Status and Prospects of Agroforestry at Kaligonj Upazila in Satkhira District

Nurunnahar, Md. Najmus Sayadat Pitol, and Arifa Sharmin

Abstract — This study presents a synopsis of different types of agroforestry practiced and farmer’s perception and attitudes towards it at Kaligonj upazila in Satkhira district. It particularly focused on demography of respondents, land use pattern, land tenure, choices of species for agroforestry, farmers’ perceptions towards agroforestry, status, and problems of agroforestry practices. A survey was conducted and total 100 of respondents were selected to collect information about the types of agroforestry accomplished here. In the study area different types of agroforestry was practiced like homestead agroforestry, cropland agroforestry, agri-aqua silviculture, agri-silvipastural and agro-aqua culture. Majority of the farmers were middle-aged (54% between 36-50 years). In study zone mainstream of the respondents (97%) were male and only 5% of the respondents were female who worked in homestead agroforestry. Most of the farmers about 56% were educated to the primary level. Mostly the farmers (70%) have own land and they practiced agroforestry, but the farmers (12%) took leased land from other were not agreed. Majority of farmers (38%) had shown positive perception (agree) and 36% strongly agreed about agroforestry. About 98% of farmers had positive attitude towards homestead agroforestry, 66% towards cropland agroforestry and 82% towards fish farm agroforestry.

Index Terms — Agroforestry, agrisilviculture, agrisilvipasture, aqua-culture, fish farm, homestead.

I. INTRODUCTION

Agriculture, the largest employment sector in Bangladesh, employs 47% of the total labor force and comprises 16.33% of the country’s GDP. Bangladesh has total agricultural land is about 70.1% of the total land, arable land 59%, permanent crops 6.5%, permanent pasture 4.6% [1]. With having a very small land in comparable to population and high population growth rate, she is facing increased pressure on the various limited resources like forest and land resources. In this situation the forest land is now replaced by agroforestry, a new technology to produce more crops and forest products to fulfill the demand in this limited land which increased the conflict for land use between agriculture and forestry. Agroforestry is a collective land-use technique where trees, shrubs, bamboos, palms, etc. are consciously used on the identical land as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence [2]. In Bangladesh, the agroforestry policies were legitimately introduced at the latter part of 1970s [3] when the energy, food and fodder crisis were appeared, and the forest started dying [4]. Nair [5] stated that it played a crucial role to sustain agricultural production because of their potentiality to meet economic, social, ecological, and institutional conditions for sustainable livelihoods. The scope of agroforestry is vast in Bangladesh because of having a numerous venue of agroforestry like homestead, roadside, railway side, institutional premises, coastal area, deforested area, charlands, embankment side, riverside etc. Agroforestry can provide food, fodder, fruit, vegetables, fuel wood, timber, medicines, fiber etc. from the same piece of land at a time. It increases crop and animal productivity on ecological basis, more trustworthy economic revenues, and greater diversity in social benefits on a sustained basis which uplift their socioeconomic status and standard of life [6], [7]. Agroforestry systems are widespread in developing countries where approximately 1.2 billion poor people depend directly on a variety of agroforestry products and services [8]. It has the potential to increase farm incomes and solve difficult environmental problems [9].

It is essential to protect and increase our forest cover to retain our existence on earth but there is no scope to increase the forest and agricultural land. In these circumstances, traditional land use pattern should be transformed into sustainable land uses like agroforestry. By increasing the amount of this system we can increase the amount of forest and also help to reduce the pressure on natural forest to fulfill forest related needs such as timber, fuel wood, fodder etc. Considering all of these it is very essential for Bangladesh to increase the forest resources through agroforestry. The attitudes and perception of farmers about agroforestry must be needed to introduce new technology and extent of agroforestry. Kaligonj upazilla of Satkhira is an important area of Bangladesh where the practice of agroforestry and fish farm are most extensive, and the area is suitable for these practices. This study aims to know the major agroforestry practices, attitudes, and perception of farmers towards agroforestry and to find the problems responsible for non-adoption of agroforestry at Kaligonj upazila in Satkhira district.

