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ADOPTION OF AGROFORESTRY PRACTICES IN WAMAKKO LOCAL GOVERNMENT AREA, SOKOTO STATE, NIGERIA

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ABSTRACT

The study assessed the adoption of agroforestry practices in Wamakko Local Government area of Sokoto State. Four districts were purposively selected for the study based on the dominance of agroforestry practices in those districts. Two villages were randomly selected from each of the selected districts. From each village, 30 farmers were conveniently selected given a total sample size of 240 respondents. Structured questionnaire was administered, retrieved and data sorted. Data were analysed using descriptive statistics. Results of the study indicated that, majority (70.8%) of the farmers were within the age bracket of 15 to 30 years and 78.3 percent were married and they had attended at least one form of formal education or the other. Furthermore, weighted mean score (wms=3.87) of the farmers stated that dispersed tree on cropland was highly practiced and adopted. To encourage agroforestry practice, incentives through the distribution of improved tree seedlings would assist greatly.

Keywords: Agroforestry; Adoption; Socio-economic characteristics

INTRODUCTION

During the past 30 years, agroforestry has progressed from being a traditional practice with great potential to the point where development experts agree that it provides an important science-based pathway for achieving important objectives in natural resource management and poverty alleviation (Mutua-mutuku, *et al.,* 2017). Despite its ubiquitous use by smallholder farm families, there is inadequate awareness about the potential of agroforestry to benefit millions of households trapped in poverty. We need a global 'agroforestry transformation' to mobilize science and resources to remove the socio-economic, ecological and political constraints to widespread application of agroforestry innovations. Building on three decades of work with smallholder farmers in Africa, Asia and Latin America, coupled with strategic alliances with advanced laboratories, national research institutions, universities and non-governmental organizations (NGOs) across the globe, the World Agroforestry Centre and its partners are poised to foster such an agroforestry transformation (Mutua-mutuku, *et al.,* 2017).

Trees play a crucial role in almost all terrestrial ecosystems. They provide a wide range of products and services to rural and urban people. As natural vegetation is cleared for

agriculture, trees are integrated into productive landscapes – this practice is known as agroforestry. Agroforestry is practiced by millions of farmers and has been a feature of agriculture for millennia (Mutua-mutuku, *et al.,* 2017). It encompasses a wide range of working trees that are grown on farms and in rural landscapes and includes the generation of science-based tree enterprise opportunities that can be important in the future. Among these are: fertilizer trees for land regeneration, soil health and food security; fruit trees for nutrition and income; fodder trees that improve smallholder livestock production; timber and fuel wood trees for shelter and energy; medicinal trees to combat disease, particularly where there is no pharmacy; and trees that produce gums, resins or latex products (Kuyah *et al*., 2016). Many of these trees have multiple uses, each providing a range of benefits. An estimated 1.2 billion rural people currently practice agroforestry on their farms and in their communities, and depend upon its products (Kuyah *et al.*, 2016). Their tree-based enterprises help ensure food and nutritional security, increase their income and assets, and help solve their land management problems. Agroforestry is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. In agroforestry systems there are both ecological and economical interactions between the different components (Schoeneberger, 2009). There are many types of agroforestry systems that are employed in a number of regions of the world and at different levels of complexity (Varah *et al.,* 2013). Silvi-pastoral systems are agricultural systems where trees are planted within a pasture field to provide feeds and shade as well as food and fuel for the farmer. Another type of agroforestry is the intercropping of crops within hedgerows of trees called agrosilvicultural system to provide windbreaks/shelterbelts for the crops and increase the soil stability of the region. Mixed-use forests are a type of agroforestry that allows for multiple crops to be produced in a small physical land area, increasing the temporal and structural diversity of the ecosystem, and the net benefits or negatives are largely based on the design of the system. The range of agroforestry systems possible can potentially allow for many different types of adaptation under a range of conditions (Schoeneberger, 2009). However, levels of co-benefits depend on the amount of diversity integrated into the system, as more diversity within the agroforestry system will lead to greater co-benefits.

According to Ali and Erensten (2017) adoption occurs when one has decided to make full use of the new technology as a best course of action for addressing a need. Adoption is determined by several factors including socio-economic variables such as individual needs, knowledge about the technology and individual perceptions about methods used to achieve those needs (Ali and Erensten, 2017).

MATERIALS AND METHODS

Study Area

The study was conducted in Wamakko Local Government Area of Sokoto State. Wamakko is 10 km west of Sokoto city. Sokoto state is located on 13°04′N 5°14′E / 13.067°N 5.233°E / 13.067; 5.233 13°04′N 5°14′E / 13.067°N as its co-ordinates (NGIA, 2016). It is bordered to the north by Tangaza Local Government, to the south by Bodinga and Yabo Local Government Areas, west by Silame Local Government, and to the

east by Sokoto and Kware Local Government Areas. It has an area of 697 km² and a population of 208,250 (NPCN, 2011). The major occupations of the people are farming, fishing and trading. The main ethnic groups are Hausa and Fulani, other Nigerian tribes also reside and live peacefully with the indigenes of Wamakko Local Government Area (SSMIYSC, 2013). The LGA was created in 199 1. The LGA has 10 Districts: Dundaye, Wamakko, Gumbi, Gumburawa, Gedawa, Kalambana, Wajeke, Arkilla, Gwiwa, and Gidan Bubu.

