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ASSESSMENT OF FARMERS' INVOLVEMENT IN AGROFORESTRY PRACTICES IN DUTSINMA LOCAL GOVERNMENT AREA OF KATSINA STATE, NIGERIA

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ABSTRACT

Various combinations of two or three elements of arable crops, woody perennials, animal husbandry, fish farming, beekeeping, and silkworm farming are included in agroforestry operations. The main factors influencing farmers' involvement in agroforestry techniques in Katsina State, Nigeria's Dutsinma Local Government Area were assessed in this study. The selection of responders was done using a multistage sampling technique. One hundred local farmers were chosen, and information was gathered from them using structured questionnaires. Descriptive statistical techniques such as the frequencies, percentages, Chi-square, and Likert scale rating using arithmetic mean were respectively used to analyse the data. Sokoto-rima (8) and Gidankyari (8) practiced all the observed predominant agroforestry practices followed by Shema (7), Gidan islamiya (7) and Isa-kiata (7). The farmers' participation level in the agroforestry practices presented had highest mean value of 1.90 as the maximum threshold level across the selected villages. There was no significant difference in the association between agrosilvopastoral systems and the demographic characteristics of the respondents. Farmers prefer to raise animals, plant trees, and grow arable crops. The conclusion reached was that the main obstacles to farmers' involvement in agroforestry methods are lack of knowledge and lack of funding. In order to increase farmers' involvement in agroforestry practices in the research region, it is advised that awareness of the advantages of agroforestry techniques be raised.

Keywords: Farmers, constraints, participation, agroforestry practices, components, awareness

INTRODUCTION

Various combinations of two or three elements of arable crops, woody perennials, animal husbandry, fish farming, beekeeping, and silkworm farming are included in agroforestry operations. Agroforestry techniques and services are essential to the livelihoods of about 1.2 billion people worldwide, particularly those living in rural households (Garrity, 2012). Improving a sustainable land use that might boost agricultural productivity and enhance the well-being of rural populations is the main goal of agroforestry (Oyebamiji *et al.,* 2013). A current definition by Leakey (2017), defined agroforestry as a dynamic, ecologically based, natural resource management system that involves the integration of trees in farm- and rangeland diversifies and sustains smallholder production for increased social, economic and environmental benefits. Nonetheless, this definition includes additional elements of agroforestry technology and emphasizes the necessity of reducing land degradation and deforestation in order to reduce poverty.

Trees as a key component of agroforestry systems are essentially important in daily lives, due to the numerous ecological and economic roles they play, they are essential to human existence (World Wildlife Foundation, 2016). In general, trees are known to offer a number of advantages, including ecological (reducing soil erosion, managing watersheds, providing windbreaks and shelterbelts, preventing desertification, and mitigating the effects of climate change), socioeconomic (generating revenue from the sale of fuel wood, timber, edible fruits, and other non-timber forest products), and cultural (historical, aesthetic, medicinal, and spiritual).Additionally, trees help to purify and improve the quality of the air; hence, cropland agroforestry has evolved substantially with sustainability, resilience, and diversity in mind (Chakraborty *et al.,* 2015). Agroforestry systems can employ a range of techniques, some of which have been used for thousands of years. These techniques include forest farming, which involves growing shade-tolerant crops within the boundaries of a managed forest, silvo-pastoral, which involves combining trees with pasture or livestock grazing areas, and alley cropping, which involves planting single rows of trees and growing crops in the alleyways between them (Turgut, 2019).

In addition to providing cash income, agroforestry also offers additional season and off-season employment, the sale of tree and non-tree products, investment opportunities such as orchards, tree products, agro-business, and a long-term supply of materials for the production of crafts, protection against soil erosion, increased nutrients for degraded soils, cheaper and more accessible fuel wood,

affordable building materials, protection for humans, animals, and crops from sunlight and wind, and fencing to protect crops from livestock and wild animals (Ajayi, 2015). Agroforestry and its practices offer a number of multipurpose services, but there are several obstacles that prevent farmers from participating to the fullest extent possible. Additionally, farmers' use of agroforestry practices is restricted due to a number of factors, such as limited access to information, limited use of machinery, poor credit availability, fast-growing trees, land tenure, marketing difficulties, insufficient capital, population growth, labor shortages, high rates of pests and diseases, low yield and theft, limited access to extension services, poor soil fertility, short growing season, and limited land access (Oyebamiji *et al.*, 2012; 2013; Ibrahim *et al.*, 2019). A few other issues that local farmers face that prevent them from engaging in agroforestry practices were also mentioned by Adedayo and Oluronke (2014). These issues include issues with the land tenure system, small land holdings, fire outbreaks, a lack of technical know-how, the inability to obtain tree seedlings, and trees that shade crops.

