CONTRIBUTION OF AGROFORESTRY PRACTICES TO RURAL HOUSEHOLD FOOD SECURITY STATUS IN CHIKUN LOCAL GOVERNMENT AREA OF KADUNA STATE

[1] Olagunju, O.E., [1*]Ariyo, O. C., [2]Olagunju, O.S. [3]Alabi O.F.
[1]Department of Entrepreneurship and Innovative Agriculture, [2]Department of Agricultural Technology, [3]Department of Agricultural Extension and Management, Federal College of Forestry Mechanization, P.M.B. 2273, Afaka, Kaduna, Kaduna State, Nigeria
***Corresponding Author**: ask4ariyo@yahoo.com 08033931981

Abstract
Agroforestry is crucial to economic growth, its practice is a powerful tool that can be used to end extreme poverty and enhance food security of the household. The study assessed the roles of agroforestry practices to rural household food security status in Chikun Local Government Area (CLGA) of Kaduna State. Fifty percent of the twelve (12) wards in Chikun LGA were randomly selected. One village was randomly selected from each ward to give a total of six villages. Twenty rural households were randomly selected from each village to give a total of one hundred and twenty (120) respondents. Data were collected using structured questionnaire and analyzed using descriptive statistics. Chi-square was used to test the hypotheses. The study revealed that the mean age of the respondents was 34.0 years. Majority (71.1%) of the respondents were married, most of the respondents (68.3%) were Christians. Chi-square analysis revealed that age (χ^2 = 25.473 p = .001), religion (χ^2 = 17.722, p =.002), household size (χ^2 = 28.923, p = .004) and source of land (χ^2 = 73.216, p = .000) had significant relationship with household food security status. The agroforestry practices were aquaculture, alley farming and apiculture respectively. Bad road network, insecurity issues and lack of technical know-how were the constraints to agroforestry practices. This study recommends that there should be good road network to rural communities to improve the movement of forestry produces and adequate security should be provided to protect the lives and properties of the people.

Keywords: *Contribution, Agroforestry practices, Rural household, Food security, Kaduna*

Introduction

Agroforestry can be defined as a system of land use where trees are deliberately planted into the same land management unit along with annual agricultural crops and/or animals synchronously with the aim of getting diverse outputs on a sustained basis (Kang, 2011; Huxley and Ranasingher, 2016). It is also described as the combination of trees with annual crop cultivation, livestock production and other farm activities. It is a series of land management approaches practiced by many people in the world and provide a wide variety of products and services that are important locally, nationally and globally. However, much attention has not been paid to their roles and acknowledged adequately in development policies and practices by which they affect the society at large (Sileshi *et al*., 2010). Agroforestry practices, also promote the diversification of production system and interaction of resource conservation, improvement and sustainability, which contribute a lot more to the livelihood of the agrarian community as it assigns a pivotal role in efforts to ensure household food security (Alexandratos, 2015).

Household food security is simply described as the availability of food within the household and everyone's access to it; a household is considered food secure when its occupants do not live in hunger or fear of starvation., household food security exists when all people within the household at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (Joseph, 2014; FAO, 2016). Lack of access to food remains a major concern for numerous rural households in Nigeria who rely on agriculture as their main source of livelihood (Kebebew *et al*., 2013; FAO, 2016). Rural household food security status depends on their food production and efforts to produce enough food are hindered by various factors such as; unpredictable rainfall, a major issue among others and high population density that puts a lot of pressure on land as more of it is required for settlement, leading to land fragmentation, hence, negative effect on food production and resulting in food insecurity (Musotsi *et al*., 2018). Agroforestry practices increases food productions and enhanced better life for the people. It is therefore important to investigate the roles it plays in household food security (Brusal, 2015). The objectives of the study are (i) describe the socio-economic characteristics of rural households in CLGA of Kaduna state (ii) identify types of agroforestry practices by rural households (iii)describe the household food security status and identify constraints of agroforestry practices by rural households CLGA of Kaduna state.

Hypotheses

H_{01}: There is no significant relationship between socioeconomic characteristics and household food security status.
H_{02}: There is no significant relationship between agroforestry practices and household food security status.
H_{03}: There is no significant relationship between constraints to agroforestry practices and household food security status.

