

FARMERS' PERCEPTION OF THE CHANGES IN LAND DISTRIBUTION IN THE BANDARBAN HILL DISTRICT OF BANGLADESH

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Abstract

The Chattogram Hill Tracts (CHT) are witnessing an escalating pace of land use change as a result of population dynamics, economic development, climatic change, greater accessibility, and agricultural technical advancements. The study was conducted in Rwangghhari and Ruma upazila of Bandarban district, Bangladesh. This study explored farmers' perception towards land use change and the factors contributing to their perception. Following a proportionate random sampling technique, a total of 120 households were sampled and survey was administered through a predesigned close ended questionnaire. A substantial number of respondents (54%) were more than 40 years old, of whom 51% were educated with an average family size was five. The respondents had an average annual income of BDT 91830. An average land holding was 3.59 acres were seen in the study area and these lands were occupied with agricultural, forest, vegetable lands and also with flat and hilly lands. Meanwhile, 98% farmers maintained medium to higher perception towards the changes of land distribution. In addition, out of eight attributes, three attributes, namely, educational attainment, agricultural training received and hill land ownership had significant influence on the perception of land use change by the respondents. The findings of the study can be utilized by the policy makers and planners of the country to formulate future land distribution policy of the CHT in future.

Keywords: Socio-economic factors, farmers' perception, land distribution change, Bandarban.

Introduction

The Indian subcontinent is the most populous regions in the world (Lambin *et al.*, 2003) and have experienced significant land use changes in recent decades (Nkonya *et al.*, 2012). For instance, there were only two megacities in 1970 (cities with populations greater than 10 million), but there are currently 23 and are expected to be 37 by 2025, with the majority

of them located in developing countries (Rui, 2013). It is found that land has both positive and negative influence on human life and environment based on the pattern of uses over time (Zenga *et al.*, 2008). In this point, Lambin *et al.*, (2003) has identified that the misuse, disuse, overuse, under use or abuse of land resources either directly or indirectly induced world's different problems. Since

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from the last decades, it is perceived that changes of land use patterns are global in nature especially because higher dependency of human being on land (NFPCSP, 2011) for livelihoods, housing in safe and secured places, accessibility of desired food for eating (NASA, 2006). Due to the lack of coordinated action from the various parties involved in land management, lands are therefore becoming a scarce commodity or natural resource (Ruben *et al.*, 2008). The problems are more severe in developing countries. LUCC (Land Use and Cover Change) is therefore crucial to consider as being a key factor affecting both global environmental change and environmental protection (Xie *et al.*, 2014; Xie *et al.*, 2012; Cao *et al.*, 2015).

In the recent years, global warming is developing around the globe so carbon sequestration has perceived as a hot topic in many fields (Haiming *et al.*, 2010). International community gives more attention to the role of forestry in carbon sequestration resulting recognition of forest contribution to carbon sequestration into the Kyoto protocol. Accordingly, it is easy and cheaper to control CO₂ emission through planting forest and there will not have much negative impact on the speed and pattern of economic development (Xi and Li, 2006). Therefore, expanding forest area is a good practice against climate change. Forestry expansion is thought to have the crucial role in mitigating global warming, although land use and land cover changes are leading factors of global environmental changes. According to the Kyoto protocol, natural terrestrial carbon sinks management in the form of global scale forestation and reforestation can reduce CO₂ as well as, improve sink strength. Although,

eighty percent of global forest that cover the earth's surface have been cleaned, degraded or fragmented, which assisted the worldwide scholars to come forward and think about the forest degradation around the globe (Lorena and Lambin, 2009).

Worldwide population expansion has created massive pressure on natural bases of countries like Bangladesh (NFPCSP, 2011), that falls the country in threat of declining cultivated lands (Zubair, 2006). Besides that, Bangladesh's rate of agricultural land conversion to non-agricultural uses is concerning for crop production and food security (Planning Commission of Bangladesh, 2009). For a country with a high population density like Bangladesh, the terms "land scarcity" and "land-hungry" are crucial. The only hilly region of Bangladesh, the Chattogram Hill Tracts, is also experiencing changes to its forest cover and other land areas. The spatial pattern of land use in the Chattogram Hill Tracts is changing with the passage of time as a result of various factors, including geophysical, socioeconomic, proximity, and climatic.