MATERIALS AND METHODS

The study Area

The study area is Katsina Dutsinma Local Government with Latitude of 12° 27' 14.11" N of equator and Longitude: 7° 29' 50.03" E and the coordinates of the study area was 12°27′18″ N 7°29′29″ E. The population of the state has been estimated to be 12,595 people. The Zobe Dam lies to the south of the town of Dutsinma. The LGA has an area of 527 square km and a population of 169,671 at the 2006 census. It was established in 1976 (Rabe, Nura, 2019). The inhabitants of the Local Government are predominantly Hausa and Fulani by tribe. Their main occupation is farming (irrigation, aquaculture, annual farming, etc.) and animal rearing. One hundred farmers were surveyed, using multi-stage sampling procedures with simple random sampling in 3 stages. The first stage was the selection of five wards from Dutsinma Local Government which were Dutsinma A, Dutsinma B, Shema, Dabawa and Kuki. Two villages were chosen at random from each of the five wards for the second stage. The third stage of sampling was the administration of ten (10) copies of questionnaire each to the two (2) selected villages from each ward to make a total of ten (10) villages. The respondents were given one hundred (100) copies of structured questionnaires, which were explained to them in a way that they could understand.

Descriptive statistics, such as frequencies and percentages, Chi-square Model were used to test for the nature of association between respondents' demographic variables (age, farm size, household size, educational status, and source of farmland acquisition) at the nominal level on the farmers' choice of agroforestry practices. A 5-point Likert scale rating using arithmetic mean was also used to collect data from the respondents, whereby for scoring, numbers from 1 to 5 were assigned to each option; 1 = strongly agreed, 2 = agreed, 3 = strongly disagreed, 4 = disagreed, and 5= undecided, and the threshold level was determined.

The Chi square (x^2) model

$$x^2 = \sum \frac{(Fo - Fe)^2}{Fe} \quad \ldots\ldots\ldots\ldots \quad (1)$$

Where:

(x^2)= Chi -square

Σ = Summation

Fo = Observed frequencies of demographic characteristics and

Fe = Expected frequencies of the demographic characteristics.

RESULTS

Demographic Characteristics of the Respondents

Age, sex, marital status, household size, education level, land acquisition, and farm size were among the demographic variables of the farm and farmers that were examined (Table 1). The majority of responders (31%) were between the ages of 31 and 40. Additionally, only 10% of the farmers were female, with 90% of them being men. The average household size (27%) was 6-9, and 79% of respondents were married. Among the farmers, 36% were educated in Qur'an. The size of the farms was always impacted by the fact that 56% of the farmers inherited their land. Two to three (2-3) hectares was the maximum farm size owned by farmers in the research areas. Due to their inability to purchase property suitable for growing agroforestry trees, most farmers relied heavily on inheriting their land. The amount of acreage they could afford for farming seasons was subsequently impacted, since family land is being fragmented, which will actually result in a smaller farm.

Table 1: Demographic characteristics of the respondents

Parameters	Frequency	Percentage	Mode
Age (years)			
20-30	30	30.0	
31-40	31	31.0	31-40
41-50	26	26.0	
>50	13	13.0	
Total		**100**	
Sex			
Male	90	90.0	Male
Female	10	10.0	
Total		**100**	
Marital status			
Married	79	79.0	Married
Single	17	17.0	
Divorce	2	2.0	
Widow/widower	2	2.0	
Total		**100**	
Household size			
2-6	22	22.0	
6-9	27	27.0	6-9
10-13	26	26.0	
14-17	15	15.0	
18-21	6	6.0	
>21	4	4.0	
Total		**100**	
Educational status			
No formal education	12	12.0	
Qur`anic education	36	36.0	
Adult education	4	4.0	Quranic education
Primary school education	13	13.0	
Secondary school education	15	15.0	
Tertiary school education	20	20.0	
Total		**100**	100
Farm size			
<0.5 ha	10	10.0	2 ha-3 ha and 3 ha above
0.5 ha-1 ha	15	15.0	
1-1.5 ha	23	23.0	
2 ha-3 ha	26	26.0	
3 ha and above	26	26.0	
Total		**100**	
Source of farmland acquisition			
Lease	3	3.0	
Inheritance	56	56.0	
Purchase	21	21.0	Inheritance
Rent	17	17.0	
Government land	3	3.0	
Total		**100**	

Common Agroforestry Practices used in the Study Area (N=100)

In the research area, the most popular and widespread agroforestry techniques were; improved fallows, scattered trees on cropland, plantation and crops, boundary marking, live fences, home garden, fuel wood and shelter belt which are found under each of the agroforestry systems in the study area. Sokoto-rima and Gidankyari practiced all the predominant agroforestry practices in the study area. Shema, Gidanislamiya and Isa-kiata respectively practised all except boundary marking and home garden. Katangaru, Hayingada and Gidanbedi were the least villages that practiced agroforestry practices from the most common and predominant agroforestry practices in the study area (Table 2).

