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Assessment of Farmers' Perception of Agroforestry Practices in Jhenaidah District of Bangladesh

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Authors' contributions

This work was carried out in collaboration between both authors. Authors AS and SAR designed the study. Author SAR performed the field survey. Authors AS and SAR performed the data sorting and analysis. Author SAR wrote the first draft of the manuscript. Author AS managed the literature searches, addressed subsequent reviewer comments and suggestions for improvement. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: The main objective of this study was to investigate and analyze the farmers' attitude towards agroforestry, the reasons for adoption of agroforestry by farmers and the problems being faced by them in the Jhenaidah district, Bangladesh.
Place and Duration of Study: The survey was conducted during May, 2014 in Jhenaidah District of Bangladesh.
Methodology: This paper includes the perspective assessment of the farmers about practicing agriculture and forest tree species, rearing pastures etc. all together in Jhenaidah District in Bangladesh. During the study a multistage random sampling technique was adopted among 102 farmers of different age (21-65^{+} years) who were interviewed through a semi-structured questionnaire individually. Likert scale is followed to identify the farmer's perception and attitude.
Results: The middle aged farmers (42.7%) were mostly interested in adopting agroforestry with traditional practice whereas young aged farmers (23.95%) appeared to practice it in a wide range.

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On the other hand, farmers (23.53%) who generally take lease for cultivation do not practice agroforestry. In the study area all farmers practice homestead agroforestry and 61% of the farmers practice cropland agroforestry. Above 80% respondents have taken positively agroforestry practice, but did not receive formal training skills or facility but just inherited ideas from their superiors.
Conclusion: Most of the farmer's (94.12%) have positive attitude towards Agroforestry in Jhenaidah district.

Keywords: Agroforestry; farmer's attitude; perception; Jhenaidah District.

1. INTRODUCTION

Bangladesh is one of the most densely populated agriculture-based countries in the world. Its population growth rate is very high and thus the area of Bangladesh is very small in comparison to its population. Rapid population growth has created new pressure on limited resources such as forest and land resources. So there is an urgent need to find a better way of producing more crops and forest products to fulfill the demand of the population in this limited land. Agroforestry can be regarded as one potential solution in meeting the needs of the society. Agroforestry has long been recognized as sustainable development models throughout the world due to the benefits it brings not only to the economy and society but also to the ecosystem [1,2]. Agroforestry systems are most extensive in developing countries where approximately 1.2 billion poor people depend directly on a variety of agroforestry products and services [3,4].

Agroforestry is a sustainable land use system that increases total production and combines agricultural crops, tree crops, forests plants and/or animals. The forests of Bangladesh are too small to meet the demands of timber and firewood and to keep the environment sustainable at present. So, to meet the increasing demand of forest products while maintaining ecological balance, agroforestry can be an important system [5].

Recent study reported that [6] agroforestry as a collective name for land use system in which woody perennials (trees, shrubs etc.) are grown in association with herbaceous plants (crops, pastures) and /or livestock in a spatial arrangement, a rotation or both and in which there are both ecological and economic interactions between the tree and non-tree components of the system.

Following Rogers [7], agroforestry adoption can be described as a mental process, commonly known as the innovation-decision process, farmers go through a stage of being aware or knowledgeable of a new agroforestry technology, to form positive or negative attitude towards agroforestry, and ultimately to decide whether to adopt the technology or not. This process can be influenced by a wide variety of factors including household factors, social factors and institutional factors as well as the long rotation period of the tree components [8]. According to Haque [9], the adoption factors of agroforestry in Bangladesh are mainly influenced by the rapid depletion of the most forest cover which is at the rate of about 10-15 thousands trees per hectare. The limited scope of allocating more Government lands for forest, the diversion of land to non forestry activities. Agroforestry can meet the dimensional needs of the rural people for food, fuel, timber, construction materials, thereby helping the poor to lead a self sustained life style. There is enough scope to improve productivity of agroforestry systems through using improved production practices like using suitable high yielding varieties, tree crop combination, space etc. Thus to exploit the potential of agroforestry for improving lives of the rural poor, the attitude of farmers towards the system should be investigated first. At present research findings on the application of agroforestry meet the ever increasing demand of growing population in Bangladesh are limited.