Published on December 10, 2020.
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DOI: http://dx.doi.org/10.24018/ejfood.2020.2.6.186
II. MATERIALS AND METHODS

A. Demographic Information of Study Area

Kaliganj Upazila of Satkhira district has an area of 333.79 sq km, located in between 22°19’ and 22°33’ north latitudes and in between 88°58’ and 89°10’ east longitudes. It is bounded by Debhata and Assasuni upazilas on the north, Shyamnagar upazila on the south, Assasuni upazila on the east, Hingalganj (community development block) in North 24 Parganas district in West Bengal, India on the west [10]. The annual average temperature of this area varies maximum 24.8°C to minimum 8.6°C. The annual rainfall is 1374 mm. [11]. Kaligonj Upazila consists of 12 unions and 256 villages. The area of the town is 7.96 sq. km. According to population census, it has a population of 274889 where male 136089 and female 138800. Population density per sq. km is 1046. Literacy rate among the people is 51.8% where male (55.4%) and female (48.2%). The number of total households is 64909 and 147 are floating [11]. Main sources of income are agriculture 56.81%, non-agricultural laborer 6.05%, industry 2.71%, commerce 19.88%, transport and communication 2.40%, service 4.37%, construction 0.93%, religious service 0.20%, rent and remittance 0.30% and others 6.35% [11]. The total high land, medium land and low land are about 4576 acres, 14590 acres and 19670 acres respectively. Ownership of agricultural land is landowner 52.48% and landless 47.52% where agricultural landowner in urban 43.45% and rural 53.03%. The total operated land area is 58959 acres where permanently cropped area, temporarily cropped area and permanently fallow land are 3652 acres, 38836 acres and 252 acres respectively and others 1647 acres [11].

B. Data Collection and Analysis

The study was conducted at Kaligonj Upazilla in Satkhira through a multistage random sampling technique. The criterion for selecting site was availability and diversity of agroforestry. Total 6 unions and 12 villages (2 villages from each union) were selected randomly. After the village selection, from each village more or less eight to ten respondents (in accordance with availability) were selected purposively who practices agriculture and total of 100 respondents were contacted to participate in the face-to-face interview. Data were collected through questionnaire survey and perception towards different agroforestry systems measured by using Likert Scale [12] during the interview.

C. Limitation of the study

Extensive survey is costly and time consuming. No fund was provided by any aid agencies, so extensive survey was not possible. Difficult to make the local people understand about the survey and all the people are not helpful. Some people don’t agree to give answer to all questions.

III. RESULT

A. Socio-economic Characteristics of the Respondents

Most of the respondents (97%) were male where comparatively little percentage (3%) of female. It indicated that male was quite active in outside profession specially farming where female farmer practice homestead agroforestry. The age of the respondents was categorized into four groups. The major of the respondents (54%) were middle aged (36-50) years, followed by about 23% were in 26-35 years, 12% were old-aged (above 50 years) and very little percentage (11%) was young aged (18-25 years). The analysis stated that majority of the respondents (56%) studied primary level where about 27% studied secondary level and 17% above secondary level. Most of respondents (46%) were confined in only farming but a little number were teacher (19%), businessman (22%) and 13% involved in other occupation. Here the income amount was classified into three categories. The highest percentage 58% were represented the medium class farmers between 2-3 lakhs followed by 16% were poor and landless (between 1-2 lakhs) where about 21.34% were higher classes (above 3 lakhs).