The Chattogram Hill Tracts (CHT) are a topographically diverse area (southeastern part) of Bangladesh is the home of about 1% of the total population of the country with 11 small ethnic communities (Rasul, 2015). For the tribal people in the CHT, forest plays an important role in the economy of tribes in the form of religious, cultural and economic activities (Baten *et al.*, 2010). The Chattogram Hill Tracts (CHT) of Bangladesh have faced the same experience of land degradation and deforestation like the mountain's areas of South and Southeast Asia due to some

environmentally bad practices as shifting cultivation and logging. Shifting cultivation (local name is ‘Jhum’) is a common agricultural practice by the 11 tribal communities in the Chattogram Hill Tracts (CHT). It is the slash and burn method of land use system of that area. The environmental condition of Bangladesh’s CHT is greatly hampered by the population’s spread from the lowland to the CHT and by local population expansion (Knudsen and Khan, 2002). The two main threats to hilly areas are deforestation and land degradation brought on by agricultural and other activities. These events contribute to the emergence of socioeconomic issues and a vulnerable hill landscape (Biswas *et al.*, 2012). Due to changes in land use and cover, CHT’s natural resource base has been declining (Biswas and Chowdhury, 2007). It is a great challenge for environmental conservation and ecological engineering construction to protect the forest quality that would hamper the local forest production seriously. Therefore, in the future the situation tends to be deteriorated and it is important to explore present land use condition of the CHT. From this perspective, the study was an attempt to investigate farmers’ perception towards the changes of land distribution, and factors contributing to their perception.

Methodology

Study site

The research was carried out in Bandarban District (Fig. 1) which is in South-Eastern Bangladesh, and a part of the Chattogram Hill Tracts. It is a part of the Chattogram Hill Tracts and one of Bangladesh’s three hill districts. Two upazilas (Rwanggchhari and

Ruma) of Bandarban were selected as the study site.

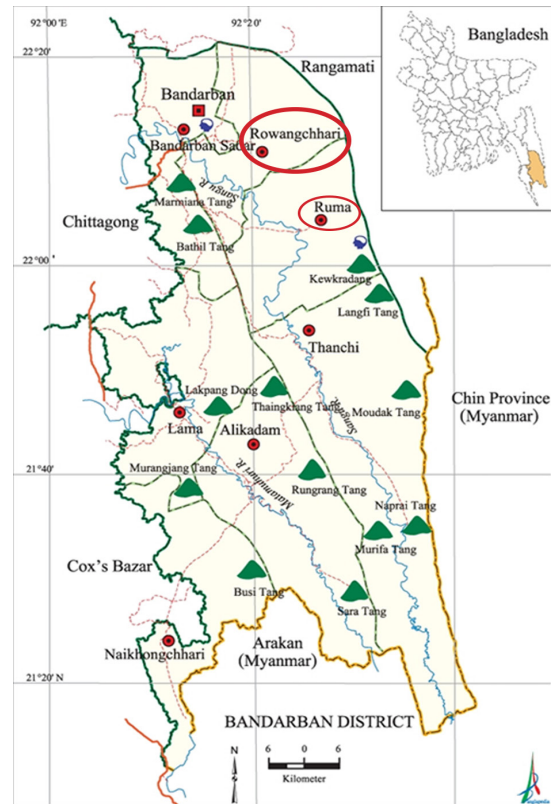


Fig. 1. Study site.

Research design

The survey-based, descriptive-diagnostic research design was applied in this research. Both ethnic and non-ethnic inhabitants of the hill areas were selected as sample of this study and the data from the respondents were gathered through in-person interview approach using a semi-structured interview schedule. The farmers who were actively involved in different agricultural activities in the study areas were the population of the present study and the total number of populations of the study area was 623. Out of which, a

sample of 120 respondents was chosen using a proportionate random sampling technique.

