

# Gender-Driven Agricultural Activities and Crop Diversification Strategies of Char Dwellers in Rangpur, Bangladesh

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## Abstract

Bangladesh is an agriculture-based country. People in this area become victim of different kinds of the climate crisis. To cope with flood or drought, or any kinds of natural disaster the char dwellers adopt different agricultural cropping strategies as they are more vulnerable during climate crises. These kinds of strategies are getting popularity because of the increasing productivity in comparison with previous years. Following the qualitative methodological approach, this study explored the gendered differences between agricultural activities and crop diversification strategies of char dwellers and how these strategies are connected with the private and public spheres. The gender division of labor and discrimination of wages has been noticed in the cycle of agricultural activities. These research findings explored the continuous popularity of sandbar cropping techniques in char areas in both men and women. However, the sack gardening technique is mainly popular among women as these kinds of techniques are adopted to produce vegetables and herbs during the climate crisis, or those who do not have enough land can also produce vegetables using these techniques. The convenience of the sack gardening technique in own yard makes it popular among women as they are staying in the household most of the time. However, raising a bed for paddy and a floating garden with banana tree sail is getting popularity among men as paddy is considered a men's crop and a floating garden is related to the public sphere. Therefore, gendered roles and relations are considered influential factors in crop choices and crop diversification strategies.

**Keywords:** Char Dwellers; Agricultural Cycle; Crop Choice; Crop Diversification Strategies; Gender Roles.

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## **1. Introduction**

There are many negative impacts of climate change on agricultural crop production in Bangladesh. A few studies explored how different kinds of crop cultivation created a positive impact on livelihood. Moreover, researchers also explored those vulnerabilities created by the climate crisis that are not gender-neutral. After conducting workshops with different gender groups in Northern Mali, it has been noticed by Djouddin & Brockhaus women and men have divergent strategies for adaptation to climate change [1]. During the climate crisis, it is hard for farmers to adopt or sustain agricultural productivity. Because of the existing patriarchal structures of our society, it became harder for female farmers in female-headed households. The crop diversification approach could be a good strategy to adapt to climate change.

As Bangladesh has a rich genetic estate, ecosystem diversity, and many human resources who are dependent on agriculture and are willing to learn new skills. There are many opportunities in the crop diversification approach that can keep a balance between major crops and minor crops. The crop diversification program was first introduced in Bangladesh during the early 1990s. It is the systematic rotation of growing crops with rice. A systematic arrangement with the rotation of rice crops is usually done with the farmer's own choice and decision-making process [2]. The relationship between land ownership and agricultural decision-making are also determined by gender and property rights. During the drought season, the riverside area becomes dry and unsuitable for cultivation. The riverside sand and silt landmasses are usually known as 'char' in the Bengali Language. Most of the people in chars are extremely poor or living on a day-to-day basis. They need to struggle a lot to produce crops and manage food to eat [3]. According to the report of REECALL project findings in the Rangpur region, it has been noticed that several men are migrating to urban places in search of other work accordingly the number of female-headed households is rising. As a result of male migration, females are involving themselves in agricultural activities.

To solve these kinds of problems, a sustainable technique is necessary to ensure that farmers can produce maximum crops with their resources and capacities. To fulfill their need the prominent NGO Practical Action Bangladesh has also introduced the sandbar-cropping technique to produce winter vegetables especially pumpkin in the char areas. For instance, growing pumpkin, squash, and watermelon are getting popular in the northern area of Bangladesh. However, the lack of knowledge regarding climate-smart agriculture, crop diversification, and sandbar cropping techniques can create a disadvantage for female farmers [4]. The main problem is about the allocation of char land in Bangladesh. In Bangladesh, the Char Development and Settlement Project is distributing the char land to the landless people. After being included in this project, almost 11800 families have been granted titles and 2200 people are in the process. Almost 143 communities with 29000 households are also vulnerable to the climate crisis. These chars are also culturally and socially conservative which leads to the well-being of women. However, the good thing is that the land titles are registered in the name of husband and wife with equal ownership shares and the wife's name is first on the title which means the wife can own the land if she is widowed, separated, or divorced. Many beneficiaries of this project mentioned that they feel secure and confident after getting the titles of land. Moreover, they are also engaging themselves in agricultural activities after getting the titles of this land. Though the existing gender inequalities are creating problems for women as there is decreasing rate of violence after being engaged in

