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Original Research Article

Land Use Pattern Change and Farmers Perception Perspective: A Case of Khagrachari Hill District, Bangladesh

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Abstract

The sole hilly region in Bangladesh is known as the Chattogram Hill Tracts (CHT), which is comprised of the three hill districts of Khagrachari, Rangamati, and Bandarban. Due to population dynamics, economic development, climatic change, improved accessibility, and agricultural developments, land usage is changing at an increasingly rapid rate in the CHT. This research was carried out in Khagrachari Sadar upazila in the Khagrachari district of Bangladesh. This study looked at how farmers perceive changes in land use patterns and the factors that influence such perceptions. A total of 180 households were sampled using the proportional random sampling technique, and the survey was conducted using a previously created, closed-ended questionnaire. The average land ownership of the farmers was 4.22 acre, although the average agricultural and forest land holding was 1.37 acre and 1.54 acre, respectively. Although, the farmers also possessed considerable amount of vegetable land and flat land also and these lands were utilized to produce different types of vegetables, crops, fruit and timber trees. Average age of the farmers was 49.75 years and 32% of them did not receive any formal education. About 62% of them did not take part any agriculture related training program. Although, 95% of the farmers had medium to poor perception on land use pattern change. Moreover, many farmers perceived that currently overall soil fertility status of the hilly land had been decreased compared to 10 years back. In addition, out of thirteen attributes, four attributes, namely, educational attainment, family annula income, agricultural training received and agricultural land ownership had significant influence on the perception of land use pattern change by the respondents. The findings from the research can be used by the nation's decision-makers and planners to create future CHT land allocation policies.

Keywords: Land use pattern, perception, farmers, Khagrachari hill district, change, Bangladesh.

INTRODUCTION

Land is fundamental to human activities and its realization and management are the key factors for sound regional development. Land use involves the management and modification of natural environment or wilderness into built environment such as settlements and semi-natural habitats such as arable fields, pastures, and managed woods (Stephens, 2019). Since from the last decades, it is perceived that changes of land use patterns are global in nature (Dale *et al*., 2000) especially because higher dependency of human being on land (NFPCSP, 2011) for livelihoods, housing in safe and secure places, accessibility of desired food for eating (NASA, 2006). Land use has generally been considered as a local environmental issue, but it is now becoming a force of global importance. Worldwide changes to forests, farmlands, water bodies, and air are being driven by the need to provide food, fiber, water, and shelter to more than six billion people. Inappropriate land use has led to some serious problems as evidenced by recent global environmental problems, such as the degradation of tropical forests, deforestation of arable land, and which concern the survival of human beings (Foley *et al*., 2005).

During the last half of the 19th century until the end of 20th century, the Chattogram Hill Tracts (CHT) experienced a major decline in forest cover, with profound impacts on local and regional ecosystems (Islam *et al*., 2007; Ahammad *et al*., 2019). The natural forest of the region, including hill forests, declined from

128,630 ha in 1990 to 102,860 ha in 2000, 92,910 ha in 2005 (Keenan, 2015) to 85,500 ha in 2014 (Reddy *et al*., 2016). Forest clearing through shifting cultivation, monoculture plantations and illegal felling contributed to major land degradation (Khan *et al*., 2007), lower soil fertility and overall threats to ecosystem service provision (Rasul, 2009; Gafur *et al*., 2003).

Clearing a patch of vegetation, growing assorted varieties of crops in the cleared land for one or two seasons and, then, moving to another plot is a major characteristic of this land-use system (Rasul *et al.*, 2004). Although this extensive land-use system was environmentally suitable in the past when population pressure on land was minimum, but presently has caused adverse impact on the environment with the gradual increase of the local population and migration of lowland people to CHT (Gafur, 2001; Knudsen and Khan, 2002). Declining forest cover and inappropriate land use have led to severe soil erosion.

The Khagrachari district of Bangladesh is a topographically diverse area (southeastern part) and the home of about 0.6 million population with 05 small ethnic communities (BBS, 2011). For the tribal people in the Khagrachari, forests play an important role in the economy in the form of religious, cultural and economic activities (Baten *et al*., 2010; Miah and Chowdhury, 2004). The Khagrachari of Bangladesh have faced the same experience of land degradation and deforestation like the mountain areas of South and Southeast Asia due to some environmentally bad practices as shifting cultivation (local name is 'Jhum') and logging (Gafur, 2001).

Land cover is closely linked to natural, socio-cultural and economic factors and also influences decision-making processes over time. To provide a better land use policy and future steps towards Khagrachari district of Bangladesh it is important to prioritize the locale and their perception towards the land use pattern changes. The results of the study can also be used as baseline information to take the further elaborative study of Khagrachari district. On the basis of the above circumstances the following objectives were settled down to conduct the study:

i. To explore the land use pattern change situation of the study area.
ii. To investigate the socio-demographic condition of the farmers' and their influence on the perception towards land use pattern changes.