Measurement of dependent variable

Perception of the respondents towards the changes of land distribution was considered as the dependent variable of this study and it was measured by constructing a 5-point Likert type scale, which was consisting of 17 items on land-use practices. Score 5, 4, 3, 2, and 1 was assigned for Strongly Agree

(SA), Agree (A), Undecided (U), Disagree (D) and Strongly Disagree (SD) respectively. Finally, perception on land use changes score of a respondent was determined by adding all the scores of that respondent against all the 17 items based on the following Equation 1. Hence, the possible perception score of a respondent could be 17 to 85, where '17' indicated highest unfavorable perception, and '85' indicated highest favorable perception on land use changes.

Perception Index (PI)= $f_{SD} \times 1 + f_{D} \times 2 + f_{U} \times 3 + f_{A} \times 4 + f_{SA} \times 5$ (1) Where,

f_{SD} = Frequency of the farmers were in strongly disagreement

f_{D} = Frequency of the farmers were in disagreement

f_{U} = Frequency of the farmers were undecided (neutral) in perception

f_{A} = Frequency of the farmers were in agreement

f_{SA} = Frequency of the farmers were in strongly agreement

Then we calculated and categorized the overall perception of the respondents towards land use changes considering 'as a rule of thumb' of mean \pm standard deviation (SD) and classified into three categories, namely, lower perception, moderate perception and higher perception towards land use changes. The similar method of categorization was also followed in several similar other studies (like, Ghosh *et al.*, 2020; Hasan *et al.*, 2010; Hasan *et al.*, 2015; Hasan *et al.*, 2021; Salawat *et al.*, 2013).

Measurement of independent variables

The independent variables of the present study were age, family size, educational attainment, family annual income, agricultural training received, ownership of total land, ownership of flat land, and ownership of hill land.

A respondent's age was calculated in years based on the actual age of his life. Family size was measured by the total number of members, including the respondent himself, spouse, children and other members who jointly lived. The number of classes completed was used to measure educational status. Family annual income of a respondent in the study area was determined on the basis of his total earnings from agriculture, service, business and other sources. The training was measured by the total number of agriculture-related training a respondent experienced from different organizations. The total land area of a respondent included homestead area, farm land, mortgaged land, leased land, flat land, hill land etc. These land areas were expressed in acres.

Factors contributing respondents' perception towards the changes of land distribution

To determine the attributes influencing the respondents' perception, all the independent variables were subjected to full-model regression analysis by following Equation 2, below:

$$y = \beta_0 + \beta_1 \times 1 + \beta_2 \times 2 + \dots + \beta_k \times k + \dots + \varepsilon \quad (2)$$

where, y is the probability of perception towards land use change: X_1, X_2, \dots, X_n indicate the independent variables such as age, family size, educational attainment, family annual income etc., while $\beta_1, \beta_2, \dots, \beta_n$ are regression coefficients of the independent variables. β_0 is constant.

The Statistical Package for Social Science (SPSS) was used to analyze the data, and statistical tests such as frequency count, percentage, mean, were conducted. The contribution of the independent variables to dependent variable was examined using 0.05, and 0.01 level of probability.

Results and Discussion

Sociodemographic condition of the respondents

According to data in Table 1, 79% of respondents fell into the category of those who were 31 to or older than 50 years old. The data in this table also showed that the respondents' average age was around 45 years. Similar results were observed in a Bangladeshi study by Mahamud *et al.* (2022), where the respondents were on average 47 years old. While, Saha *et al.* (2021) also discovered comparable results in Bangladesh, where respondents' average ages were 46.22

years. In addition, Hasan *et al.* (2017) came to the conclusion that younger respondents had broader perspectives and more exposure to social media than older respondents did.