agricultural activities as women are working actively and becoming empowered in comparison with previous times [5]. This study explored how they are trying to cope with crop diversification techniques related to char farming. As preexisting gender inequalities are creating an impact on the capacities and agricultural knowledge of female farmers, their adaptation strategies, unequal access to information, and behavior related to crop cultivation would be analyzed from gender perspectives.

## **2. Objectives of the Study**

### **2.1 Broader Objective**

To analyze the agricultural activities and crop diversification strategies of char dwellers from gender perspectives.

### **2.2 Specific Objectives**

1. To explore the gender division of labor in agricultural activities among char dwellers.
2. To explore crop choices and diversification strategies from gender perspectives.

## **3. Literature Review and Conceptual Understanding**

The farming system model concentrates on combining farming activities, practices of management, and constraints regarding resources and provides alternative options for decision-making. The crop choice model is one of the approaches that can ensure the participation of community people. The crop choices are also determined by income choice, gender, and cash flow [6]. Nowadays researchers are keeping the focus on female-managed plots, endogeneity of input choice, and the influence of intra-household allocation processes. Even these researchers also raised questions about the assumptions of the same usage of agricultural production function by men and women. In reality, the usage of agricultural production functions may differ. Even the crop choice could be different based on gender or the lack of access to cultivate specific crops would be different as well. According to Quisumbing, the majority of studies conducted from the 1980s to the 1990s explored if the background characteristics controlled, female farmers are more productive than male farmers [7]. Bangladesh is becoming the victim of climate change crises like flooding, drought, and river erosion that are creating a heavy impact on the land decrease and crop productivity. Around the world, farming is one of the important livelihoods as 2.5 billion people are dependent on agriculture directly. Moreover, everybody is dependent on the agricultural production system. These kinds of climate crises are creating an impact on the productivity of rice. Especially these kinds of rice mono-cropping could be stopped ensuring the diversity of crops that has the potential to improve diets and nutritional status. Growing vegetables and fruits would ensure diversity including proper diet and nutrition. In many countries, it has been noticed that men and women are responsible for growing different kinds of crops. As gender relations in Bangladesh are patriarchal, the existing norms in the country control women's economic and agricultural activities. Though most of the women are working in post-harvesting activities they are not getting any remuneration as it is considered household activities. This study explored how the position of women in the empowerment agriculture index is showing the disadvantaged or advantaged position of female farmers in our society [8].

Char people also try to diversify their livelihood in multiple ways and they try to diversify the cropping technique to cope with the climate change situation and follow different agricultural strategies. According to the Practical Action report, it has been observed that using the pit cultivation approach pumpkin and other crops can be grown in sandbar areas. Generally, sandbar areas are large, barren islands that are made of sand and silt deposited when flooding happens and river change their way. In the dry season sandbar normally appears due to the decrease in water flow. Because of the climate crisis, the population in char areas is increasing day by day. In Bangladesh, flooding washes away houses and agricultural land and displaces more than 200000 people who take shelter in public places after losing their everything in the flood. The char lands of the three main rivers are Jamuna-Brahmaputra, Ganges-Padma, and Meghna covering almost 8450 km with a population of 6 million in 1992-1993 and this population has increased to 12 million in 2010. As most of the char dwellers are extremely poor and marginal so they fight to produce and manage food. Therefore, to ensure a sustainable agricultural system they introduced the sandbar-cropping technique to produce vegetables during the winter season. This technique is mainly for pumpkin cultivation. Sandbar cropping is a method where farmers need to dig holes in sandy land and fill these areas with manure, composed of pumpkin seeds etc.