In Bangladesh, gradually the farmers are adopting agroforestry widely. It has potential to complement the desired products and services from forests. Jhenaidah is one of the high lands in Bangladesh. The estimate terrain elevation above sea level is 8 meters. Also there is a satisfactory amount of precipitation in agroforestry practices occurred in every year. Farmers have adopted agroforestry in large scale because of high income, suitable use of land and space, erosion control and protection, crop diversification and risk reduction. But it is very important to know the perception and attitude of the farmers to agroforestry for the further development of agriculture as well as forestry. Besides, earlier there was no such study

happened over this concept. As for this; the area is much suitable to study and analyze the perception, attitude and thinking of the farmers towards agroforestry.

The objectives of the present study are to have a clear idea about the major agroforestry practices in the study area, to know farmer's attitude (intention or view point) and perception (realization or appreciation) about their practice and the problems faced by them regarding the practice.

2. METHODOLOGY

2.1 Study Area

Jhenaidah was a former subdivision of Jessore district. It became a separate district in 1984. Jhenaidah is surrounded on the north by Kushtia and Rajbari districts, on the east by Magura district, on the south by Jessore district and on the west by Chuadanga district and India. The total area of the district is 1,964.77 sq. km (758.60 sq. miles). The district lies between 23º13` and 23º46` North latitudes and between 88º42` and 89º23` East longitudes [10]. The district consists of 6 upazillas, 67 unions, 945 mauzas, 1144 villages, 6 paurashavas, 54 wards and 136 mahallas. The upazillas are Jhenaidah Sadar, Shailkupa, Kaliganj, Harinakundu, Kotchandpur and Maheshpur. Total population of the district is 17, 71,304 among them total male is 8, 86,402 and female is 8, 84,902. The male-female ratio is about 100. The density of the area is 902 per sq. km. About 87.23% of the population lives in rural area and 12.77% are in urban area. Total literacy of this district is 48.4% (both male and female) [11]. The economy of Jhenaidah district is predominantly agricultural. People generally grows paddy, jute, wheat, sugarcane and mustard seed, onion garlic and varieties of pulse and vegetables are the major crops of this district. Besides various fruits like mango, banana, jackfruit, guava, coconut, etc are grown [11].

Fig. 1. Map of Jhenaidah District [12]

Table 1. Name of the sampling units in Jhenaidah district of Bangladesh

Name of the upazilla (first sampling unit)	Name of the unions (second sampling unit)	Name of the villages (third sampling unit)
Jhenaidah Sadar	Kumrabaria	Defolbarri
		Ramnagar
	Ganna	Kalohati
		Kutidurgapur
Kaligonj	4 No. Niamotpur	Mostobapur
		Mohessorchandra
		Dapna
	Durgapur	Shingdoho
		Alaipur
Shailkupa	Dudhsor	Dudhsor
		Tripurakandi
	Umedpur	Krishnapur
		Bisnupur
Kotchandpur	Kotchandpur Pourosova	Solemanpur
		Rudropur
	Elangi	Elangi
		Gurrpara

2.2 Materials and Methods

The study was conducted at Jhenaidah district of Bangladesh during May 2014. An exploratory survey was conducted in Jhenaidah district to explore information regarding the demographic profile of respondents, annual income of respondents, and cultivation practice, attitude, perception and thinking towards agroforestry practice.