Table 1's findings showed that although the average family size was 5.0, 93% of the respondents had families with two to seven individuals. The average family size was larger than the national average family size of 4.06 of Bangladesh (BBS, 2016). According to Adekunle and Agbaje (2012), a large family size in Nigeria results in more mouths to feed, which necessitates greater exploitation of various resources and services. It was noticed from this study that about 49% respondents had no formal education, while about 47% of them had primary to SSC level education. In their study, Ghosh *et al.* (2021) found that about 53% respondents didn't have any formal schooling participation in Chapainawabganj Sadar upazila of Chapainawabganj district. The importance of education for a person cannot be underestimated. People with greater education tend to be more cosmopolitan. They enjoy traveling outside of their home region. They are eager to learn more about various topics. People who are educated read newspapers, attend several Krishi melas, watch various television programs about agriculture, and stay current on new technologies. They enjoy visiting the local agricultural offices to discuss their issues in the field with the personnel there. Their education enables them to be environmentally aware. They therefore have intense feelings regarding the changes in farming practices. Despite the fact that the study location is a typical hilly area, their educational achievement exceeded expectations (Chakma *et al.*, 2021; Suza *et al.*, 2021).

Result presented in Table 1 indicated that, in the study area most percentage (62.71%) respondents were tenant, although 27% of them had their own land. However, these lands are used to cultivate different types of crops, vegetables, fruits and timber.

The average family annual income of the respondents was BDT 91830 and 78% of

them had income within BDT 100000. According to Economic Census 2020 of Bangladesh, the per capita income is more than BDT 165200. This data indicates that the respondents' annual income was far less than that of the national average. As it was fully hilly areas of the country and opportunities of different income generating activities was lower than the other parts of the country.

Table 1. Sociodemographic characteristics of the respondents

Variable	Category	Percent	Mean
Age	Up to 30 years	20.3	44.37
	31-40 years	25.4	
	41-50 years	22.0	
	More than 50 years	32.2	
Family size	2 – 4 members	37.9	5.00
	5 – 7 members	55.2	
	> 8 members	6.9	
Education	No education	49.2	4.15
	Primary	11.9	
	Secondary to SSC	35.6	
Farmer type	More than SSC	3.3	
	Own land	27.12	
	Tenant	62.71	
Family annual income	Both type	10.17	91830.50
	<100000 BDT	78.00	
	100001 to 200000 BDT	15.30	
	200001 to 300000 BDT	3.40	
Extension media contact	>300000 BDT	3.40	
	No one	49.2	
	SAAOs only	20.3	
Agricultural training received	Seed dealers	1.7	1.2
	Others of agril. offices	28.8	
	No training	47.45	
	1-2 training	32.2	
	3-4 training	18.64	
	>4 training	1.71	

The respondents' extension media contact was measured by which information source they contacted. About 48% respondents of the study area maintained no contact with anybody for getting extension services. They traditionally cultivated their farming land. Their (49%) main media of getting extension services were the SAAOs and others of the local agricultural offices. Extension agents can help media producers by keeping them informed of farmers' concerns and information needs, and by reporting any failure to understand the content of the products of mass media. Extension activities convey the latest technologies to the clients and educate them on alternative practices, thus reducing the information irregularity often related with the latest technologies (Ghimire and Huang, 2015). This results in a cognitive change of the users with an eventual change in behavior and also in skill. Findings presented in Table 1 revealed that in the study areas most percentage (47.5%) of the respondents did not receive any training on any agricultural

issues. On the other hand, about 51% respondents of the study area received 1-4 training on agriculture and related issues. It is perceived that the respondents tend to practice traditional farming. Poor transportation system and lack of availability of water for irrigation in the hilly areas worked as catalyst of the respondents to perform traditional agricultural system. So, it is a very difficult task to bring them under training facilities. Through a study, Chakma *et al.*, (2021) also found similar types of findings.