Sampling Procedures and Sample Size

Four (4) districts were purposively selected out of the 10 districts in Wamakko local government area, for the study based on the dominance of agroforestry practices in those districts. The districts selected are Dundaye, Gumburawa, Gidan Bubu and Wamakko. Two villages were randomly selected from each of the selected districts making eight (8) villages. From each village, 30 farmers were conveniently selected given a total sample size of 240 respondents.

Data Collection

Two hundred and forty (240) copies of structured questionnaire were administered, retrieved and sorted for analysis. Data collected were on the socio-economic characteristics of the respondents, usefulness of agroforestry practices and level of adoption of agroforestry in the study area. In addition, a Likert-scale was used in the questionnaire in which, the respondents were required to grade the scale based of their level of adoption of agroforestry practices, ranging from 1 very high, 2 high, 3 low and 4 very low. Weighted mean score (WMS) and mean ranking (MR) was also used to get the highest level of adoption.

Data Analysis

Data collected were analyzed using descriptive statistics (frequencies and percentages). Statistical Package for Social Sciences (SPSS) Version 20.0 was used for the analysis.

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Farmers

Results in Table 1 indicate that majority (70.8 %) of the farmers fell within the ages of 15 to 30 years. In addition to this, 29.2 % fell within the ages of 31 years and above in the study area. This implies that the majority of the agroforestry farmers were within the active age to provide labour force; younger farmers participated more than older ones in the farming activities. This is supported by Ali and Erensten (2017) who stated that younger farmers are more likely to adopt an innovation than older farmers because of strength, better education and more exposure to new ideas.

All of the farmers involved in agroforestry practice were men. Men who were mostly the household heads had more access to land and participated more in outdoor activities than

women. The predominance of men in agroforestry practice was due to the cultural and traditional practices which restricted women from farming activities. This finding agreed with Ango *et al.* (2011) who reported that majority of rural populace in the northern part of the country engages in farming, while the female folks partake only in rearing of children, domestic and other house chores and processing of agricultural produce.

Majority of the farmers (78.3%) were married while 21.7% of them were single. This could mean that the married individuals were more committed to their responsibilities and worked very hard to earn a living because of the responsibilities they shoulder. The finding is supported by Olarinde *et al.* (2008) who reported that one of the most important factors which determine technical efficiency of a business is the marital status of individual.

Some proportion (35.0%) of the farmers had family size of 1 to 5 persons, this implies that the small family size could be as a result of small income and poverty. Also, the labour was limited because of the small size of the family, this is in agreement with Adewale (2017) who stated that the plot of land which rural populace possess are mostly small in size because of the nature of inheritance in which the children share the land left behind when their parent die. On the other hand, 8.8% of the farmers had family size of between 16 persons and above. Other studies indicated that large family size is expected to enable farmers to take up labour intensive activities (Note and Ostermeier, 2017).

Table 1: Distribution of farmers according to their socio–economic characteristics

Variables	Frequency	Percentage (%)	Variables	Frequency	Percentage (%)
Age (years)			Level of Education		
15-20	49	20.4	Quranic	61	25.4
21-25	72	30.0	non formal	36	15.0
26-30	49	20.4	Primary	41	17.1
31- above	70	29.2	Secondary	32	13.4
Total	240	100.0	Adult	32	13.3
Gender			Tertiary	38	15.8
Male	240	100.0	Total	240	100.0
Marital status			Farming experience		
Single	52	21.7	1-5	75	31.3
Married	188	78.3	6-10	85	35.4
Total	240	100.0	11-15	38	15.8
Family size			16- above	42	17.5
1-5	84	35.0	Total	240	100.0
6-10	104	43.3	Farm size (ha)		
11-15	31	12.9	1-4	92	38.3
16- above	21	8.8	5-9	65	27.1
Total	240	100.0	10-14	52	21.7
			15- above	31	12.9
			Total	240	100.0

Source: Field survey, 2015

Most of the farmers have attained and obtained one form of formal education or the other and this would help farmers in adopting any technology introduced to them. This is in agreement with Vagnani and Volpe (2017) who reported that education influence the adoption of new innovations, ideas and techniques in business operations. It is also noteworthy that 36 farmers (15%) did not have formal education and as such it might be difficult for them to adopt modern technique, innovations or new ideas in farming activities.

Most of the farmers had many years of experience in Agroforestry practice, this implies that the more experienced a farmer is, the more efficient he is supposed to become and vice versa. This is in agreement with Onubuogu *et al.* (2013) who reported that farmers with more experience would be more efficient and have better knowledge on climatic conditions.

