The Present Scenario of Agro-Forestry Practices and its Conservation in Jashore District of Bangladesh

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[Abstract : The study was conducted to explore the present scenario of agro-forestry practices as well as its conservation in Jashore district of Bangladesh. We surveyed 60 farmers of two sub-districts named Chowgacha and Manirampur Upazilla under Jashore district in the North-West and South-West region of Bangladesh through using a questionnaire during the period of June to July 2018. Data were collected by using a structured interview schedule. Comparative study was done between agro-forestry and non-agro-forestry system village. Majority of the people were 30% directly involved in yard stead cultivation in Chowgacha Upazilla. But in Manirampur Upazilla, they were almost 25% involved in farmland activities. There was a significant difference between annual incomes between two Upazilla. Findings from the study revealed that agro-forestry system practiced in these Upazilla net income analyses are more profitable than non-agro-forestry village. The comparative analysis revealed that socio-economic condition is better than that of Non-Agro-forestry (NAF) or monoculture farmers. Compare to non-agro-forestry villages, income from sale of livestock, fruits, milk and milk products was higher in agro-forestry villages. It is high time to integrate agro-forestry into existing farming system which will be the strongest driver to meet the food sufficiency of rural resident for longer months and ensure food security sustainably in the study area. Furthermore, agro-forestry system should be properly practiced to maintain an environmental friendly solution.]

[Keywords : Agro-forestry, Cultivation status, Cropland, Livelihood condition, Socio-economic development.]

Introduction

Bangladesh is the 12th densely populated country in the world with population density of 1,115.62 people per square Kilometer (BBS, 2019). About 80% of the total population lives in the rural areas whose livelihood are centered on agriculture and related activities. There are 64 Districts in Bangladesh. Jashore is one of them. Geographically it is in the South-Western zone of Bangladesh. It is located at 88º40′ to 89º50′ East and 22º47′ to 23º47′ North. It is bounded by Jhenaidaha and Magura Districts on the North, Satkhira and Khulna Districts on the South, Narail and Khulna District on the East. Jashore District encompasses 2606.98 km². Jashore consists of the eight Upazilla. These are the Abhaynagar, Bagherpara, Chowgacha, Jashore Sadar, Jhikargachha, Keshabpur, Manirampur

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and Sharsha (BBS, 2011 : 13-33). Our study area Chowgacha and Monirampur upazilla are situated in Jashore district.

In Bangladesh about 17% of the Gross Domestic Product; GDP comes from the most prominent sector of agriculture which provides 45% employment opportunity (BBS, 2014). With the passage of time over population creates pressure on its limited resources such as agriculture, forest and land. The size of the forest coverage of Bangladesh was 17% but now with increasing pressure of population on forest the size decreases gradually about 6-7 % at present. Due to man-made disturbances such as deforestation, illegal logging and harvesting, slash and burn on agriculture, conversion of non-forest land for settlement, farming, recreation and industrialization have forced to decrease the percentage of forest about 2.1% annually over the last three decades (Wood, 1990). Over population is the main burden which decreases per capita land area about 0.005 ha/capita/year since 1989 (Hossain and Bari, 1996 : 21-28).

To maintain the balance of environment, 25% of the forests is mandatory. But it is a matter of great regret that forests coverage is decreases gradually about 11% and its deforestation rate is increased as 33% per year of any country in the world (Gain, 1995; FAO, 2010; Rahman, 2010 : 134-141). Our government is trying to solve these problems to increase our agricultural land for the well-being of our farmers; therefore further benefits on economic sectors. To meet up the demand and to maintain sustainable environment, a new possible solution is mandatory. A new emerging solution, agro-forestry has been practiced in many parts of Bangladesh in a limited land.

Since the period of Genesis II, the mythical Garden of Eden that time every tree was pleasant to sight and good for food. That was the time of early Mediterranean when agro-forestry had recognized subsequently as an integral component of agriculture (Ninez, 1984). At present plant trees on same land has become monotonous for farmers to meet up their demand for fodder, fuel, timber and fruit. Agro-forestry practices is defined as the concurrent use of the limited land for different purposes such as agriculture, forestry, horticulture and raising livestock in association with crops (Neupane, 2000). Similarly, it can be used as proper land use practices for growing trees, crops and of both with animals in the same unit of land (Shams, 2013).