Land area distribution of the study area

Ownership of total land area

Total land area plays a critical role in aggregated family income. Increasing land size has a positive impact on the farmers' net profit, as well as economic, technical and labor efficiency. Data concerning the total land size of the respondents have been shown in Fig. 2. Data displayed in Fig. 2 exhibited that, the highest proportion (76%) of the respondents

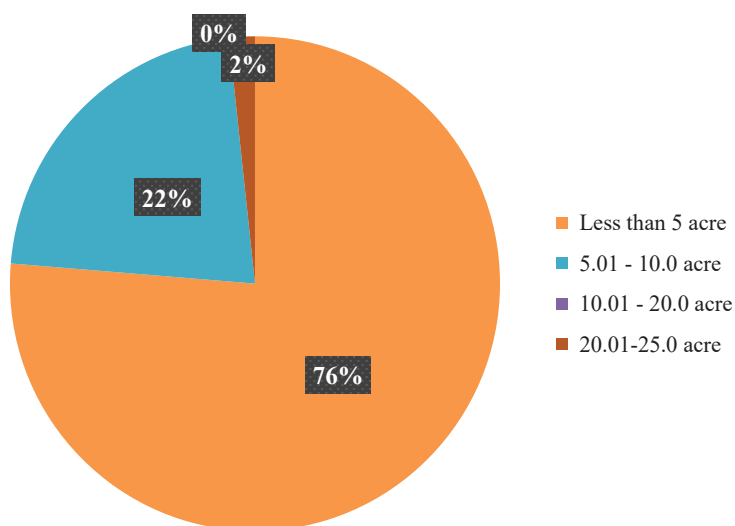


Fig. 2. Distribution of the respondents according to their ownership of total land.

had less than 5 acres of land, followed by (22%) of them had 5.01-10.0 acres of land.

The average land holding in the study area was found 3.59 acres while the national average is 0.56 acres (Alam *et al.*, 2020). Hence, the average land ownership was far more than the national average as because of the lesser population density in hilly areas. In the CHT, the population density is about 136 persons per square kilometer as against 1,147 persons per square kilometer of the whole country (Acharjee, 2019).

Ownership of flat land

The CHTs are different from other districts of Bangladesh because of the undulated land pattern. Generally Bengali/non-ethnic people are the main inhabitants of flat areas while ethnic people prefer to live in hilly areas. Based on flat land ownership, the respondents were classified into four categories as presented in Fig. 3, below:

Data displayed in Fig. 3 revealed that, the highest proportion (71%) of the respondents had 0.01-3.0 acres of flat land with an average of 0.86 acres. Cultivable plain land is scarce in the CHT region and the land suitable for intensive field crop cultivation is less than 5% of the total area (Talukder *et al.*, 2013).

Ownership of hilly land

The CHT is predominantly hilly (north-west to south-southeast regions) topography and is characterized by steep slopes (2/3 area). Based on the ownership of hilly lands, the respondents were classified into five classes as presented in Fig. 4.

Findings from Fig. 4 indicated that around half of the respondents (47%) belonged to 0.01-3.0 acres of hilly land category with an average land holding of 2.57 acres. The economy of the area is agriculture-based and it was the main source of livelihood of the hill residents. The key crops grown in hilly slopes include rice, sesame, chili, ginger, turmeric,

