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IMPACT ASSESSMENT OF COOPERATIVES ON FOOD SECURITY AMONG CATFISH FARMING HOUSEHOLDS IN OYO STATE, NIGERIA

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ABSTRACT

Lack of agricultural credit has remained a major constraint to production in agriculture. The role of cooperatives particularly among farming households in expanding productivity and eventually ensuring food security cannot be overstated. This study examined food security status and its determinants among catfish farming households in Oyo State, Nigeria. A multistage sampling technique was employed to select 120 catfish farming households. Primary data was collected using a structured questionnaire and analyzed using descriptive statistics, the United States Department of Agriculture (USDA) household food security model and logit regression. Results from this study showed that the average household head in the study area was 43 years old. The majority (82.4%) were married with an average household size of 5 persons. The catfish farmers were highly educated with 91.8% having a formal education. The majority (93.5%) had a farming experience of 1-2 years and less than half (42.5%) had access to extension services. About two-thirds of the farmers were members of a cooperative society out of which 52.5% were loan beneficiaries. In terms of food security status, 38.3% of the households were highly food secure, 21.7% were marginally food secure, 13.3% had low food security status and 26.7% of the households were very low food secure. Food insecurity exists among the catfish farming households as a cumulative percentage of 40% were food insecure. Household food security status in the study area as modelled by the logit regression was determined by educational qualification ($p<0.05$), household size ($p<0.01$), farming experience ($p<0.01$), income ($p<0.01$) and cooperative members that were loan beneficiaries ($p<0.01$). This study recommended that efforts and policies should be directed towards timely loan accessibility to farmers to address their resource acquisition challenges and eventually improve food security status. Awareness should also be created to encourage farmers to organize themselves into groups and also be members of a cooperative society.

Key words: cooperatives, catfish, food security, households, loan, USDA, assessment, farming

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INTRODUCTION

Agriculture contributes significantly to the economic growth and development of several countries in the world, particularly developing ones. About 70% of the population in Nigeria are agrarian in nature as it serves as a means of livelihood for a significant number of people, particularly rural inhabitants who produce food through their engagement in various agricultural-related activities in a bid to ensure food security [1]. According to Perez-Escamilla and Segall-Correa [2], food security is defined as a situation that exists when "all people at all times have unhindered physical, economic and social access to sufficient, safe and nutritious food which meets their dietary and food preferences to living an active and healthy life either at the individual, household, national, regional or global levels." Food insecurity on the other hand, according to Food and Agricultural Organization, exists when people do not have adequate physical and economic access to food [3].

The concept of food security is encompassing as it involves four major concepts which include availability, accessibility, affordability and utilization of food. Food availability implies the ability of the household to have highly nutritious food in adequate quantities, continuously and regularly either by local production or purchases. Food accessibility and affordability among households imply unhindered economic and physical access to safe and nutritious food in the correct amount that meets their nutritional requirements. Food utilization refers to the consumption of nutritious food that meets the macro and micronutrient requirements of individuals in households. In light of the above, it is evident that food security may not be attained, if individuals' access to food is not sufficiently addressed. This implies that individuals' physical and economic access to food is germane to fighting food insecurity issues.

Household food insecurity matter is worrisome in Nigeria, given the fact that more than 70% of the population is still living on less than one dollar per day and more than 50% are food insecure, while the majority even consume below the minimum dietary requirements [4, 5]. Furthermore, earlier studies by Orewa and Iyangbe [6], Akerele *et al. [7]*, and Olawale [8] reveal that more than 53 million (about 30%) of the Nigerian population are hungry and 52% live below the poverty line. In addition, the scourge of food insecurity is more prominent among rural farming households than urban households as earlier studies documented that more than 70% of rural farming households in southwestern Nigeria are food insecure [9, 10, 11]. Several socio-economic factors such as age, household size, educational attainment and lack of access to credit have been identified in the literature to predispose rural households to food insecurity but notable among them is inadequate income [12,

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13]. Rural households are predominantly subsistence farmers and incomes generated from farming activities are barely sufficient to meet the needs of their family. This has a pronounced negative effect on households' overall welfare including food security [14].

