LIVELIHOOD CHANGES OF CHAR (Dry land) WOMEN DUE TO INVOLVEMENT IN ACTIVITIES OF THE CHAR LIVELIHOOD PROGRAM

ABSTRACT

Climatic hazards are common in Bangladesh on delta and riverine island communities, which are large sandbars formed in riverbeds due to silt and alluvium deposition. Specifically, these hazards are caused by the dynamic erosion and accretion of riverbanks. The natural disaster caused by the subsequent sediment buildup on the riverbed and river bank erosion poses a serious threat to the way of life for the residents of Char, particularly the women, by causing damage to or destruction of houses, crops, and family income. The Char Livelihood Program (CLP) attempted to strengthen women's resilience and sense of empowerment while simultaneously improving their livelihoods, nutrition, access to clean water, sanitation, and hygiene habits of char women. This study was mainly undertaken to investigate the extent of changes in the livelihood status of char women due to the involvement in Char Livelihood Program (CLP), explore the factors that may influence the livelihood changes of the char women due to involvement in the CLP. Besides, the problems faced by the char women while working in CLP were also investigated. Data were collected from four villages of Islampur Upazila (sub-district) under Jamalpur district purposively and analyzed using Multiple Linear Regression Models. The goal was to identify the variables that affect the char women's changes in their livelihood. Findings indicated that involvement in char livelihood program had significant influence on the livelihood of char women. The main factor included years of schooling, family size and knowledge of CLP. Collectively, the factors explained 32.3% variation in the livelihood changes of char women. The most influential challenges, from highest to lowest, included unavailability of transport and poor communication status, and lack of commitment of the service provider. Therefore, in order to overcome these obstacles, efforts must be made to ensure seasonal transportation system and enhance road communication infrastructure to enable char women to move around freely in order to carry agricultural products and to connect with relevant stakeholders for better farming and income operations.

Keywords: [Livelihood, char land, women, char livelihood program]

1. INTRODUCTION

Bangladesh is a riverine country with the largest delta in the world [1]. Due to its geographical, social, and economic circumstances, Bangladesh is the South Asian nation most susceptible to climate change [2, 3]. Similar hazardous events, such as floods, riverbank erosion, droughts, cyclones, water logging, etc., are assumed to be made worse by climate change, which has a negative impact on living communities and financial progress [4, 5, 6, 7].

These climate hazards are common in Bangladesh on delta and riverine island communities, which are large sandbars formed in riverbeds due to silt and alluvium deposition. Specifically, these hazards are caused by the dynamic erosion and accretion of riverbanks [8, 9, 10, 11]. These regions are referred to as "char areas" because they are prone to various natural disasters and socioeconomic vulnerabilities. People who work in different industries, such as business, agriculture, or fishing, will experience different effects. Many char villages lose a significant amount of their arable and usable land each year due to regular riverbank erosion [8]. There are approximately 6.5 million people living there, making up over 5% of Bangladesh's [3]. The natural disaster caused by the subsequent sediment buildup on the riverbed and river bank erosion poses a serious threat to the way of life for the residents of Char [12, 13]. They significantly affect the life of the Char people, particularly the women, by causing damage to or destruction of houses, crops, and family income [14, 15, 16, 3, 17]. In addition, food security of char area is threatened by soil erosion, which results in the loss of agricultural area [11,13].

The vulnerability of the Char land people's livelihood in Bangladesh is increased not only by climatic stressors but also by some anthropogenic stressors like poor communication, a lack of a market chain, high input costs, inadequate institutional support, a lack of training and skills, inadequate microcredit facilities, and so forth [3]. Due to their remote position, char-dwellers typically do not have access to appropriate food, housing, land, health care, or basic social safety nets and limited access to government services like markets, healthcare, and education [18, 19]. Because of patriarchal social norms, limited educational possibilities, and little control over household economics and decision-making, women on the chars face unique obstacles [20].

Government and non-government organizations in Bangladesh launched a number of measures to aid Char land people [11]. For instance, Rural Development and Cooperatives Division initiated the Chars Livelihood Programme (CLP) with the financial assistance of UK

Department for International Development (DFID). The Char Livelihood Program (CLP) aimed to improve livelihoods, nutrition, water, sanitation, and hygiene practices for women while also enhancing their resilience and sense of empowerment [21]. Each CLP participant has to first meet strict eligibility requirements, such as being credit less, incomeless, landless, and assetless. A core participant's entire household profited from the CLP package. But the only candidates chosen as core participants were women [22, 23]. The range of services offered by CLP was designed to improve the status of women and establishing gender equality in char communities [24] and assist women become more self-assured, give them the skills they need to take charge of their lives, and empower them to make choices that would benefit both them and those around them [23]. At the conclusion of the 18 months of support, CLP aimed to have its members "graduate" from extreme poverty [25].

Several studies have been conducted on marginal people's livelihood and mostly on char dwellers in different parts of the country e.g., Rahman and Davis [26]; Kabir [27]; Paul [28]; Mondal [29]; Bayes and Hossain [30]; Saifullah [31]; Uddin and Rahman [32]; Islam [33]; Karim [34]; Mollah and Ferdaush [35]; Rana and Nessa [36]. Other studies analyzed livelihood of char people due to river bank erosion, [17] and their vulnerability to Climate Change and Natural Hazards [3, 7]. However, very limited the authors were unable to find any research were conducted on how the char livelihood program has affected the livelihood of char women in the Jamalpur district, specifically regarding the relationship between livelihood and well-being status. Thus, this study intends to investigate the extent of changes in the livelihood status of char women due to the involvement in Char Livelihood Program (CLP), explore the factors that may influence the livelihood changes of the char women due to involvement in the CLP and identify the problems faced by the char women while working in CLP.