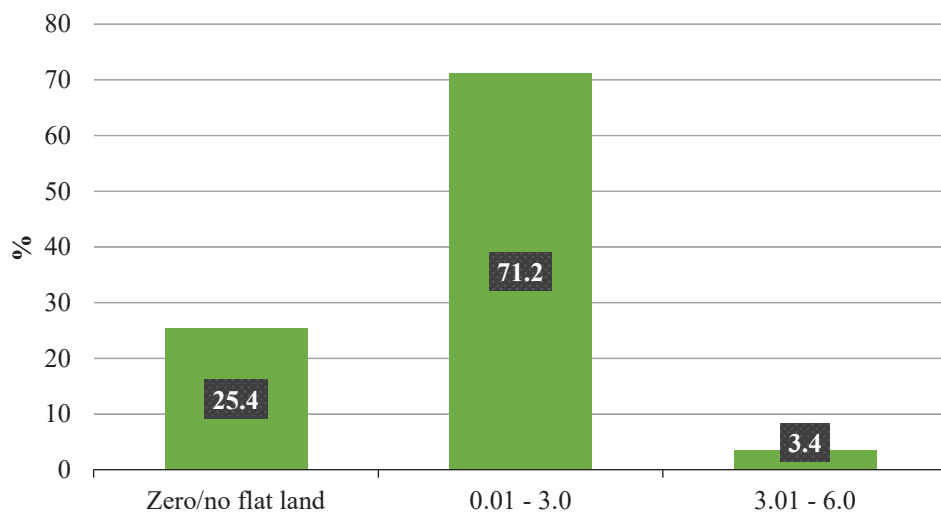


Fig. 3. Distribution of the respondents according to ownership of flat land.

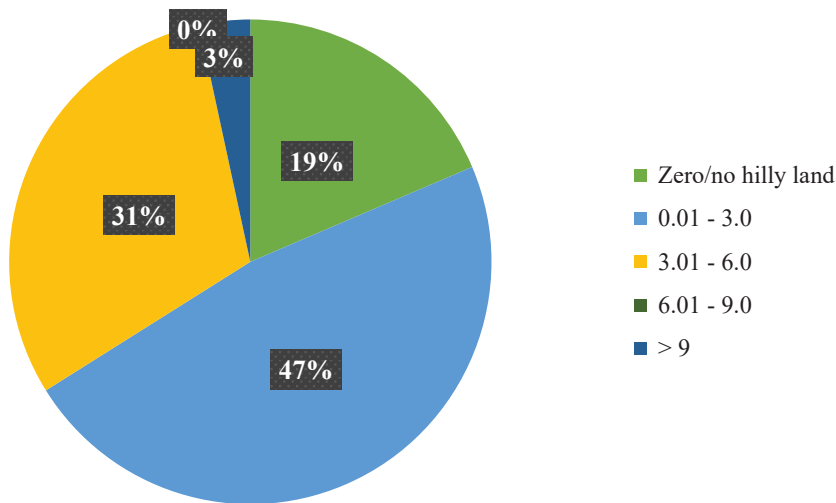


Fig. 4. Distribution of the respondents according to their ownership of hilly land.

cucurbitaceous (sweet gourd, bitter gourd etc.), maize, banana, aroids, cotton, okra etc. also some fruits and timber species.

Perception of the respondents towards the changes of land distribution

Perception of the respondents towards land use changes (LUC) in the study area are discussed below which could provide a clear idea about the thinking of local people toward the land cover changes.

Perception of the respondents on different land distribution

The study area's land was divided into four categories: agricultural land, forest land, water land, and built-up area (Fig. 5), and the perceptions of the respondents regarding the various land distributions were gathered. The study area's respondents believed that forest land was occupied more frequently than other types of land, with 49% of the study area's lands being covered by forest. While the agricultural land occupied came in second

with 33%. On the other hand, the respondents believed that 9% of the total land area was occupied by both water and built-up areas. In the study area, cities, roadways, and other built-up areas were present.

The majority of respondents stated that both the built-up area and the amount of forest land had increased. They felt that the social forestry initiative had contributed to a larger overall forest area. While the shifting agricultural practices were also getting smaller day by day, this result was thought to be caused by them. Hasan *et al.* (2020a) also exhibited similar type of findings.

Overall perception of the respondents towards the changes of land distribution

The overall perception scores of the respondents towards the changes of land distribution were calculated and provided here through Fig. 6, below:

Data furnished in Fig. 6 indicated that 69% respondents had moderate perception towards