Credit support to farming households in form of loan availability by cooperatives at minimal interest rates could help in alleviating food insecurity problems. The credit helps poor households to participate in diverse income-generating activities, increase the current level of production and investments to improve their livelihoods [15]. Numerous programmes have been embarked upon by the government to deliver credit services to rural households [16], and among such programmes is the setting up of cooperatives. Cooperatives perform a major role in combating poverty in rural households and promoting food security [17, 18]. Rural households with little income combine their resources to form cooperatives to bring about more income. Cooperatives gather divergent resources such as information, credit and labour among members to achieve production on a large-scale and buy food or fulfil other basic needs of its members [19]. Long-term food security is thus guaranteed by their numerous supportive functions [20]. However, several empirical studies on cooperatives and credit access have concentrated on adoption of technology, farm productivity, technical efficiency, commercialization and reduction in poverty rate while neglecting its impact on rural farming households' food security [21, 22, 23, 24, 25]. Therefore, further studies are required to reveal the effect of cooperatives on food security among rural farming households. There are limited empirical research on the impact of cooperatives on food security, particularly fish farming households in Nigeria. This study fills this literature gap. The objectives of this study include: firstly, to describe the socioeconomic characteristics of catfish farming households in the study area, secondly, to determine their food security status and thirdly, to examine the effect of cooperative loans on catfish farming households' food security status.

MATERIALS AND METHODS

Study Area

The study was carried out in Ido Local Government Area, Oyo State. It is located in the tropics, has a land area of 986 km and an estimated population of 146,200 in 2016 following a projection from the 2006 census [26]. It shares boundaries with Akinyele Local government in the East, Ibarapa East Local government in the West, Ibadan South-west in the North and Egbeda Local government in the South. The study area consists of 10 areas for ease of identification (Alaro, Apete, Awotan, Akufo, Ayobo, Abidogun, Apata, Ido, Omi-adio and Owode) and over 600

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villages. Large hectares of grasslands abound which support livestock production as well as many rivers and water bodies to practice fish farming, though the predominant occupation of the people is farming.

Sampling Technique and Data Collection

This study employed a multistage sampling technique to select catfish farmers in the study area. Stage one involved a purposive selection of six (6) areas known for engaging in catfish farming while stage two involved the simple random selection of two (2) communities from each area which give the total sum of twelve (12) communities. The third stage involved a proportionate sampling to size from each community to give a total of 120 catfish farmers. This was done since the number of catfish farmers across the communities were not the same. A minimum of eight (8) farmers were selected from each community.

Primary data were collected through the administration of a structured questionnaire to elicit information from the catfish farmers. Collected data were analyzed using descriptive statistics and a logit regression model. Descriptive statistics were computed in form of tables, frequencies and percentages to summarize the socioeconomic characteristics and classify the households according to their food security status.

Determination of household food security

This study adopted the USDA (United States Department of Agriculture) Food Security Survey Module. Households were classified into four classes in line with their food security status which was generated from the USDA survey tool [27]. An 18-item household food security questionnaire was employed in data collection. Determination of household food security status was derived following the respondents' responses (yes/no) to a list of questions regarding their actions when there are difficulties in meeting the food needs of the household members [28]. Each of the questions inquires whether the action occurred at any time in the household during the last 30 days [29] and whether it was due to lack of money or food but not voluntary fasting or dieting. The total number of positive responses (yes) received from the list of questions in each household was used to generate a score. In households with children, the score ranges from 0 to 18 and 0 to 10 in households without children. In line with this, the households were grouped into four classes, namely highly food secure, marginally food secure, low food secure and very low food secure.

i) Highly food secure households: These households consistently access food without any problem, barriers or anxiety. These groups are allotted the value of 1 on the food security scale.