MATERIAL AND METHODOS

Study location

The study was conducted in Khagrachari Sadar upazila in the Chattogram Hill Tracts (CHT) of Bangladesh (Figure 1). More specifically three unions of this upazila were selected as the study area. The unions were Khagrachari Sadar union, Boronal union and Merung union. The upazila of Khagrachhari Sadar is made up of many hills and beautiful forests. High and low hills, crooked roads, Teak, Roar, Gamari, Chapalish, Karai, etc. are all present. This Sadar Upazila is beautifully ornamented by nature.

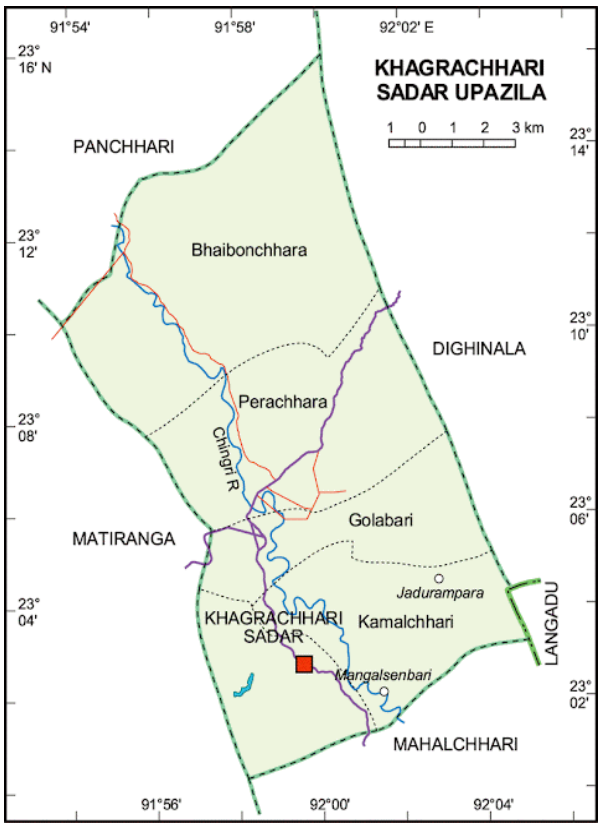

Figure 1: Map of Khagrachari Sadar Upazila

Khagrachari Sadar is special because of the union of the sky and the mountains, as well as the little poems, fountains, and mountain pathways. Khagrachhari Sadar Upazila is a great spot for nature enthusiasts because it is surrounded by a mystic and beautiful natural world. This upazila is covered in the distinct beauty of the natural world. Everyone is fascinated by the different way of life and stunning natural surroundings of the hill people in this upazila. Panchhari Upazila is to the north, Langadu Upazila of Dighinala and Rangamati Districts is to the east, Mahalchhari Upazila is to the south, and Matiranga Upazila is to the west of Khagrachhari Sadar Upazila. Between 23.00" and 23.21" north latitude and 91.55" to 92.00" east longitude is Khagrachhari Sadar Upazila. Khagrachhari Upazila has a square-like shape.

Research design, population and sampling

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. Total population of Khagrachari Sadar union, Boronal union and Merung union were 210, 189 and 200, respectively. Out of these 599 populations, we took 30% of them, that is, a total number of 180 respondents as sample. The sample was chosen using a proportionate random sampling technique.

Different variables and their measurement

Independent variables and their measurement technique

Age, family size, level of education, family income, agricultural training received, ownership of total land, ownership of agricultural land, ownership of flat land, and ownership of hilly land were the independent factors in the current study.

Based on the actual age of the respondent's life, the respondent's age was determined in years. The total number of individuals in the family, including the respondent's spouse, kids, and additional family members who shared a residence, was used to calculate the size of the family. Education level was determined by the number of classes taken. The total annual family income of a respondent in the research area was calculated using his earnings from all businesses, services, and other sources. The total number of agriculture-related training sessions a respondent attended from various organizations served as a measure of the training. A respondent's total land area includes their homestead, farmland, leased land, mortgaged land, hilly land, etc. Acres were used to express these land areas.

Measurement of dependent variable

Perception of the respondents towards the changes of land use patterns was considered as the dependent variable of this study. For measuring the respondents perception towards land use pattern change, a 5-point Likert type scale is widely 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.

$$\text{Perception Index (PI)} = fSD \times 1 + fD \times 2 + fU \times 3 + fA \times 4 + fSA \times 5 \ldots\ldots\ldots (1)$$

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, using mean standard deviation (SD) as a "rule of thumb," we calculated and assessed the respondents' overall perception of land use changes, classifying it into three categories: lower perception, moderate perception, and higher perception. In other related research (like, Ghosh *et al*., 2021a; Hasan *et al*., 2010; Hasan *et al*., 2015; Hasan *et al*., 2021; Hasan *et al*., 2023**;** Salawat *et al*., 2013) the same approach of categorizing was used.

