



## Correlation Analysis of Small Scale Farmers Perception in Adoption of Agroforestry Systems in the Tolon District of Ghana

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Received: January 2022

**Abstract:** Farm characteristics and perceptions of farmers in taking up of the agroforestry practices were studied in the Tolon district of northern Ghana during 2020. Four communities; Nyankpala, Dimabi, Kpendua, and Tunayili were selected randomly and 50 respondents were chosen in each community to make a sample size of 200. Personal interviews with questionnaires, key informant interviews and field observation were used to gather data on the field. The data were analyzed using frequency and percentage distributions, and correlational investigations. The findings of the study revealed that 34% of the responded were active in the practice of agroforestry. Further, significant relationship was observed between respondents' personal variables such as age, gender, educational level, and marital status and adoption of agroforestry practices ( $P < 0.01$ ). It is proposed that benefits of agroforestry be promoted among famers for wider adoption of this system and to provide adequate technical assistance to farmers who are interested in practicing agroforestry that guaranteed efficient use of available resources on farmlands owned by all types of landholders.

**Key words:** Adoption, agroforestry practices, farmers.

The shrinkage of farm and forestry lands due to industrial growth, burgeoning urban population, and land required for recreation and leisure called for the adoption of notion of multiple lands uses (Tokede *et al.*, 2020). This approach is unavoidable in developing countries, which rely mainly on agricultural products to maintain their economies. In light of the rising demand for land, the land area has been set aside and because of this there is an urgent need to make optimum use of existing land area to benefit a wide range of land users. The rural people in developing countries face a major challenge in meeting their dimensional needs in terms of food supply, fuel supply, timber supply, and construction materials, and agroforestry appears to be an answer in the form of a combination of forest trees with crops or domestic animals or both (Saha *et al.*, 2018). The agroforestry systems have impacted favorably farmers' lives with associated benefits of it via higher crop productivity, food security (Coulibaly *et al.*, 2017), enhanced resilience of rain-fed agricultural system and thus production stability (Beedy *et al.*, 2013; Awazi and Tchamba, 2019). In rain-fed agriculture, inclusion of legume trees into maize-based cropping systems enhanced water use efficiency

and production stability. Besides, agroforestry is also well-known for its environmental benefits through provision of a variety of ecosystem services (Nair, 2011).

Gradually, and even when embraced, structures to halt the deforestation and environmental degradation process have been poorly managed or maintained. Many unrelated aspects assist affect views of agroforestry, despite significant progress being made in the study and distribution of this information. The features of the farmer, the characteristics of the environment, and the characteristics of the invention are all included in this set of factors. This research focuses on the characteristics and attitudes that impact farmers' adoption of agroforestry methods, and how this affects farmers' willingness to implement agroforestry practices.

### Materials and Methods

The research was carried out in the Tolon district of the northern region of Ghana. The district covers a total geographical area of 1353.66 km<sup>2</sup> and sharing 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

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Longitudes 0°53' and 1°25' West. The district is characterized by grasslands and scattered Guinea Savannah woodlands that includes drought-resistant species such as *Vitellaria paradoxa*, *Pakia biglobosa*, *Adansonia digitata* and *Acacia longifolia*. *Azadirachta indica* and *Mangifera indica* are the domesticated woody perennials.

The study was conducted during March to August 2020. Four communities; Nyankpala, Dimabi, Kpendua, and Tunayili were selected randomly, and 50 respondents were selected from each area to make a sample size of 200. Semi-structured questionnaires were used for the survey. 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 the questionnaire.

A focus group discussion (FGDs) comprised two to six randomly chosen respondents were undertaken to collect in-depth information on the small-scale farmers' perception of agroforestry systems adoption. The key topics discussed during the group deliberations include the degree of respondents' involvement in agroforestry practice and their perception, knowledge, and understanding of adopting agroforestry practice. The researcher was restricted to initiating the discourse by using a checklist of subjects to guide the sessions. These informal approaches helped gain valuable and accurate information that would have been difficult to collect through the questionnaire interview. 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 data recorded on demographic features, state of agroforestry practices and perceptions of respondents on adopting agroforestry practices were analyzed using descriptive and inferential statistics and expressed in frequency distribution and percentages. The social characteristics and agroforestry practice adoption were linked by using the coefficient correlation. The coefficient correlation was also used to illustrate the connection between agroforestry practices' adoption and perception of agroforestry practices.

## Results and Discussion

### *Demographic characteristics of respondents*

The data presented in Table 1 revealed that majority (82%) of respondents were males while 18% were females. The age respondents showed that 12.5% were less than 25 years of age, 28% between 25-35 and 20% were between 35-45, while 39.5% were above 45 years. The educational status of respondents showed that 17% had no formal education, 46% had primary education, and 26.5% had secondary education, while 10.5% had tertiary education. Most respondents (72%) were married, while 28% were single. The farm size ownership of respondents revealed that 49% had farm size of <1 acre, 38.5% had <2-5 acres and 12.5 had >5 acres. 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	Per cent
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

### Status of agroforestry practices among respondents

From Table 2 it was observed that 22.5% of respondents were active in agroforestry techniques, whereas the vast majority (77.5%) were not involved in the activity.

