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Knowledge and Attitude of Rural Women towards Agroforestry Practices in Kaduna State

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Authors' contributions

This work was carried out in collaboration among all authors. Authors OEO, BO and LG designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors OSO and MMO managed the analyses of the study. Authors SOO and LGT managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Agroforestry practices offer a solution to the problem posed by the high demand on land and stands as a means of halting the vicious circle of deforestation, soil erosion and degradation. This study assessed the knowledge and attitude of rural women towards agroforestry practices in Kaduna State. The objectives of the study were to describe the socio-economic characteristics of rural women, examine the sources of information on agroforestry, find out the level of knowledge of rural women on agroforestry practices and ascertain the attitude of rural women toward agroforestry practices. From the thirteen (13) districts in Chikun LGA, six districts were randomly selected. Twenty women were sampled from each district to give a total of one hundred and twenty (120) respondents. Descriptive and inferential statistics was used to analyze the data. Knowledge test and Mean score were used to determine the knowledge and attitude of rural women towards agroforestry practices. Inferential statistics were used to test the hypotheses. The mean age was

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30.23 years. Silvopastural, Taungya system and Tropical shelter wood system were the main types of agroforestry practices. Chi-square showed that there were significant relationships between some selected socio-economic characteristics such as age (χ^2=75.625, p = .001), membership of organization (χ^2 = 16.499, p = .003), educational status (χ^2= 11.704, p = .020) and agroforestry practices. Correlation analysis showed that there were significant relationships between knowledge (r = .652, p = .002), attitude (r = .264, p = .001) and agroforestry practices. In conclusion, rural women have low level of knowledge and unfavourable attitude towards agroforestry practices. This study recommends that agroforestry training should be conducted for the rural women in order to increase their knowledge level which will in turn lead to a favourable attitude towards agroforestry practices.

Keywords: Knowledge; attitude; agroforestry practices; rural women; Kaduna state.

1. INTRODUCTION

The increasing population pressure on natural resources due to increased demand for food and wood for different purposes has made it difficult for the life supporting system such as vegetation to keep pace with the demand by man [1]. Many parts of Africa have continued to experience decline in per capital farm income, land and soil degradation, aggravated by biodiversity, where climate is highly variable especially in the arid parts of Africa [2,3]. Land plays an important role in the livelihood activities [4]. Food security and poverty reduction cannot be achieved unless issues of soil fertility have been addressed through agroforestry practices which play a vital role in regaining the fertility of the soil [5]. Agroforestry science and its application in development by small holders throughout the tropics play important role through the combination of forestry, agriculture and pastoralism in achieving greater food security [6]. It is a very promising way of linking food production with improved forest management [7]. Agroforestry combines agriculture and forestry practices to create a more integrated, diverse, productive, profitable, healthy and sustainable land use system, this same unit satisfy the ecological needs as well as the socio economic needs of the rural women [8].

Agroforestry can be described as a dynamic ecologically based natural resource management system, that through integration of trees on farms and the agricultural landscape, diversification and sustained production is increased for social, economic and environment benefits for land users at all levels [9]. According to [10], agroforestry can be viewed as a societal response primarily borne out of the need to fulfill the immediate basic needs for food, fuel, fodder, shelter and protection. It is a concept that harmonizes agriculture with forestry and pastoralism; it is a very promising way to link food production with improved forestry activities [11]. Agro-forestry is another word for age-old land use system where forestry, agriculture and pastoralism are practiced in combination [12], Agroforestry is a sustainable management system for land that increases overall production, combines agricultural crops, tree crops and forest plants and/or animals sequentially and applies management practices that are compatible with cultural patterns of local population [8]. Agroforestry trees yield useful products and play vital roles such as planting trees within home gardens, agricultural fields and commercial trees interplant with food crops. This does not exclude fruit trees which are limited to those that provide fruit for human food such as mangoes, citrus, as well as some nut-bearing trees, such as walnut [13]. Growing trees along with crops and livestock enhances crop yield, conserves soil and nutrient recycling while producing fuel wood, fruits and timber [14]. According to [15] agroforestry provides a number of benefits to farmers such as; enhancement of soil fertility in many situations and improvement of farm household resilience through provision of additional uch as firewood products for sale or home consumption as fuel. Agroforestry trees provide important ecosystem services including soil spring, stream and water shed protection, animals and plant biodiversity conservation and carbon sequestration and storage all which ultimately affect food and nutritional security [16].