Because of low agriculture productivity, many male farmers are leaving agriculture & shifting to another profession. On the other hand, women in vulnerable disaster-prone, or riverine island areas are being connected to farming. Nevertheless, it has also been observed that they have limited knowledge of farming in comparison to male farmers because of their lack of mobility. Considering this situation, Monash University & Oxfam have started a five-year collaborative project named 'PROTIC' which will help to deliver appropriate agricultural information such as crop farming, homestead gardening, fisheries, livestock, horticulture, poultry through ICT to marginalized women [9]. According to the study by International Food Policy Research Institute, it has been observed that after the migration of the important labor force to the rural areas women are taking lead in the agricultural activities. This study explored how the supply of labor influenced the female labor force participation in the Delta region of Bangladesh and how the migration of men influenced women to take over the activities. Therefore, the existing problem is increasing women's labor force in the agricultural system with a triple burden of work and time poverty.

### ***3.1 Climate Crisis in Char Area***

Chars are small landmasses that are formed along the riverside. The erosion and accretion of sand bars can create new char land in riverside areas. Normally, poor people try to settle home and potential agricultural streams in char areas [10].

### ***3.2 Defining Crop Diversification***

Crop diversification is a new adaptation strategy for the climate crisis. It is a shift from a low-profitable cropping system to a highly profitable cropping system. It is a mixture of different cropping systems along with aquaculture, horticulture, and other non-farm activities of rural agriculture. There are four types of cropping systems which are mono-cropping, crop rotation, sequential cropping, intercropping, and relay cropping techniques, etc [11].

### **3.3 Conceptualizing Gender Roles**

The concept of gender roles is ascribed to women and men on their perceived gender differences. Gender roles are determined by society and influenced by cultural, and environmental factors or by a particular community. Gender roles create the boundaries between the private and public spheres where the private sphere is normally considered as women's domain and the public sphere is normally considered as men's domain. There are three different kinds of roles. For instance: productive, reproductive, and community management roles. We can also see the differentiation between men's and women's work in the agricultural cycle. Women and men take on agricultural activities based on the ideologies of society towards gender roles. Our society thinks that women and men are suitable for different roles [12] .

### **4. Methodology of the Study**

To conduct this study qualitative method has been followed as this method will be helpful to understand different cropping techniques and reasons for choosing these techniques. Also, the qualitative methodology will help this study to explore crop choices of char dwellers and the gender division of labor in the agricultural cycle. To include different perspectives, an In-depth Interview has been conducted among the char dwellers of the rangpur region. To understand different kinds of crop diversification strategies, this study focused on three different kinds of char areas. One is island char which is Dhusmara Char, another is peninsula char which is Char Gonai and the last one is attached char which is Arazi Hariswar. Moreover, this study emphasized on couple interviews to understand the gender differentiation of crop choices and agricultural activities in the agricultural cycle. To fulfill the purpose of this study 12 couple has been selected from three areas. To maintain the confidential identity of respondents numbering has been done. To mention women and men a and b have been given respectively as gender identifiers. Also, different perspectives of Government personnel, researchers, and agricultural officers have been covered by taking different Key Informant Interviews. This data collection has been done from mid-January to the first week of March 2022. After finishing data collection, transcription and translation have been done to focus on the reflections of the respondents. After memoing the data, coding has been done to organize field data properly. Based on the coding, data analysis has been done from gender perspectives.