Materials and methods

The research was conducted in Chikun Local Government Area (CLGA) of Kaduna State. It covers an area of about 445,659 km and the geographical coordinates are 10º 16' 0" North, 7º6' 0" East. CLGA is situated in Northern Guinea Savanna Zone. It shares boundaries with Igabi and Kaduna South LGA to the North and with Kajuru to the East, Birnin Gwari and Giwa LGA to the West and Kachia LGA to the South. The ethnic groups comprise Gbagyi predominantly, Hausa, Kataf, Igbo, Fulani and Yoruba. The main occupation is farming; crops cultivated include rice, yam, maize, guinea corn, millet and cassava, while animals such as goats, sheep and cows are reared. A multistage sampling technique was employed. The first stage involved purposive sampling of six (6) rural wards which include; Nasarawa, Maraban Rido, Danbushiya, Sabon Gayan, Kujama, and Kudandan out of the twelve (12) wards in the study area. In the second stage, twenty (20) households that were into agroforestry practices were purposively selected because of the focus of the study. This gave total of one hundred and twenty (120) respondents. Primary data were collected using well-structured questionnaires. Personal interview were conducted for farmers who can neither read nor write. Simple descriptive statistics was used to achieve the objectives of the study, while Chi-square was used to test the hypotheses. The Household Food Insecurity Access Scale (HFIAS) (FANTA Scale) of the United States Agency for International Development (USAID) (2007) was used to categorize households. The HFAIS Score was calculated for each household by summing the codes for each frequency of occurring item. The maximum score for a household is 27 while the minimum is 0. The higher the score, the more food insecurity (access) the household experienced while the lower the score, the less food insecurity (access) a household experiences.

Results and discussion

Socio-economic characteristics of respondents

The highest (39.2%) of the respondents are within the age of 21-30 years (Table 1), this implied that the majority of the respondents were in their youthful age and very energetic to carry out agroforestry practices so that, they can provide adequate food and nutrition for their households. This agreed with the report of Ogunjobi *et al*., (2008) which stated that people within this age group are agile and strong to carry out farming operations; hence their involvement in agroforestry practice can serve as employment opportunities and generate means of livelihood for rural households. Table 1 also showed that some (45.0%) of the respondents had household size of 6-10, it was observed that large household size is necessary in order to satisfy labour requirement on the farm. On the other hand, a large household size will increase household consumption expenditure which will compete with the money the farmer would use for other production purposes (Azeez, 2012). Table1 further revealed that most (35.8%) of the respondents purchase the land they use for agroforestry practices for their household, some (29.2%) of the respondents inherited their land, some others (19.2%) go for rent, about (11.7%) of the respondents obtained their land through gift while very few 4.2% were leasehold respectively.

Table 1: Distribution of respondents based on socio- economic characteristics

Variable	Frequency (N=120)	Percentage
Age		
> 20	5	4.2
21-30	47	39.2
31-40	29	24.2
41-50	24	20.0
50 and above	51	12.5
Household size		
1 – 5	24	20.0
6 – 10	54	45.0
11 – 15	23	19.2
16 – 20	10	8.3
20 and above	9	7.5
Monthly income		
₦10, 000 and below	34	28.3
₦11, 000 - ₦20, 000	25	20.8
₦21, 000 - ₦30,000	34	28.3
₦31,000 - ₦40, 000	9	7.5
₦41, 000 and ₦50,000	5	4.2
₦50,000 and above	13	10.8
Source of land		
Purchased	33	35.8
Rented	23	19.2
Inherited	35	29.2
Leasehold	5	4.2

Gift	14	8.3

Source: Field survey, 2021

Distribution of the respondents based on types of agroforestry practices

Table 2 showed the types of agroforestry practices that rural households were involved. The majority (96.7%) of the respondents practices the aquaculture system of agroforestry practices, which involved planting trees around fish ponds in other to provide fodder and herbivorous fish. The majority (95.8%) of the respondents were practicing Taungya system of agroforestry, this implies that nowadays rural household embraces food crops and inter-planted with the trees in the same piece of land, which causes an increase in food supply to their households, and most (92.5%) of the respondents were practicing alley farming and apiculture respectively. This result agreed with Shilabu, (2018) that aquaculture system of agroforestry increases rural household income and also provides food and shelter which serve as food security to the household.