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:

$$y = \beta o + \beta 1x1 + \beta 2x2 + \cdots + \beta kxk + \cdots + \varepsilon \ldots. (2)$$

Where, y is the probability of perception towards land use change: X_1, X_2 ……., X_n indicate the independent variables such as age, family size, educational attainment, family annual income etc., while β_1, β_2, ……., β_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.

3. RESULTS AND DISCUSSION

3.1 Individual characteristics of the respondents

Data displayed in Table 1 indicated that more than 50 years of age constituted the highest proportion (54.20%) of the respondent followed by up to 30 years age category (45.80%) with an average of 50.88 years. In the study area, the average age of the respondents was 50.88. Through their studies Mahamud et al., (2022) and Saha *et al*., (2021) found an increase average of the farmers and which was 47 years and 46.22 years, respectively. Meanwhile, younger respondents, according to Hasan *et al*., (2017a), had broader opinions and more exposure to social media than older respondents. The highest portion of the respondents (33.90%) had secondary to SSC level education and 65% of them were educated either in primary, secondary or tertiary level which was less than the national literacy

level that was 72.89% (BBS, 2019). Although, 32% of them didn't have any types of formal education. In their study, Ghosh *et al.* (2021b) discovered that 53% of respondents in Chapainawabganj Sadar upazila of Chapainawabganj district in Bangladesh did not participate in any formal schooling. It is impossible to overstate the value of education for an individual. Higher educated individuals frequently venture outside of their local area. They read newspapers, go to several agricultural fairs, and watch various agricultural television programs in an effort to learn more about a variety of issues. They enjoy going to the neighborhood agricultural offices to talk to the staff there about problems they are having out in the field. They might be ecologically conscious due to their knowledge. They thus feel strongly about the modifications to farming methods. Their academic achievement exceeded expectations despite the study location being a typical hilly environment (Chakma *et al*., 2021; Suza *et al*., 2021).

The average family size was 4.90 which was higher than the national average (4.06) (BBS, 2019). While, Hasan *et al*., (2023) in Bangladesh also observed a similar type of finding that the average family size of the farmers was 4.90.

Table 1: Individual characteristics of the respondents

Characteristics	Categories	%	Mean
Age	Up to 30	45.80	49.75
	31-40	--	
	41-50	--	
	More than 50	54.2	
Education	No education	32	4.64
	Primary education	30.5	
	Secondary to SSC	33.90	
	SSC and above	3.6	
Family size	2 - 4	42.4	
	5 - 7	47.5	4.90
	> 7	10.1	
Farmer type	Both type	35.1	-
	Tenant	15.8	
	Own land	49.1	
Family annual income	Up to 100000	50.8	
	100000.01 to 200000	28.8	
	200000.01 to 300000	8.5	156379.66
	300000.01 to 400000	8.5	
	More than 400000	3.4	
Extension media contact	No one	18.60	-
	SAAOs only	42.40	
	Seed dealers	1.70	
	Others of Agril. Offices	10.20	
	Both SAAOs and Others of Agril. Offices	25.40	
	Others	1.70	
Agricultural training received	No training	61.7	1.29
	1-2 training	44.1	
	3-4 training	13.3	
	>5 training	5	

Most percentage of the respondents (49.10%) had their own land for cultivation and average family annual income was BDT 156379.66. The per capita income in Bangladesh, according to the Economic Census 2020, is higher than BDT 165200. According to the data, the respondents' annual income was significantly lower than the national average. Due to the area's complete hilliness, there were fewer opportunities for various income-generating occupations than in other sections of the nation. Most percentage of the respondents (42.40%) maintained contact with the Sub Assistant Agricultural Officers (SAAOs) for agricultural information. Most of the respondents (61.70%) didn't receive any training on agriculture and related issues while 44.10% respondents received 1-2 training on agriculture. The perception is that the respondents frequently engage in conventional farming. The respondents' use of the old agricultural system was sparked by the poor transportation infrastructure and lack of irrigation water in hilly locations. Consequently, it is a very challenging task to place them in training institutions. Through a study, Chakma *et al.*, (2021) also made similar discoveries.

3.2 Ownership of different types of lands

3.2.1 Ownership of total land

Data presented in Figure 2 depicted that majority of the respondents (83.10%) had up to 5 acres of land followed by 5.01-10.0 acres of land (11.90%).