Theoretical overview

Livelihood is best defined as the methods and means of living in the world [37]. The idea centers on resources, including land/property, crops, food, knowledge, money, and social ties and how these relate to a particular society's political, economic, and sociocultural traits. A livelihood is made up of the skills, resources, and pursuits necessary to make a living [38]. Understanding the assets of the poor in terms of their human, natural, physical, financial, and social capitals, as well as their coping mechanisms for shocks, trends, and seasonality (i.e., their context of vulnerability), as well as their institutional, commercial, and cultural

structures and processes, can open up opportunities to more effectively target development strategies at the poor and assist them in achieving new livelihood outcomes [39].

In Bangladesh, there is a substantial disparity in the manner of living between urban and rural residents, primarily due to poverty. According to Khatun's [40] study, public infrastructure, education, credit, and income are the main factors contributing to poverty. The situation is similar to Bangladesh's char-dwellers, who are excluded from the advantages of mainland Bangladeshi society due to their inadequate communication infrastructure [41]. Moreover, these places have not been the focus of Bangladesh's development initiatives from governmental or private sectors [42]. According to a study by Sarker and Sultana [43], char women's status in the study area was unsatisfactory. Riverbank Char women were less likely to participate in family decision-making, maintained a lower standard of living, and are increasingly finding themselves employed in farm-level agriculture.

Conceptual Framework of the Study

The conceptual framework of the study was developed based on the sustainable livelihood framework developed by the Department for International Development (DFID), [44] (see Figure 1). This paper applies the insights from the Sustainable Livelihood Framework on char women to examine changes in three key indicators of livelihood i, that is income, well-being, and food security. These indicators can help to define and explain changes in livelihood of char women due to involve in char livelihood program. The framework argues that a variety of interacting factors, including social propaganda in their surroundings, have an impact on livelihood changes of char women [45]. Nevertheless, it can be challenging to look into every one of these aspects in a single study. Hence, this paper only considers three categories of indicators. First, it examines the selected characteristics of the char women which includes age, education, family size, income, farm size, credit received, extension media contact, training on different livelihood improvement program and knowledge on char livelihood program. Second, it briefly discusses the problems being confronted by the char women involving with char livelihood program.

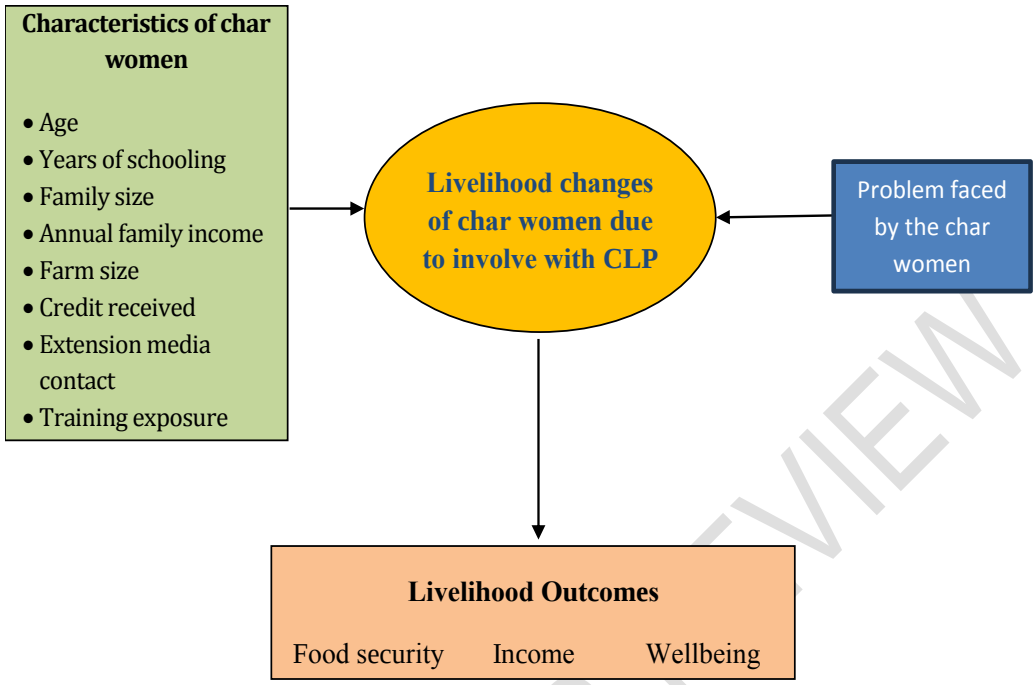

Figure 1. Conceptual framework of this study

2. Methodology

The study was conducted in four villages of two unions namely Sapdhari and Belgacha under Islampur Upazila (sub-district) of Jamalpur district Flooding and erosion are common in this upazila, and the people who live in the remote settlements along the Jamuna River are extremely poor and have a difficult time making ends meet [8]. In addition, this Upazila was one of the core areas of the char livelihood program. Islampur Upazila was primarily selected as a suitable area for the study because this Upazila is situated near the bank of the river Jamuna where most of the women have been suffering from vulnerabilities across different dimensions: physical and economic exist and it was inevitable that certain challenges would arise. Four villages, i.e., Chengania, Projapoti, Char Shisua, and Munniar char were selected as the specific location for this study because in those villages the char livelihood program was conducted and most of the women were asset less, income less and suffering from food insecurity before conducting the char livelihood program. The study considered those women as respondents who were involved in the char livelihood program activities. All of the women (200) in the study area from the selected program were considered as the population of the study. A total of 100 char women (half of the population

