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Small-Scale Farmers' Perception of the Adoption of Agroforestry Practices in Tolon District, Ghana

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A R T I C L E I N F O

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A B S T R A C T

This study was conducted in the Tolon district of Ghana to determine small-scale farmers' perceptions, motivation and problems faced by them in the adoption of agroforestry practices. Primary data were collected through a pre-structured questionnaire from a sample of 200 respondents who were selected using a multi-stage random sampling technique. Data analysis was done by using the percentage and total weighted score (TWS) method. Most of the farmers in the study area have a positive perception of the adoption of agroforestry practices. Crop diversification, high returns and risk minimisation were the major motivational factor, whereas small landholding size, lack of awareness and poor knowledge, poor market accessibility, lack of subsidy, credit facility, lack of good quality planting material and longer period for tree growth were the major problems faced by the farmers in the study area. Thus, the study suggested that farmers can be encouraged to practice agroforestry through improved agroforestry extension services, cooperative groups and distribution of quality planting material to farmers.

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Introduction

The development of environmentally friendly farming techniques is receiving a great deal of attention nowadays days. Following the goal of achieving sustainable agricultural systems, agroforestry is becoming more important for reducing pressure on natural forests and addressing climate change. Concurrently, it increases returns to small-scale farmers and enhances livelihood security. Agroforestry is viewed as an alternative theory for rural growth around the world, focused on species-rich, low-input farming practices that include a vast variety of new indigenous tree crops, rather than high-input monocultures with just a few main food crops (Krebs & Bach, 2018). As a result, the implementation of agroforestry systems has the potential to solve contemporary issues such as an increase in population, environmental degradation and deforestation (Appiah et al., 2016; Foli et al., 2018). Agroforestry systems have been practiced in Ghana for millennia and handed down from generation to generation (Kiptot & Franzel, 2012). These approaches have allowed indigenous peoples to become self-sufficient and generate economic advantages. Furthermore, although most agroforestry study has been undertaken from a biophysical standpoint, assessing farmers' views and attitudes about agroforestry is critical for raising its adoption rate among farmers. Therefore, this study was conducted in the Tolon district of Ghana to analyse farmers' perception of agroforestry practices, and the motivating variables affecting the adoption of agroforestry practices and to highlight the problems farmers experience while adopting agroforestry practices in the Tolon district of Ghana.

Materials and Methods

The research was carried out in the Tolon District of the Northern Region of Ghana. The district covers a total area of land 1353.65550 km^2 and shares borders with Kumbungu to the North, Central Gonja to the South,

Sagnarigu Districts to the East and North Gonja to the West, lies between latitudes 9° 15' and 10° 02' North and Longitudes 0° 53' and 1° 25' West. The district is characterized by grasslands and scattered guinea savannah woodlands and includes drought-resistant species such as *Vitellaria paradoxa, Pakia biglobosa, Adansonia digitata, Acacia longifolia, Azadirachta indica, and Mangifera indica*. The district experiences unimodal annual rainfall. The rainfall begins late in April when low rainfall rises to its peak by July-August and declines suddenly and stops entirely by October-November. The mean yearly rainfall of the district extends from 950 mm to 1200 mm. A continuous dry season occurs between November to March when temperatures rise between 33°C to 39°C during the day, and at night the mean temperature ranges between 20°C to 26°C (GSS, 2019).

The multi-stage random sampling design was used for the study. The first stage involved the purposive sampling of the district due to its significance to food production in the country and most institutes concerning agriculture come from the district. The second stage involved the random selection of four communities namely Kpalsogu, Dimabi, Kpendua, and Tunayili where agroforestry practices were more predominant. The third stage involved randomly selecting 50 respondents from each of the selected communities who were actively involved in agroforestry practice. In total, the sample size for the study was 200 respondents. The researcher trained four enumerators who were natives of the area for two days. The questionnaire pre-testing was performed by applying it to twenty chosen respondents. The finding of the pretest allowed the researcher to adjust some questions in the questionnaire. During the entire study process, field observation was carried out to guarantee the quality of information gathered from the respondents through the interview schedules.