B. Size of Land Holding and Land Tenureship

The analysis indicated that mostly the respondents (62%) were small farmers (less than 1 acre), 12% landless and 26% had more than 1 acre (Fig. 2) of land. On the other hand, 70% of respondents had own land where only 12% of respondents took lease of land from others called “borga” system (Fig. 2). About 18% of respondents had both own land and took lease from another people.
C. Agroforestry Practices in the Study Area

The survey showed that, about 96% of the respondents practice agroforestry while agroforestry practice was not new in the study area. The land use systems in the study area included annual crop production, fish farm (gher culture), agroforestry and horticulture. Agroforestry practices undertaken by farmers in the study area included homestead agroforestry, boundary plantation, private woodlot, mixed cropping and aquasilviculture and so on (Table 3).

1. Land Use System and Type of Crops Cultivated in the Study Area

This study obtained that 19% of the respondents largely depended on annual crop production (Table 2). In consideration of agroforestry system significant number (37%) of users were involved in agro-silvicultural system. Other system was practiced in a limited portion and about 23% of farmer’s rear domestic animals with annual crops (Table 2). It found that people were interested in rearing domestic animals (21%) with annual crop and tree because of immediate high cash return.

<table>
<thead>
<tr>
<th>TABLE 2: CROPS TYPE AND RESPONSE OF FARMERS IN THE STUDY AREA</th>
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<tr>
<td>Type of crops</td>
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<td>Annual crops</td>
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<td>Annual crop + Tree</td>
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<td>Annual crop + Domestic animals</td>
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<td>Annual Crop + Tree + Domestic animals</td>
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1.1. Homestead Agroforestry

In the study area almost 98% of farmers practiced home garden traditionally. Another 2% of farmers did not practice homestead agroforestry in absence of available homestead area.

1.2. Cropland Agroforestry

All the respondents (100%) said that performance of the tree crops was better in this system than monoculture. About 65% of respondents said no reduction occurred in crop production where 30% said there was a little effect but 5% said the crop production reduced.

1.3. Boundary Plantations

Boundary plantations act as windbreaks to protect crops. For timber trees, annual crops, fuel wood and fruits trees planted along boundaries spaced at 6 m × 6 m, 5 m × 5 m, 4 m × 4 m and 3 m × 3 m respectively. Commonly used trees for boundary plantation such mahagoni, babla, neem, supari, date palm, coconut, raintree, kocha (jiga) etc. were grown along field boundaries or bunds of paddy, jute, halud, zinger fields and gher (fish farm) also (Table 3). Babla and Mahagani also had high commercial values. Boundary plantations are still so popular in the study area for their benefits.

<table>
<thead>
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<th>TABLE 3: PLANTATION TYPES AND COMBINATIONS</th>
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<td>Agroforestry Practice</td>
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<tr>
<td>Boundary plantation</td>
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<td>Mixed Cropping</td>
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<td>Monoculture</td>
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<td>Agrisilvicultural Systems</td>
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<td>Homegarden</td>
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<td>Woodlot</td>
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1.4. Mixed Cropping

Most of the farmers (72%) contained various annual crops, which was commonly referred to as mixed cropping system. In the study area ligumes, different vegetables along with jute and paddy were the common practice in mixed cropping system. These farmers had a multi-cropping system with different types of vegetables and provided farm stability.

1.5. Woodlot

About 37% of the respondents had woodlots. The major woodlot species in Kaligonj were mehagani, rain tree, babla, gamar, ipilipil, eucalyptus, akashmoni etc (Table 3).
2. Agri-aqua Silviculture, Agri-silvipastural and Agro-aqua Culture

In the study area these three types of culture were available. Various trees and shrubs preferred by farmers were planted on the boundary and around fish ponds. Tree leaves were used as feed for fishes and animals. The main role of this system was fish production and bund stabilization around fish ponds. In the study area 38% of respondents were practicing agri-aqua silviculture and 22% farmers were related in agro-aqua culture practice because of high economic returns.

