Asian Journal of Agricultural Extension, Economics & Sociology
3(6): 619-629, 2014; Article no. AJAEES.2014.6.013

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Living Condition, Livelihood and Crop Diversification among Rural Farm Households in Remo Division of Ogun State Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author AOI designed the study, performed the statistical analysis, wrote the protocol. Author OIA wrote the first draft of the manuscript. Authors AOI and OIA managed the analyses of the study. Authors ASO and author OIA managed the literature searches and did the proofreading. All authors read and approved the final manuscript.

Original Research Article

Received 22nd December 2013
Accepted 12th April 2014
Published 2nd July 2014

ABSTRACT

This study empirically assesses the livelihood and crop diversification of rural farm households in Remo Division of Ogun State Nigeria. The study drew a sample of 120 rural farm households through a multi-stage sampling technique and the primary data obtained were analyzed using the descriptive statistical measures, Simpson Index, and Tobit regression model. Results indicated that an average farm household head was 43.9 years old and had 3.6 years of schooling. In term of living conditions, averagely, roads in the communities were tarred but in poor state with households sourced drinking water from borehole. Most farming communities had no access to health services but had primary school as the main educational institution. Ninety six per cent of the farm households diversified their cropping activities with 43.3 percent diversified into three or more crops. The Tobit results revealed that there were marginal increases in crop diversification with increase in household size, farm size and educational level but crop

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diversification decreases as farmers grow older in age and farming experience. Implications were drawn for provision of functional social amenities and encouragement of farmers to join/form cooperative societies for easy access to loans that promotes crop diversification.

Keywords: Social amenities; economic activities; rural people; crop diversification; simpson index.

1. INTRODUCTION

Evidence from literature confirmed that rural people in Africa and Asia diversified their economic activities to encompass a range of productive areas that include farm and non-farm income generating activities. Motivations for this diversification are multifarious, linked with wide range of possible activities, and associated with both positive and negative outcomes [1,2].

In agriculture, the concept of diversification can be viewed from either the micro/macro level or sector/sub-sector. At the farm or micro level, diversification could either be from the traditional subsistence or commercialization agricultural system. Diversification from the traditional subsistence is a coping mechanism for risk aversion to act as an insurance against adverse climatic conditions and biotic and abiotic stresses. This implies that diversification at this level of agricultural system involves growing more staples. With commercialization of agriculture, diversification is a strategy to generate additional income through the use of available resources in diverse and complimentary activities. Thus, diversification at commercial level of agriculture is a move away from traditional crops to high value crops that are more market oriented, leading to progressive substitution out of non-traded inputs in favour of purchased inputs [3]. Diversification at the macro level is a move away from agriculture to secondary and tertiary sectors (industry and service sectors) owing to change in consumers expenditure due to sustained economic growth and rise in per capita incomes. This is reflected in the contribution of different sectors to national income and absorption of labour force. All these can occur within each sub-sector (crops, livestock forestry etc.) and across sub-sectors.

Moreover, diversification in agriculture could be classified into the following three categories [4-6]: Shift of resources from farm to non-farm activities; shift of resources within agriculture from less profitable crop or enterprise to more profitable crop or enterprise and use of resources in diverse but complimentary activities. Crop diversification strategy belongs to the second category and it involves shifting from less profitable to more profitable crops, changing of variety, cropping system, increasing exports and competitiveness in both domestic and international markets, protecting the environment, and making conditions favourable for combining Agriculture-Fishery-Forestry-Livestock [7,8,3]. Indeed, this is a silent revolution within crop production sector. The motives behind this silent revolution are livelihood sustainability through raising the income levels, urbanization expansion, infrastructural development and trade liberalization policies.

Indeed, different forms of diversification in agriculture which include crop diversification are sub-set of livelihood diversification. Livelihood diversification is not necessarily synonymous with income diversification but an attempts by individuals and households to find new ways to raise incomes and reduce environmental risk, which differ sharply by the degree of

freedom of choice (to diversify or not), and the reversibility of the outcome [9-12]. This includes both on- and off-farm activities which are undertaken to generate income additional to that from the main household agricultural activities, via the production of other agricultural and non-agricultural goods and services, the sale of waged labour, or self-employment in small firms, and other strategies undertaken to spread risk. Included in this is what termed 'activity or environment diversification' in agriculture or more radical migratory strategies [9-11]. Similarly, households may wish to diversify as a strategy for coping with an unexpected shock, or to minimize risk ex-ante by participating in activities that generate imperfectly correlated returns.