of 200) were selected randomly from these four villages while all women of these villages were the population of this study. This study used a random sampling technique to select the sample from the population. For further clarity of the locale of the study, a map of Jamalpur district and Islampur Sadar Upazila (sub-district) showing study unions are presented in Figure 2.

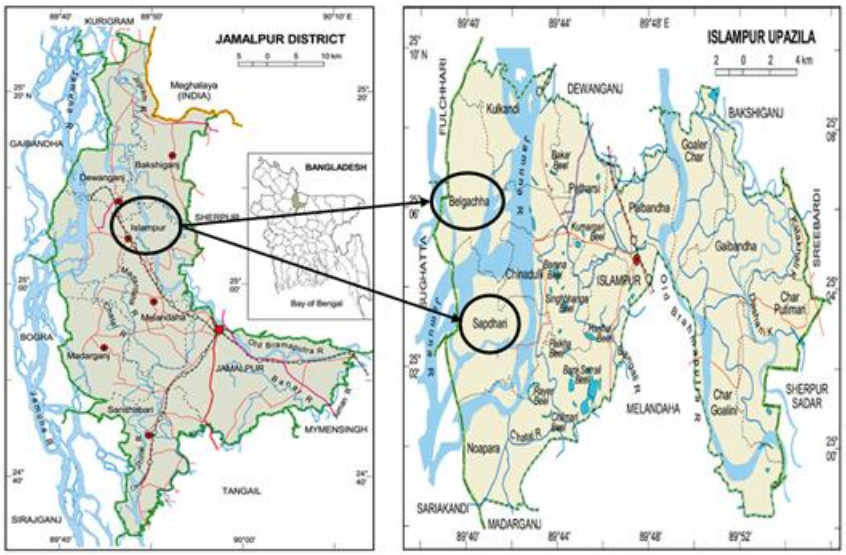

Figure 2. Map of Jamalpur district and Islampur Sadar upazila (sub-district) showing the study unions

Nine selected characteristics of the char women were considered as independent variables of the study. These were age, years of schooling, family size, annual family income, farm size, credit received, extension media contact, training exposure and knowledge of the char livelihood program. The focus variable of the study was the extent of livelihoods change. In 1999, DFID introduced a new version of the Sustainable Livelihood Framework, which is often called the DFID framework in livelihood literature [44]. This framework is used to determine a particular population's livelihood status, especially the poorer population.

By analyzing a few earlier studies [29, 46] the researcher set the livelihood changes score to determine the extent of changes in the livelihood status of the char women due to involvement in the Char Livelihood Program. To measure the change in livelihoods of the char women in the study area, three different indicators known as major livelihood outcomes, which included food security, income and well-being were selected. The measuring procedure of the indicators and total livelihood score of the focus issue is described below.

Food security: Food security of a respondent was measured on the basis of the availability of necessary food throughout the year after involving with the char livelihood program. The information was collected for twelve months and each aspect was put against a three-point Likert type scale 'decreased', 'unchanged' and 'improved', and the scores were given as '0', '1' and '2', respectively. Thus, the food security score could vary from 0 to 24 while, 0 indicates the lowest and 24 indicates the highest level of food security.

Income: Total number of items of the source of income was nine. Each aspect was put against a three-point type scale 'decreased', 'unchanged' and 'improved', and the scores were given as '0', '1' and '2', respectively. Thus, the income score could vary from 0 to 18 while, 0 indicates the lowest and 18 indicates the highest level of income. During the survey, the dollar rate was 84.7 Bangladeshi taka for 1 USD.

Wellbeing: Total number of items of the source of wellbeing was six. Each aspect was put against a three-point type scale 'decreased', 'unchanged' and 'improved' and the scores were given as '0', '1' and '2', respectively. Thus, the wellbeing score could vary from 0 to 12 while, 0 indicates the lowest and 12 indicates the highest level of wellbeing.

Total livelihood change score: Total number of items of the livelihood change thing was three. Thus, after doing the total sum of the three livelihood-changing indicators, the livelihood change score could vary from 0 to 54, with 0 indicating no livelihood changes and 54 indicating high livelihood changes.