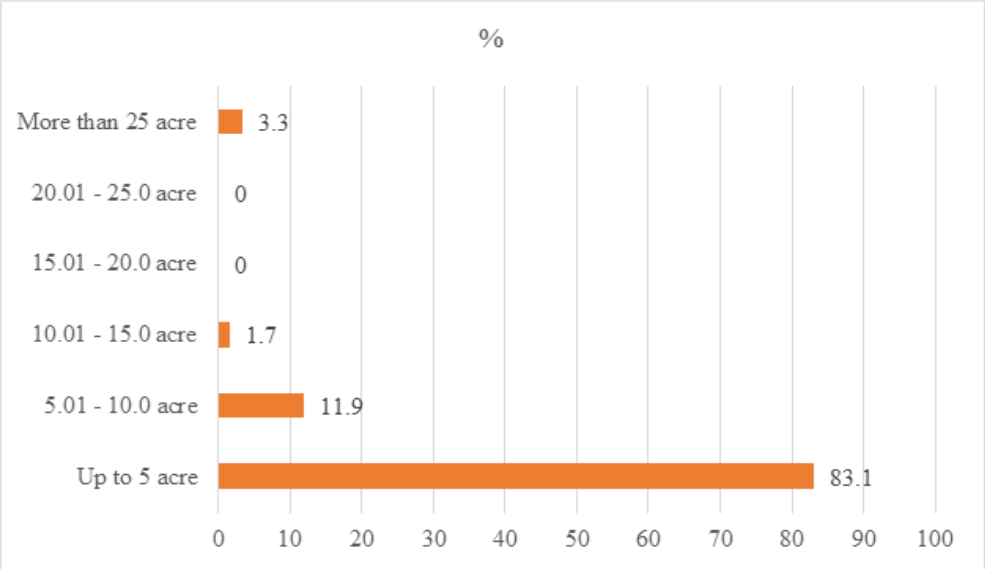

Figure 2: Distribution of the respondents according to their ownership of total land

The average land ownership was 4.22 acres which was quite higher than the national average (0.56 acres) (BBS, 2020). Meanwhile, Hasan *et al*., (2022) through their study in Bandarban hill district in Bangladesh found that average land holding of the study area was found to be 3.59 acres and they also concluded that the higher average land holding was due to lower population density in the hilly areas. The total area of the land is related to the respondents' net income and the quantity of cultivation.

3.2.2 Ownership of agricultural land

Based on the ownership of agricultural land, the respondents were classified into four categories as depicted in Figure 3. The majority (89.80%) of the respondents possessed 0.1-3.0 acres of agricultural land with an average of 1.37 acres. The difference between mean distribution of total land ownership and agricultural land ownership was 2.85 acres. It indicated that in the study area limited land area was occupied by cultivated crops.

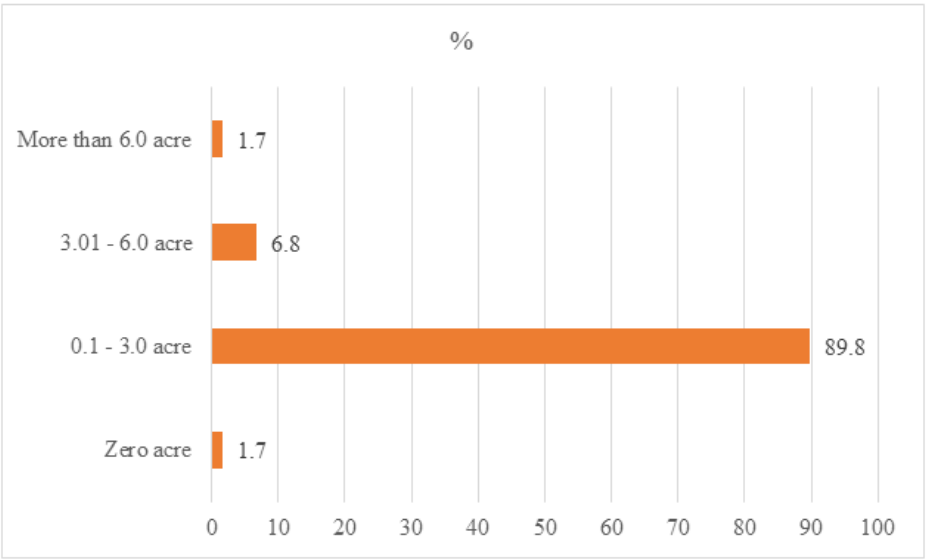

Figure 3: Distribution of the respondents according to their ownership of agricultural land

It was revealed that relatively less lands were used to cultivate crops in the study area. This may be caused in part by the research area's hilly terrain, which made it difficult for the respondents to plant more field crops. As a result, those who took part in the study should concentrate more on growing horticulture crops than field crops.