During the study a multistage random sampling technique was adopted. Jhenaidah district was selected purposively as the study area. Four upazilla are namely- 1. Jhenaidah Sadar, 2. Kaligonj, 3. Shailkupa and 4. Kotchandpur were selected randomly. These are first sampling unit. Then again from each upazilla two unions were selected randomly as second sampling unit. Finally, two villages from each union were selected as third sampling unit. From each village more or less five to seven (in accordance with availability) respondents were selected. A total of 102 respondents participated in the face-to-face interview. A detailed socio-economic survey was conducted by using a semi structured questionnaire [8,13-18] to assess the demographic profile of the respondents, present agroforestry practices in Jhenaidah district, farmer's attitude towards the practice and problems related to the practice. All the sampling units are shown in the Table 1 (above).

A Likert scale [19] is a psychometric scale commonly involved in research that employs questionnaires. It is the most widely used approach to scaling responses in survey research, such that the term is often used interchangeably with rating scale, or more accurately the Likert-type scale, even though the two are not synonymous. When responding to a Likert questionnaire item, respondents specify their level of agreement or disagreement on a symmetric agrees-disagrees scale for a series of statements. Thus, the range captures the intensity of their feelings for a given item.

3. RESULTS AND DISCUSSION

3.1 Demographic Features of the Respondents

The demographic features of the respondents in the study area are shown in Table 2. In the study area both male and female are involved in agroforestry practices in which 82% respondents are male and 8% are female. It indicates that males are quite active in outside profession specially farming. The age of the respondents is divided into four categories. Major respondents (42.7%) were middle aged, 23.95% respondents were young, 23.95% were old and 9.3% respondents are very young. The table indicates that a majority of the respondents (59.27%) studied primary level. Here primary level assumed that the respondent who have studied between class I to V. About 23.87% respondents have studied secondary level which is assumed from class-VI to SSC examination. The least

percentage (16.86%) respondents have studied above secondary level. The land holding size was categorized in three groups i.e., land less (23.95%), less than 1 acres (42.7%) and more than 1 acre (35.41%). The farmers (35.41%) are more interested to grow cereals/trees for their domestic use and cash crops.

The respondents are involved in various occupations. But 80.39% of these respondents are confined in only farming. Some people have mixed profession along with cultivation. There are also some other occupations i.e. service holder, teacher, businessman, etc. but in a little number. The annual income of the farmers falls in four categories. The highest percentage (35.3%) is represented by farmers who earn from $700-$1400 and appear to be in the middle income category. 15.68% of the respondents earn $1401-$2100 whereas about 21.34% of the respondents earn above $2800 per year. 50% respondents have land ownership. 32.29% respondents take land leased from others which is known as borga system. 17.71% respondents have own land and lease land to other people by Borga system. This study revealed 50% of the farmers have land ownership and are more interested in agroforestry practice. But who have no land of their own (28%) are not interested in agroforestry practice. A similar observation was reported by Parihaar et al. [15] in Kumaun, India.

3.2 Present Status of Agroforestry in Jhenaidah District

In Jhenaidah district the land use systems include annual crop production, horticulture and agroforestry. The agroforestry practices include homestead agroforestry, cropland agroforestry and woodlot. The annual crops cultivated in the homestead agroforestry are various types of vegetables with multipurpose tree species like Mango, Jackfruit, Mehogoni, etc. Babla, Coconut, Raintree, Mehogoni, etc. are practiced in different types of Cropland agroforestry along with the annual crops like paddy, sugarcane, etc. In woodlot plantation Mehogoni, Rain tree, Babla, Gamar, Ipilipil, *Eucalyptus*, Akashmoni etc. are planted by the farmers in Jhenaidah District.

Table 3 presents that about half of the farmers (40.20%) largely depends on annual crop production. A significant number (25.50%) of user is involved in agri-silvicultural system. Other system is practiced by a limited number of respondents. Most farmers showed remarkable interest to grow annual crops in order to provide annual household consumption. They also wanted to increase income by incorporating trees. The study found that people are more interested in pasture culture (20.59%) with annual crop because of its immediate high cash return.