Farmers` Level of Involvement in Agroforestry Practices in the Study Area

The level of respondent involvement was low and this was revealed by their arithmetic mean value of 1.90. The wards displayed weak participation in agroforestry practices. Arithmetic mean below the threshold level of 0.50 showed weak participation (Table 3).

Association between Demographic Characteristics of the Respondents in Agrosilvopastoral Systems

Agrosilvopastoral systems and respondent demographics did not significantly differ in their association, according to the chi-square test of independence. However, the demographic characteristics demonstrated a strong positive link, and the phi, which indicates the strength of the relationship, was low (Table 4).

Principal Constraints to Agroforestry Practices in the Study Area

The distinguished constraints that militate against the farmer practicing agroforestry were the unavailability of market (58%), lack of information concerning agroforestry practices (92%), unavailability of machineries and skills (70%), insufficient capital to carryout agroforestry practices (82%) and accessibility to land for farming purposes (51%) (Figure 1).

Table 2: Distribution of predominant agroforestry practices in the selected villages

Common AF practices/ Villages	Improved fallows	Scattered trees on cropland	Plantation and crops	Boundary marking	Live fences	Home gardens	Fuel wood	Shelter belt	Predominant practice(s) per villages
Darawa	*	*			*	*	*	*	6
Katangaru	*	*				*	*	*	5
Isa -kiata	*	*	*	*	*		*	*	7
Sokoto rima	*	*	*	*	*	*	*	*	8
Shema	*	*	*		*	*	*	*	7
Hayingada	*	*				*	*	*	5
Gidankyari	*	*	*	*	*	*	*	*	8
Gidanislamiya	*	*	*		*		*	*	6
Btashar	*	*	*			*	*	*	6
Gidanbedi	*	*				*	*	*	5
Total	10	10	6	3	6	8	10	10	63

AF: Agroforestry

Table 3: Distribution of farmers` level of involvement in the major agroforestry systems per village

Participation	Darawa	kantagaru	Isa kiata	Sokoto rima	Shema	Hayingada	Gidankayri	GindinIslamiya	Btashar	Gidanbedi	Mean value
Agrosilviculture (Trees and crops)	1.71	1.72	2.01	2.09	1.99	2.04	1.61	2.11	1.98	1.77	1.90
Silvopastoral (Trees and fodder)	1.71	1.72	2.01	2.09	1.99	2.04	1.61	2.11	1.98	1.77	1.90
Agrosilvopastoral (trees, crops and fodder)	1.71	1.72	2.01	2.09	1.99	2.04	1.61	2.11	1.98	1.77	1.90

Field Source: 2021

Table 4: Relationship between the demographic characteristics of the respondents and agrosilvopastoral systems

Demographic characteristics	x^2	df	p	Phi	Decision
Age	3.640	3	0.363	0.185	NS
Marital status	6.874	3	0.270	0.238	NS
Gender	2.882	1	0.199	0.155	NS
Household size	4.214	5	0.541	0.202	NS
Educational status	5.621	5	0.359	0.236	NS
Farm size	3.300	4	0.629	0.174	NS
Source of farmland acquisition	5.328	4	0.491	0.204	NS

x^2= Chi-square, df: degree of freedom, p: probability level at 5%, NS Not Significant