### **5. Gendered Cropping Pattern**

After conducting the study, the different cropping patterns of char areas has been identified. Among these crops, the major crops are (1) Paddy, (2) Maize, (3) Groundnut, (4) Onion, (5) Garlic, (6) Pumpkin, (7) Water gourd, etc. During the field study, the major cropping pattern identified in the field was based on paddy and maize [13]. According to the KII, Nasima, women activist and female farmer of AraziHarishwar, *This area is flood-prone. During the 2017 flood, I had to leave the home. Last year, the paddy field was flooded too. Harvesting was possible for only Nepalese Swarna and the Pari Dhan. We cultivate sulok, corriander, and AlondiSoch. Soch is usually used in Panchphuron which is the Bengali tradition of cooking and a mixture of five kinds of spices together. In the chili pepper cultivation field, we also cultivate red amaranth, radish (vegetables), and Napa shak. We also cultivate coriander in the onion field.* According to 1a (34),

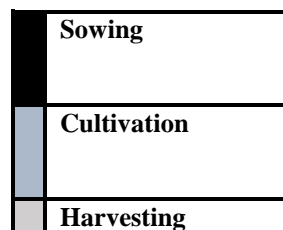
Araziharishwar, *We cultivate potato, maize, chilly, mustard seed, pumpkin, groundnut, cauliflower, cabbage, pointed gourd, ridged gourd, wheat, bottle gourd, red spinach, water morning glory, lentils, spices, onion, garlic, chili in our cultivable field. We do not take much time for fallowing now. Thus, the way, we try to maintain our household needs also.* In the Rabi season (November-March), a large number of crops are usually grown, especially in the northern and middle regions chars, though their productivity was rather low due to limited use of modern varieties, high irrigation and inputs cost, and non-ensured fare price of produces [14]. They have mostly cultivated pumpkin, mustard, watermelon, onion, garlic, chili, pulses, potatoes and other vegetables, maize, wheat, squash, gourd, capsicum, Boro rice, groundnut, banana, and many other crops on these lands this season.

S l	Na me	Pou sh	Ma gh	Falgun	Chaitr a	Baish ak	Jus ta	Ash ar	Shrabo n	Vadr o	Ars hin	Kar tik	Agra han	Pou sh
1	Cro p	Jan	Feb	Mar	Apr	May	Jun	Jul y	Aug	Sep	Oct	Nov	Dec	
2	Rice B. Am on					>							=	
3	Rice T. Am on						>						=	
4	Boro Rice	>				=								
5	Aus Paddy			=				>						
6	Maize				=							>		
7	Wheat			=								>		
8	Mungbean							>					=	
9	Potato					=					>			
10	Pumpkin									>			=	
11	Onion				=						>			
12	Garlic			=							>			
13	Groundnut				=									
14	Eggplant				=					>				
15	Mustard		=							>				

1	Colliflower										>		
1	Cabbage		=								>		
1	Bottle Gourd			=				>					
1	Pointed gourd		>							=			
2	Bitter gourd		>								=		
2	Cucumber				=					>			
2	Tomato									>			
2	Jute				>					=			

**Figure 1:** Crop Calendar of Char Areas.

Months	J	F	M	A	M	J	J	A	S	O	N	D
Aman								■	■	■	■	■
Banana	■	■		■	■	■	■	■	■			■
Betel Leaf	■	■	■	■	■	■	■	■	■	■		■
Boro	■	■	■	■	■						■	■
IRRI	■	■	■	■	■		■					
Jute				■	■	■	■					
Postodana			■	■	■	■						
Lentil	■	■	■							■	■	■
Mustard	■	■	■	■	■	■	■	■		■	■	■
Oil Seed	■	■	■	■	■							
Sugar cane	■	■	■	■	■	■	■	■	■	■	■	■
Summer vegetables				■	■	■	■	■				
Watermelon	■	■	■	■	■							
Wheat	■	■	■	■	■							
Winter Vegetables	■									■	■	■