<table>
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<th>TABLE 4: SPECIES WITH LOCAL AND SCIENTIFIC NAME</th>
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<td>Local name</td>
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<td>Mahogoni</td>
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<td>Raintree</td>
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<td>Koroi</td>
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<td>Ipil-ipil</td>
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<td>Sissoo</td>
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<td>Kadam</td>
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<td>Neem</td>
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<td>Gamari</td>
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<td>Kathal</td>
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<td>Jam</td>
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D. Farmers Perception and Attitudes Towards Agroforestry System

It found that majority of farmers (38%) had shown positive perception (agree) where about 36% strongly agreed about agroforestry (Fig. 3). The farmers of Kaligonj Upazila had favorable to a more favorable attitude towards agroforestry in general. But they showed a slightly different perception in terms of homestead and cropland. About 96% of the farmers strongly agreed with homestead agroforestry where only 2% of the respondents disagreed with it. No farmers strongly disagree with it. Other hands, 45% of the respondent were on the positive side with agroforestry practice on cropland. Some of them (18%) were not interested where 10% of respondents thought negatively. Only 6% of respondents had no comments in this regard. For fish farm agroforestry, the farmers of the study area showed very positive attitudes and perceived that it was very beneficial. Most of the respondents (58%) showed a strong interest where about 24% of respondents showed interest in it. But about 15% thought that it had some negative impact where the other 5% strongly opposed it.

E. Impact of Trees on Agricultural Crops

Most of the respondents (52%) said that trees were not harmful to agricultural crops. It had played a great role in managing and space utilization on land where 32% of respondents said that trees were harmful to agricultural practice because of some managing problems. They said that trees had significant disturbance on the crop which reduced the production by shade and nutrient, water competition and arose the possibility for crop failure and pathogenic attack. 16% of respondents were confused about it and had no comments.

F. Benefits of Agroforestry

Most of the respondents practiced farmland agroforestry for high cash return from timber, produced fodder for their livestock, and fuelwood to grow trees to fulfill their combustion needs. Other respondents practiced meeting shelter or shade requirements for their crops, fruit production, livestock, and timber were also reasons to plant trees. Some mentioned that trees in farmland also work as the living fence among people. The study revealed that farmers were very cooperative with this issue. They helped each other rear livestock and fish farm together in many areas.

G. Reasons for not Planting Trees on Farmlands

Some of the farmers showed a negative impact on planting trees on farmland. They mentioned that tree shade problems, the possibility of crop failure, reduction of crop production, pathogenic dispersal, reduction of soil nutrition, leaf fall problem, water, and nutrients competition, and management
The socio-economic characteristics had much influence on the adoption behavior regarding new practices [14]. FAO [15] reported that the people in higher socio-economic status were participated more in innovative and adaptive activities than the poorer. Here the attitude and perception in agroforestry were our main focus but also collected the socio-economic characteristics of the respondents like age, education, occupation and income etc.

It found that the involvement of women in agroforestry were very low and most of them practice homestead agroforestry. About 97% were male where comparatively little percentage (3%) of female. Islam et al [16] and Dey et al [17] also found that the participation of female (19% and 31%) was also less than the male (81% and 69%). Among the respondents most of them were middle-aged farmers. They were so active in forestry and agroforestry area and considered as economically active members in rural economy [16]-[19]. Education is the main and vital weapon for bringing a positive change in the behavior of individual farmer, which develops knowledge and other desirable qualities [20]. Education may make a farmer more receptive to advice from an extension agency and more able to deal with technical recommendation that requires a certain level of literacy [21]. Only 56% respondents took the primary education in this study that indicated an alarming situation of our country. Sharmin and Rabbi [19] found about 59.27% farmers took the primary education where Hosain and Islam [18] stated only 28% took primary education and about 22% were illiterate. Income is also a vital characteristic for measuring socio-economic consequence like family status and working pattern of people. It revealed that poor farmers were less interested to agroforestry because they need daily basis or seasonal basis income to live. They had little or no land and money so, they also fear to plant trees within cropland whether crop production would reduce. But who were economically feasible practiced agroforestry in both farm land and homestead land for future savings.

