings of Oluwasusi and Tijani (2016) where 100 percent of the respondents used the strategy, 82.78 percent of the farmers planted cover crops as a mitigation strategy, somewhat in tandem with the findings of Tesfaye, (2016) where about 80 percent of the farmers used the strategy, this could be because, the respondents perceived high temperature, surface flooding and wind and identified the strategy has being efficient in curbing these.

The percentage of respondents that employed the usage of organic manure or chemicals were 82.05, this resonates the finding of Oluwassusi and Tijani where 81 percent of the respondent used the strategy, this is most likely going to increase their production costs. 76.92 percent used crop rotation, confirming the findings of Oluwasusi and Tijani (2016) and Tesfaye (2016) where 96.7 and 62.25 percent respectively used the strategy, this is expected to help in breaking the development of pests and diseases on the farmlands. 67.40 percent of the respondents employed mixed cropping, this is against the finding of Oluwasusi and Tijani (2016) where 100 percent of the respondents used the strategy, the type of crop grown could be the responsible factor for the difference, this implies that, mixed cropping is a very popular strategy in the study area. And finally, 64.10 percent of the respondent adopted the use of hybrids, this is in tandem with the findings of Oluwasusi and Tijani (2016), Innocent (2012), and Molua (2012) wherein 58.25, 69, and 65 percent respectively make use of the strategy.

Table 2: Distribution of the Adaptation Strategies

Adaptation Strategies	Frequency	Percentage
Conservative Agriculture	190	69.60
Agro-Forestry	114	41.76
Use of Organic Manure/chemicals	224	82.05
Crop rotation	210	76.92
Crop Diversification (Mixed Cropping).	184	67.40
Changing planting date	122	44.69
Mulching	268	98.17
Fadama	142	52.02
Use of hybrids	175	64.10
Planting Cover Crops	226	82.78
Fallowing	164	60.07
Zero Tillage	86	31.50
Water Harvesting/irrigation	55	20.15
Drainage Construction	122	44.69
Modern Housing	53	19.41
Offering Prayers or Rituals	271	99.28

Source: Author's field survey, 2019

Table 3 showed the level of usage of the identified adaptation strategies, 91 respondents representing 33.33 percent were low users, 159 respondents representing 58.24 percent were medium users while 23 respondents representing 8.43 percent were high users. The Medium users being the highest shows that the respondents are still skeptical about the adaptation strategies while still not want to miss out of its benefits. High cost associated with users of the strategies could also be one of the reasons for recording relatively high low users amongst the respondents in the study area.

Table 3: Level of Usage of the Various Identified Adaptation Strategies

Variables	**Frequency**	**Percentage**
Low Users	91	33.33
Medium Users	159	58.24
High Users	23	8.43
Total	273	100

Source: Author 's field survey, 2019

The result presented in table 4 showed that, age, household size, primary occupation of household head, years spent in schooling, farmland ownership, access to weather information, number of income generating activities or livelihood diversification, shocks, and adaptation index are all significant at 1% while livestock ownership and access to weather information both significant at 5% level as significant variables in the measurement of vulnerability. As presented in the table, an increase in age have the probability of increasing the vulnerability of the respondents by 2.9%, this implies that, as the age of the respondent's increases, so is the chance of vulnerability to food insecurity, this confirms the findings of Sisay *et al.,* (2016).

An increase in household size have the chance of increasing vulnerability by 28.5%, implying that, when the number of household membership increases, there will be increased need for food hence increased chance of vulnerability, this is in tandem with the submission of Capaldo *et al.,* (2010). Primary occupation of the household head has a positive relationship, as the primary occupation moves towards civil service, the probability of vulnerability to food insecurity increases by 4.0 percent, this could be because of the irregularity in the payment of civil servant's salary in the study area at the time when the data for the study were collected.

Year spent in school showed a negative relationship with vulnerability, a unit reduction in years of schooling have the chance of increasing vulnerability to food insecurity by 29.9 percent, this could be because adoption of improved farming technology and access to modern farming techniques that will boost profitability is enhanced by educational attainment of the household head (Sisay *et al.,* 2016).

A unit reduction in farmland ownership have the chance of increasing vulnerability to food insecurity by 41.6 percent, this could be because land is seen as one of the major economic resources in agriculture (Mesfin, 2014) and owning one's farmland afford flexibility on the weather adaptation strategies to be used for improved agricultural profitability (Ojoko, 2017). Reduction in number of livestock ownership have the chance of increasing vulnerability to food insecurity by 24.3 percent, this could be because, livestock ownership serves as shock absorber to any decline or loss in arable farm profitability that may be occasioned by the shocks (Sisay *et al.,* 2016).

A unit reduction in access to weather information have the chance of increasing the respondent's vulnerability to food insecurity in the study area by 30 percent, this could be because lack of a prior information on weather elements could impair an efficient decision making relative to farming decisions as affirmed by Ogundari (2017). A unit decrease in the number of income generating activities or livelihood diversification of the households have the chance of increasing vulnerability to food insecurity by 37.7 percent. This could be because, a reduction in livelihood diversification increases the riskiness of sources of income, or, because the more diversified sources of income are, the lesser the economic risk such households will face (Mesfin, 2014) and (Thornton *et al*, 2014)

Also, a unit increase in the adoption index of weather variability adaptation strategies have the chance of increasing vulnerability by 15.1 percent, this is however against *apriori* expectation, this could be because higher adoption index is strongly linked with reduced sources of income and farming as primary occupation in the study area. Finally, a unit increase in exposure to shocks (in the forms of conflict, ill health of economically productive member of the household, draught, flooding) have the chance of increasing vulnerability to food insecurity by 16.9 percent, this resonates the findings of Sisay *et al.,* (2016).