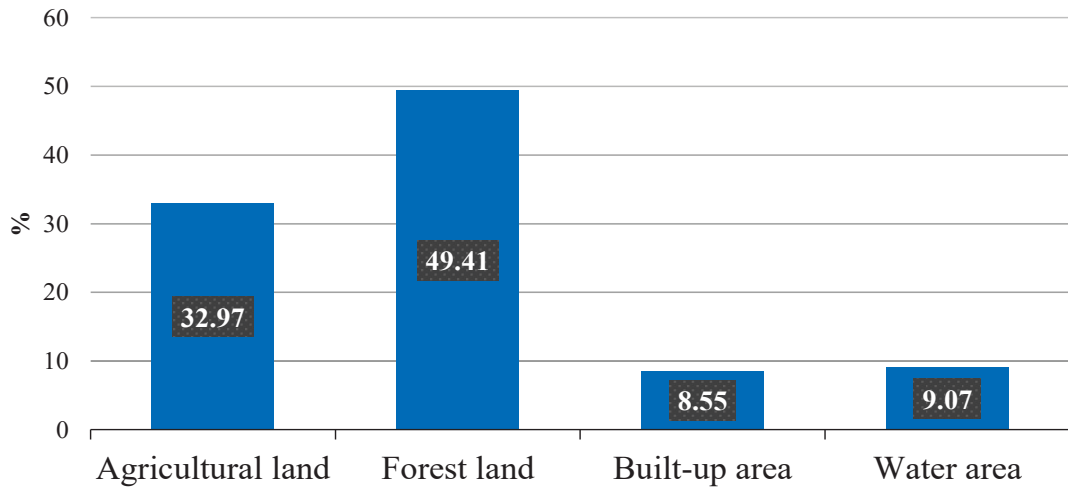


Fig. 5. Distribution of the respondents according to their opinion on land distribution.

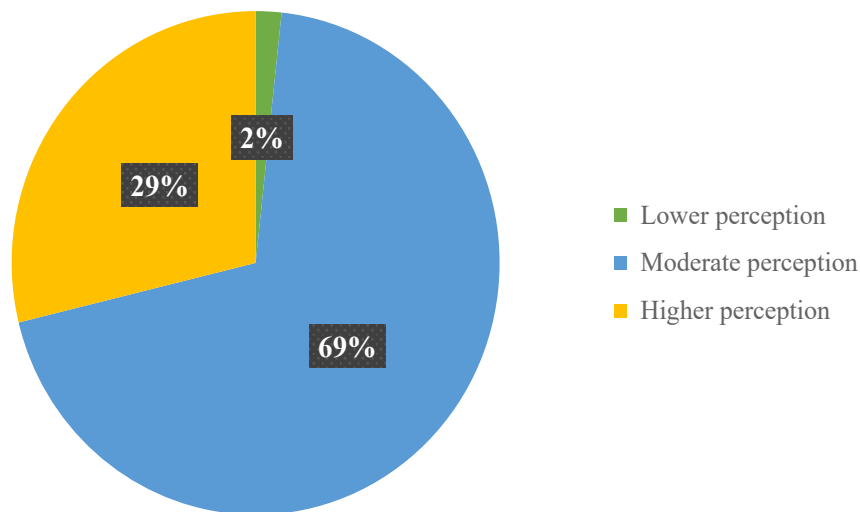


Fig. 6. Distribution of the perception of respondents towards the changes of land distribution.

the changes of land distribution in the study area, while, 29% of them had higher perception towards the changes of land distribution. Important features of the CHT forest are the existence of semi-evergreen deciduous to tropical rain forests which includes reserved forests and plantation forests (accounts for 40% of total forest cover of Bangladesh, although, the forest area of the CHT is

characterized into seven subtypes. These subtypes include, Tropical wet evergreen, Tropical mixed evergreen, Tropical moist deciduous, Tropical open deciduous, Bamboo, Lowland freshwater swamp, and Savanna (de Milde *et al.*, 1985; Hasan *et al.*, 2020b). Hasan *et al.*, (2020b) also concluded that in addition to acting as a carbon sink to prevent global warming and climate change, forests

provide sustainable sources of life such as water and air. According to a study by Kibria *et al.* (2015), indigenous people in the CHT are heavily dependent on land resources to maintain their way of life. However, due to poor land use practices, both the state of the forest and the indigenous population of CHT were in danger. Through a different study, Kafy *et al.* (2017) determined that urbanization has a significant impact on changes in the CHT's land cover, specifically the conversion of hill forests to built-up regions as well as to crops and shrublands.