The adoption of agro-forestry system brings not only sustainability of environment but also provides organic matter and nutrient recovery in soil (Sanchez, 1997). Agro-forestry systems are capable to grow different types of trees such as Jackfruit (Artocarpus heterophyllus), Sisso (Dalbergiasisso), Babla (Acacia nilotica), date palm (Phoenix sylyestris) in association with crops such as rice, wheat, jute, oilseed, sugarcane, vegetables and others surrounding agro-ecological region (Abedin and Quddus, 1991; Banglapedia, 2014; Food Agricultural Organization; FAO, 2004; and Hasan *et al.*, 1997 : 55-62). The

practice of monoculture has been reduced through the adoption of agro-forestry production which reduces the rate of deforestation (Rahman, 2012).

Farmers can overcome their economic problems through product diversification; increase the productivity of soil fertility and ameliorating the microclimate situation surrounding environment (World Bank, 2011). To ensure self-sustained life and meet up the demand for fuel, fodder, timber, medicinal products, essential materials are found from agro-forestry products (Haque, 1993 : 12-16). It has been estimated that about 80-82% of forests products comes annually from agro-forestry system to meet up our daily requirements (Scherr, 1992; Sanchez, 1995 : 5-55). The objective of the study was to explore the mode of agro-forestry practices and non-agro-forestry practices between Chowgacha and Manirampur village.

2. Materials and Methods

2.1. Study Area

The main two Upazilla such as Chowgacha and Manirampur had been selected under Jashore district for considering their role in economic sectors. Chowgacha is located about 23.2667° North latitudes and 89.0250° East longitudes beside the Jashore University of Science and Technology. It has a total population of about 269.31 km² and situated on the bank of river Kopothakho (Banglapedia, 2016).Another Manirampur is located between 22°55' and 23°06' North Latitudes and in between 89°09' and 89°22' East Longitudes. The area of Manirampur Upazilla is 444.72 sq km. Among the two Upazilla Durbadanga and Kultia union from Manirampur Upazilla and Narayanpur and Phulsara union from Chowgacha Upazilla were selected. Three persons per household are economically employed on an average in the two study area.

The study area enjoyed a tropical monsoon climate with the lowest rainfall in Bangladesh. The monsoon usually starts in May and ends in late September. The annual rainfall within the tract varies from 1,400-1,800 mm. and the average daily temperature ranges from 12° C during December-January to about 31°C during May-August .Four main seasons namely the dry or winter season (December to February), the pre-monsoon hot season (March -May), the monsoon or rainy season (June-September) and the post monsoon or autumn season (October–November) are recognized in the study area.

2.2. Sampling Design

South-western and North-Western part of Jashore district plays a dominant role in agriculture sector of Bangladesh. For this reasons, among the eight upazillas, two upazillas such as Chowgacha and Monirampur had been chosen for getting proper idea about the present status of production mode of agro-forestry practiced.

Two unions out of the seventeen unions from Monirampur and two unions out of eleven unions from Chowgacha Upazilla, a total of four unions were selected to get proper overview of the study area.

To get proper idea random sampling techniques were used to identify a total of twelve villages of which three villages from each union were selected. To find out the agro-forestry and non-agro-forestry practices, sixty household selected randomly. From these twelve villages, a total of 60 households are randomly selected. In selecting 60 households ware imposed to make sure that half of the households are Agro-forestry practitioners and the rest half was Non-Agro forestry or monoculture practitioners.

2.3. Data Collection and Analysis

To fulfill the objectives of the study and to get proper idea, a household survey with proper structured questionnaire is obligatory. To gain actual idea about the landscape, farm behavior, mode of production, income analysis, livelihood condition, transect walk ware carried out. Microsoft Excel was used to enter the initial collected data. To avoid some errors collected data was checked randomly compared to original completed questionnaire. Descriptive statistical analysis including frequency distribution, percentage, cross tabulation, mean and standard deviation (SD) are used for data analysis to summarize the farmers' socio-economic characteristics and farm specific characteristics.

This study classified surveyed farms into three categories : small (< 0.25 ha), medium (between 0.25 to 0.35 ha) and large (>0.35 ha) whereas farmers are classified as four income groups. Income group 1 includes less than Tk. 0.20 million yearly household income; group 2 includes Tk. 0.21 to 0.41 million.