One of the major challenges in Nigeria is the production of insufficient food and fiber to meet the need of her ever increasing population [17]. With rapid population growth and land use pressure, natural fallows and shifting cultivation have been reduced to below the minimum threshold required for the system to sustain itself and these have led to land shortage and decrease in soil fertility; also, attempt to resuscitate land and promote yield with the use of chemical fertilizer have also resulted in soil

toxicity and environmental pollution [18,19]. Agro-forestry practices represent land use practices as it offers a solution to the problem posed by the high demand on land and stands as a means of halting the vicious circle of deforestation, soil erosion and degradation, how it can improve the income of the rural women and other environmental problems.

Women's participation in agroforestry is also fundamental for maintaining the agricultural production and other management activities. The involvement of rural women in agroforestry activities has been ignored not only in Nigeria but all over Africa [20]. Rural woman are faced with challenges of home chores and they are involved in cutting down trees for fuel wood [21]. Although rural women make livelihood from the collection and sales of farm products such as vegetables, fruits, soup condiments, staking materials, fodders and medicinal herbs, they are not conversant with the appropriate agroforestry practices and the appropriate tree species that will have no shade and root competing effect on crop [22]. It is therefore necessary to understand the level of rural women's knowledge and attitude towards agroforestry practices. According to [23] the present level of knowledge of the rural women on agroforestry is low because rural women lack educational training. The unfavourable attitude is also attributable to ignorance of agroforestry practices by the rural women, as majority of them are not aware of the beneficial /damaging effect of certain practices [24]. With the increased level of knowledge on agroforestry, rural women can carry out silvicultural operation on trees around their homesteads and on their husband's farm, thereby contributing to sustainable forest management, environmental protection and biodiversity conservation. According to [25] women can be very active in afforestation practices and therefore champion the communal forest management and development. Women's participation is fundamental for maintaining the agricultural production and other management activities. It is against this backdrop, the study was undertaken with the following objectives:

The specific objectives of this study are:

i. To describe the socio-economic characteristics of rural women in Chikun Local Government Area;
ii. To describe the types of agroforestry practices in Chikun Local Government Area;
iii. To identify the sources of information on agroforestry practices in Chikun Local Government Area;
iv. To find out the level of knowledge of rural women on agroforestry practices in Chikun Local Government Area;
v. To Ascertain the attitudes of rural women toward agroforestry practices in Chikun Local Government Area and
vi. To Examine the constraints against agroforestry practices in Chikun Local Government Area.

The following null hypotheses were tested

$H_0$1: There is no significant relationship between the selected socio-economic characteristics and agroforestry practices.
$H_0$2: There is no significant relationship between knowledge, attitude and agro forestry practices.

2. METHODOLOGY

The study was carried out in Chikun Local Government Area (LGA) of Kaduna State. Chikun LGA covers an area of about 445,659 km and lies between the latitude of 10°C North and Longitude 9°C East between the latitude and longitude 10°N and 8°E of the equator. Chikun LGA is situated in Northern Guinea Savanna Zone, and 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 group is Gbagyi predominantly while Hausa, Kataf, Igbo, Fulani and Yoruba tribes are also present there [26]. It is an agrarian society and the crops planted there include: rice, yam, maize, guinea corn, millet and cassava while the trees range from *Psidium guajava, Tamarindus indica, Moringa oleifera, Vitelaria paradosa, Vitex doniana, Prosopis Africana, Gliricidia sepium, Leuceana leucocephala, Acacia auriculiformis,* Jacarda, and *Acacia nilotica.* Livestock such as cattle, sheep and goat are also reared.