The second objective of the study, to identify factors affecting the livelihood status of the char women, was measured by regression analysis. The data were cleaned, coded, and analyzed with the statistical software for social science (SPSS) var. 22. Microsoft Excel 13 was used to prepare different charts and graphs. Multiple regression analysis (both enter and stepwise methods) was used to identify factors affecting the livelihood status of the char women. Stepwise regression analysis helps quantify the individual contribution of factor variables upon removing insignificant variables from the model [47]. The equation is as follows (Eq. (1)

$$y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \in_i \ldots\ldots\ldots\ldots (1)$$

Where, y_i =livelihood status of the char women, β_0 = constant, X_1= age, X_2 = years of schooling, X_3 = family size, X_4 = annual family income, X_5 = farm size, X_6 = credit received, X_7 = extension media contact, X_8 = training exposure, X_9 = knowledge of CLP, $\in$I = Error term

Problems faced by the char women in changing their livelihood due to Char Livelihood Program to maintain their livelihood were measured by asking their opinion on some selected problems. The possible problems were first identified through Focus Group Discussion (FGD). In the study, eleven problems were identified through FGD. A three-point Likert-type rating scale was used for computing the problem score of a respondent. For each problem score of '3', '2' and '1' was assigned to indicate the extent of the problem as 'High', 'Medium' and 'Low', respectively. The total problem scores were computed for each respondent by adding the scores for all the problems. For eleven problem statements, the possible range of problem scores could range from '(11×1) = 11' to '(11×3) = 33', where '11' indicated the lowest level of problems and '33' indicated the highest level of problems.

The survey collected data from 100 char women through personal interviewing in March 2020. The interviews were conducted with the respondents individually in their respective houses or house premises. In order to test the formulated hypotheses of the study, Pearson's Product Moment Correlation Coefficient (r) was used. The SPSS (Statistical Package for Social Science) computer program was used for analyzing the data.

3. RESULTS AND DISCUSSION

3.1 Personal profile of the char women

Table 1 present data on socio-economic characteristics of the char women. It reveals that most of them (74%) of the char women were from middle age category (36-55). Furthermore, it reveals that 41% of the participants had no formal education, while 29%, 21%, and 9% of them completed primary, secondary, and upper secondary levels, respectively. Some women completed primary, secondary, or higher education, which is a good sign for introducing char livelihood programs among women. Literate women are more imaginative and progressive than illiterate farmers because they are more aware of their rights and contributions to society. As a result, it can be stated that good training and mass education programs may assist uneducated women in the study region in becoming enlightened with the power of education.

Table 1 Socio-economic characteristics of the char women (n=100)

Characteristics (Measuring unit)	Score range		Respondents		Mean	SD
	Possible	Observed	Category	Percent (N=100)		
Age (Year)	Unknown	26-66	Young (18-35) Middle aged (36-55) Old (>55)	15.00 74.00 11.00	44.34	8.97
Level of education (Year)	Unknown	0-16	No education Primary (1-5) Secondary (6-10) Higher secondary (>10)	41.00 29.00 21.00 9.00	4.03	4.59
Family size (No. of members)	Unknown	4-9	Small (up to 4) Medium (5-7) Larger (>7)	9.00 75.00 16.00	6.14	1.26
Annual family income ('000' taka)	Unknown	55-320	Low (up to 100) Medium (101-300) High (>300)	96.00 3.00 1.00	76.38	26.94
Farm size (Hectare)	Unknown	0.00164-4.05	Landless & Marginal (0.02-.2) Small (0.21-1.0) Medium (1.01-3.0) Large (>3.0)	26.0 73.0 0.00 1.00	0.35	0.40
Credit received ('000' taka)	Unknown	0-520	No credit Low (1-30) Medium (31-60) High (>60)	7.00 78.00 14.00 1.00	28.25	50.88
Training received (No. of days)	Unknown	1-5	No (0) Short term (1-2) Medium term (2-5) Long term (>5)	26.00 74.00 0.00 0.00	0.74	0.44
Extension media contact (Score)	0-39	13-25	No contact (0) Low (1-13) Medium (14-26) High (>26)	0.00 2.00 98.00 0.00	15.62	1.74
Knowledge on char livelihood program (Score)	0-32	14-23	Low (up to 11) Moderate (12-22) High (>22)	0.00 99.00 1.00	16.76	1.55

Source: Author's field survey, (n=100); *SD= Standard deviation

Respondents' average family size was six people (6.14), which was higher than the national average of 4.06 [48]. In particular, the majority of respondents (75%) had a medium family size of five to seven people, 16% had a family size of seven or more people, and 9% had a family size of four or fewer individuals.

The annual income range indicates that almost majority (96%) of the respondents earn up to 100,000 Bangladesh Taka (BDT) (1 USD = 84.7 BDT). The average farm size for the respondents to the survey was 0.35 hectares. This was smaller than the 0.6-hectare national average for farm size [49]. In specifics, the majority of the women (73%) had small farms, while 1% had large farms and 26% were belong to the landless and marginal category. However, none of the women had medium farm size (Figure 3).