Table 2. Status of agroforestry practices among respondents'

Status of agroforestry practices	Number of respondents	Per cent
I am an active participant in the practice	45	22.5
I am not an active participant in the practice	155	77.5
Total	200	100.0

The factors of sex, age, educational level, and marital status substantially impacted adoption of agroforestry approaches. Variables such as farm size, farm type, and land area were not significant. This is aligned with the results of Oladele *et al.* (2020), who found a significant relationship between respondents' age and educational level and the adoption of agroforestry methods, but no significant relationship between respondents' farm size and the adoption of agroforestry practices. However, findings of the study contradicted with that of Zerihun *et al.* (2014) and Mwase *et al.* (2015), who reported that age had no impact on agroforestry adoption.

Respondents' adoption of agroforestry techniques was substantially connected to age, sex, educational status, and marital

Table 3. Respondents' perception of agroforestry

Variables	1	2	3	4
	F (%)	F (%)	F (%)	F (%)
Difficult to practice	99 (49.5)	45 (22.5)	38 (19.0)	18 (9.0)
Improve farm productivity	15 (7.5)	46 (23.0)	135 (67.5)	4 (2.0)
Difficult to understand due to its technicality	25 (12.5)	128 (64.0)	45 (22.5)	2 (1.0)
The practice is common among local farmers	33 (16.5)	45 (22.5)	120 (60.0)	2 (1.0)
Time-consuming	30 (15.0)	90 (45.0)	72 (36.0)	8 (4.0)
Profitable	10 (5.0)	68 (34.0)	102 (51.0)	20 (10.0)
Expensive to practice	45 (22.5)	128 (64.0)	25 (12.5)	2 (1.0)
Labor intensive	25 (12.5)	94 (47.0)	65 (32.5)	16 (8.0)
Not practicing on a small piece of land	20 (10.0)	138 (69.0)	34 (17.0)	8 (4.0)
Deter the practice of modern farm	20 (10.0)	129 (64.5)	48 (24.0)	3 (1.5)
Not practiced by low-income farmers	6 (3.0)	147 (73.5)	47 (23.5)	0 (0.0)

F (Frequency), Figure in brackets are the percentage.  
1 (Strongly agree), 2 (Agree), 3 (Neutral), 4 (Disagree).

status, according to the results of the association between respondents' characteristic characteristics and respondents' view of agroforestry. The size of the farm, the kind of farm, and the area of the land were not relevant. The finding corroborates Adesina and Chianu, 2002. Farmers' perceptions were affected by their behaviors, particularly personal features (gender, age, marital status, educational level).

### Respondents' perception of agroforestry practices

The majority (49.5%) of respondents strongly agreed that agroforestry practices are difficult to practice (Table 3). Only (9%) of the respondent disagreed that agroforestry practices are difficult to practice whilst 19% of the respondents were neutral that agroforestry practices are difficult to practice and 22.5% of the respondents agreed agroforestry practices are difficult to practice. The 7.5% of respondents strongly agreed that agroforestry practices improved farm productivity, 2% disagreed that agroforestry practices improved farm productivity whilst 67.5% of the respondents were neutral that agroforestry practices improve farm productivity. The 23% of the respondents agreed that agroforestry practices improve farm productivity.

In terms of technical difficulty for adoption of agroforestry, 12.5% of the respondents strongly agreed that agroforestry practices were difficult to understand due to their technicality, 1% disagreed that agroforestry practices were difficult to understand, 64%

agreed that agroforestry practices were difficult to understand due to its technicality and 22.5% of the respondents were neutral.

The results also revealed that 16.5% of the respondent strongly agreed, 22.5% agreed, 60% neutral and only 1% disagreed that agroforestry practices were prevalent among local farmers. The 15% of the respondent strongly agreed that agroforestry practices were time-consuming, 45% agreed that agroforestry practices were time-consuming whilst 36% of the respondent were neutral that agroforestry practices were time-consuming and only 4% disagreed that agroforestry practices were time-consuming.

The results also revealed that 5% of the respondent strongly agreed that agroforestry practices were profitable, 34% agreed whilst a majority (51%) of the respondent were neutral that agroforestry practices were profitable and only 10% disagreed that agroforestry practices were profitable.

Furthermore, the findings revealed that 22.5% of the respondent strongly agreed, 64% agreed, 12.5% neutral and 1% disagreed that it was expensive to practice.

The 12.5% respondents strongly agreed, 47% agreed whilst 32.5% were neutral that agroforestry practices were labor intensive and only 8% of the respondents disagreed that the practice is labor intensive.