Primary data was used for the study. The primary data was collected through the use of well-structured questionnaire. Interview schedule was conducted in case of illiterate farmers who can neither read nor write. From the thirteen districts in Chikun LGA, six districts were randomly selected, twenty rural women were randomly selected from each district which gives a total of one hundred and twenty (120) respondents. Descriptive and inferential statistics was used to analyze the data. Knowledge test and Mean score were used to determine the knowledge and

attitude of rural women towards agroforestry practices. Inferential statistics were used to test the hypotheses.

3. RESULTS AND DISCUSSION

3.1 Socio- Economic Characteristics

Table 1 is presented with the socio-economic characteristics of respondents. The mean age was 30.23 years. This implied that the respondents were characterized by young and active women. This is in line with [27] that young people that are agile and virile are gainfully employed in farming, hence their involvement in agroforestry practice is more. Majority (82.5%) of the respondents were married, while few of the respondents were re single. This result is in accordance with the findings of [28] who noted that people in the rural area get married earlier than their peers in urban area in order to get labour for farm work. Some (27.5% and 37.5%) of the respondents had primary education and secondary education respectively which could give them access to information. This finding corroborates [29] that education is a key factor that gives insight about farming activities and also improve the attitude of rural women towards farming. Fifty percent (50%) of the respondents had household size of 6-10units to be mentioned some (47.5%) have household size of 1-5 while few (2.5%) have household size of 11 and above. It is observed that large household size is necessary in order to satisfy labour requirement on the farm. On the other hand household size will increase household consumption expenditure which will compete with the money the farmer would use for other production purpose [30]. Table 1 also revealed that some (27.5%) of the respondents have monthly income from ₦11, 000 – ₦ 20, 000 and few (5.0%) of the respondents have monthly income that is greater than ₦41,000. Table 1 also showed that majority (72.5%) of the respondents belong to religious group, (7.5%) belong to work group, (5.0%) belong to co-operative society, (7.5%) belong to farmers club, while (7.5%) belong to tribal groups. Membership of organizations enhance access to information and financial help to assist and support members' well-being especially in time of need. Table 1 also shows that majority (72.5%) of the respondents use their personal savings as their source of income, some (20%) of the respondents raised their capital via family and friends while few (5.0%) of the respondents who were members of cooperative society got their assistance from cooperative society. Table 1 also showed that majority (70%) of the respondents use their family members as their source of labour, while some (20%) and (10%) of the respondents hired the labour and animal traction as source of labour respectively.

3.2 Distribution of Respondents Based on the Types Agroforestry Practices

Fifty percent (50%) of respondents were practicing Taungya system. The respondents emphasized during the interview schedule that the Taungya system is more practiced because it enhances increased food production, embraces a multiple land practices involving the joint production of forestry and agricultural crops. This result in line with the finding of [31] that Taugya and Tropical shelter wood system increase the fertility of the soil and provide shade in the farm. Also, the study revealed that 45% of the respondents were engaged in silvopastural, while 25%, 22.5%, 35%, 7.5% and 2.5% were engaged in Agro silvopastoralism alley cropping, alley farming, aquaculture and sericulture respectively. Agroforestry involves some agricultural practices that broaden both the scope of activity of the farmer and the accruing benefits. Its adoption is a social change that requires communal considerations in as much as the environment is a common pool of resources. Agroforestry combines agriculture and forestry practices to create a more integrated, diverse, productive, profitable, healthy and sustainable land use system [8]. This implied that, multiple use of land through agroforestry practices could improve the capability of rural women for improved standard of living.

3.3 Distribution of Respondents Based on their Sources of Information

Table 3 showed the sources of information on agroforestry practices. Sixty percent (60.0%) of the respondents received their information through radio because it is the cheapest means of getting information, some (22.5%) of the respondents received their information through TV, while few (10.0%) received their information from family and friends and through newspaper. This result is agreed with the finding of [32] Goddard and Saunders (2001) that radio plays a significant role in informing farmers about farming activities and it is the easiest means of getting information. This implied that the radio can be used maximally to inform and teach rural women on the benefits of agroforestry practices.

