Farm Typology and Farming Households Livelihood: A Case Study of Osun State, Nigeria

Grace Oluwabukunmi Akinsola[a], Muhammad Adeiza Bello[a]*, Opeyemi Eyitayo Ayinde[a] and Rofiat Ayoola Abdulqaudir[a]

[a]University of Ilorin, Dept. of Agricultural Economics and Farm Management, Nigeria

Abstract

Agriculture remains the primary source of livelihood for majority of households in developing countries. However, there exists a diversity of farming systems among farming households, arising from variation in household characteristics and resource endowments. This heterogeneity in farming systems interplays with the livelihood of these households. Therefore, understanding the farming systems practiced by different farming households can provide a valuable framework for designing development policies and interventions. Hence, the study examined the relationship between the farm typologies and livelihood of farming households in Osun State, Nigeria. The study used the data collected from 120 farming households selected through a three-stage sampling procedure to create three (3) farm types using the Principal Component Analysis and Cluster Analysis. Descriptive statistics was used to describe the characteristics of the households selected for the study. The study also adopted the sustainable rural livelihood index to determine the livelihood status of the farming households and Pearson's correlation analysis to determine the relationship between the identified farm types and the livelihood of the farming households. Findings from the study revealed that majority of the households are smallholders with less than 2 hectares of farmland holding. The cluster analysis result revealed that majority (66.7%) of the farming households practice rainfed farming system characterized by crop-livestock subsystems with major production of food crops and poultry, while others practiced irrigated farming system dominated by food crop production and production of perennial crops (cash crops) with rearing of small ruminants. Majority (68.3%) of the farming households average in livelihood status. Factors determining the farm typologies include age, total land holding, portion of land cultivated, herd size, area of land under irrigation, commercialization index, and income source. Hence, the study provided a basis for designing multilevel interventions aimed at improving the livelihood of smallholder farming households in the study area.

Introduction

Agriculture sector in developing nations is very essential for generating employment and stimulating economic development (Omorogiuwa et al. 2014; Bello et al. 2022). The rural economy of most African nations depends heavily on the smallholder farm sector to drive inclusive growth and development (Kanu et al. 2014). Interestingly, this farm sector is characterized by poor farmers whose livelihood is hinged on their farming system. Assessing the farming system dynamics practiced by the rural farmers can help to provide valuable insight for addressing their prevailing poverty situation and improving their livelihood. Hence, this study is focused on examining the relationship between the farm typologies and the livelihood of farming households in Osun State, Nigeria.

Material and Methods

The study was conducted in Osun State located in the southwestern region of Nigeria. Primary data collected by interviewing 120 farming households using a structured questionnaire was used for the study. The interviewed households were selected using a three-stage sampling procedure. The first stage involved the random selection of three Local Governments Areas (LGAs) in the state. Four villages were randomly selected from each LGA in the second stage while in the third stage, ten farming households were selected at random from each village to make a total of 120 farming households used for the study. Descriptive Statistics, Principal Component Analysis (PCA), Cluster Analysis, Sustainable Rural Livelihood index, and Pearson's correlation analysis were used for the study. Descriptive was used to characterize the socioeconomics of farming households, the PCA and CA were used to classify the farms into groups or types, the Sustainable Rural Livelihood index was adopted to determine the livelihood status of the farming households, and the Pearson's correlation was used to establish the relationship between the farm types and the livelihood status of the farming households.

Results and Discussion

Descriptive statistics

The result of the socioeconomic characteristics of the households revealed that the majority of the households are male-headed with a mean age of 45 years. The household heads have an average farming experience of 18 years, while 36.7% and 24.2% of them had secondary and tertiary education respectively as the highest level of education attained. Furthermore, an average household in the study area has 6 members.

Principal Component Analysis (PCA)

A total of 15 variables were utilized in the PCA and six components with eigenvalues greater than one were extracted and used as input for the cluster analysis. The six components from the PCA result collectively explain 68.09% of the variation of the original data set. The first principal component (PC1) accounts for 17.82% of the variation in the dataset. It is significantly and positively correlated to the total land holding of the farmers, herd size, poultry ratio, small ruminant ratio, and commercialization index, indicating that the households are involved in the commercial production of livestock. PC2 explains 13.71% of the variation in the dataset and the result suggest that household with older farmers are more likely to have a larger household size. It further explains the dependence of the households on the commercial production of livestock as source of livelihood (income). PC3 explains 11.32% of the variation in the dataset. This component indicates the dependence of these farmers on crop production as source of income and the advantage of households with more members to leverage on family labor to carryout farming activities. It further explains the land use decision of the households for the production of perennial crops and food crops. The implication of this is that this category of farming households produces more or less of perennial crops and less or more of primary food crops respectively. PC4 accounts for 9.32% of the variation in the data set. This component indicates the physical and financial resource of the farmer. PC5 and the sixth PC6 explain 8.22% and 7.7% of the variation the data set respectively. While PC5 is positively correlated with the portion of cultivated land, area of land under irrigation, and share of hired labor, PC6 is positively correlated with the total land holding, portion of cultivated land, share of hired labor and other assets. PC6 shows the physical capital and the human resource available to the households.