Summarily, the objective of diversification may vary depending on the level of agricultural development; overall, it is a strategy for poverty alleviation, employment generation, environmental conservation, and augmentation of farm income through better use of available resources [13,4]. Based on the above, it will be interesting to know the nature and determinants of crop diversification in rural Nigeria, especially in the south-western part where the tropical climate allows varieties of crops to be grown.

2. METHODOLOGY

2.1 The Study Area

This study was carried out in Remo division of Ogun State. Ogun state was created in 1976 with Abeokuta being the State capital. The state is predominantly agrarian and comprises of four divisions with twenty Local Government Areas (LGAs). The four divisions in Ogun state include Ijebu, Egba, Yewa and Remo divided on the basis of their socio-cultural and historical peculiarities. The Remo division however consists of LGAs namely Ikene, Sagamu and Remo North local government areas. The land size of Remo division is approximately 97,298 hectares [14] which is effectively used for farming. The climatic pattern is humid tropical region characterized by the relatively high annual temperature, high precipitation, high evaporation, low pressure and high relative humidity. The inhabitants are mainly Yoruba, speaking various dialet of Remo. Remo is noted for production of kola nut, large scale production of rubber, about 25% of the total area is of forest reserve suitable for livestock. The study area is good for maize, plantain, beans, cassava, sugarcane, other food crops, and endowed with human and mineral resources.

2.2 Sampling Procedure

Multi-stage sampling technique was used to select 120 farm household heads used for the study. The first stage involved the purposive selection of three (3) local government areas based on the population of food crop farmers in the study area. The second stage involved random selection of four (4) farm communities from each of the three local government areas selected in stage one. The third stage involved the selection of ten (10) farm household heads from each of the 12 farm communities selected in stage two.

2.3 Analytical Technique

The data collected for this study were analysed using both descriptive and quantitative techniques.

2.3.1Simpson index

Following [15- 17,7], Simpton index was used to determine the pattern of crop diversification among farm households.

$$I = 1 - \sum_{i=1}^{n} A_i^2 \quad (1)$$

Where:

$$A_i = \frac{X_i}{\sum X_i} \quad (2)$$

Where:

Xi = Planted area of ith crop, i= 1,2,3…6
Ai = Proportionate planted area of the i th crop in the total planted.

When

I Shows a value of zero, it means that the farmer is least diversified while a value of one indicates the most (highly) diversified.

The crops planted by farmers in the study areas include maize, yam, cassava, vegetables, pineapple and melon. Most farmers cultivated at least two of these crops (diversified) while those that did not diversify cultivated only one crop.

2.3.2 Tobit regression model

The Tobit model was considered the most appropriate because some farmers that highly diversified in specified period may not diversify during the period covered by the survey because of the prevailing crop price, pressure from farm work, health and many other possible factors. Also, conventional regression methods fail to take into account the qualitative difference between zero and continuous observation. Therefore, Tobit model assumes that all zeros are attributable to standard corner solutions. As such, zero observations are accounted for and the censored regression provides a more accurate estimation.

The Tobit model for the analysis of the determinants of crop diversification takes the following specifications:

$$I_i^* = \beta L_i + \mu_i \qquad \mu_i \sim N(0, \sigma^2) \quad (3)$$

$$I_i = I_i^* \text{ if } I_i^* > 0$$

Where $L_{i,}$ is the explanatory variable, μ_i is the standard cumulative normal with mean zero and variance σ^2. Where I_i = Crop Diversification (Simpson index values, representing the

crop diversification index, where $0 \leq I \leq 1$; as provided in crop diversification result. According to [19], the dependent variable in this kind of model is subject to both the lower bound D_L and upper bound D_U. In the case of both lower and upper bounds, the model can be characterized as

$$I^* = \beta_1 + \beta_2 L_i + u_i$$

$$I = I^* \quad \text{for } I^* > I_L,$$

$$I = I_L \quad \text{for } I^* \leq I_L$$

The model is known as a censored regression model because I^* is unobserved for $I^* < I_L$ or $I^* > I_U$. It is effectively a hybrid between a standard regression model and a binary choice model, and OLS would yield inconsistent estimates if used to fit this model.
The explanatory variables used include:

L_1 = Age of the household head (years)
L_2= Household size (number of person)
L_3= Gender (Male = 1, Female =0)
L_4= Farm experience (years)
L_5= Farm size (hectare)
L_6= Dependency ratio (number of non-working members/ total household size)
L_7= Membership of cooperative (member=1, otherwise=0)
L_8= Average distance between land parcel (Km)
L_9= Access to credit (Yes =1, No=0)
L_{10}= Nearest to market (Km)
L_{11}= Education (years)
L_{12}= Availability of good road (Yes=1, No=0)

The μ_i is the model errors which are assumed to be independent N $(0, \delta^2)$ distributed, conditional on X_i's.