4.2.3 Ownership of forest land

According to Hasan *et al*., (2020a), the forest has a significant impact on the religious, cultural, and economic activities of the tribal people living in the CHT. The Chattogram Hill Tracts (CHT) tribal tribes frequently engage in shifting cultivation, also known locally as "Jhum." The land use pattern in that region is slash and burn. Additionally, it should be emphasized that not all of the CHT's forestlands are government-owned reserved forests. The forest property is also owned by the CHT's general populace. Based on the forest land ownership, the respondents of the study area were classified into the following four categories which are portrayed in Figure 4.

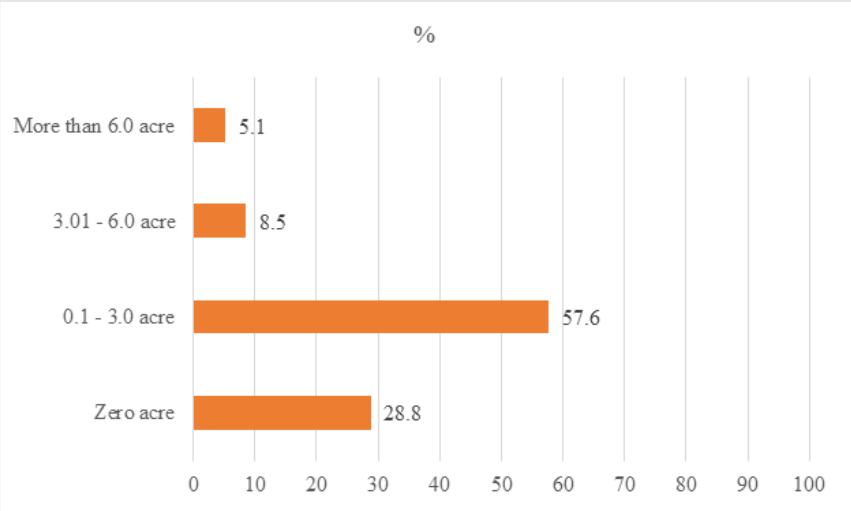

Figure 4: Distribution of the respondents according to their ownership of forest land

Data contained in Figure 4 indicated that most percentage of the respondents (57.60%) of the study area had 0.1-3.0 acres of forest land ownership with an average of 1.54 acres. This forest land was occupied for cultivating timber and non-timber plants, growing different types of fruit species like mango, litchi, banana, and different types of turmeric, taro and potato.

3.2.5 Ownership of vegetable land

The land of the CHT is a good place for different types of vegetable production. Although, the per capita intake of vegetables of the people of Bangladesh is only (167 gram) per day against 400 grams of daily requirement (HIES, 2016). The respondents were classified into three categories according to vegetable land ownership which was shown in Figure 5.

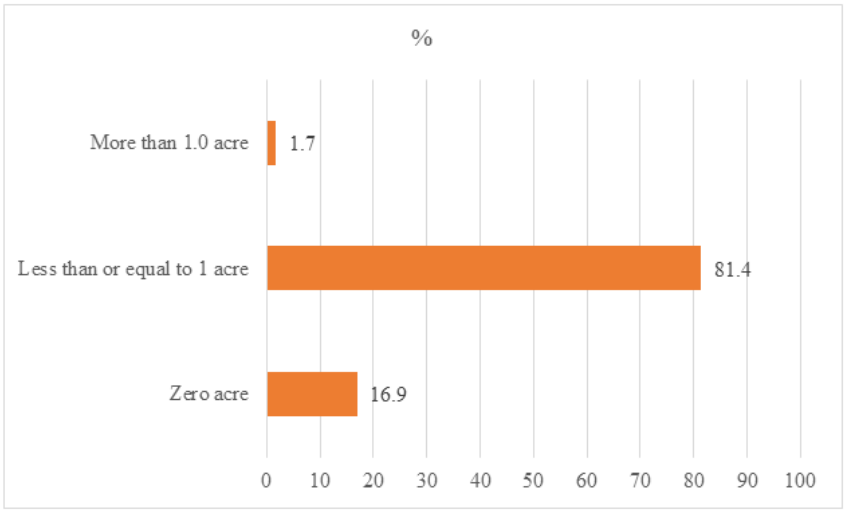

Figure 5: Distribution of the respondents according to the ownership of vegetable land

According to Figure 5, about 81.40% of the respondents of the study area had less than or equal to 1 acre of vegetable land. While, 16.90% of the respondents had no vegetable land ownership. It was also noticed that average vegetable land ownership of the respondents was 0.35 acre which showed a lower picture. Because vegetable production requires more flat land, timely availability of water, more intensive care (pest and insect control) which were not available as required in the hilly areas of Khagrachari district.