Table 1. Principal Components, Eigenvalues, and Cumulative Explained Variance

Variables	Correlation between variables and Principal Components					
	PC1	PC2	PC3	PC4	PC5	PC6
Age	0.2650	**0.4864**	0.0140	− 0.1643	0.2706	− 0.0266
Household Size	− 0.2397	**0.4008**	**0.3127**	0.1306	0.0103	− 0.2291
Total land holding	**0.3447**	− 0.1514	0.1348	0.2340	0.2604	**0.3428**
Portion of land cultivated	0.1656	0.1501	**0.3114**	0.1999	**0.5320**	**0.3550**
Area under perennial crops	0.2738	− 0.1959	**0.4852**	0.1495	− 0.1658	0.1317
Area under food crops	0.1143	0.2427	**− 0.6509**	0.0168	0.2386	0.1147
Herd size	**0.4092**	**0.3652**	− 0.0685	− 0.0675	− 0.2408	− 0.0796
Poultry ratio	**0.4033**	0.2742	− 0.0430	− 0.0250	0.1869	− 0.0544
Small ruminant ratio	**0.3420**	0.1842	− 0.0125	0.1029	0.2712	− 0.0562
Commercialization index	**0.4038**	**0.3092**	− 0.2136	− 0.2606	− 0.0799	− 0.1523

Area of land under irrigation	0.2575	– 0.0612	0.2584	**0.5264**	**0.4212**	– 0.1340
Share of hired labor	– 0.1687	0.0234	0.1889	0.2199	**0.4878**	**0.4471**
Income source	– 0.2084	**0.3671**	**0.4748**	**0.6829**	0.0897	0.1656
Expenditure on agro-inputs	– 0.1906	0.2638	0.5632	– 0.0165	– 0.2410	0.2392
Other assets	0.0577	0.1497	0.1055	**0.5053**	– 0.0849	**0.5224**
Eigenvalues	2.42	1.87	1.53	1.32	1.12	1.01
Cumulative explained variance	17.82	31.53	42.85	52.17	60.39	68.09

Source: Authors' estimation

Note: *The bold values represent loading greater than 0.28 and denote variables that significantly correlate with the respective Principal Component.*

Cluster Analysis (CA)

The hierarchical and the k-means clustering technique were used for this analysis and three clusters were obtained. A cluster dendrogram generated from the hierarchical clustering grouped the farmers into three different clusters based on the structural and functional characteristics of their farms such as land, crop, and livestock resources as well as their livelihood activities (Figure 1). The components loading (Figure 2) also supports the three-cluster output.
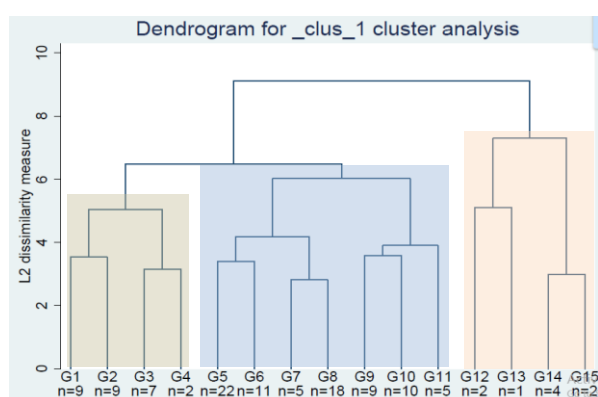