Table 4: Estimation of vulnerability to food insecurity

Variables	**OLS Regression**			**FGLS Regression**		
	Coefficient	Std. Error	t	Coefficient	Std. Error	t
Sex	- .0195554	.0746051	-0.26	.1195776	.1171433	1.02
Age	.0044475	.0033837	1.31.	0288885	.0053824	5.37***
Household Size	.0775619	.0159504	4.86***	.284767	.0249808	11.40***
Pry Occ.	.0541485	.0258982	2.09**	.1749754	.0394694	4.43***
Yr. in Schl.	-.0061797	.0061144	1.01	-.0299459	.0094976	-3.15***
Land Ownership	-.1092052	.0646574	-1.69*	-.4158631	.0974893	-4.27***
Farm Size	.0122928	.0093978	1.31	.017638	.0140619	1.25
Livestock	-.0319354	.0637532	-0.50	-.2427926	.0967612	-2.51**
Farming Ex	-.0014	.0033663	-0.42	-.0077064	.0052609	-1.46
Coop M	.0525395	.0576848	0.91	.1162326	.0877359	1.32
Political M.	-.014917	.0546788	-0.27	-.0513928	.0840175	-0.61
Weather info	-.0777718	.0574329	-1.35	-.2797171	.0881701	-3.17***
Livelihood D	-.1076363	.0300849	-3.58***	-.3764947	.0511909	-7.35***
Time to get Water	-.0012816	.0027126	-0.47	-.0038878	.0041962	-0.93
Tim to get healthcare	.0002649	.001021	0.26	-.0002013	.0016496	-0.12
Debt Status	-.0360627	.0346582	-1.04	.0214578	.0943708	0.23
Income	-6.86e-09	1.90e-07	-0.04	4.44e-07	2.92e-07	1.52
Dependency	.0237407	.1415243	0.17	.198094	.2173094	0.91
Adoption I.	.0326502	.0097469	3.35***	.1514422	.0153395	9.87***
Shocks.	0389654	.0563317	0.69	.1692495	.0874005	1.94***
Constant	.1181766	.2251312	0.52	-2.162502	.3546052	-6.10***
R^2 =		30.4			69.8	
Observation		273			273	

Source: Source: Author 's field survey, 2019

***significant at 1 percent, ** significant at 5 percent and significant at *10 percent

Table 4 presented the food vulnerability status of the households in the study area. A total number of 86 households representing 31.50% are vulnerable while 187 households representing 68.50 percent are not vulnerable to food insecurity in the study area. This shows a dissimilar result with the findings of Mesfin (2015) where 52 percent and 48 percent of surveyed households were vulnerable and non-vulnerable to food insecurity respectively. This implies that, any slight disturbance on the current demographic factors, event of conflict or inefficient usage of adaption strategies, 48 percent of the households will be negatively affected irrespective of their current food security status.

Table 5: Vulnerability to Food Insecurity Status

Food security status	**Vulnerability Status**		
	Vulnerable (%)	**Non-vulnerable (%)**	**Total**
Food insecure (P_x H_x)	49(56.98)	00(00)	49 (17.95)
Food Secure P_x, H_x	00(00)	41(21.93)	41 (15.02)
Food Insec. P_x, Food Sec H_x	00(00)	146 (78.08)	146 (53.48)
Food Sec P_x, Food Insec H_x	37 (43.02)	00(00)	37(13.55)
Total (%)	**86 (31.50)**	**187(68.50)**	**273 (100)**

Source: Author's field survey, 2019

P_x and H_x represents planting and harvesting seasons respectively.

Based on the level of usage of weather variability adaptation strategies, table 5 presents a summary of the result, low, medium and high users accounted for 17.44, 68.61 and 13.95 percents of the vulnerable households respectively while the non-vulnerable households were 40.64, 53.48 and 5.88 percent respectively. This implies that, high users (though proportionately the fewest) were the lowest vulnerable and non-vulnerable.

Table 5: Distribution of Vulnerability Status Based on Usage Level

Variables	Vulnerability Status		
	Vulnerable (%)	Non-vulnerable (%)	Total (%)
Weather Variability Adoption Level			
Low Users	15 (17.44)	76 (40.64)	91 (33.33)
Medium Users	59 (68.61)	100 (53.48)	159 (58.24)
High Users	12 (13.95)	11 (5.88)	23 (8.43)
Total(%)	**86 (31.50)**	**187 (68.50)**	**273 (100**

Source: Author's field survey, 2019

Limitation of the study and area of further study

This study had using primary data collected from the same farming household during planting and harvest seasons examined the effect of weather variability adaptation strategies usage on vulnerability to food insecurity in Oyo state and concludes that, adoption index shows a positive significant relationship with vulnerability to food insecurity in the study area. However, food utilization cardinal point of food insecurity conceptualization was beyond its scope while the distance or depth of vulnerability of the households was not determined as well. These areas can be further investigated to add to the existing body of knowledge in the investigation of vulnerability to food insecurity in the study area.

Conclusion and Recommendations

This study had examined the effect of weather variability adaptation strategies usage on vulnerability to food insecurity in Oyo state and concludes that adoption index shows a positive significant relationship with vulnerability to food insecurity in the study area, hence, requisite weather variability adaptation strategies should be promoted in the study area while providing incentives to use them, Policies should be put in place to develop rural economy in a bid to enhance livelihood diversification since more sources of income helps in leveraging agricultural shocks thus reduces vulnerability to food insecurity, Local weather, soil and crop specific weather variability adaptation strategies be promoted in native languages through means most generally accessible to farmers, Integrative policies that will enhance optimum household size and use of land be enacted and implemented in the study area.

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