3. RESULTS AND DISCUSSION

3.1 Personal Characteristics of Farm Household Heads

The description of farm household heads' personal characteristics is presented in Table 1. A large proportion (35%) of the farm household heads is aged between 31 and 40 years. The mean age of the household heads in the sample was 43.9 years. This implies that most of the farmers are still in their active ages and thus expected to be productive for available resources. This against the common reports [18, 8] that there are aging rural farm population in Nigeria and that availability of off-farm livelihood options might be necessary to retain youths within the rural farm sector. Also, majority (71.7%) of the households are headed by males. This agreed with the tradition in the western part of Nigeria where males are expected to be the head of the family. In addition, majority of the household heads are married with an average household size of seven members. Spouse and children are important household family labour in traditional farming system. In terms of education, the mean education year of the household heads was 3.6 years with majority (43.3%) of the sampled household heads having no formal education. This finding conforms to the results of previous authors who had observed that most rural farm households had no formal

education, and this has implication on their farm activities. This may limit their ability to take full advantage of extension services, thus affecting their income generation and poverty.

In addition, 65.8 percent of the farm household heads were Christians as against 34.2 percent who were Muslims. Religion has been observed to have influence on farm decision of farmers. For instance, some religions support pig rearing where others do not. However, there is no discrimination on crop farming in most African countries. Farming was the primary occupation of most (92.5%) household heads with average farming experience of 29.2 years. This supported the claim that Nigeria is an agrarian nation as agriculture was once the main stay of the economy.

Table 1. Distribution of sampled farm household heads by personal characteristics

Variables	Frequency	Percentage	Mean
Age of the Household Head			
≤30	21	17.5	
31-40	42	35.0	
41-50	17	14.2	43.9 years
51-60	20	16.7	
>60	20	16.7	
Sex of household head			
Male	86	71.7	
Female	34	28.3	
Marital status			
Single	7	5.8	
Married	104	86.7	
Divorced	1	.8	
Widowed	8	6.7	
Educational level			
Primary school	39	32.5	
Secondary school	23	19.2	
Tertiary education	4	3.3	3.6 years
No formal education	52	43.3	
Religion of Household			
Christianity	79	65.8	
Islam	41	34.2	
Occupation			
Civil service	4	3.3	
Farm	111	92.5	
Trading	3	2.5	
Artisanship	2	1.7	
Farm experience			
1-10	6	5	
11-20	13	10.8	
21-30	24	20	29.2 years
≥30	77	64.2	
Household size			
1 – 4	34	28.3	
5 – 8	53	44.2	
9 – 12	26	21.7	6.5
≥ 12	7	5.8	persons
Total	**120**	**100.0**	

Source: Computed from survey data, 2011

3.2 Living Conditions and Access to Social Amenities among Farm Households

This section describes the socio-economic characteristic of the farm household base on their living condition. The major determinants of household welfare are access to basic social amenities and living conditions. Thus, this study examined these key indicators among the sampled rural farm households. The results are summarised on (Table 2). Table 2 showed that 72 per cent of the farming communities had their road tarred but still in poor state. This has implications on the cost of transporting their usually bulky farm produce to the market, with the tendency to reduce net farm income and increase poverty situation. It is important to note that over 90 per cent % of the rural farm households live in communities that are linked to the national electricity grid. This also have implications on the level of value addition that is possible in the rural farm sector, given that most agro-processing activities requires stable electricity supply. However, while 82.5 % used borehole as source of drinking water, 85 % and 85.8 % of the communities have no access to postal service and public land telecommunication system, respectively. The only available telecommunication service was the mobile private telecommunication system. It is believed that telecommunication can influence the level of crop diversification among farmers as it aids information on market prices of commodities, extension service (e.g information on how to grow certain crops and best combination of crops) to farmers and recently fertilizer disbursement to farmers in Nigeria. The table further revealed that sixty-eight per cent of the communities have no access to health services, while sixty-one per cent of the communities had nursery and primary schools. All these have long term effect on the living condition of the rural farm households.