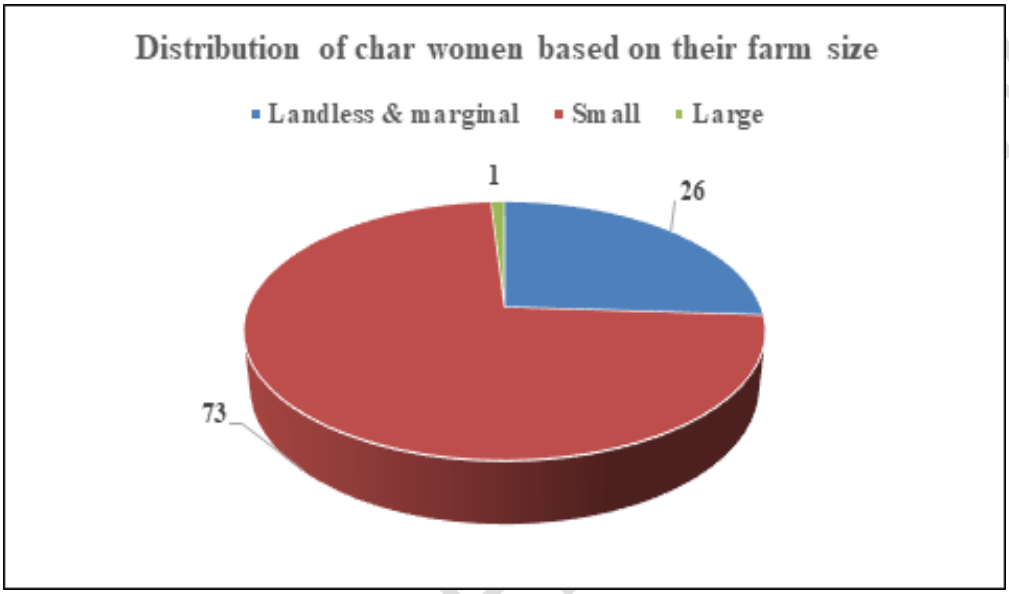

Figure 3. Distribution of the char women based on their farm size

In terms of access to credit facility, around (92%) reported they had low to medium access to credit support from various sources, whereas 7% had no access and 1% had high access to credit support (1 USD = 84.7 BDT). Data presented in Table 1 indicates that more than half of the respondents (74%) received short term training, while 26% did not receive any training. Analysis indicated that a significant proportion of the respondents (98%) had medium access to extension media. In terms of knowledge of the char livelihood program, majority of the respondents (99%) had moderate knowledge while 1% had high knowledge.

3.2 Extent of livelihood changes of the char women

Table 2 presents information about the extent of changes in the livelihoods of char women. Findings indicate that majority (83%) of the respondent experienced medium level of change in three examined aspects of livelihood outcome, 12% experienced high changes, 5% experienced low changes while none of them experienced no change. It means, involvement of char women with the char livelihood program played a crucial role on their livelihood changes.

Table 2 Extent of livelihood changes of the char women

Score range		Respondents			Mean	Standard deviation
Possible	Observed	Categories of livelihood change	No.	%		
0-54	23-31	Low (0-18)	5	5	27.05	1.64
		Medium (19-36)	83	83		
		High (37-54)	12	12		

This result is consistent with findings that revealed that rural women's participation in fish processing has changed their livelihood to a low to moderate extent [50, 51, 45]. Table 3 summarizes the 27 aspects of the char women's livelihoods that were chosen to represent the three important livelihood outcomes. With respect to food security, majority of the respondents had highest access to the necessary food during “Agrahayan” month (Mid-November to Mid-December) followed by Chaitra and Falgun (Mid-Febrauary to Mid-April). As this month ("Agrahayan") is the season to harvest "Aman" rice, this is linked to the abundance of food grains in their family during this time. In their study, Rahman et al. [52] discovered a similar conclusion that "Agrahayan" was the month with the greatest food security.

Regarding income, the most significant change was attributed to crop cultivation followed those attributed to livestock crops and fisheries. The majority of households depend on the production of crops, whether it be rice, pulses, or any other agricultural crop, therefore the crop accounts for a significant portion of their income. Similar findings were made by Kumar et al. [53], who discovered that participation in cooperative societies and crop production had a positive impact on farmers' livelihoods.

Table 3 Ranking of the issues of livelihood change of the char women

Aspects	Score	Rank
Food security		
Agrahayan (Mid-November to Mid-December)	184	1
Chaitra (Mid-March to Mid-April)	159	2
Falgun (Mid-February to Mid-March)	151	3
Baishakh (Mid-April to Mid-May)	131	4
Poush (Mid-December to Mid-January)	122	5
Magh (Mid-January to Mid-February)	117	6

Karthik (Mid-October to Mid-November)	73	7
Ashwin (Mid-September to Mid-October)	18	8
Jaishthya (Mid-May to Mid-June)	8	9
Ashar (Mid-June to Mid-July)	4	10
Shrabon (Mid-July to Mid-August)	2	11
Vadro (Mid-August to Mid-September)	1	12
Income		
Crops (rice, wheat, vegetables, fruits etc.) cultivation	159	1
Livestock (fodder) Crops	132	2
Fisheries	116	3
Wage labor	114	4
Dairy, Beef fattening, Poultry etc.	111	5
Business	107	6
Service	105	7
Remittance	101	8
Others	100	9
Wellbeing		
Better quality food and clothing	138	1
Better nutrition and sanitation facilities	129	2
Change in household asset	128	3
Better health facilities	102	4
The capacity to provide better education to children	96	5
Improved living accommodation	95	6

With respect to social well-being, the findings showed positive changes of respondents that could be attributed to involvement with the char livelihood program. Perhaps the most obvious reason for changing the well-being of char women is increased income and the ability to buy daily necessities of life. The findings also demonstrate that in terms of changing the livelihood of well-being outcome, char women were able to take a better-quality food and cloth, followed by better nutrition and sanitation facilities, and change in household asset due to involve in char livelihood program. Sarker [54] reported that farmers' wellbeing has significantly improved as a result of their participation in CLP.