Table 2: Distribution of respondents based on their agroforestry practices

Agroforestry practices	Frequency	Percentage %
Taungya	115	95.8
Aquaculture	116	96.7
Apiculture	111	92.5
Alley farming	115	95.8

Source: Field survey 2021

Distribution of respondents based on food insecurity status

There are several factors that may be responsible for household food insecurity. However, inability to access adequate food due to insufficient funds is one of the major factors. Table 3a showed that some (64.2%) of the respondents worry about food and (55.8%) of the respondents were hindered from eating the kind of foods they wanted due to lack of resources. Few of the respondents (49.2%) eat few foods due to the lack of resources to eat enough foods. The implication of this is that rural household experiences a shortage of food (food insecurity) because of the lack of resource to them. Table 3b showed that the majority (75.80%) of the respondents were mildly food insecure, they emphasized that they were unable to eat preferred food or take a more monotonous diet than they desired. Only a few (9.12%) of the respondents were food secure and there were no cases of severely food insecure households. Agroforestry practices contribute to the quantity and quality of rural household diet through the provision of a variety of food items, income, medicine and employment.

Table 3a: Distribution of the respondents based on their food security status

Household food security	Yes	No	Rarely	Sometime	Often	Remark
1. In the past four week did you worry that your household will not have enough food to eat?	70(64.2)	43(35.8)				
How often did this happen?			86 (71.7)	24(20.0)	10 (8.3)	
2. In the past four weeks did you or any household member not able to eat the food you prefer because of lack of resources?			49(40.8)	71(59.2)		
How often did this happen?			54 (45.0)	48(40.0)	18 (15.0)	
3. In the past four week did you or any household member have to eat a limited variety of food due to lack of money to purchase food?	67 (55.8)	53(44.2)				
How often did this happen?			63 (52.5)	38(31.7)	19 (15.8)	
4. In the past four weeks did you or any household member have to eat food that you really did not want?	62(51.7)	48(3)				
How often did this happen?			48 (40.0)	38(31.7)	34(28.3)	
5. In the past four weeks did you or any household member have to eat fewer meals in a week because there was not enough food?	59(49.2)	61(50.8)				
How often did this happen?			40 (33.3)	48(40.0)	32 (26.7)	

Household food security	Yes	No	Rarely	Sometime	Often	Remark
6. In past four weeks was there ever no food to eat of any kind in your household because of lack of resources to get food?	87(72.5)	33(27.5)				
How often did this happen?			63(52.5)	38(31.7)	19(15.8)	
7. In the past four weeks did you or any household member not able to eat the food you prefer because of lack of resources?	70(64.2)	43(35.8)				
How often did this happen?			86(71.7)	24(20.0)	10(8.3)	
8. In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of lack of resource to obtain other types of food?			49(40.8)	71(59.2)		
How often did this happen?			54(45.0)	48(40.0)	18(15.0)	
9. In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	67 (55.8)	53(44.2)				
How often did his happen?			63(52.5)	38(31.7)	19(15.8)	

Table 3b: Distribution of the respondents based on the household food security status

Food security status	Frequency	Percentage (%)
Food secure	10	9.12
Mildly food insecure	91	75.80
Severely food insecure	19	15.08
Total	120	100

Source: Field survey, 2021

Distribution of respondents based on constraints to agroforestry practices

Table 4 showed the constraints faced by rural households in agroforestry practices. The majority (95.8% and 95.8%) of the respondents faced problems of unpredictable rainfall and high cost of land for tree planting, most (88.3%) of the respondents had inadequate seeds, the seed is limited in their rural households to plant and used of agroforestry trees species to be incorporated with crops, some (75.8%) faced problems of the high cost of labour, while others (66.7% and 59.3%) of the respondents had challenges of technical know-how and insecurity to contend with. This implied that unpredictable rainfall and high cost of land for tree planting are the major constraints facing the agroforestry system by rural households in the study area.