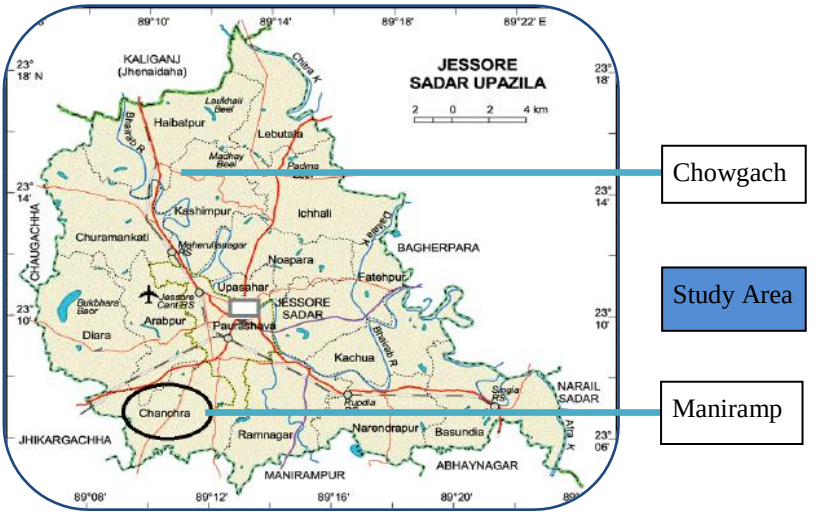


Figure 1 : Map of Study area

The commonly used technique for valuing agriculture and tree crops is the income approach Information is collected on all the sources of income of the households. Four major indicators of farmer's household livelihood situation have been taken into consideration to evaluate overall household situation. A Weighted Mean Index (WMI) has been constructed for each of the indicators, and finally an aggregate WMI is determined to examine the overall situation. Aggregate WMI is calculated through equation 1 following [16].

$$WMI = W_1 f_1 + W_2 f_2 + ... + W_n f_n = \frac{\sum W_i f_i}{\sum f_i} \qquad (1)$$

Where, WMI= Weighted Mean Index

Wi= Assigned weight for a particular class under satisfaction scale

fi= Corresponding frequency of that class

Results and Discussion

Respondent Occupation

Agriculture is the main occupation of this selected area. In Chowgacha upazilla about 56% (25 respondents) were engaged in agriculture mainly agro-forestry practices whereas 65% (20 respondents) were involved in monoculture activities. Apart from that in Manirampur upazilla 65% (20 respondents) were take part in agro-forestry practices which is quite low from Chowgacha area.

Upazilla		**Respondent's occupation**			
	Sector	**Agriculture**	**Labor**	**Service**	**Total**
Chowgacha	AP	25(56)	5(30)	10(14)	40(100)
	NAP	20(65)	10(15)	10(20)	40(100)
	Total	45	15	20	80
Manirampur	AP	20(65)	10(20)	5(15)	35(100)
	NAP	25(60)	7(30)	3(10)	35(100)
	Total	45	17	8	70

Table 1 : Occupation pattern of respondents in the study area (Source : Field Survey, 2018)
Note : AP=Agro-forestry Practices, NAP=Non-Agro-forestry Practices

Land Asset of the respondents

From the below table, it is clearly revealed that total land of Chowgacha upazilla is 1.05 ha (SD=.84, N=30) and Manirampur upazilla 0.68 (SD=.54, N=30) which indicates that people of this upazilla involved in agro-forestry practices. Besides, Farm size is enough to fulfill their demand especially people of these upazilla are not so idle because they are involved in farmland activities like livestock management etc.

Land Asset	Chowgacha upazilla (N=30)		Manirampur Upazilla (N=30)	
	Mean	SD	Mean	SD
Total land (ha)	1.05	.84	.68	.54
Arable land (ha)	.68	.56	.39	.18
Farmland (ha)	.34	.18	.29	.22

Table 2 : Land Asset of the Respondents (Source : Based on field survey, 2018)

Different category of Agro-forestry Products practices

From thee supplied fig. 2 showed different types of agro-forestry products were chosen varies with their mode of cultivation style. Majority of the people of Chowgacha Upazilla had taken different types of agro-forestry products. Among these, they involved in yard stead productions about 30% followed by 24% crop-based, 20% medicine based and so on. On the other hand, in Manirampur Upazilla, majority of the people almost 25% were directly involved in farmland activities followed by 20% crop-based and fish-based activities. This figure showed clear concept of taking different agro-forestry system to become solvent. They were adapted with different types of agro-forestry production system.