**Figure 2:** Agricultural Activities of Char in a Year.

**6. Gender Division of labor in Charland**

The gender division of labor is notable in the Char areas. There are some activities where the presence of women is very high and there are also some other activities where women are absent. Though this gender division of labor varies from field cropping to kitchen garden. Sometimes, this gender division of labor is also determined by the cultural understanding or definition of men’s work and women’s work. Moreover, this division of labor varied in the cycle of agricultural activities. During the field visit the deviations in the major farming interventions has been noticed as follows:

**6.1 Preparation of soil**

The preparation of the soil is mostly done by male-only. For instance: men prepare the soil with a tractor machine or sometimes manually with cow and bamboo. In the case of pumpkin cultivation women also work removing sand and mixing fertilizer in the sands. Women were not found driving power trailers, and they are not learning this as this is considered a heavy job or a men’s job.



## **6.2 Sowing**

The sowing of all crops is mainly done by the male. However, some female farmers can sow the seeds of chili, and groundnut. Putting seed potato, groundnut and onion are done by both males and females. No woman of that char area was recorded seeding the Transplanted Aman as well as the transplanted onion.

## **6.3 Adding manures and fertilizer**

Women work adding manure and fertilizer. The participation of women in adding organic manures to pumpkin cultivation is comparatively high though they have less participation in the cultivable land. Women work to make bio-fertilizer whereas men keep the knowledge about chemical fertilizers and they normally spread chemical fertilizers.

## **6.4 Irrigation**

Machine irrigation is led by men, on the other hand, hand irrigation in the winter crops including the pumpkin and other homestead vegetables led by the women. They use a bucket and pitcher to collect water.

## **6.5 Protecting from Weeds**

Women also work in weeding. They have great participation in weeding nowadays. Hand weeding is a common practice for winter crops. Women in the char areas who do not have much land are working as day laborers to do weeding on other's land as well. Some weeds were reported collected as a vegetable by the women. Moreover, sometimes they dry the weeding trash and use these to make fire or bio-fertilizer.

## **6.6 Harvesting**

Most of the paddy harvesting is done by males especially paddy harvesting, and maize harvesting. While there is the requirement of head carry, no woman does this. Harvesting of winter crops is notably done by women, including potato harvesting, onion harvesting, chilly harvesting, and another vegetable harvesting too are done by women in this char areas.

## **6.7 Storage**

Storage is done by both males and females. However, in char areas after talking with respondents it has been noticed that women take care of the storing seed for the next season also whereas men do not take part in storing activity. However, men take part in storing paddy and wheat. After storing some crops, women grind wheat, and maize to use as dry food during the flooding season.

According to 2b (M) (28), Char Gonai, *"My wife helps me during the sowing and seeding time of groundnut and she understands how to do that"*. On the other hand, her wife 2a (F) also mentioned, *"I do everything for homestead gardening. From preparing the soil to harvesting, I know how to make a hole and mix fertilizer to produce good pumpkin or bottle gourd."* According to 3a (27), Dhusmara, *"I know what kinds of seed should be*

sowed in what time. As I don't go to market, I don't know what seed would be good for sowing and give us a good profit. On the other hand, in 3b (32) her husband mentioned,

*My wife helps me to conduct activities in the agricultural field but I need to tell her what to do and at which time. Moreover, women do not know how to sow onion as it is time-consuming. At the same time, they need to maintain the level of proportion when sowing seeds. Therefore, we do the sowing of certain seeds and they do the sowing of certain seeds.*

Here, some of the couples are maintaining the pattern of shifting ideology. Both of them are working but females are mainly connected with private sphere activities. At family farms, labor division has generally been based on complementarity between persons of different gender and generations, resulting in specific male and female spheres and tasks. In this 'traditional' labor division, gender inequality is inherent as women are the unpaid and invisible labor force. Although this 'traditional' labor division still prevails through time and space, new arrangements have emerged [15]. After talking with the respondent from AraziHarishwar, DhusmaraChar, and Char Gonai it has been noticed that traditional labor division still exists. However, women are also engaging themselves in different types of agricultural activities right now though taking part in spreading insecticides, planting onion seeds, and planting paddy are still considered men's jobs. People consider homestead gardening as the work of the private sphere and consider agricultural fieldwork in the public sphere. Therefore, automatically they think women are responsible to do homestead gardening whereas men should work in the agricultural field. However, these kinds of thoughts have been changing over the years. A couple of young generations are taking part in all kinds of activities though these changes are happening because of the increasing awareness done by GO and NGO advocacy. Therefore, on the family farm who will do what also depends on the traditional understanding of gender division of labor, convenience of women, and local perception of women's knowledge.