The secondary data required for the study were obtained from policy documents, journals and books, etc. Simple mathematical and statistical tools such as the percentage method were used to analyse the collected data. Thus, to reduce the variability among the respondents, the total weightage score method was used to provide different weights to the problems. Each respondent was asked to indicate his/her extent of agreement or disagreement against each problem along a 5-point Likert scale: Strongly agree, agree, neutral, disagree and strongly disagree. Weights assigned to these responses were 5, 4, 3, 2 and 1, respectively (Chaudhary et al., 2019). Weight according to their importance was given, and multiplied the values of problems (X) by the weights (W). Then, all the values were added to obtain the total score and the problem with the highest score was given the first rank and the one with the lowest score was given the lowest.

Results and Discussion

Demographic characteristics of Respondents

Table 1. shows the majority (82%) of the respondents were males, while 18% were females. The age respondents illustrate that 12.5% were less than 25 years of age, 28% were between 25-35, 20% were between 35-45, and 39.5% were above 45years.

The educational status of respondents showed that 17% had no formal education, 46% had primary education, 26.5% had secondary education, and 21% had tertiary education. Most respondents (72%) were married, while 28% were single. On the farm size respondents,49% farm on <1 acre of land, 38.5% farm on 2-5 acres of land, and 12.5 of the respondent's farm on above 5 acres of land. The respondents' type of farming revealed that 51% of the respondents practiced the mixed cropping system while the remaining 49% practiced the mono-cropping system.

Table 1. Demographic characteristics of Respondents

Variables	Description	Number of respondents	Percent (%)
Sex	Male	164	82
	Female	36	18
	Total	200	100
Age	<25	25	12.5
	25-35	56	28
	35-45	40	20
	Above 45	79	39.5
	Total	200	100
Educational level	No formal	34	17
	Primary	92	46
	Secondary	53	26.5
	Tertiary	21	10.5
	Total	200	100
Marital status	Single	56	28
	Married	144	72
	Total	200	100
Farm size	<1 acre	98	49
	2-5 acres	77	38.5
	Above 5 acres	25	12.5
	Total	200	100
Farming type	Mixed cropping	102	51
	Mono cropping	98	49
	Total	200	100

Table 2. Small-scale farmers' perception of agroforestry adoption

Statement	SA	A	N	D	SD	TWS*	Rank
Increase farm income via diversification	115(57.5)	35(17.5)	10(5)	25(12.5)	15(7.5)	810	3rd
Protect the crops against wind and wild animals	76 (38)	58(29)	12(6)	28 (14)	26 (13)	730	5th
Risk minimization	102 (51)	68(34)	5(2.5)	15(7.5)	10(5)	837	2nd
Increase self-sufficiency	85(42.5)	40(20)	12(6)	35(17.5)	28(14)	719	7th
Competition between trees and crops	90(45)	85(42.5)	5(2.5)	10(5)	10(5)	835	8th
Improvement in soil fertility	98(49) **	78(39)	6(3)	10(5)	8(4)	848	1st
Easily accessible markets for tree crops	74(37)	65(32.5)	4(2)	34(17)	23(11.5)	733	6th
The problem of fuel wood fodder and timber availability will be solved through agroforestry	80(40)	40(20)	18(9)	33(16.5)	29(14.5)	709	9th
Input cost for the adoption of agroforestry is less	76(38)	64(32)	4(2)	48(24)	8(4)	752	4th

TWS-Total weighted score, Figure in parentheses represents percentages of the total responses; SA (Strongly agree), A (Agree), N (Neutral), D (Disagree), SD (Strongly disagree)

Table 3. Motivational factors influencing small-scale farmers' adoption of agroforestry

Statement	SA	A	N	D	SD	TWS*	Rank
Availability of incentives	98(49)	42(21)	2(1)	22(11)	36(18)	744	6th
Availability of fuelwood, fodder and timber	70 (35)	62(31)	10(5)	30(15)	28 (14)	716	7th
Risk minimization	86 (43)	72(36)	2 (1)	28(14)	12(6)	792	4th
Proper land-use	79(39.5)	63(31.5)	3(1.5)	36(18)	19(9.5)	747	5th
High returns	109(45)	55(42.5)	3(2.5)	22(5)	11(5)	829	3rd
Accessibility to the market for produce	95(47.5)	80(40)	2(1)	8(4)	15(7.5)	832	2nd
Crop diversification	120(60) **	63(31.5)	2(1)	10(5)	5(2.5)	883	1st

TWS-Total weighted score, Figure in parentheses represents percentages of the total responses SA(Strongly agree), A(Agree), N(Neutral, D(Disagree), SD(Strongly disagree)

Farmers' perception of the adoption of agroforestry practices

Table 2 shows the analytical view in terms of farmers' perception of the adoption of agroforestry practices in the study area. Total weightage score analysis was done, followed by the ranking.