3.2.6 Ownership of flatland

Although the CHT is the hilly areas of the country, the district Khagrachari has a considerable amount of flat land also. Bengali population/non-tribal people generally live on the flat lands whereas the indigenous communities live more in the hilly areas (Eusuf, 1997). Based on flat land ownership, the respondents were classified into four categories as presented in Figure 6.

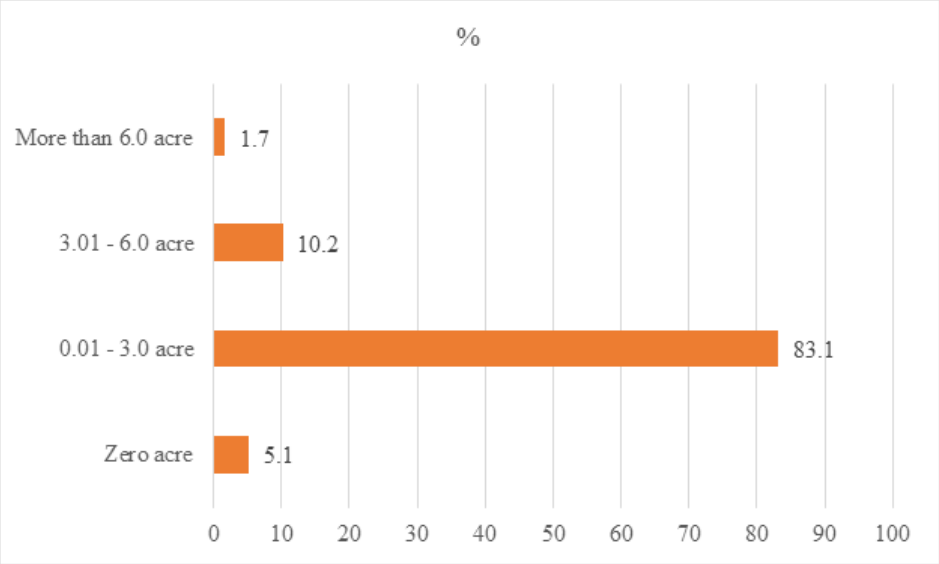

Figure 6: Distribution of the respondents according to the ownership of flat land

Form the Table 11, it is clear that most of the respondents (83.10%) had flat land ranged from 0.01 to 3.0 acres and the average flat land ownership was 1.68 acres. Flat land is used for building houses, cultivation of different crops, vegetables, etc.

3.2.7 Ownership of hilly land

The CHT is predominantly mountainous (north-west to south-southeast regions) topography and characterized by steep slopes (2/3 area). Based on hilly land ownership, the respondents were classified into five classes presented in Figure 7.

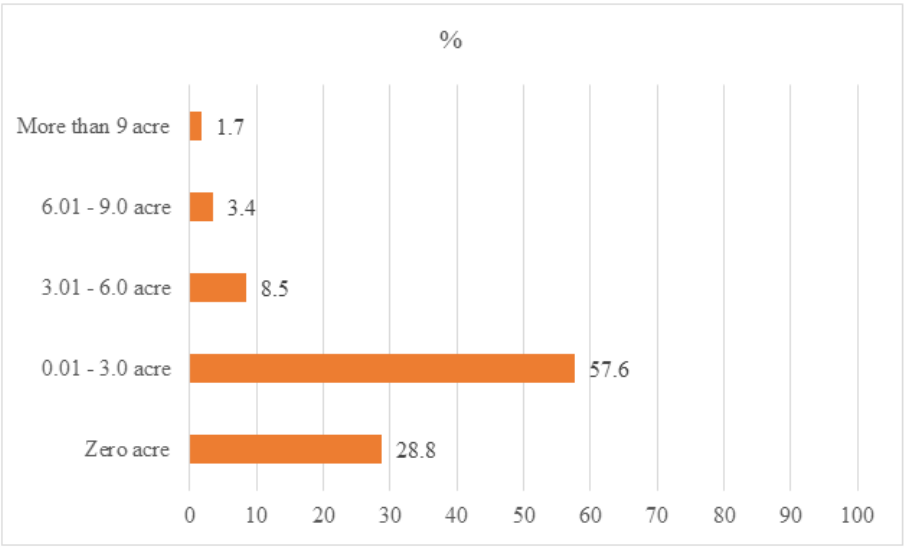

Figure 7: Distribution of the respondents according to the ownership of hilly land

Data presented in Figure 7 exhibited that more than half of the respondents (57.60%) had ownership of 0.01 to 3.0 acres of hilly land and the average hilly land ownership of the study area was 1.61 acres. The economy of the area was mainly based on agriculture and it was perceived as the main source of livelihood. The main crops generally grown in hilly land included rice, sesame, chili, ginger, turmeric, sweet gourd, bitter gourd, cucumber, maize, banana, aroids, cotton, okra etc. also some fruits and timber species were also grown.