The results also revealed that 10% of the respondent strongly agreed, 69% agreed, 17% neutral and only 4% disagreed that agroforestry practices were not practiced on a small piece of land. The 10% of the respondent strongly agreed that agroforestry practices prevented the practice of modern farming, 64.5% agreed, 24% neutral only 1.5% disagreed that agroforestry practices deter the practice of modern farming. Also, 3% of the respondents strongly agreed, 73.5% agreed and 23.5% were neutral that agroforestry practices were not practiced by low-income farmers.

The consequence was that the majority perceived agroforestry activity as complex and technical. The lack of access to agroforestry extension workers may have limited respondents' knowledge of agroforestry practices and hence their perception of agroforestry innovations.

Despite the benefits of agroforestry practices, most respondents in this survey did not engage in them. The findings of this research corroborated those of Ndjeunga and Bantilan (2005), who found that, despite the immense promise of agricultural innovations, smallholder farmers in Africa are hesitant to adopt them. The results also revealed that respondents' perspectives differed. Nevertheless, most respondents consider agroforestry a demanding and scientific approach consistent with identified knowledge and perception about technology as critical to its adoption (Lu *et al.*, 2005).

#### *Correlation analysis showing the relationship between characteristic variables and adoption of agroforestry practices of respondents*

The data presented in Table 4 revealed that adoption of agroforestry practices is significantly related to age ( $r=0.614$ ;  $p=0.000$ ), educational status ( $r=-0.898$ ;  $p=0.000$ ) and marital status ( $r=0.678$ ;  $p=0.000$ ). While sex ( $r=-0.128$ ;  $p=0.945$ ), size of farm ( $r=0.213$ ;  $p=0.370$ ), farm type ( $r=0.129$ ;  $p=0.370$ ) and size of land ( $r=0.074$ ;  $p=0.608$ ) are not significant. The implication of this result is that age, educational status and marital status of the respondents are the ones that constituted significantly to the adoption of agroforestry.

Table 4. Correlation analysis showing the relationship between characteristic variables and adoption of agroforestry practices of respondents

Variable	p-value	r -value
Age	0.000**	0.614
Sex	0.945	-0.128
Educational level	0.000**	-0.898
Marital status	0.000**	0.678
Farm size	0.370	0.213
Farm type	0.370	0.129
Size of land	0.608	0.074

\*\* Correlation is significant at the 0.01 level.

#### *Correlation coefficient (R) between perception toward agroforestry and adoption of agroforestry practices*

The correlation of coefficient demonstrated a link between respondents' perceptions of agroforestry and the extent of adoption of agroforestry among communities. It was observed that there existed a statistically significant association between respondents' perceptions and the extent of agroforestry

adoption. The coefficient of correlation (R) is 0.977, and the significance value is 0.00 ( $P > 0.01$ ), indicated that the relationship was not significant. The consequence is that there is a statistically significant association between respondents' perceptions of agroforestry techniques and their degree of adoption of such methods. Adoption of agroforestry methods will be encouraged if they are seen positively.

*Correlation analysis showing the relationship between characteristic variables and perception of agroforestry practices of respondents*

The result revealed that respondents' adoption of agroforestry practices was significantly related to age ( $r=0.798$ ;  $p=0.000$ ), sex ( $r=-0.357$ ;  $p=0.025$ ), educational status ( $r=0.858$ ;  $p=0.000$ ) and marital status ( $r=0.522$ ;  $p=0.000$ ) (Table 5). While size of farm ( $r=0.054$ ;  $p=0.450$ ), farm type ( $r=0.258$ ;  $p=0.069$ ) and size of land ( $r=0.163$ ;  $p=0.255$ ) were not significant implying that age, sex, educational status and marital status of the respondents are the ones that constituted significantly to the perception of respondents on agroforestry practice.

The association between respondents' perceptions of agroforestry and its degree of adoption revealed a strong relationship between respondents' perceptions of agroforestry and its level of adoption. The R coefficient was 0.977, and the significance level was 0.00 ( $P > 0.01$ ). This research corroborates with the results of Zubair *et al.* (2009), which revealed that perception impacts the adoption of agroforestry practices.

Table 5. Correlation analysis between characteristic variables and perception of agroforestry practices

Variable	p-value	r value
Age	0.000**	0.798
Sex	0.025*	0.357
Educational level	0.000**	0.858
Marital status	0.000**	0.522
Farm size	0.450	0.054
Farm type	0.069	0.258
Size of land	0.255	0.163

\* Correlation is significant at the 0.05 level.

\*\* Correlation is significant at the 0.01 level.

## Conclusion

Agroforestry adoption in the Tolon district was low, according to the majority of respondents. Agroforestry methods were more

likely to be adopted by people of a certain age, educational level, and marital status than by others. Additionally, the respondents' characteristics (age, gender, educational attainment, and marital status) were shown to have a strong link with their perceptions of agroforestry. To practice agroforestry, the respondents are of view that it was difficult, which indicated a lack of understanding. Agroforestry was discovered to be influenced by people's perceptions of it.

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