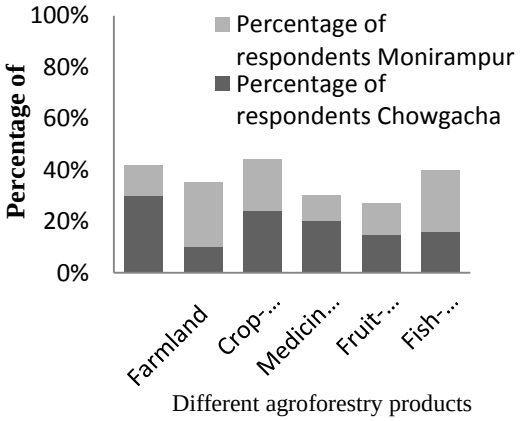


Figure : Different agro-forestry practices in the study area

Financial benefits of the Respondents

Agro-forestry practices brought not only significant differences in case of income and expenditure changed bout also rendered pivotal role in changing their livelihood condition.

Indicators	Chowgacha Upazilla	Monirampur Upazilla
Annual income in mean (BDT in million)	0.24	0.23
Standard deviation	0.15	0.09
Value of minimum	0.09	0.07
Value of maximum	0.67	0.55
Annual expenditure in mean	0.23	0.22
Calculation of Standard deviation	0.07	0.05
Value of minimum	0.05	0.03
Value of maximum	0.17	0.13

Table 3 : Financial benefits of the Respondents

From the above table, it was found that with the passage of time their mean annual income was increased rapidly in Chowgacha Upazilla than in Manirampur Upazilla. People of Chowgacha Upazilla took agro-forestry practices as their main occupation that was why their annual income was higher than that of Manirampur Upazilla. People of Manirampur Upazilla also became conscious to earn their income through agro-forestry system which paved the way to earn higher income to solve their socio-economic condition to lead their life easy and comfortable.

Trees on Farmland

From the below table, it was clearly observed that people of this Chowgacha Upazilla was directly involved to grow different types of medicinal products than Manirampur Upazilla which showed that farmers were more eager to grow medicinal products. Apart from that fruits numbers practices were greater than that of Manirampur Upazilla. However, the number of fodder trees was almost similar due to the land holding capacity was greater in non-forestry villages than agro-forestry practices.

Village	FT	Variation	FWT	Variation	MTN	Variation	FN		Variation (AP-NAP)
CAP	52	30	146	129	125	102	136	110	6
CNAP	22		27		23		26		
MAP	46	26	123	91	136	80	128	66	18
MNAP	20		32		56		62		

Table 4 : Number and types of trees on farmland (Source : Household Survey, 2018)

Note : FTN= Fodder Trees number, FN= Fruit numbers, MTN= Medicinal Trees numbers, FWT= Fuel wood and timber

CAP= Chowgacha Agro-forestry Practices; CNAP= Chowgacha Non-Agro-forestry Practices

MAP= Manirampur Agro-forestry practices, MNAP= Manirampur Non-Agro-forestry Practices

Category of AP and NAP in case of Income Group and Farm size

	Income Group of Chowgacha Upazilla					
Size of farm	**Agro-forestry Practices (AP)**			**Non-Agro-forestry Practices (NAP)**		
Farm Size	Group no 1	Group no 2	Total	Group no 1	Group no 2	Total
Small	2	22	24	0	2	2
Medium	3	5	8	3	1	4
Large	1	2	3	2	0	2
Total	6	29	35	5	3	8

Table 5 : Cross-tabulation of CAF Farmers : Income Group and Farm Size

	Income Group of Manirampur Upazilla					
Farm Size	**Agro-forestry Practices (AP)**			**Non-Agro-forestry Practices (NAP)**		
Farm Size	Group 1	Group 2	Total	Group 1	Group 2	Total
Small farm	15	2	17	0	1	1
Medium	2	0	2	0	1	1
Large farm	4	1	5	2	0	2
Total	23	3	26	1	3	4

Table 6 : Cross-tabulation of Manirampur Farmers : Income Group and Farm Size

From the above table, it was clearly observed that most of the AP in Chowgacha farmers belongs to group 2 whereas in Manirampur Upazilla group 1 indicates higher income. In agro-forestry practices village this indicated that farmers were

able to meet up their demand through agro-forestry production than that of the non-agro-forestry villages. Apart from that the non-agro-forestry farmers' income would be less than 1 lack which was not enough to meet up their demand.