Fig. 1. Cluster dendrogram for three farm types (n = 116)
Note: L2 dissimilarity measure is an indicator of the dissimilarity between clusters
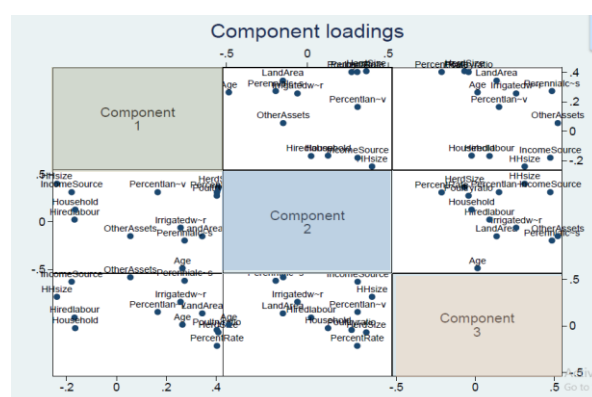

Fig. 2. Component loading for cluster analysis

The three clusters account for 96.7% of the sampled farmers in the study area. Cluster 1 accounts for 22.5% of the sampled households. This cluster consists of households with mainly older farmers with an average age of 50 years characterized by having the least total farmland holding (0.8 ha) and the largest proportion of farmland under cultivation (80%). These households cultivate primary food crops and perennial crops (cash crops) on 71% and 29% of the cultivated land respectively, with only 24% of the cultivated land under irrigation. The households also have the least Herd size (TLU) of 0.9 with poultry ratio of 84.3% and small ruminant ratio of 15.7% of the total livestock unit. The households have a commercialization index of 60%. Based on this characterization, this cluster can be described as *an irrigated farming system dominated by crop production practiced by households with elderly, market-oriented farmers producing majorly food crops.*

Cluster 2 is the largest cluster accounting for 66.7% of the sampled households. This cluster consists of households with mainly younger farmers with an average age of 43 years characterized by having the second largest total farmland holding (1.1 ha) and 60% of total farmland under cultivation. These farming households cultivate primary food crops and perennial crops (cash crops) on 90% and 10% of the cultivated land respectively, with 8.4% of the cultivated land under irrigation. The households have the largest herd size (4.3) with poultry ratio of 93% and small ruminant ratio of 7%. The households also have a commercialization index of 80%. Based on this characterization, this cluster can be described as *rainfed farming system characterized by crop-livestock subsystems with major production of food crops and poultry by households with young, market-oriented farmers.*

Cluster 3 is the smallest cluster accounting for 7.5% of the sampled households. The cluster consist of households with mainly elderly farmers with average age of 62 years characterized by having the largest total farmland holding (1.4 ha) and the least proportion of total farmland under cultivation (55%). These households cultivate primary food crops and perennial crops (cash crops) on 37% and 63% of the cultivated land respectively, with the lowest proportion (5.3%) of cultivated land under irrigation. The households

have the second largest herd size (3.7) with a poultry ratio of 48% and small ruminant ratio of 52%. The farming households also have a commercialization index of 57%. Based on this characterization, this cluster can be described as *a rainfed farming system characterized by mixed crop-livestock subsystems, with major production of perennial crops (cash crops) and small ruminants by households with elderly, market-oriented farmers.*

Livelihood Status of the Farmers
Findings revealed that revealed the mean livelihood status of the farming households was 65.0% which implies that majority of the households have average livelihood status. About 16.7% of the farmers have low livelihood status, 68.3% of the farmers have average livelihood status, while 15% of the farmers have high livelihood status. Furthermore, the livelihood status of the farming households based on their livelihood capital. The households have low level of financial capital (40.0%), average level of human capital (68.7%), social capital (69.3%), and physical capital (70.4%) as well as high level of natural capital (76.7%).

Relationship between the Livelihood Status of the farming households and their Farm Types
The correlation result revealed that age has a significant and positive relationship with the livelihood status of the farming households. This implies that as the age of household head increases, their livelihood status is also likely to increase. Total land holding, portion of land cultivated, and herd size are positively correlated with the livelihood status of the households. This is indicative that the higher the land holding, portion of land cultivated, and herd size owned by the farming households, the higher their livelihood status. The commercialization index of the households is positively correlated with the livelihood status of the households. This indicates that the higher the degree of market orientation of farming households towards farm produce, the higher their livelihood status. The result further revealed that income source is positively correlated with the livelihood status of households. This is an indication that households with diversified income sources i.e., on-farm and off-farm, are more likely to have improved livelihood status.

Conclusions and Outlook
The study revealed that the majority of the households have moderate livelihood status and rely on rainfed-subsistence agriculture. The resource endowments of the farming households, commercialization index of the households, and income source significantly and positively contributed to their livelihood status. The findings of this study provide a profound basis for designing policy interventions by policymakers for improving the livelihood of rural farming households. However, farming households are encouraged to diversify their livelihood by engaging in meaningful income-yielding off-farm employment.

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