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ii) Marginally food secure households: Accessing adequate food in these households may be challenging at times, but the quality, quantity and variety of their food intake are not considerably reduced. An adjustment is shown in their daily food management. These are assigned the value of 2 on the food security scale.

iii) Low food secure households: Food intake quantity and normal eating patterns are not considerably disrupted among these groups of households but diet quality, variety and desirability are considerably disrupted. These are allotted the value of 3 on the food security scale.

iv) Very low food secure households: For this group of households, there is reduction in food intake owing to financial constraints and as a result, the eating patterns of a few household members will be disrupted. The group's value on the food security scale is 4.

Determinants of food security status of catfish farming households

Logit regression model was used to determine the factors associated with a household's likelihood of being food secure or not. It is a binary choice model in which the dependent variable is dichotomous in nature. The logit model was employed because the estimated probabilities lie between the range of 0 and 1. Also, they do not exhibit linear relationship with the explanatory (independent variables) but rather depend on the cumulative logistic distribution function stated below:

$$Pi = E(Y = 1/X_i) = \alpha + \beta_i x \quad (1)$$

$$P_i = E\{Y = 1/X\} = 1/1+e^{-z} \quad (2)$$

For ease of exposition, $z_i = \alpha + \beta_1 x_1 + \beta_2 x_2 \ldots \beta_n x_n$.

Where Pi = Probability of being food secure.

The log of odds ratio or the logit (L) $= Ln\left(\frac{\text{the probability of being food secure}}{\text{the probability of not being food secure}}\right) = z_i + u_i$

i = indexes of the households' observations,

β_i = parameters of the independent variables,

u_i = error term follows a normal distribution with a mean zero, 0 and variance σ^2.

To get the value of z_i, the likelihood of observing the sample needs to be formed by introducing a dichotomous dependent variable Y_i such that Y is equal to 1 if the household is food secure and 0 if otherwise. The logit model was estimated using the Maximum Likelihood Estimation (MLE) technique, the most commonly used

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technique for estimating the logit model. The independent variables hypothesized to determine the food security status among the households are specified as follows:

Y = Household food security status
X_1 = Age of the household head in years
X_2 =Sex of the household head, dummy (male-headed household =1; 0 otherwise)
X_3 = Marital status of the household head, dummy (married =1; 0 otherwise)
X_4 = Educational status of the household head, dummy (educated = 1; 0 otherwise)
X_5 = Household size (number of individuals)
X_6 = Household head involvement in fish farming, dummy (full time = 1; 0 otherwise)
X_7 = Experience of the household head in fish farming (number of years)
X_8 = Estimated monthly income in naira per month
X_9 = Household head is a member of cooperative society, dummy (member = 1, otherwise 0)
X_{10} = Household head cooperative loan status, dummy (beneficiary =1; 0 otherwise)
X_{11} =Access to extension services, dummy (access = 1; 0 otherwise).

RESULTS AND DISCUSSION

Socio-economic characteristics of catfish farming households

The socio-economic characteristics of the catfish farming households are shown in Table 2. The majority (65.0%) of the household heads were between 31 and 40 years of age. In addition, 18.3% were between 41 and 50 years while the 51-60 age group constituted the least (1.7%). This implies that the majority of the household heads in the study area were still in their productive and active capacity, thus, could still actively engage in fish farming and may increase their chances of being food secure. Also, a relatively high percentage (63.3%) of the households were headed by males while 36.7% were headed by females. This suggests the dominance of men's involvement in agriculture and particularly catfish farming.

Distribution of the respondents by marital status indicated that 9.2% were single, 82.4% were married, 5% were divorced and 1.7% were widowed. Information elicited from the collected data revealed that literacy level was high among the household heads with the majority (91.8%) having tertiary education while 5.0% and 8.2% had secondary and primary education, respectively. The level of education could determine the level of opportunities available to improve livelihood strategies, enhance food security and consequently reduce the level of poverty.

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The high educational status of the household heads will enable them to acquire knowledge and skills for budgeting, saving, adoption of innovations and resource usage. Furthermore, education plays a vital role in agricultural production as it promotes better exposure and access to vital information that enhances performance [30, 31, 32].

More than half (54.2%) of the sampled households had between 5- 8 persons with very few (1.6%) having large household size of more than 9 persons in. This may, however, put pressure on household resources particularly food.