Impact of CAF on Livelihood of Households

From the weighted mean of two Upazilla, it was clearly revealed that Agro-forestry household condition was good than that of the Non-agro-forestry household. Members of the household were satisfied with their agro-forestry practices.

Indicators	**Chowgacha Weighted Mean**		**Manirampur Weighted Mean**	
	AP	NAP	AP	NAP
Household Food Security Condition	3.28	2.54	2.88	1.56
Household Education Expenditure Affordability	4.84	3.83	3.50	2.45
Household Clothing Expenditure Affordability	3.53	2.54	4.76	3.34
Household Medical Expenditure Affordability	4.23	3.34	4.87	3.27

Table 7 : Calculation of Weighted mean of Livelihood of the Households

Income from livestock products

Chowgacha village	BMP (Lit)	CMP (Lit)	IMS (TK)	QGS (N)	IGS (TK)	IOL(TK)	IMP (TK)	CE (TK)
AP	1500	680	20116	916	11207	2026	4201	640
NAP	500	200	6456	213	4200	600	2312	3000
AP-NAP	1000	480	13660	703	7007	1426	1889	-2360
Manirampur Village								
AP	1450	760	22367	528	11626	3045	5423	876
NAP	400	300	7860	328	2000	567	3425	459
AP-NAP	1050	460	14507	200	9526	2478	1998	417

Table 8 : Income from livestock production and source of income by village (Source : Household Survey, 2018)

Note : AP- Agro-forestry Practices, NAP-Non-Agro forestry Practices, BMP-Buffalo milk production, CMP-cow milk production, IMS-income from milk sale, QGS-quantity goat sale, IGS-income from goat sale, QO-quantity of livestock other than above, IOL-income from other livestock, IMP- income from milk product, CE-income from chicken and egg, N-number of livestock., Tk= Bangladeshi taka

From the above table, it was clearly revealed that agro-forestry practices village was more capable to buffalo and milk production approximately 1500 and 680 liters compared to Non-agro-forestry village. This is due to abundant fodder supply which enhances their farm size. Apart from that that there was a significant difference in the milk production and income status derived from the livestock (large cattle) in Agro-forestry and Non-agro-forestry villages. However, the result showed that income derived from chicken and eggs was more in Non-agro-forestry village.

Conclusion

Agro-forestry is the land use science, which deals with the interactions between trees, crops, and of both with animals in the same unit of land. The study clearly showed variation of the chosen agro-forestry products. Majority of the people were 30% directly involved in yard stead cultivation in Chowgacha Upazilla. But in Manirampur Upazilla, they were almost 25% involved in farmland activities. There was a significant difference between annual incomes between two Upazilla. Annual income was higher in Chowgacha Upazilla whereas in Manirampur Upazilla people became more active to take part different agro-forestry production to increase their income. Similarly, the study clearly showed that the non-agro-forestry village was facing a shortage of firewood and fodder due to heavy pressure of grazing on forest and community lands. Agro-forestry system practiced in both the Chowgacha and Manirampur Upazilla, income analysis showed that agro-forestry farms are more profitable than non-agro-forestry farms. Income from sale of livestock, fruits, milk and milk products was higher in agro-forestry village as compared to non-agro-forestry village.

At present, it is mandatory to take effective steps for Programme implementation to teach about the benefits of agro-forestry system. Not only this, small home agro-forestry system should be ensured first than community-based approach to gain sustainable solution. In fine, agro-forestry practices are becoming an environmental friendly at present. Besides, it has no environmental impact to fulfill the sustainable development goal as well as in meeting food requirement of rural household to greater extent.

Recommendation

The benefits of agro-forestry system can bring drastic changes in our agricultural sectors. Besides, to alleviate poverty reduction agro-forestry practices in agricultural sectors can introduce new way to get rid of poverty so to enhance our economic development. It is high time, our government can render pivotal role to facilitate more training to teach every farmers about the effective role of agro-forestry to develop our nation's economy. In addition, policy makers can take part active role to design the necessary support measures to increase farm income as well as livelihood in every district. Therefore, it suggests for planned expansion of cropland agro-forestry for overall socio-economic development of the farmers.

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