Table 4: Distribution of respondents based on constraints to agroforestry practices

Constraints	Frequency	Percentage %
Unpredictable rainfall	115	95.8
High cost of land	115	95.8
Inadequate seeds	106	86.3
High cost of labour	91	75.8
Technical know-how	80	66.7
Insecurity/kidnapping issues	71	59.2

Source: Field survey, 2021

Test of Hypotheses

Chi-square analysis on Table 5 revealed that age (χ^2 = 25.473, p = .001), education (χ^2 = 18.937, p =.015), religion (χ^2 = 17.722, p =.002), household size (χ^2 = 28.923, p= .004), other income generating activities (χ^2 = 18.101, p =. 001), monthly income (χ^2 = 55.517, p= .003) membership in organization (χ^2 = 43.120, p= .000), source of labour (χ^2 = 12.213, p =. 016), source of capital (χ^2 = 31.216, p =. 002), and source of land (χ^2 = 73.216, p= .000) were significant to household food security status. The null hypothesis which states that there is no significant relationship between the selected socio-economic characteristics and agroforestry practices is hereby rejected. The implication of this is that age plays a significant role in agroforestry practices, at a

young age they are very strong and energetic. Religion also improved and allow rural households to participate in agroforestry practices, farmers who belong to religious groups obtained seeds, fertilizer and also income to rural households. Size of households also contributes and boost level of agroforestry production among rural households, larger households' size supports their farming household regularly than smaller households. Land is a major factor to agroforestry farmers, land successfully contribute to about 90% agroforestry practice where most of the rural household farm using simple and local farm toots, land play a vital role in assisting household food security status.

Table: 5 Chi-square analyses on the socio-economic characteristics and agroforestry practices

Variable	χ^2	df	p-value	Remark
Age	25.473	8	0.000	S
Religion	17.722	2	0.002	S
Household size	28.923	8	0.000	S
Source of land	73.216	8	0.000	S

Source: Field survey, 2021

Chi-square analysis between agroforestry practices and household food security status

Table 6 showed that, significant relationship exists between agroforestry practices -alley cropping (χ^2 = 27.735, p = .000), alley farming (χ^2=11.771, p=.003) and household food security. This implied that rural households involved into alley farming and alley cropping as a means of their livelihood. Therefore, the null hypothesis which stated that there is no significant relationship between agroforestry practice and household food security status is hereby rejected.

Table 6: Chi-square analysis between agroforestry practices and household food security of the respondents

Agroforestry practices	χ^2	df	p.value	Remark
Taungya	1.663	2	0.435	NS
Aquaculture	1.319	2	0.517	NS
Apiculture	3.101	2	0.212	NS
Alley cropping	27.735	2	0.000	S
Alley farming	11.771	2	0.003	S

Source: Field survey, 2021

Chi-square analysis between constraints and household food security status

Table 7 showed a significant relationship between some identified constraints to agroforestry practices such as bad road network (χ^2 = 10.419, p = .005), technical know-how (χ^2 = 21.826, p= .000), farm mechanization (χ^2=10.751, p=.005), insecurity (χ^2 =6.341, p=.042) kidnapping (χ^2 = 7.231, p=.027) and household food security. This implied that rural household faced problems of bad road network which make it difficult for rural households to move their good and service from one place to another, this could also reduce the activities of agroforestry practice in the study area, technical know-how affect rural household, this is another major problems of agroforestry practice because they are not fully well trained and equipped with agroforestry practice and techniques that will harness massive production from their farms. Thus, the null hypothesis which stated that there is no significant relationship between constraints to agroforestry practice and household food security status is hereby rejected.

Table 7: Chi-square analysis of constraints to agroforestry practice and household food security

Constraints	χ^2	df	p.value	Remark
High cost of land	1.663	2	0.435	NS
Bad road network	10.419	2	0.005	S
Technical know-how	21.828	2	0.000	S
Farm mechanization	10.751	2	0.005	S
Insecurity	6.341	2	0.042	S
Kidnapping	7.231	2	0.027	S

Source: Field survey, 2021

Conclusion

The study concludes that age, religion, household size, and land were significant to household food security status. Alley cropping and alley farming were the two types of agroforestry practices engaged by the respondents which are significant to food security. Few of the respondents were food secured and no cases of severely food insecure household. Bad road network, insecurity and lack of technical know-how were the significant constraints to agroforestry practices.

Recommendations

Based on the findings of the study, the following recommendations were made;

i. The respondents should be encouraged to practice agroforestry, this will enhance the food security of the rural households

ii. There should be good road network to rural communities to improve the movement of forestry, agricultural inputs and produces from one location to another.

iii. Adequate security should also be provided to protect the lives and properties of the rural households in the study area.

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