In terms of farming experience, majority (93.3%) had a farming experience of 1-2 years while very few (6.7%) had farming experience of 3 years and above. The number of years a farmer spends in the farming business may give an indication of the practical knowledge he has acquired. This implies that, the experience gained enables the farmer to use their resources prudently and consequently enhance their household welfare and food security status [33, 38].

Access to extension services showed that less than half (42.5%) of the sampled household heads had access to extension services while majority (57.5%) did not have access which may affect their productivity. Farmers that had access to extension services were privileged to be exposed to new and improved technologies and other benefits more than those without access.

Majority (62.5%) of the household heads were into fish farming on a part-time basis while very few (37.5%) engaged in fish farming on a full-time basis. This implies that most of the household heads engaged in other forms of income generating activities. Monthly income distribution across the sampled households showed that one-quarter (25.0%) earned above ₦100,000 ($237.41) while majority (63.3%) earned between ₦50,000 ($118.70) and ₦100,000 ($237.41) and very few (14.0%) earned below ₦50,000 ($118.70) monthly. Distribution of household heads according to membership of cooperative society revealed that majority (64.2%) belonged to one cooperative society or the other while very few (35.8%) did not belong to any cooperative. This may be attributed to the fact that credit or loan can be easily accessed from cooperative society compared with other formal sources like banks. In terms of cooperative loan status, majority (52.5%) of the household heads were loan beneficiaries from the cooperative society while very few (47.5%) were non-beneficiaries.

Determination of food security status of catfish farming households

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The food security status of the catfish farming households in the study area shown in Table 3 revealed that 38.3% were highly food secure, 21.7% were marginally food secure, 13.3% were low food secure while 26.7% were very low food secure. This implies most (60.0%) of the households were highly food secure with a cumulative percentage of 40.0 being food insecure. This implies that the problem of food insecurity exists among the farming households. This result agrees with earlier submission of Ibok [5], Adeniyi and Ojo [10] and Oluyole and Taiwo [11] who reported that food insecurity situation is more pronounced among farming households than urban households.

Determinants of food security status of catfish farming households

Results for factors influencing food security status of fish farming households are shown in Table 4. Educational qualification, household size, farming experience, income and cooperative members that were loan beneficiaries were statistically significant at different levels and positively influenced food security status of the catfish farming households.

Educational qualification was statistically significant ($p<0.05$) suggesting that highly educated household heads were more likely to be food secure than those with lower education levels. Furthermore, heads that were able to secure loans ($p<0.01$) from cooperatives to increase their production had the likelihood for their households to be more food secure than their counterparts who were neither members nor loan beneficiaries. This could be as a result of easy access in obtaining and usage of such funds in meeting basic needs like food among other things. This result corroborates the earlier submission of Ayantoye *et al.* [34], Tasie *et al.* [35] and Aidoo *et al.* [36] that access to credit improves food production and income of rural households, thereby improving the households' food consumption pattern and the probability of a household to be more food secure.

Household size ($p<0.01$) and farming experience ($p<0.01$) were positively related to food security status of households. This means that the more the number of income-generating adults in the household, the more their capacity to contribute to improving the welfare of the households' members and thus increasing the likelihood of the households being more food secure than those households with fewer income- generating members. Also, increase in farming experience would increase the likelihood of the household being food secure. The likelihood of a household being food secure also increased with average monthly income ($p<0.01$).

CONCLUSION

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Farm households borrow cooperative loans and engage in fish farming to reduce poverty and food insecurity problems. Findings from the study showed that the majority of the catfish farming households were not confronted with serious food security issues possibly due to the availability of sufficient lending agencies to assist in production. Therefore, the impact of cooperatives in making loans accessible to the farmers appears to have increased income levels and improved food security status. Furthermore, loans should be properly managed, released on time and given on regular basis to genuine farmers to ensure proper utilization since agricultural operations are time bound.

The study also identified key determinants of catfish farming households' food security status as educational qualification, household size, farming experience, household monthly income and loan beneficiary from cooperative society. Therefore, efforts at improving farming households' food security status should be directed towards households with these characteristics.