3.3 Comparison of different aspects of livelihood change

The study also aims to comprehend the distinctions between the three livelihood shifts experienced by the char women participating in the char livelihood program. (Figure 4).

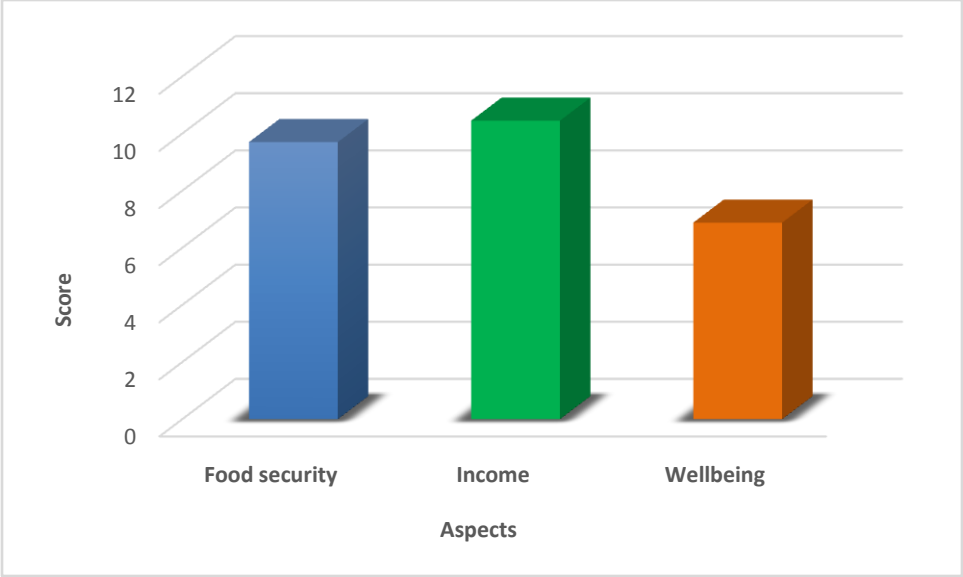

Figure 4. Comparison of different aspects of livelihood change

Figure 4 demonstrates that the element of char women's income with the highest status (10.45) suggests that income had changed the most as a result of participation in the char livelihood program, followed by changes to food security (9.7) and wellbeing change (6.88). Food security had changed because of increased income through crop cultivation followed by livestock crop cultivation and fisheries activities. Notably, the findings showed that increased income helped to meet their livelihood needs such quality of food, clothing, better nutrition and sanitation facilities, and access to health services.

3.4 Factors affecting the livelihood status of the char women

This section presents findings and brief discussions from step-by-step multiple linear regression analysis to examine factors that can be attributed to changes in the livelihood of char women due to involvement in char livelihood program. Multiple linear regression analysis was carried out to determine the factors and their relevance in predicting the focus variable. The regression analysis results (Table 4) show that all the explanatory variables, such as year of schooling, family size, and knowledge of CLP significantly influence livelihood change (R^2 = 0.323) of char women. The multicollinearity test among the model's variables was performed using the Variance Inflation Factor (VIF) which is shown in Table 4. Since the maximum VIF value was 1.111, so multicollinearity was not a problem, and the variables also had high tolerance values. The results of the study also showed that these

variables could collectively explain 32% variation (R^2 = 0.323) of factors that contribute to changes in the livelihood of char women due to involvement in the char livelihood program with high statistically significant (F = 4.769, p< 0.001). On the other hand, normality and heteroscedasticity tests were done before doing the multiple linear regression analysis.

Year of schooling: The year of schooling of the char women had a significant positive impact on livelihood change, indicating that if year of schooling increases by one unit, the char women's livelihood will improve by 0.106. In other words, the char women with having more year of schooling, the more significant the livelihood change in a positive way. The result is plausible as similarly observed by Sarker [54] and argued that that increase in year of schooling leads to improve livelihood outcomes.

Table 4. Summaries of the linear multiple regression analysis

Explanatory variables	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	19.331	2.399		8.059	0.000		
Age (X_1)	0.027	0.017	0.146	1.603	0.112	0.907	1.102
Years of schooling (X_2)	0.106	0.032	0.296	3.346	0.001	0.964	1.038
Family size (X_3)	0.309	0.118	0.236	2.608	0.011	0.917	1.090
Annual family income (X_4)	-9.119	0.000	-0.150	-1.684	0.096	0.953	1.049
Farm size (X_5)	-0.053	0.362	-0.013	-0.147	0.883	0.975	1.026
Credit received (X_6)	-0.106	0.570	-0.017	-0.185	0.853	0.948	1.055
Extension media contact (X_7)	0.026	0.083	0.027	0.311	0.757	0.976	1.025
Training exposure (X_8)	0.457	0.334	0.123	1.369	0.174	0.936	1.068
Knowledge on CLP (X_9)	0.307	0.097	0.290	3.169	0.002	0.900	1.111
N=100, R^2 = 0.323, Adjusted R^2 = 0.255, F value= 4.769							

Family size: It is also evident from Table 4 that the family size of the respondents showed a significant positive relationship with the change in the livelihood status of char women involved in Char livelihood Program, indicating that if family size changes by 1 unit (one number) then the livelihood changes by 0.309. Family size is considered an essential factor in changing the livelihood of char women. The reason could be because Char women participating in Char livelihood programs who have large family size may use family labor in productive work for crop cultivation and other income-generating activities to ensure their daily needs and meals.