Contribution of the characteristics of the respondents on their perception towards the changes of land distribution

To determine the factors influencing the respondents' perception towards the changes of land distribution, eight independent variables were subjected to regression analysis. Regression results in Table 2 indicated that three out of eight characteristics of the respondents showed a significant contribution to land use changes perception.

The model seems to have good fitness as indicated by R square. R^2 value was 0.753, which revealed 75.3% of the variation in perception on changes of land distribution. The adjusted R^2 (which is the measure of goodness of fit of the estimated regression model) value of 0.713 indicated a good fitting of the model. The multiple regression analysis (Table 2) results explained that educational attainment showed a positive and significant contribution towards the changes of land distribution perception. This characteristic was significant at the 5% level. The regression coefficient 'b = 0.265' showed that one unit increase in education would increase respondents' perception towards the changes of land distribution by 0.265 units. That means if the educational attainment of the respondents increased it would positively change their perception. Agricultural training received of the respondents showed a positive and significant contribution toward land use change perception. This characteristic was significant at the 1% level. The regression coefficient 'b=0.313' showed that one unit increase in the agricultural training would

Table 2. Contribution of the selected characteristics of the respondents on their perception towards the changes of land distribution

Sl. No.	Variables	Estimated Coefficient (β)	t- value (sig.)
1.	Age	0.080	1.007 (0.319)
2.	Family size	-0.019	-0.247 (0.806)
3.	Educational attainment	0.265	2.590 (0.013*)
4.	Family annual income	-0.101	-1.277 (0.207)
5.	Agricultural training received	0.313	2.893 (0.006**)
6.	Ownership of total land	-0.148	-0.481 (0.633)
7.	Ownership of flat land	0.030	0.025 (0.980)
8.	Ownership of hill land	0.576	2.123 (0.039*)

$R^2=0.753$, Adj. $R^2=0.713$, $F=19.052$ ** $P<0.01$, * $P<0.05$.

increase respondents' perception towards the changes of land distribution by 0.313 units. That means if the agricultural training of the respondents increased it would positively change their perception. Saha *et al.* (2021) likewise found a similar significant and favorable association between respondents' awareness and the agricultural instruction they had received. Meanwhile, ownership of hill land exhibited a positive and significant contribution towards land use change perception. This characteristic was significant at the 5% level. The regression coefficient 'b=0.576' showed that one unit increase of hill land ownership would increase respondents' perception towards the changes of land distribution by 0.576 units.

Conclusion

Based on the above findings, the following conclusions were drawn:

- i. More than half (54%) of the farmers of the study area were in between 41 to over 50 years of age, with average family size was 5 and about 51% of them were literate. About 47% farmers did not take part any agricultural training. The average family annual income of the farmers was BDT 91830. About 50% farmers used to maintain contact with DAE personnel (SAOs and others of DAE office, mainly) for receiving extension services, although 49% of them maintained no contact with anybody for getting extension services. These could create a medium perception of the farmers on land use change.
- ii. The farmers of the study area had an average of 3.59 acres of land. Of which

they had 76% had less than 5 acres of land. Moreover, 71% farmers had 0.01 to 3.0 acres of flat land and 78% of them had 0.01 to 6.0 acres of flat land. The farmers perform all types of production related activities utilizing these lands.

- iii. In the study area 98% farmers exhibited moderate to higher perception towards the changes of land distribution. Most of them perceived that the natural balance was not maintained like before. Although, majority of them perceived that establishing more cities, roads and establishment could be supportive to develop the study area. Results of regression analysis illustrated that among the selected eight characteristics, educational attainment, agricultural training received and ownership of hill land had significant influence on the perception of the farmers towards the changes of land distribution. To increase more favorable perception, it was pertinent to increase more of the above mentioned three attributes.

Declaration of competing interest

The authors declare that they have no conflicts of interest.

Acknowledgments

This research was financially supported by the Research Management Wing (RMW) of Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur, Bangladesh (Code No. 5921-1) and the logistic support was obtained from the Department of Agricultural Extension and Rural Development (AER) of BSMRAU.

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