Policies that will make loans accessible to farmers by government and non-governmental agencies will go a long way in addressing the challenges encountered during resource acquisition and eventually improve household food security. Farmers should be encouraged to organize themselves into good and reliable cooperatives (for those who do not have cooperatives in their locality) or join good and reliable cooperatives (for non-members). This awareness can be created through agricultural extension agents, village meetings, social gatherings and through mass media such as radio and television, as this will enhance their access to microcredit and subsequently improve their food security status.

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Table 1: USDA module of food security classification

Food security status	Household with children (18 questions)	Code
Highly food secure	Between 0 and 2 positive responses	1
Marginally food secure	Between 3 and 7 positive responses	2
Low food secure	Between 8 and 12 positive responses	3
Very low food secure	Between 13 and 18 positive responses	4

Source: United States Department of Agriculture (USDA), 2016

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Table 2: Socio-economic characteristics of catfish farming households

Characteristics	Frequency	Percentage (%)
Age		
≤ 30	18	15.0
31-40	78	65.0
41-50	22	18.3
51 and above	2	1.7
Sex		
Male	76	63.3
Female	44	36.7
Marital status		
Single	11	9.2
Married	101	84.2
Widow/widower	2	1.7
Separated	6	5.0
Level of education		
Primary	4	8.2
Secondary	6	5.0
Tertiary	110	91.8
Household size		
1 – 4	53	44.2
5 – 8	65	54.2
9 and above	2	1.6
Farming experience (years)		
1- 2	112	93.3
3 and above	8	6.7
Access to extension services		
Yes	51	42.5
No	69	57.5
Involvement in fish farming		
Full time	45	37.5
Part time	75	62.5
Household monthly income in naira		
< 50,000	14	11.7
50,000 – 100,000	76	63.3
> 100,000	30	25.0
Membership of cooperative society		
Yes	77	64.2
No	43	35.8
Cooperative loan status		
Beneficiary	63	52.5
Non-beneficiary	57	47.5

Source: Computed from field survey

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Table 3: Distribution of catfish farming households according to the food security status

Food security status	Frequency	Percentage
Highly food secure	46	38.3
Marginally food secure	26	21.7
Low food secure	16	13.3
Very low food secure	32	26.7
Total	120	100.0
Food secure households	72	60.0
Food insecure households	48	40.0

Source: Computed from field survey

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Table 4: Determinants of food security status among catfish farming households

Variables	Estimated ß values	Standard error	z-value	p>|z|
Age	0.0156	0.0532	0.29	0.769
Sex	-0.2200	0.6868	0.32	0.749
Marital status	0.5478	0.9751	0.56	0.574
Educational qualification	0.6191**	0.2666	2.32	0.020
Household size	0.7535***	0.2591	2.91	0.004
Fish farming involvement	-0.1359	0.8215	0.17	0.869
Farming experience	0.3079***	0.1061	2.90	0.004
Monthly income	9.25e-06***	3.16e-06	2.93	0.003
Membership cooperative society	1.8631*	1.0285	1.81	0.070
Loan beneficiary	2.7564***	0.7041	3.91	0.000
Access to extension services	1.3013*	0.6795	1.91	0.055
Constant	-7.027	2.5708	2.73	0.006
Log-likelihood function	-36.6299			
χ^2 of Likelihood Ratio test (df = 11)	88.26			
Pro>chi^2	0.000			
Number of observations	120			
Pseudo R^2	0.5464			

Source: Computed from field survey

***, **, implies that the coefficients are statistically significant at p<0.05

REFERENCES

1. **Onuoha FC and GE Ezirim** Climate change and national security: Exploring the conceptual and empirical connections in Nigeria. *Journal of Sustainable Development in Africa.* 2010; **12(4):**255-269.

2. **Perez-Escamilla R and A Segall-Correa** Food insecurity measurement and indicators. *Revista de Nutricao.* 2008; **21:**15-26.