Majority (86.2%) of the farmers had land size between 1 and 9 hectares, 6.3 percent had land size that fall within 10 and 14 hectares, while 7.5% had land size that fell within 15 hectares and above. This implies that the majority of farmer had large plot for their agricultural activities. This disagrees with Adewale (2017) who stated that the plot of land which rural people possess is mostly small in size because it has to be shared among the heirs of deceased owners.

Usefulness of Agroforestry Practice

Majority of the farmers (wms =3.78) stated that agroforestry practice was highly useful in the provision of food and it was ranked first, this implies that most of the agroforestry practices are done purposely for products from trees such as fruits and seeds. Similar finding by Kuyah *et al*. (2016) reported that agroforestry trees have many uses in our environment ranging from provision of services such as purification of air, production of food, fruits, fuel, timber, gums and other products, they also ensure conservation of soil, while provision of timber was ranked the least (wms = 2.59). This could be due to the fact that in rural areas trees are usually cut down or harvested for fuel wood before the trees matured as such it makes it difficult for timber production, also because of lack of timber-based industries in the study areas.

Table 2: Distribution of farmers according to the usefulness of agroforestry practices

Variables	VH	H	L	VL	WMS	MR
Usefulness of agroforestry practices						
Provision of food (fruits vitamins)	204 (85.0)	34 (14.2)	2 (0.8)	0 (0.0)	3.84	1st
Increase in soil nutrients	91 (37.9)	118 (49.2)	30 (12.5)	1 (0.4)	3.25	4th
Provision of fuelwood	179 (74.6)	57 (23.8)	4 (1.7)	0 (0.0)	3.73	2nd
Provision of timber	49 (20.4)	69 (28.8)	95 (39.6)	27 (11.3)	2.59	7th
Protection against wind and storms	113 (47.1)	107 (44.6)	19 (7.9)	0 (0.0)	3.39	5th
Provision of income	156 (65.0)	76 (31.7)	6 (2.5)	2 (0.8)	3.61	3rd
Protection of soil from erosion	60 (25.0)	114 (47.5)	62 (25.8)	3 (1.3)	2.97	6th,

Source: Field survey, 2015; Likert scale-VH=very high, H= high, L= low, VL= very low, WMS= weighted mean Score and MR= mean rank

This finding goes contrary to the findings of Glover and Elsiddig (2012) who reported that agroforestry trees are grown in order to produce wood which is cut into lumber (sawn wood) for use in construction of buildings, bridges, track ways, poles for power lines, carts, farm implements and boats among others.

Level of Adoption of Agroforestry Practices

Majority of the farmers (wms =3.87) stated that dispersed tree on crop land was highly adopted and was ranked first in the ranking scale. This could be possible because trees are scattered in the crop land in most of the rural areas, similar finding by Chavan *et al*. (2016) reported that in most of the farms in rural areas, trees were scattered all over the farms which provide shade, fruits, fuelwood among others to the farmers; and 1.72 wms of farmers adopted planting on terraces, which ranked the least. This was because most of the study area is made up of flat topography and therefore planting on terraces was not necessary. Also, lack of inadequate information from extension workers to farmers may be responsible for poor adoption of agroforestry practices. Similarly, ineffective linkage between extension workers and farmers is responsible for low adoption of agroforestry technologies by farmers (Kandel *et al.*, 2016).

Table 3: Distribution of Farmers According to the Level of Adoption of Agroforestry Practices

Variables	VH	H	L	VL	WMS	MR
level of adoption						
Alley cropping	52 (21.7)	85 (35.4)	96 (40.0)	7 (2.9)	2.76	6th
Home garden	104 (43.3)	120 (50.4)	15 (6.3)	0 (0.0)	3.37	4th
Shelter belts	145 (60.4)	87 (36.3)	7 (2.9)	0 (0.0)	3.58	2nd
Living fence	141 (58.8)	82 (34.2)	15 (6.3)	2 (0.8)	3.51	3rd
Planting on terraces	10 (4.2)	15 (6.3)	116 (48.3)	96 (40.0)	1.74	7th
Dispersed tree on crop land	211 (87.9)	26 (10.8)	3 (1.3)	0 (0.0)	3.87	1st
Improved fallow	34 (14.2)	95 (39.6)	95 (39.6)	16 (6.7)	3.01	5th

Source: Field survey, 2015; Likert scale-VH=very high, H= high, L= low, VL= very low, WMS= weighted mean Score and MR= mean rank

CONCLUSION

Many of the farmers maintained trees in their farmland in form of agroforestry practices, and collect fuel wood, and fodder from these trees for their sustenance. This type of management system has contributed to the improvement of soil fertility in the study area. Agroforestry practice is strongly adopted in the study area.

Based on the findings, the study recommends several ways in which policy and regulatory practices can be improved to support farming communities in the practice of agroforestry. Many smallholder farmers do not have the knowledge and skills to manage agroforestry, therefore government should find a way of educating and training the farmers. Government should distribute improved tree seeds and seedlings suitable for agroforestry freely to every farmer who shows interest to go in to agroforestry practice. This will also encourage other farmers to adopt the practice.

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