Knowledge of CLP: The respondents' Knowledge of CLP significantly impacted livelihood change, indicating that livelihood changes by 0.307 with one unit change of knowledge on CLP. Higher CLP knowledge among Char women resulted in significant changes to their patterns of livelihood because CLP knowledge was a major factor in motivating Char women to participate in CLP activities and improve their livelihood, as evidenced by their outcomes in terms of livelihood. Udayakumara & Shrestha, [55] showed similar findings where they found that knowledge gained from training was an important factor that contributed to the livelihood changes of the respondents. Table 5 presents findings from step-by-step multiple linear regression analysis to help understand the contribution of the significance of each variable in explaining variation in changes in the livelihood char women due to involvement in the char livelihood program.

Table 5 Summary of the step-wise multiple regression

Models	Multiple R	Multiple R^2	Variation explained (percent)	Significance level
Constant + X_3	0.345	0.119	11.9	0.000
Constant + X_3 + X_2	0.429	0.188	6.9	0.007
Constant + X_3 + X_2 + X_9	0.501	0.251	6.3	0.004

The results of the multiple regression analysis show that among the explanatory variables, three variables, such as family size (X_3), years of schooling (X_2) and knowledge on CLP (X_9) significantly influence the livelihood changes of rural women. The analysis revealed that family size (X_3) expresses the dependent variable by 11.9%, years of schooling (X_2) expresses by 6.9% and knowledge on CLP (X_9) expresses 6.3%on the changes in the livelihoods of char women involved in the char livelihood program. These results concurred with those of Itam et al. [56], who discovered that the size of the family was a significant determinant of the efficiency of resource usage among small-scale fish farms in Cross River State, Nigeria.

3.5 Problems faced by the char women while involved in the CLP

3.5.1 Extent of problems faced by the char women

Problems faced by the char women while working in CLP were measured through 11 selected items of problems with a three-point Likert type scale i.e., high = 3, medium = 2, low = 1. The observed score of the problems faced by the women in maintaining livelihood ranged from 18 to 28 against a possible range of 11 to 33. Results presented in Table 6 showed that the mean and standard deviation of the problem score was 23.07 and 0.209 respectively. Results indicated that the highest proportion (82%) of the respondents in the study area faced a medium extent of problem, while 15% of the respondents faced a high

extent of problem while working in CLP and 3% of the respondents in the study area faced a low level of problem.

Table 6 Categorization of selected char women based on their problems faced

Score range		Respondents			Mean	Standard Deviation
Possible	Observed	Categories	No.	%		
11-33	18-28	Low (up to 18)	3	3	23.07	0.209
		Medium (19-25)	82	82		
		High (>25)	15	15		

The mean scores of problems were in the medium extent of problem categories. However, most of the respondents were in the medium extent of problem categories implies that almost all of the respondents faced similar problems to a similar extent. This might be due to the similar socio-economic background of the respondents in the study areas. However, many of the selected respondents are the only earning member of their family besides their husbands, and their little earnings are spent on meeting basic needs and could not generate any savings. That is why their resources are insufficient to obtain enough possessions and many of them had insufficient assets. Once they were assetless but involved with CLP they were able to raise some assets. They only possess nominal low-cost household goods and most of them responded poses the same type of characteristics that's why they face a similar type of high problem. Ahmed and Ahmmed [57] found similar results.

The findings of Roy et al. [58] indicate that the highest proportion (72%) of the respondents in the study area faced high problems, while the rest 28% of the respondents faced medium problems in receiving services for the nutrition of food and none of the respondents in the study area faced low level of problems.

3.5.2 Rank order of the problems faced by the char women

The extent of problems faced by the char women in maintaining livelihood with their rank order values has been presented in Table 7.

Table 7 Rank order of the problems faced by the char women

Problems faced by the women	Score	Rank
Unavailability of transport	295	1
Poor communication facilities	294	2
Lack of technical education	289	3
Lack of management efficiency	253	4
Underestimate as female	216	5
Poor training facilities	205	6
Lack of awareness about different basic needs and other facilities	176	7
Sexual harassment	164	8
Trust on the service provider	139	9
Poor linkage between women and service provider	136	10
Lack of commitment of the service provider	125	11

The extent of problems faced by the char women while involved in CLP with their rank order values of each problem has been presented in Table 7. 'Unavailability of transport' was rated as the major problem that the respondent encountered while involved in CLP. They are unable to move different places (shops, agriculture office, veterinary clinic, input shops) and sell their product in markets for more profits due to a lack of transportation problems.

'Poor communication facility' was ranked as the second most serious challenges. Poor communication facility' was ranked as the second most serious challenges. Due to a lack of adequate transportation or communication facilities, residents of the isolated char area struggle all year long to go to the mainland. There are not enough roads or transportation options in the flood-prone chars because they are inundated every year during the monsoon. Locals move around in boats or rafts made from banana plants during the monsoon.