Table 2. The demographic profile of the respondents in the study area

Selected characteristics	Categories	Percentage (%) of farmers
Gender	Male	82
	Female	18
Age (years)	Very young (18-25)	9.3
	Young (26-35)	23.95
	Middle aged (36-50)	42.8
	Old (above 50)	23.95
Level of education	Primary	59.27
	Secondary	23.87
	Above secondary	16.86
Annual income	$700-$1400	31.38
	$1401-$2100	35.3
	$2101-$2800	15.68
	Above $2800	17.64
Farm size (Acre)	Landless (take lease)	23.9
	Less than 1 acre	42.7
	More than 1 acre	33.4
Land tenureship	Own	50
	Taken lease	32.29
	Both	17.71

Table 3. Types of crops, trees grown in the study area

Type of crops	No of farmers	Percentage of farmers (%)
Annual crops	41	40.20
Annual crop + Tree	26	25.50
Annual crop + Pasture	21	20.59
Annual Crop + Tree + Pasture	14	13.73

Most of the people in Jhenaidah district learn agroforestry from indigenous knowledge systems and have a tradition of practicing Agroforestry practice. Recently their practices have been reinforced by the need for socio-economic and environmental sustainability. Three common Agroforestry types were found in the study area.

3.2.1 Homestead agroforestry

The most and widely practiced system of agroforestry in this area is homestead agroforestry. Homestead agroforestry includes mixed plantings of annual, tree crops and pasture around dwelling area, which is a common type of multistoried agroforestry system. The farmers grow multipurpose trees in their homegardens for flowers, fruits, and seeds, trees, fish, agricultural crops, cattle, etc. which is shown in Table 4. In the study area are also reported by Prihaar et al. in 2015 in Kumaun, India [16]. All farmers practice homestead agroforestry traditionally.

3.2.2 Cropland agroforestry

Cropland agroforestry combines the production of agricultural crops and trees in the cropland through intercropping. Three cropland agroforestry types were found in the study area which is boundary plantation, mixed cropping and woodlot.

Boundary plantations combine perennial, preferably leguminous trees or shrubs grown around an arable crop. Sometimes boundary plantations act as windbreaks to protect crops. Timber trees are planted along boundaries spaced at 6 m x 6 m or 5 m x 5 m to reduce excessive shading of annual crops, while for fruits trees 4 m x 4 m is ideal and trees for fuel wood are planted at 3 m x 3 m spacing in the study area. Most common trees for boundary plantation are Babla, Supari, Date, Coconut, Rain tree, Mahagoni, Palm which are grown along field boundaries or bunds of paddy, wheat fields (Table 4). 41% respondents preferred Supari and Date with paddy for boundary plantation in Jhenaidah district.

Mixed cropping constitutes one of the main agricultural land use practice in the study area. Most of the farmers (61%) practice various annual crops simultaneously on the same unit plot which is commonly referred to as mixed cropping system. Table 4 presents that different types of legumes, vegetables along with sugarcane, paddy and betel leaf are commonly practiced in mixed cropping system in the study area.

3.2.3 Woodlot

Woodlot plantation is another common agroforestry practice in Jhenaidah district. Mainly the multipurpose tree species are preferred in this system. The major woodlot species in Jhenaidah district are Mehogoni, Rain tree, Sisso, Babla, Gamar, Ipilipil, *Eucalyptus*, Akashmoni etc. About 32% respondents were or are now practicing woodlot plantation because of its rapid large amount cash return.

3.3 Farmer's Perception about Agroforestry in the Study Area

Farmer's perceptions about agroforestry in the villages were found to be diverse. The farmers of Jhenaidah district practices agroforestry traditionally within their agricultural cropland as well as their homestead. They perceived that the practice is done for their own satisfaction and household consumption. In the study area a remarkable proportion of the farmers (44.2%) think positively about agroforestry systems. They believed that Agroforestry does not hamper their traditional Agricultural system and it has a great role in managing, space utilization and recreational role and to meet their demands of wood, firewood and other forest products. 21.57% respondents strongly agreed with this point of view.