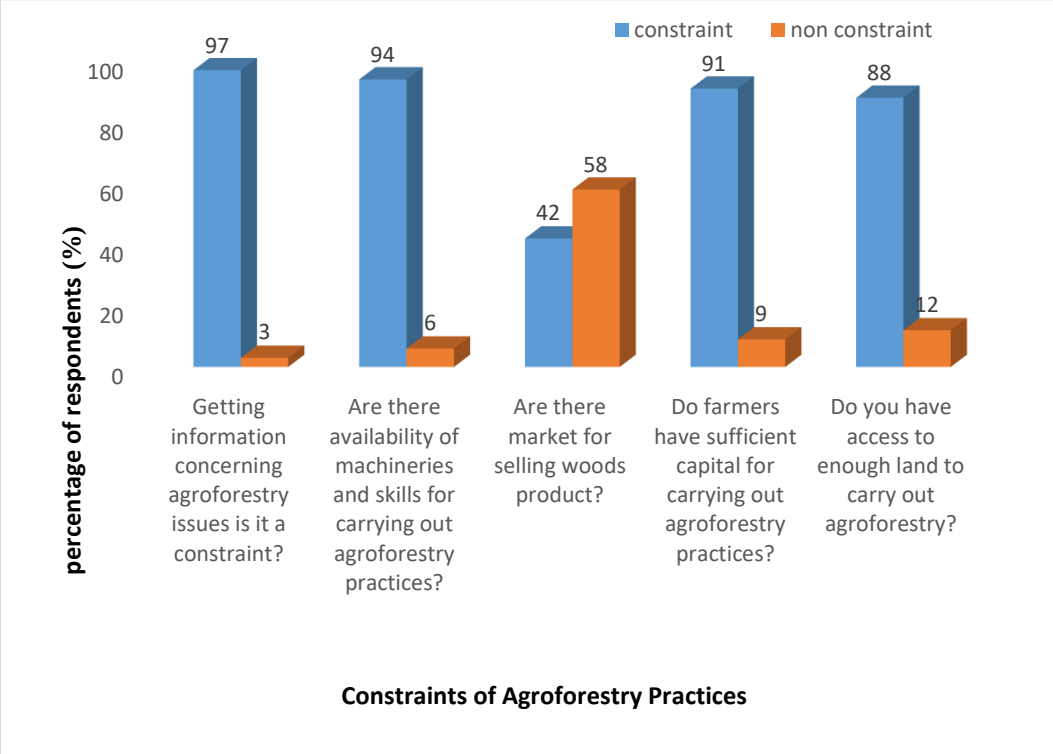

Figure 1: Distribution of farmers` constraints in agroforestry practices

DISCUSSION

In the study area, middle-aged farmers were the most engaged human resource in agroforestry activities, as evidenced by the fact that the majority (31%) of respondents were between the ages of 31 and 40. This age group was considered to be the most active and productive, which may have an impact on their propensity to engage in agroforestry practices, according to Oyebamiji (2014). An important indicator of production, age can have a favorable or negative impact on farmers' inputs and output. Oyebamiji *et al.* (2014) confirmed that these groups of people are the economically active population, which is also in agreement with this. The males made up the research area's workforce. In the study region, it was discovered that men dominated the production of crops, agroforestry trees, and a combination of crops and trees with the rearing of sheep and goats. In general, the farmers in the research area had large families. It is projected that men will dominate agroforestry techniques because farming requires a lot of energy, as noted by Akinwalere (2017).

Six to nine (6-9) family sizes made up the majority of households. According to Lawal-Adebowale and Oyegbami (2004), this is because farmers must

employ family members as farm laborers in order to save money on production costs associated with hiring farm labor. Due to their lack of appreciation for education and their inability to perceive any connection between formal education and farming, the farmers in the area had a Quranic education (Lawal-Adebowale, 2002). Any society's evolution is greatly influenced by education.

The respondents' average farm sizes ranged from two to three hectares (ha), with three (3) ha being the largest. This suggests that small landholdings have been a significant barrier to the intentional inclusion of trees in farming systems, as there will be competition between trees and crops for available land. This supports the conclusions of Adekunle and Bakare (2004) and Akinwalere (2017) that the majority of local farmers are small-scale producers with a few hectares of land. Inheritance is the mode of land ownership. Due to the high cost of land ownership, Amusa and Simonyan (2018) found that the majority of farmers inherited their farmland. The size of farmers' farms was always impacted by the land they acquired.

Scattered trees, shelter belts, alley crops, enhanced fallow, fuel wood production, wind breaks, and shelter belts were the most popular and common methods. In one of his research, Oyebamiji *et al.* (2012) also noted that the most prevalent agroforestry approaches in the study area are home gardens, shelter belts, improved fallows, and scattered trees. Ajayi (2015) asserts that the respondents stand to gain greatly by participating in agroforestry methods. Insufficient knowledge about the concept of agroforestry and a lack of funding to implement the techniques resulted in low levels of participation from the farmers. High levels of involvement begin with raising awareness, according to Mahmood and Sheikh (2005), and Lwoga (2010). There was little correlation between the demographic traits of the respondents and agrosilvopastoral systems. One of the key elements influencing farmers' degree of involvement in agroforestry system techniques is awareness.

CONCLUSION

Majority of farmers were middle-aged and such they are the most active and productive proponents. The farmers' household size encourage family members as farm laborers in order to save money on production costs associated with hiring farm labor. However, due to their lack of formal education their involvement in agroforestry practices is adversely affected. Generally, farmers owned their farm land through inheritance as a result of high cost of purchasing a piece of land. Hence, farmers' mode of land acquisition invariably affected their farm size. The predominant agroforestry practices were scattered trees, shelterbelt, alley cropping, improved fallows, fuel wood production, wind break, and shelter belts. The farmers' level of involvement in the agroforestry practices was low due to inadequate information about the idea of agroforestry and insufficient capital to engage in the practices. The association between agrosilvopastoral systems and the demographic characteristics of the respondents was low. Therefore, farmers' degree of participation in the research area will be influenced by their awareness of the advantages of agroforestry practices. However, in order to increase farmers' involvement in agroforestry practices in the research region, it is advised that awareness of the advantages of agroforestry techniques be raised.

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