However, during the dry season, the only means of transportation available to carry items in chars is horse carts; during this time, people must walk from the difficult-to-reach areas to the mainland for at least an hour. The residents of the char areas suffer more when transporting items via the uneven and muddy paths because there are no concrete roads in these places. This inadequate infrastructure also prevents char women to get access to government services like markets, healthcare, and education facilities [19]. This poor communication facility also prevents them to contact with different stakeholders, especially extension workers. This is consistent with findings from Ghana, where agricultural extension agents reported that one of the biggest challenges to providing climate change extension was a lack of transportation options [59].

"Lack of technical education" ranked third. Since education is the most important and fundamental element, having a strong technical and academic education is essential to

earning enough money and changing one's way of life. It makes women more capable of working. They won't be able to take the initiative to engage in other kinds of income generating activities if they are unable to obtain appropriate technical education. This problem was also stated in the study of Akter et al. [60] that Bangladesh is facing challenges in promoting women's literacy, because of their responsibilities at home, the majority of rural women do not have the time to attend education and training.

However, “Lack of commitment of the service provider” were identified as minor problems by the women to maintain a good livelihood. The responders' poor literacy rate and lack of technical knowledge led them to pay insufficient attention to the service provider's commitment. In contrast, Roy et al. [58] found that among the issues rural women faced with household food nutrition, "Non-cooperation of BRAC program's agent" was regarded as the most important challenge, while "Deficiency of knowledge of BRAC agent" was ranked as the least important issue.

4. CONCLUSION

This paper has analyzed the extent of changes in the livelihoods for char women due to involvement in activities of the char livelihood program. The key findings of the study regarding livelihood outcomes changes were satisfactory as most of the char women had changed their livelihood outcomes at medium to high level. However, based on the results of the study, the following conclusions have summarized:

First, participation in the char livelihood program helped char women to increase their income that in turn helps them to change their livelihood outcomes of food security and wellbeing. Analysis shows that majority (83%) of the char women experienced medium and 12% experienced high changes in their livelihood outcomes. Thus, it could be concluded that involvement in the char livelihood program played a positive role in improving the livelihood of the char women. Second, there are several factors that influence the direction and level of changes to the livelihood that char women can gain through the involvement of char livelihood program. The factors include year of schooling, family size, and knowledge of CLP. Analysis shows that these factors explained 32% variation in the livelihood changes of the char women. Therefore, when implementing policy measures in this regard, decision-makers and relevant authorities should emphasize the factors.

Third, char women experience some problems that limited their desired extent of changes in livelihood outcomes. When participating in the Char Livelihood program, the analysis reveals that 82% of the char women have medium-level of problems that prevent them from

achieving the targeted level of changes in livelihood outcomes. The problems included unavailability of transport, poor communication status and lack of technical education. Tackling these challenges require efforts to ensure seasonal transportation system and enhance road communication infrastructure to enable char women to move around (nearest market, shops, agriculture office, veterinary clinic, input shops) freely in order to carry agricultural products and to connect with relevant stakeholders (extension worker, service providers, input dealers) for better farming and income operations. To enhance their livelihood outcomes, various governmental and non-governmental organizations may implement suitable measures, such as offering technical education and training in alternative income-generating activities.

Recommendations for further studies

There is huge opportunity to pursue further research related to this issue. Some of them are listed below:

- First of all, in order to provide more broadly applicable conclusions on the matter, it is not possible to cover farmers from a wide range of regional contexts due to resource constraints. However, Similar studies might be carried out in other char areas that are part of the char livelihood program, taking into account the characteristics of more respondents in order to obtain a more comprehensive image of the whole country, which could be useful for the development of successful policies.

- Secondly, to assess of the livelihood change of the char women, three livelihood outcomes such as food security, income, and well-being have been considered in this study. However, the study has not looked into other outcomes of livelihood such as social status, purchasing power, the confidence of the respondents, etc. It would be interesting to look other outcomes of livelihood due to Char livelihood Program.

- Thirdly, this research has considered only livelihood outcome part of DFID framework to assess the livelihood changes, other segments of DFID framework can be studied to get the complete picture of the Char land people.

ETHICAL APPROVAL AND CONSENT

Respondent participation:

a) Voluntary participation and informed consent: Participants consents were obtained without outside pressure or constraints on individual freedom of action.

b) Formally well informed: A statement of letter that describes the study and the researcher and formally requests participation.

c) Informants are informed about recording during conducting interview.

d) Respect for the values and motives of others: Respect for the individuals and institutions values and views that are being studied.

e) Anonymity and confidentiality: Personal data of the respondents were collected anonymously and confidentially.

2. Data collection and storage:

a) Honest reporting: Information were collected to produce and report accurate data.

b) Researchers stored the data after anonymizing the respondent's name.

3. Interpretation of the results:

a) Plagiarism: To avoid plagiarism of others' text, material, ideas and research results, researcher used source or reference

4. Use and dissemination of the research: The researcher will convey research results to the participants in a comprehensible and responsible manner. The authors are deeply indebted to all the char (dry land) women who took part in the interview. This paper is drafted from a MS thesis work submitted for the fulfilment of MS degree at Bangladesh Agricultural University. Therefore, the research work (thesis) has been presented during MS defense and the authors are grateful for the discussion and feedback they received from the defense committee members and reviewers of the thesis.

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