Table 1. Distribution of respondents based on their socio-economic characteristics

Variables	Frequency (n=120)	Percentage (%)
Age		
Below 20	24	20.0
21-30	42	35.0
31-40	42	35.0
41-50	12	10.0
Marital Status		
Single	21	17.5
Married	99	82.5
Educational status		
Non-formal education	33	27.5
Quranic education	6	5.0
Primary education	33	27.5
Secondary education	45	37.5
Tertiary education	3	2.5
Household size		
1-5	57	47.5
6-10	60	50.0
11 and above	3	2.5
Monthly income ₦		
≤ 10,000	27	22.5
11,000-20,000	33	27.5
21,000-30,000	30	25.0
31,000-40,000	24	20.0
41,000 and above	6	5.0
Membership in organisation		
Religious group	87	72.5
Work group	9	7.5
Cooperative society	6	5.0
Farmers club	9	7.5
Tribal group	9	7.5
Source of Capital		
Personal savings	87	72.5
Family and friends	24	20.0
Cooperative society	9	7.5
Source of Labour		
Family	84	70.0
Hired	24	20.0
Animal traction	12	10.0

Source: Field survey, 2019

Table 2. Distribution of respondents based on their agroforestry practices n=120
***-multiple response**

Agroforestry practices	Frequency*	Percentage (%)
Apiculture	15	12.5
Aquaculture	9	7.5
Silvopastural	54	45.0
Taungya	60	50.0
Tropical shelter wood	60	50
Agro silvopastoralism	30	25.0
Alley cropping	27	22.5
Alley farming	42	35.0
Sericulture	3	2.5

Source: Field survey, 2019

3.4 Distribution of Respondents Based on their Knowledge on Agroforestry Practices

To ascertain the levels of knowledge on Agroforestry practices, the respondents were asked to respond freely to 14 items on a dichotomous response of "Yes or No". The score for each respondents was calculated. (The maximum score was 28 and the mean score was 12.5). Table 4a revealed that most (65%, 60% and 57.5%) of the respondents had good knowledge of Agroforestry practices such as silvipastoral, taungya and tropical shelter wood system respectively while some (45% and 35%) of the respondents were conversant with agro silvopastoralism and alley cropping, only few (27.5% and 7.5%) of the rural women had knowledge in apiculture and sericulture. The rural women may not be aware of the benefits that can be derived from these Agroforestry practices, however with improved knowledge on such practices, the rural women could have more favourable attitude towards them. This was supported by [33] that rural women have low level of knowledge on some agroforestry practices. Furthermore, Table 4b revealed that the level of knowledge of Agroforestry practices of rural women is low as majority (60.8%) of the respondents had low level of knowledge. This implied that limited knowledge of agroforestry practices remains a barrier to the widespread of agroforestry practices. Even to farmers who are aware of agroforestry, their understanding is still limited when compared to the scientific concept of agroforestry, which means its benefit may not be maximized. This was also corroborated by [34] that when the knowledge about agroforestry practices is high among the rural women it will increase the livelihood activities and will lead to increase in food security, employment, and income generation which will have great effect on their standard of living.

Table 3. Distribution of respondents based on sources of information N=120, * - multiple response

Sources of Information	Yes*	Percentage
Radio	72	60.0
Television	27	22.5
Billboard	6	5.0
Phone	15	12.5
Family and friends	12	10.0
Newspaper	12	10.0

Source: Field survey, 2019

3.5 Distribution of Respondents Based on their Attitude to Agroforestry Practices

Agroforestry offers a sustainable balanced productivity between wood and food and also an increase in total productivity per unit area of land. However, with low level of knowledge of importance of agroforestry practices, there will be unfavourable attitude to planting trees. For example, when the environmental costs of flooding and erosion, are taken into consideration, the economic merits of agroforestry become more real. Table 5a showed a 5 point scale of Likert-type on attitude to agroforestry practices with 9 items with response. The score for each respondent was calculated. With the mean score of 3.45. Table 5b revealed that the most (59%) of the respondents had unfavourable attitude towards planting of agroforestry trees while 41% had favourable attitude towards planting of agroforestry trees. Hence with increased level of knowledge on the benefits of agroforestry practices focusing on resistance, positive attitude towards tree planting can be enhanced. Trees stand for improved *r*esistance of farms to unpredictable weather extremes, resistance of farmers to harvest fluctuations and resistance to current and future environmental challenges [35].