3.5 Respondents' perception towards the changes of land use pattern

To find out the perception of the respondents of the study area towards land use pattern, 12 positive statements and 5 negative statements (a total no. of 17) were inquired. Findings were displayed in Table 2 indicated that the statement number 15 scored most (score = 280) which implied that most of the respondents thought that "overall fertility status of the hilly land has decreased compared to 10 years ago". The second highest score was observed by the statement number 5 ("I think the number of wild animals and birds have been decreased compared to before"). The 3rd ranked opinion of the respondents was the statement number 3 and that was, "In my opinion, roads/towns/built-up areas have increased in my area compared to 10 years ago". This statement was followed by the statement number 1 and which was "the amount of forest land is reduced now compared to 10 years ago".

Table 2: Distribution of different statements on the basis of their total scores

Sl.	Statements	Score	Rank
1.	I think that the amount of forest land is reduced now compared to 10 years ago	258	4th
2.	In my opinion, farming land has increased in my area compared to 10 years ago	131	15th
3.	In my opinion, roads/towns/built-up areas have increased in my area compared to 10 years ago	261	3rd
4.	I think irrigation water is more available in cropland now	234	8th
5.	I think the number of wild animals and birds have been decreased compared to before	272	2nd
6.	Due to increased built-up area in my area, cropland production has declined	178	13th
7.	I think the natural balance in my area still good like before	109	17th
8.	I think irrigation water will be much easier in the future	227	9th
9.	I will plant more trees to protect the environment and maintain natural balance	249	6th
10.	I will ensure the proper use of my land resources	235	7th
11.	The government of our country is always taking steps to ensure the proper use of forest land in the hilly areas	185	11th
12.	In my opinion, if there are more cities and roads in the hilly areas can improve the area as a whole	257	5th
13.	I think the role of the government is the most important in maintaining the natural balance of the hilly areas	180	12th
14.	I am pleased with the present land management of the hilly areas	175	14th
15.	Overall fertility status of the hilly land has decreased compared to 10 years ago	280	1st
16.	I always use to cultivate agriculture in a comprehensive way	226	10th
17.	I have an idea about the future policies of the government regarding the proper use of land in the hilly areas	123	16th

Meanwhile, the lowest score was obtained by the statement number 7 and it was a negative statement ('I think the natural balance in my area still there as before'). Hence, on the basis of the respondents' opinion natural balance was changed as a result of change in biodiversity.

When the overall perception scores of the respondents were calculated, then they were classified into three categories and Figure 8 represented the distribution of the perception of the respondents on land pattern change.

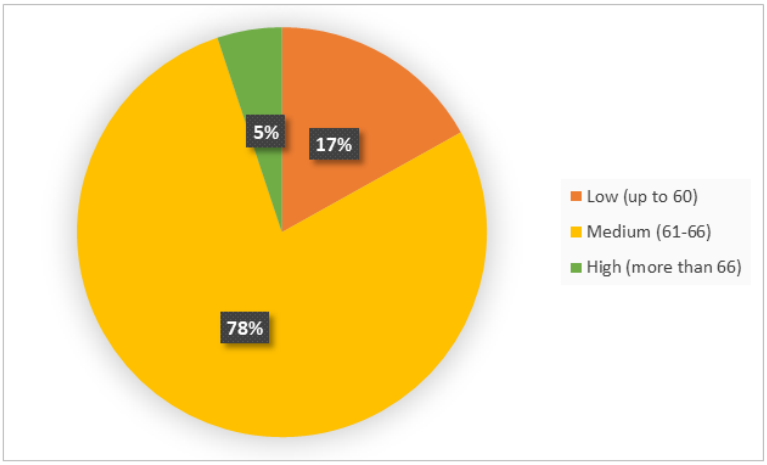

Figure 8: Distribution of the respondents according to their perception on land pattern changes

Findings in Figure 8 showed that the most percentage of the respondents (78%) had medium perception (score 61-66) on land pattern changes. Meanwhile, 16.90% of the respondents had poor perception on land pattern change and only 5.10% of the respondents had high perception. The overall findings on perception indicated that most of the respondents of the study area had poor to medium perception towards land pattern change. The presence of semi-evergreen deciduous to tropical rain forests, including reserved forests and plantation forests, which make about 40% of Bangladesh's total forest cover, is one of the CHT forest's key characteristics (Hasan *et al*., 2020b). Indigenous people in the CHT are largely reliant on land resources to sustain their way of life, according to research by Kibria *et al*., (2015). However, the condition of the forest and the native population of CHT were both at risk as a result of poor land use practices. Moreover, urbanization significantly affects changes in the CHT's land cover, particularly the transformation of hill forests into built-up areas as well as crops and shrublands.