3.3 Pattern of Rural Farm Households Crop Diversification

One of the objectives of this study is to analyse the livelihood and crop diversification pattern among rural farm households in the study area. The results are summarised on (Table 3). The results showed that majority (52.5%) of the respondents moderately diversified, 43.3% highly diversified while 4.2% did not diversify. It should be noted that diversification, in the context of this study, means cultivating more profitable crops in addition to the existing crops. Those that are highly diversified cultivate at least three crops, those that moderately diversified cultivated at least two crops, while those that did not diversify cultivate only one crop among the six crops studied. Most crop farmers did not depend on one crop because of risk associated with market price fluctuation, drought, excessive rainfall, fire, climate change, etc. This strategy is adopted to ensure secured livelihood. In all, 95.8 per cent of the farm households diversified their cropping activities.

3.4 Determinants of Crop Diversification

Table 4 shows the results of the Tobit analysis of the determinants of crop diversification among the farm households with the sigma value and log likelihood function showed that the model is of good fit reasonably at $p<0.01$. The results on Table 4 revealed that age, household size, farm experience, farm size, membership of cooperative societies and education were the main albeit significant factors that determine crop diversification among farming households in Ogun state, south-western part of Nigeria. Farm households' crop diversification level significantly increased with household size, farm size, membership of cooperative societies and education; thus, confirming that households' crop diversification was driven by larger household size, farm size, higher level of education and farmers'

participation in social group. An increase in the farm family member, farm hectarage, educational level of farmer, and being a member of cooperative society increase the crop diversification level of the household by 0.62, 0.11, 0.58 and 0.99, respectively. This implies that farmers involved in crop diversification for the following reasons; to ensure secured livelihood for the teeming household members with readily available family labour; presence and availability of farm land; awareness of the economic potentials of such practice; and easy access to loans.

Table 2. Distribution of rural farm households by access to social amenities and living conditions

Variables	Frequency	Percentage
Access road		
Tarred and in poor state	86	71.7
Un-tarred but motorable	21	17.5
Tarred but in good state	13	10.8
Electricity		
Linked to national grid	108	90.0
Not linked to national grid	12	10.0
Water source		
Pipe-borne	15	12.5
Bore-hole	99	82.5
Stream	6	5.0
Postal service		
Post office	18	15.0
None	102	85.0
Land phone		
Nitel analogue	15	12.5
Nitel digital	2	1.7
None	103	85.8
Available GSM		
Mtn	4	3.3
Mtn&Glo	8	6.7
Glo&Airtel	4	3.3
Mtn, Glo&Airtel	104	86.7
Health services		
Not available	82	68.3
Private hospital	10	8.3
Govt health centre	24	20.0
Maternity centre	4	3.3
Schools		
None	17	14.2
Nursery/primary	73	60.8
Tertiary	4	3.3
Nursery/primary and secondary	26	21.7

Source: Computed from survey data, 2011

Table 3. Pattern of rural farm households crop diversification

Degree of crop diversification	Frequency	Percent
Not diversified	5	4.2
Moderately diversified	63	52.5
Highly diversified	52	43.3
Total	**120**	**100.0**

Source: Computed from survey data, 2011

Also, the response of the farmers' age and farming experience to the level of crop diversification were significantly negative; thus, signifying that farm households' crop diversification decreases as the farmers get older in age and farming experience by 0.0684 and 0.574, respectively. Experience is a function of age. Thus, in many cases the aged farmers are more experience in farming but less diversify because of old age. The marginal effects for significant variables showed that the crop diversification has decreasing effects of 0.07 and 0.53 as the farm household head grow older in age and farming experience, respectively. Also, there were marginal increases in crop diversification by 0.24, 0.42, and 0.23, with an additional increase in the household size, farm size and farmer's educational level, respectively.

Table 4. Estimated Tobit regression results on determinants of crop diversification

Variable	Coefficient	Marginal effect	T-value
Constant	-1.723*	-0.676	-1.72
Age	-0.0684*	-0.068	-1.75
Household size	0.620**	0.243	1.96
Gender	-0.287	-0.112	-0.089
Farm experience	-0.574*	-0.525	-1.83
Farm size	0.107*	0.421	1.66
Dependency ratio	-0.106	-0.419	-0.23
Membership of cooperative	0.987***	0.780	4.30
Average distance between land parcel	0.346	0.136	0.66
Access to credit	0.273	0.107	0.47
Nearest to market	-0.646	-0.253	-0.21
Education	0.584***	0.229	2.68
Availability of good road	0.371	0.145	0.94
Sigma	0.1552***		
Log likelihood function	- 82.576		

****, ** and * denotes that the associated coefficient is significant at 1%, 5% and 10% level, respectively*
Source: Computed from survey data, 2011