3.6 Distribution of Respondents Based on Constraints to Agroforestry Practices

Table 6 showed that majority (77.5%, 70%, 64.2%, 62.5%) of the respondents lack credit facilities, lack technical know-how, have inadequate knowledge on the choice of agroforestry trees species to be incorporated with crops and (or) animals as well as possess inadequate knowledge of agroforestry principles. This implies that without adequate capital, farming will be difficult to embark upon. This result is in line with the findings of [36] that rural women lack credit facilities or subsidies to carryout agroforestry practices; the farmers also have multiple criteria for assessing new technologies, including economic profitability, risk, contribution to food security, time taken to see return on investment and labour requirement, less privileged farmers also face serious overall resource problem, which limit their ability to invest even in highly profitable agroforestry systems, particularly given poorly developed credit and land markets [24].

Table 4a. Distribution of the respondents base on their level of knowledge on agroforestry practices (item score). n=120

Knowledge on agroforestry practices	Yes	No
Do you know that agroforestry can help mitigate loss or shortage of crop failures	30(25.0)	90(75.0)
Apiculture	33(27.5)	87(72.5)
Aquaculture	12(10.0)	108(90.0)
Silvopastural	78(65.0)	42(35.0)
Taungya	72(60.0)	48(40.0)
Tropical shelter wood system	69(57.5)	51(42.5)
Agro silvopastoralism	54(45.0)	66(55.0)
Alley cropping	43(35.0)	78(65.0)
Sericulture	9(7.5)	111(92.5)
Do you have knowledge of the principles that guide your choice of agroforestry?	27(22.5)	93(77.5)
Do you know that the plant and (or) animals combine with trees must be compactible?	39(32.5)	81(67.5)
Do you know that trees and (or) animal combined together must not be affected by same pest and diseases	45(37.5)	75(62.5)

Source: Field survey, 2019; Figures in parenthesis are percentages

3.7 Test of Hypotheses

3.7.1 Chi-square analysis of the socio-economic characteristics and agroforestry practices

Table 7 showed in the Chi-square analysis that Age (χ^2 = 75.627 p = .001), marital status (χ^2 = 25.247, p =.003), monthly income (χ^2= 18.295, p = .002), membership in organization (χ^2 = 16.499, p = .002), Household size (χ^2= 16.219, p =. 004), educational status (χ^2 = 11.704, p = .020) were significant to agroforestry practices. Therefore the null hypothesis which states that there is no significant relationship between the selected socio-economic characteristics and agroforestry practices is hereby rejected. This implies that policies and programmes that target involvement of rural women in agroforestry should consider the above socioeconomic characteristics. Agroforestry is found to be the most desirable strategy for maintaining social, economic and ecological sustainability [37].

Table 4b. Distribution of respondents based on their knowledge on agroforestry practices N=120

Score	Frequency	Percentage (%)
High	47	39.2
Low	73	60.8
Total	120	100.0

Source: Field survey, 2019

Table 5a. Distribution of respondents based on their attitudes to agroforestry practices. N=120

Attitudinal Statement	SA	A	U	D	SD	Total	Total/N
Agroforestry is a difficult task	150	312	0	24	0	486	4.05
Agroforestry takes a lot of land	90	168	36	102	9	405	3.38
Agroforestry leads to land fragmentation	75	120	18	90	18	321	2.68
Agroforestry enhances population and spread of agricultural pest sand diseases	75	168	9	72	21	345	2.88
Agroforestry brings about cost minimization due to the use of organic and manure from plants and animals	150	288	0	24	3	465	2.88
Agroforestry enhances soil fertility	240	228	36	30	0	534	4.45
Agroforestry practices improves the environmental Condition	120	72	0	84	24	300	2.50
Agroforestry practices brings about multiple income to the farmer	165	264	0	24	9	462	3.85
Agroforestry practices brings about land reclamation	75	84	0	108	24	291	2.43