The farmers also perceived that Agroforestry is more profitable and less risky than other agricultural options. From agroforestry practice the farmers reported that they can get agricultural crops in the short term as well as earn a large amount of cash from the sale of the

trees in the long term. In field survey, the farmers said “Though trees in cropland initially cause some damage of crops like shade problem, leaf fall problem, nutrition problem; it has an overall good return in a longer time horizon.’’

On the other hand, only 6.86% farmers are not eager to practice agroforestry system because of lack of capital, lack of interest, lack of knowledge on agroforestry systems, prolonged time in profit earning, lack of technical assistance, do not have suitable land for this practice, probability of risks and unstable market price for agroforestry product. Most of these reasons were also reported by Kittur and Bargali [4] in India.

The farmer’s perception about agroforestry in the study area is measured by Likert Scale [19]. On the average most of the respondents showed their clear perception about agroforestry which represented column 4 (agree) of Likert scale. These results were encouraging, which showed that the farmers were realizing the importance of trees, crop and pasture to meet their demand of protein, timber, fuel wood, fodder requirements and increase the capital formation. As shown in Fig. 4, majority of farmers (44.12%) had positive perception about agroforestry. 21.57% respondents strongly agreed whereas 6.86% farmers are strongly disagreed about the practice. 16.67% were placed in the neutral category.

3.4 Farmer’s Attitude towards Agro-forestry in the Study Area

The results revealed that majority of the farmers in Jhenaidah had `favorable’ attitude towards agroforestry. But they showed slight different attitude in term of homestead and cropland agroforestry in Likert scale [19].

Fig. 2. Mixed cropping at Jhenaidah District (field survey, 2014)

Fig. 3. Woodlot plantation at Jhenaidah District (field survey, 2014)

Table 4. Types of crops and trees grown under agroforestry practice in the study area

Agroforestry practices	Types of trees	Types of crops	Pasture
Homestead agroforestry	Supari, Coconut, Mehogoni, Sajina, Khejur, Tal, Jam, Kamranga, Neem, Jackfruit	Different vegetables.	Cow, Goat, Buffalos, Swan, Duck, Hen, Hogg, Pigeon
Boundary plantation	Khejur, Coconut, Babla, Akasmoni, Mahagoni, Neem, Rain tree	Paddy, Jute, Wheat, Papaya, Banana, Turmaric	-
Mixed cropping	Supari, Coconut, Mehogoni, Sajina, Khejur, Tal, Jam, Kamranga, Neem, Jackfruit	Rice, Maize, Allum, Turmaric, Banana, Ginger, Tomatoes, Cabbage, Chilli,	Cow, Goat, Buffalo, Swan.
Woodlot	Mehogoni, Akashmoni, Sisso, Raintree, Teak	-	-

3.4.1 Homestead agroforestry

Homestead agroforestry has been practicing long time ago. Consequently the farmers tend to be very positive where the score 5 in Likert scale. They get different benefits from this system like protein, food from cattle, fuel, fodder, vegetables and also cash from these. 94.12% of the farmers showed positive attitude towards homestead agroforestry (Fig. 5).

3.4.2 Cropland agroforestry

For the cropland agroforestry the farmers of Jhenaidah district showed a little less interest than the homestead agroforestry. Never the less most of them showed positive attitude in the Likert scale in this regard.

The response of the majority of the respondent (59.8%) was found to be favorable to agroforestry practice on cropland (Fig. 6). But some respondents (17.65%) did not show much interest to agroforestry. On the other hand, 3.92% farmers strongly disagree with this practice whereas 16.67% respondents did not provide comments for or against agroforestry practice.

Most of the respondents (57.5%) said that trees are not harmful for agricultural crops and believe to play a great role in managing and space utilization. Besides, they indicated that trees helps to produce quality products. On the contrary, 30.2% respondents said that trees are harmful for agricultural practice because of difficulties in management, cause significant disturbance on crop thereby reducing the production. This finding was in agreement with that reported by Bargali *et al* 2004 and 2009 [2,18] where increased possibility of crop failure and pathogenic attack was noted.