The study revealed that 49% of respondents placed at 1st rank with the highest (848) total weighted score which shows the strong agreement among the respondents regarding improvement in soil fertility through agroforestry adoption in the study area, "risk minimization" by the adoption of agroforestry scored 2nd rank and increase farm income via diversification scored 3rd rank. It was observed that the lowest TWS (709) was given the 9th rank. These findings corroborate with the findings of Abukari (2019) who indicated that most farmers adopt agroforestry practices to increase soil fertility levels.

Factors of motivation influencing the adoption of agroforestry practices among farmers

Crop diversification, high returns and accessibility to the market for produce were the major motivational factors among the respondents to adopt the agroforestry practices in the study area (Table 3).

Further, it was observed from the study that proper availability of market and incentives for the agroforestry produce will lead to the higher adoption of agroforestry practices and will enhance their farm income. These findings are consistent with the findings of Abukari and Mumuni, (2020) and Pathania et al. (2020), who indicated that crop diversity and high financial returns are the primary motivators affecting agroforestry practice adoption.

Problems faced by small-scale farmers in the adoption of agroforestry practices

The most important problem perceived by the farmers was small landholding size with the highest TWS score (917), followed by lack of planting materials (TWS; 829), Longer gestation period of tree crop (841), lack of awareness and poor knowledge (TWS; 837), high initial cost of input for agroforestry practices (TWS; 829), lack of credit facilities (TWS; 826), the lack of subsidy (TWS; 820), poor market accessibility (TWS; 801) and lack of incentives with the TWS score of 749 were ranked 1 to 9, respectively by respondents in the study area (Table 4). Gara et al. (2020) made a similar discovery, stating that farmers are willing to adopt an agroforestry system suitable for their locations but are unable to do so because of landholder size.

Conclusion

The results from the study showed that most small-scale farmers had a positive perception of the adopted agroforestry practices. They perceived that the adoption of agroforestry can improve their farm productivity, minimise the risk and enhance their overall income in comparison to practicing monoculture. The study also revealed that crop diversification and high financial returns are the key motivational factors influencing the adoption of agroforestry practices in the area. The main problems faced by the farmers related to the agroforestry adoption were small landholding size, lack of awareness and people's knowledge about agroforestry, lack of incentives, poor market accessibility and lack of planting material.

Therefore, it is concluded that the adoption level of agroforestry may be increased in the study area by considering these determinant factors at the time of designing a good agroforestry system for better productivity, sustainability and adoptability. Lack of capital with the farmers restricts the adoption of agroforestry practices thus, the credit agencies must provide necessary incentives in the form of lowering the cost of credit to the farmers to encourage the adoption of agroforestry practices. Moreover, proper marketing strategies can be formulated for better disposal of tree products by developing the producers-industry linkages.

Table 4. Problems faced by small-scale farmers in the adoption of agroforestry practices

Statement	SA	A	N	D	SD	TWS*	Rank
Lack of awareness and poor knowledge	120(60)	40(20)	2(1)	33(16.5)	5(2.5)	837	4th
Lack of incentives	79 (39.5)	66(33)	1(0.5)	33 (16.5)	21(10.5)	749	9th
Poor market accessibility	99 (49.5)	60(30)	5(2.5)	23(11.5)	13(6.5)	801	8th
Lack of subsidy	89(44.5)	78(39)	2(1)	26(13)	5(2.5)	820	7th
Lack of credit facilities	90(45)	86(43)	1(0.5)	15 (8.5)	9 (3)	826	6th
Lack of planting material	97(48.5)	90(45)	1(0.5)	9(4.5)	3(1.5)	869	2nd
High initial cost of inputs for agroforestry practices	89(44.5)	83(41.5)	2(1)	20(10)	6(3)	829	5th
Longer period for tree growth	95(47.5)	80(40)	3(1.5)	15(7.5)	7(3.5)	841	3rd
Small land size	150(75)	35(17.5)	2(1)	8(4)	5(2.5)	917	1st

TWS-Total weighted score, Figure in parentheses represents percentages to the total responses; SA (Strongly agree), A (Agree), N (Neutral), D (Disagree), SD (Strongly disagree),

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