3. **Food and Agriculture Organization.** Voices of the Hungry. http://www.fao.org/economic 542 pp. FAO 2015 *Accessed on 21st December 2015.*

4. **Babatunde RO, Omotesho OA, Olorunsanya EO and GM Owotoki** Determinants of vulnerability to food insecurity: A gender-based analysis of farming households in Nigeria*. Indian Journal of Agricultural Economics*. 2008; **63(1):**1–10.

5. **Ibok OW** Analysis of food security and productivity of urban food crop farmers in Cross River State. Unpublished master's thesis, 2012; University of Calabar, Nigeria.

6. **Orewa SI and CO Iyangbe** The struggle against hunger: the victims and the food security strategies adopted in adverse conditions. *World Journal of Agricultural Sciences.* 2010; **6(6):**740-745.

7. **Akerele D, Momoh S, Aromolaran AB, Oguntona CRB and AM Shittu** Food insecurity and coping strategies in South-West Nigeria. *Food Security.* 2013; **5:**407–414.

8. Olawale S Nigeria poverty statistics and poverty rate in Nigeria. 2018; *Retrieved Aug 2020* from: https://naijaquest.com/nigeria-poverty-statistics/

9. **Babatunde RO, Omotosho OA and OS Sholotan** Factors influencing food security status of rural farming households in North Central Nigeria. *Agricultural Journal.* 2007; **2(3):**351–357.

10. **Adeniyi OR and OA Ojo** Food security status of rural farming households in Iwo, Ayedire and Ayedaade Local Government Areas of Osun State, South-western Nigeria. *African Journal of Food, Agriculture and Nutrition Development.* 2013; **13(5):**8209–8223.

11. **Oluyole KA and O Taiwo** Socio-economic variables and food security status of cocoa farming households in Ondo State, Nigeria. *Asian Journal of Agricultural Extension, Economics and Sociology.* 2016; **9(1):**1–7.

12. **Odemenem IU and CPO Obinne** Assessing the factors influencing the utilization of improved cereal crop production technologies by small-scale farmers in Nigeria. **Indian Journal of Science and Technology.** 2010; **3(1):**180–183.

13. **Ndifon HM, Agube EI and GN Odok** Sustainability of agricultural cooperative societies in Nigeria: The case of South-South Zone, Nigeria. *Mediterranean Journal of Social Sciences.* 2012; **3(2):**19–25.

14. **Chikaire JU, Ani AO, Atoma CN and AR Tijani** Extension services for effective agricultural risk management in Orlu agricultural zone of Imo State, Nigeria. *Scholars Journal of Agriculture and Veterinary Sciences.* 2015; **2(1A):**1–8.

15. **Ijaiya GT and A Abdulraheem** Commercial banks credits to the agricultural sector and poverty reduction in Nigeria: A calibration analysis. *Nigerian Journal of Agribusiness and Rural Development.* 2000; **1(1):**143–157.

16. **Ugbajah M and C Ugwumba** Analysis of micro credit as a veritable tool for poverty reduction among rural farmers in Anambra State, Nigeria. *Disciplinary Journal of Agriculture and Food Science.* 2013; **1(10):**152–159.

17. **Shiferaw B, Kassie M, Jaleta M and C Yirga** Adoption of improved wheat varieties and impacts on household food security in Ethiopia. *Food Policy.* 2014; **44:**272–284, https://doi.org/10.1016/j.foodpol.2013.09.012

18. **Zeng D, Alwang J, Norton GW, Shiferaw B, Jaleta M and C Yirga** Export impacts of improved maize varieties on poverty in rural Ethiopia. *Agricultural Economics*. 2015; **46(4):**515–526.

19. **Tefera DA, Bijman J and MA Slingerland** Agricultural co-operatives in Ethiopia: evolution, functions and impact. *Journal of International Development.* 2016; *29(4):*431–453. https://doi.org/10.1002/jid.3240

20. **Lecoutere E** The impact of agricultural co-operatives on womens' empowerment: Evidence from Uganda. *Journal of Cooperative Organization and Management*. 2017; **5(1):**14–27.

21. **Francesconi GN and R Ruben** The hidden impact of cooperative membership on quality management: A case study from the dairy belt of Addis Ababa. *Journal of Entrepreneurial and Organizational Diversity.* 2012; **1(1):**85–103.