Field Survey, 2019

3.7.2 Correlation between knowledge, attitude and agroforestry practices

Table 8 reveals the correlation matrix of the relationship of knowledge and attitude on agroforestry practice. The results shows that there were positive and significant relationship between knowledge (r = .652, p = .002), attitude (r = .264 p = .003) and agroforestry practices. This implies that cultivating a positive attitude about agroforestry practices is essential because participation would be influenced by the level of knowledge about agroforestry practices. This is in line with the findings of [38] that when knowledge about agroforestry is increased attitude towards agroforestry practices will be favourable which will also enhance the level of participation in agroforestry practices. Glover [39] pointed out that attitude of rural women need to change towards agroforestry practices in order increase their level of participation in agroforestry practices.

Table 5b. Categorization of attitude of rural women towards agroforestry practices n=120

Attitude	Frequency	Percentage
Favourable	51	42.5
Unfavourable	69	57.5
Total	120	100

Favourable= above the mean; Unfavourable = below the mean

Table 6. Distribution of respondents based on constraints in agroforestry practices n=120, *- multiple response

Constraint	Frequency*	Percentage (%)
Lack of credit facility	93	77.5
Lack of technical know-how	84	70.0
Complication in management	72	60.0
Inadequate knowledge of agroforestry principles	75	62.5
Lack of awareness and poor knowledge on improved fallow	66	55.0
No effective laws on livestock grazing	51	42.5
Lack of coordination between forestry and agriculture	42	35.0
Lack of access to land	39	32.5
Inadequate knowledge of choice of agroforestry trees species to be incorporated with crops and (or) animals	77	64.2

Source: Field survey, 2019

Table 7. Chi-square analysis on the socio-economic characteristics and agroforestry practices

Variables	χ^2	Df	P-value	Remark
Age	75.627	22	.001	S
Marital status	25.247	1	.003	S
Monthly income	18.295	4	.002	S
Educational status	11.704	4	.020	S
Household size	16.219	2	.004	S
Membership in organization	16.499	4	.002	S
Source of capital	3.605	2	.165	NS
Source of labour	8.914	2	.012	NS

Source: Field survey, 2019

Table 8. Correlation between knowledge, attitude and agroforestry practices

Variable	R-value	P-value	Remark
Knowledge	.652	.002	S
Attitude	.264	.003	S

Source: Field survey, 2019

4. CONCLUSION

The study assessed knowledge and attitude of rural women towards agroforestry practices in Kaduna State. The mean age was 30.23 years. The types of agroforestry practices mostly engaged by the rural women were agro Silvopastural, Taugya system and Tropical wood shelter system. The major constraints militating against agroforestry practices were lack of credit facility, lack of technical know-how, inadequate knowledge of agroforestry principles, inadequate knowledge of choice of agroforestry trees species to be incorporated with crops (or) animals. The result of the hypotheses showed that there were significant relationships between some selected socio-economic characteristics such as age, marital status, monthly income, membership in organization, educational status and agroforestry practices. PPMC showed there were significant relationships between knowledge, attitude and agroforestry practices. Hence, it could be concluded that \the level of knowledge of agroforestry practices of rural women is low with unfavourable attitude towards agroforestry practices.

5. RECOMMENDATIONS

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

i. Training should be conducted for the rural women in order to change their mindset towards agroforestry practices and also to increase their knowledge level which will in turn lead to a favorable attitude towards agroforestry practices.
ii. Involvement of rural women in planning and execution of agroforestry practices for them to know the technicalities involved in the practices.
iii. Forestry extension agent should be trained so as to enlighten rural women about the benefits of agroforestry practices to increase their knowledge about agroforestry practices.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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