Contribution of the selected characteristics of the respondents on their perception towards land pattern changes

To determine the attributes influencing the farmers' perception on land use change, all the 13 independent variables were subjected to full-model regression analysis. In the analysis, it was revealed that educational attainment, family annual income, agricultural training received and ownership of agricultural land of the respondents were found to have significant influence (Table 3).

The model seems to have good fitness as indicated by R-square. The coefficient of multiple determination, R^2 was 0.641 for the model. This means that the explanatory variables in the model explained about 64.1% of the variation in respondents' attitude. The adjusted R^2 (which is the measure of goodness of fit of the estimated regression model) value of 0.549 indicated a good fitting of the model.

Table 3: Contribution of selected characteristics of the respondents on their perception towards land pattern changes

Sl. no.	Variable	Coefficient (β)	t- value	*P*
01.	Respondents' age	0.022	0.961	0.934
02.	Educational attainment	0.486*	2.919	0.024
03.	Family size	-.002	-0.015	0.988
04.	Farmer type	0.967	0.422	0.184
05.	Family annual income	0.487*	2.260	0.029
06.	Agril. training received	0.864**	3.467	0.002
07.	Ownership of total land	0.005	0.308	0.112
08.	Ownership of agril. land	0.009*	1.479	0.027
09.	Ownership of forest land	-0.004	0.068	0.200
10.	Ownership of water land	0.006	-0.096	0.857
11.	Ownership of vegetable land	-0.010	-1.117	0.676
12.	Ownership of flat land	-0.521	-1.662	0.104
13.	Ownership of hilly land	0.061	0.961	0.921

R^2=0.641 Adjusted R^2=0.549 F=4.020 **01% LS, *05% LS

In regression analysis, educational attainment showed a significant and positive influence on respondents' perception towards land cover change (Table 3). The value of regression co-efficient (0.486) was significant at 5% level. The regression coefficient 0.486 implied that for every unit increase of education there was a corresponding 0.486-unit increase in the overall attitude of the respondents towards land cover changes. Through a study Sultana *et al*., (2023) found that farmers ecosystem service change was influenced by education attainment.

Family annual income of the respondents exhibited a significant and positive influence on respondents' perception towards land pattern change. The value of regression co-efficient (0.487) was significant at 5% level. The regression coefficient 0.487 implied that for every unit increase of family annual income there was a corresponding 0.487-unit increase in the overall attitude of the respondents towards land cover changes. Through their study in Bangladesh, Hasan *et al*., (2021) observed that family annual income of the farmers had significant and positive influence on the perception of vermicompost as waste management practices. Similar positive and significant relationships between family annual income and attitudes toward sustainable agriculture were discovered by Ghosh and Hasan (2013). Meanwhile, some other Bangladeshi studies (like, Hasan *et al*., 2015, Hasan *et al*., 2009) also found similar positive and significant contribution of family annual income on the farmers' attitude of respective fields

The agricultural training received of the respondents and their perception towards land pattern changes showed positive and a significant relationship where the computed 'β' value was 0.864. This statement is significant at 1% level. The regression coefficient

explained that the value of perception on land pattern changes increased by 0.864 times for one time increase the agricultural training receive. Similar conclusions were reached by (Hasan *et al*., 2017a), who discovered that farmers' responses to floating agriculture for sustainable development and food security depended on their level of agricultural training. Other researchers, such Chakma *et al*., (2021), Hasan *et al*., (2017b), and Hasan *et al*., (2018), have found through their studies that agricultural training has a positive and significant impact on the attitudes and perceptions of farmers.

4. CONCLUSIONS

Most of the farmers of the study area were more than 50 years old, with average family size of 4.90, had own land and average annual income of BDT 156379.66. Most of the farmers had secondary to SSC level education and used to maintain contact with SAAOs for receiving extension services, although 61.70% farmers did not receive any kind of training on agriculture.

Most of the farmers of the study area, on an average possessed 4.22 acres of total land. They had a significant amount of agricultural (1.37 acres), forest land (1.54 acres), water land (1.50 acres), vegetables land (0.35 acres) and also both flat land (1.68 acres) and hilly land (1.61 acres).

Among the selected characteristics of the respondents, educational attainment, family annual income, agricultural training received and ownership of agricultural land had significant contribution on the farmers' perception towards land pattern changes in the study area. It was important to improve more of the three aforementioned characteristics in order to boost more positive perception.

Declaration of Competing Interest: The authors declare that they have no conflicts of interest.

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