22. **Abebaw D and MG Haile** The impact of cooperatives on agricultural technology adoption: empirical evidence from Ethiopia. *Food Policy.* 2013; **38:**82–91. https://doi.org/10.1016/j.foodpol.2012.10.003

23. **Abate GT, Francesconi GN and K Getnet** Impact of agricultural cooperatives on Smallholders' technical efficiency: empirical evidence from Ethiopia. *Annals of Public and Cooperative Economics.* 2014; **85(2):**257–286. https://doi.org/10.1111/apce.12035

24. **Verhofstadt E and M Maertens** Can agricultural cooperatives reduce poverty? Heterogeneous impact of cooperative membership on farmers' welfare in Rwanda. *Applied7u 8i9o0p-[=Economics and Perspective Policy.* 2015; **37:**86–106.

25. **Carter MR, Cheng L and A Sarris** Where and how index insurance can boost the adoption of improved agricultural technologies. *Journal of Development Economics.* 2016; **118:**57-71.

26. **National Population Commission of Nigeria.** https://www.citypopulation.delphplnigeria-admin.php?admlid=NGA028 NPC, 2016. *Accessed on 23rd August 2022.*

27. **Obayelu AE** Comparative analysis of households' socioeconomic and demographic characteristics and food security status in urban and rural areas of Kwara and Kogi States of North-Central Nigeria. *African Journal of Food, Agriculture and Nutrition Development.* 2012; **12(3):**6027-6054.

28. **Bickel G, Nord M, Price C, Hamilton WL and JT Cook** Guide to measuring household food security, 2000. Revised. *USDA, Food and Nutrition Service.* https://naldc.nal.usda.gov/download/38369/PDF *Accessed on 16th February 2010.*

29. **Maitra C and DSP Rao** Poverty-food security nexus: evidence from a survey of urban slum dwellers in Kolkata. *World Development.* 2015; **72:**308-325.

30. **Onuabugu GC and C Nnadozie** Socio-economic factors affecting broiler brooding in Obowo Local Govt. Area of Imo State. Proceedings of the 39th Annual Conference of the Agricultural Society of Nigeria, Benin City, 2005; 132 – 135.

31. **Erie GO** Gender differentials in productive efficiency in food crop farmers in Edo State, Nigeria. PhD Thesis, 2008, Ambrose Alli University, Ekpoma. 139pp.

32. **Estruk O and M Oren** Impact of household socio-economic factors on food security: Case of Adana, Turkey. *Pakistan Journal of Nutrition.* 2014; **13(1):**1–6.

33. **Nwaru JC** "Rural credit market and resource use in arable crop production in Imo State of Nigeria". PhD Dissertation, Micheal Okpara University of Agriculture, Umudike, Nigeria. 2004.

34. **Ayantoye K, Yusuf SA, Omonona BT and JO Amao** Food insecurity dynamics and its correlates among rural households in South-western Nigeria. *International Journal of Agricultural Economics and Rural Development.* 2011; **4(1):**43-55.

35. **Tasie CM, Wonodi JO, Wariboko ON and I Ajuru** The effect of microcredit delivery on rural crop farmers in Rivers State, Nigeria. *Journal of Vocational Education and Technology.* 2012; **9(2):**85-96.

36. **Aidoo R, Mensah J and T Tuffor** Determinants of household food security in the Sekyere-afram plains district of Ghana. 1st Annual International Interdisciplinary Conference AIIC 2013 Azores, Portugal.

37. **United States Department of Agriculture.** Survey tools. United States Department of Agriculture- Economic Research Service. USDA, 2016. http://www.ers.usda.gov/topics/food nutrition-assistance/food-security-in-the-us/survey-tools.aspx *Accessed on 17th October 2022.*

38. **Oke FO, Kiyesi CI and D Akerele** Socioeconomic correlates of catfish production status in Ido Local Government Area of Oyo State, Nigeria. *Agricultura Tropica et Subtropica.* 2021; **54(OV):**184-191.