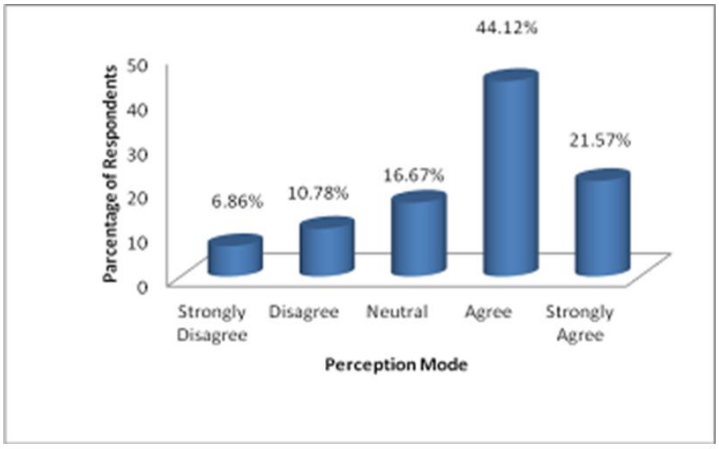

Fig. 4. Farmer's perception on agroforestry in study area

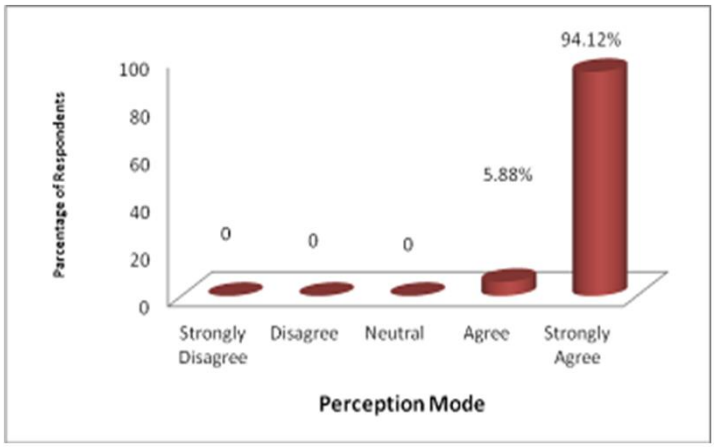

Fig. 5. Farmer's attitude towards homestead agroforestry in study area

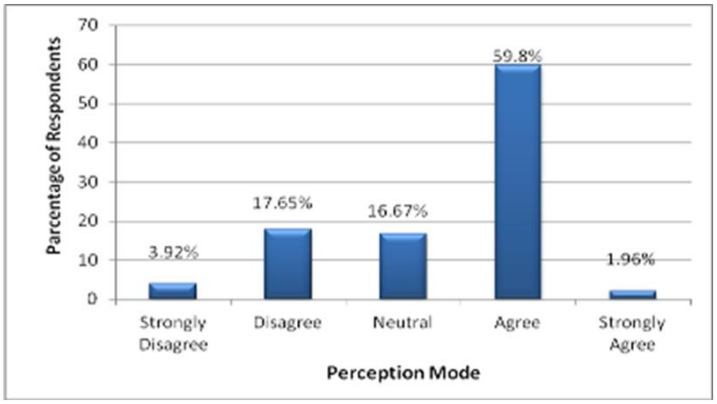

Fig. 6. Farmer's attitude towards cropland agroforestry

4. CONCLUSION

Agroforestry is becoming popular in Jhenaidah district. Middle aged farmers (36-50) (42.7%) are interested in agroforestry practice than traditional practice. The adoption of the practice by younger generation of farmers (26-65) is improving from time to time perhaps due to access to modern education and exposured to new ideas as migrant. Those farmers with primary level of education (59.27%) form the major of respondents in the area. But others who studied beyond primary school showed better interest in agroforestry. Most of the farmers (94.12%) in Jhenaidah District have positive attitude towards agroforestry. If implemented properly, the agroforestry practice has remarkable potentials for improving the socio-economic and ecological conditions of farmers in Jhenaidah.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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