In addition, land holding and tenureship are the vital indicators of economic condition of the respondents [22]. It revealed that the people (70%) who had own land for agricultural practice, they were interested in agroforestry practice. But landless people (12%) were not agreeing to practice any permanent or long term system on other’s land. They practice traditional monoculture, cereal crops etc. Hosain and Islam [18] also stated that the respondents (76%) who had sufficient own land were more interested but 24% landless were not interested to agroforestry. About 26% respondents having more than 1 acre of land, were more interested to practice fish farm agroforestry and to grow cereals/trees for their domestic use and cash crops. The people (18%) who had some own land and some leased land were interested to agroforestry.

Perception indicated the farmer's awareness and understanding of the agroforestry systems at Kaligonj Upazila in the Satkhira District. Perception is the ability to see, hear, or understand something [19]. In this study, an average score of 4 showed by the Likert scale indicated that the farmers were agreed to practice agroforestry. These results were encouraging, which showed that the farmers were realizing the importance of trees, crops, and pasture to meet their demand of protein, timber, fuelwood, fodder requirements, and increase the capital formation. On the other hand, a few farmers were not willing to perceive the agroforestry systems because of lack of capital, lack of interest, lack of knowledge on agroforestry systems, don’t have suitable land for this cultivation practice. Farmers’ perception and attitude towards agroforestry were reported nearly similar in the Jhenaidah, Jessore, and Meherpur districts of Bangladesh [18], [19], [22]. Most of the people in Kaligonj Upazila learned agroforestry inherently and from indigenous knowledge systems and had a tradition of practicing agroforestry practice. They did not have any training on it. Recently their practices had been reinforced by the need for socio-economic and environmental sustainability. Three common agroforestry types were found in the study area as homestead agroforestry practice, cropland agroforestry practice and fish farm agroforestry. In homestead agroforestry, mixed plantings pattern with annual, tree crops and pasture around dwelling area were a common type practice in this area. Tree species were narikol, supari, aam, kanthal, jam, keora, tentul, peyara, kul, neem, kathadam, mahogoni, koroi, sirish etc. Vegetables species were halud, ada, lau, chal kumra, banana, pepe, misti kumra, lebu, sim, begun, piu sak and animals were cow, goat, hen, duck, buffalo, pigeon etc (see their scientific name in Table 4). In case of cropland agroforestry, some villages of Muthurespur and Dhalbaria union crops were not grow well because of salty soil. However, fodder crops, shade loving crops and shallow rooted crops can be grown economically. Multipurpose woody perennials were planted and managed over time to produce fuel wood, poles, and stakes for climbing crops where food and animal components integrated especially during the initial establishment phase [23]. The foremost purposes of establishing woodlots were to protect the agricultural fields
from soil erosion, prevent drying up of water springs, landslips, and landslide, and maintain the stream regime. The agroforestry exercise is being popular day by day and the small land holders (less than 1 acre) were the most interested among the respondents to practice agroforestry for getting more welfare from this sundry cropping system.

V. CONCLUSION

Agroforestry is ecologically appropriate land use system in Bangladesh. A large portion of farmers in our country has positive attitudes toward it. Gradually the farmers are adopting agroforestry widely. It has the potential to complement the products and services of desired form forests. There is a widespread practice of agroforestry at Kaligonj Upazila in the Satkhira district. Farmers have adopted agroforestry on a large scale because of high income, sustainable use of land and space, erosion control and protection, crop diversification, risk reduction, and they showed high interest to practice its broader range. Since the findings of the study pointed out that there is a scope for improving the perception level and creating a more favorable attitude of farmers towards agroforestry. The government and responsible authorities take some initiatives to trained-up the farmers for making the agroforestry system potential and uplift the farmers’ socio-economic status.

ACKNOWLEDGEMENT

The authors at first thank to the almighty Allah. Then also thank to Forestry and Wood Technology Discipline, Khulna University, Bangladesh for providing care in field during data collection and analysis. This research did not take any financial aid.

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