4. CONCLUSION AND RECOMMENDATIONS

The findings of the study revealed that most farm households are still in their active age. Thus they are expected to be productive for available resources. However, it was observed that majority of the farmers had no formal education. In term of living condition and social amenities, most roads in the communities are tarred but in poor state. Most households sourced water from borehole. In addition, most households enjoyed private telecommunication system to guarantee communication and other market information. Most farming communities had no access to health services but had primary school as the main educational institution. Moreover, large percentage of the farm households diversified their livelihood and economic activities. The Tobit results revealed that there were marginal increases in crop diversification with increase in household size, farm size and educational level but decrease with age and farming experience. The policy implications and recommendations from this study include provision of adequate and functioning social amenities in the rural areas to keep farmers in their communities, particularly by improving the road network, telecommunication network, and provision of health centres. Government and farmers should provide enabling environment for the formation of cooperative societies and encourage farmers to join the existing cooperative societies, as this will aid crop diversification and market access.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Adams WM, Mortimore MJ. Agricultural Intensification and Flexibility in the Nigerian Sahel. Mimeo, Department of Geography, University of Cambridge, UK; 1997.
2. Dercon S, Krishnan P. Income Portfolios in Rural Ethiopia and Tanzania: Choices and Constraints. Journal of Development Studies. 1996;32(6):850-875.
3. Pingali PL, Rosegrant MW. Agricultural Commercialization and Diversification: Processes and Policies. Food Policy. 1995;20(3):171-186.
4. Ryan JG, Spencer DC. Future Challenges and Opportunities for Agricultural R & D in the Semi-arid Tropics. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-arid Tropics. Mimeo; 2001.
5. Delgado CL, Siamwalla A. Rural Economy and Farm Income Diversification in Developing Countries. In Food Security, Diversification and Resource Management: Refocusing the Role of Agriculture. Peters, G.H. and Joachim Von Braun (eds). Proceedings of Twenty-Third International Conference of Agricultural Economists, Ashgate Publishing Company, Brookfield, Vermont, USA; 1999.
6. Delgado CL, Siamwalla A. Rural Economy and Farm Income Diversification in Developing Countries. MSSD Discussion Paper No. 20, International Food Policy Research Institute, Washington DC; 1997.
7. De UK, Chattopadhyay M. Crop Diversification by Poor Peasants and Role of Infrastructure: Evidence from West Bengal. Journal of Development and Agricultural Economics. 2010;2(10):340-350.
8. Okali D, Okpara E Olawoye J. The Case of Aba and its Region, South Eastern Nigeria. Working Paper Series on Rural–Urban Interactions and Livelihood Strategies. Human Settlements Programme, IIED; 2001.
9. Stark O, Levhari D. On Migration and Risk in Less Developed Countries. Economic Development Cultural Change. 1982;31(1):191-196.
10. Barret CB. Non-farm Income Diversification and Household Livelihood Strategies in The Rural Africa: Concept, Dynamics And Policy Implications. Food Policy. 2000;26(4):315-331.
11. Ellis F. The Determinants of Rural Livelihood Diversification in Developing Countries. Journal of Agricultural Economics. 2000;51(2):289-302.
12. Barghouti S, Kene S, Sorby K. Poverty and Agricultural Diversification in Developing Countries. The World Bank Mimeo. Washington DC, USA; 2003.
13. Satyasai KJS, Viswanathan KU. Diversification of Indian Agriculture and Food Security. Indian Journal of Agricultural Economics.1996;51(4):54-67.
14. NPC. National Population Census, Nigeria Census Figure; 2006.
15. Roonnaphai N. Enhancing Sustainable Development of Diverse Agriculture in Thailand. Economic and Social Commission for Asia and the Pacific (CAPSA) Working. 2005;1-75:90.
16. Bhattacharyya R. Crop Diversification: A Search for an Alternative Income of the Farmers in the State of West Bengal in India. Conference Paper for International Conference on Applied Economics (ICOAE). 2008;83-94.

17. Ibrahim H, Rahman SA, Envulus EE, Oyewole SO. Income and Crop Diversification among Farming Households in a Rural Area of North Central Nigeria. Journal of Tropical Agriculture, Food, Environment and Extension. 2009;8(1):84-89.
18. Department for International Development, DFID. Rural Urban Development: Case Study- Nigeria: Oxford Policy Management. 2004;22.
19. Dougherty C. Introduction to Econometrics. 3rd Edition. Oxford University Press, London; 2007.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history.php?iid=566&id=25&aid=5159