According to the KII, women activists, Nasima, AraziHarishwar,

*The male has to work more for the cultivation of mastered seeds. The major labor engagement is on Khaj kata and JhulDeya. Khaj kata is the lining of high divides between the crop plots. Also, more labor is needed from the male during the cultivation of Aman paddy; during paddy harvesting, they also have to work more in the morning and afternoon. Women are more engaged in the homestead work in the morning and making food for day laborers during the harvesting time. They can go to the field at around 10 am. During the Magrib prayer time, the husbands took the cattle to the shed.*

**Table 1:** Gender Differentiation of Agricultural Work.

Activities	Mostly by Men	Mostly by Women
Preparation of soil	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Sowing (Depends on Crops)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Adding Manure & Bio-Fertiliser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Adding Manure & Chemical Fertiliser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Irrigation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Protecting from Weeds (Depends on Crops)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Harvesting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Storage	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

### 7. Gender Discrimination in Wages

Gender discrimination is very noticeable among day laborers. For the same work, women get 200 to 250 taka whereas men get 300 to 400 taka. They always believe that men can carry heavy things like carrying potatoes to the market which cannot be done by women so they should be paid more. In some cases, men are also doing the same work as women though they are getting less amount of money in the name that they cannot do it properly. For instance: Weeding of unnecessary plants from the cropping field. To do this work both of them need the same kinds of effort but women are paid less, and men are paid more. Even green chili plugging is 300 for men. However, men do not take part in plugging small vegetables much. It is thought that men are supposed to bear heavy things like carrying crops to the field whereas women are plugging or managing seeds only so that they are getting less amount of money. Though women are getting training and engaging themselves in agricultural activities, there are some stereotypical attitudes of men towards women. According to 4a (55), AraziHarishwar,

*Women don't know much about insecticides in the char area. They don't know how to transplant onion plants as it is necessary to keep the measurement in a particular manner and they are not good at measurement. Therefore, they don't take part in these kinds of activities and get less payment.*

His wife 4b (40), AraziHarishwar mentioned,

*Women cannot carry heavily loaded crops on their heads like potatoes so men need to carry these crops. Men also do the seedlings for paddy that women cannot because it is not possible to stand in the water for a long time with heavy wet clothing so men get 300-350 taka whereas women get 150-250 taka.*

The differentiation of labor depends on the pre-existing knowledge about gender roles and how women are perceived as less capable in society so that without exploring their skills and tagging them as men's work

women are becoming the victim of wage discrimination. Sometimes, doing the same work as weeding they are also getting less amount of money as they are always being considered as a backup breadwinner of our society.

## **8. Reason for Alternative Crop Diversification**

At the same time, flooding washes away and destroys most of the crops. According to Hafizur Rahman, KII, Agricultural Researcher,

*From the agricultural perspective, flooding reduces the production rate. During the flooding time, the dropping of flowers is the reason for less productivity. Because of these consequences, we focus on crop diversification strategies.*

According to KII, Nasima, Women activist and farmer, Araziharishwar, mentioned,

*We used to see the fallow ground for a long time when farmers did not have any work so they could not do any savings for flooding time. At present, because of the variety of crops, we do not see much fallow ground. The crop diversification strategies are necessary as they could help us to cope with adverse flooding situations and take steps ahead of time.*

Therefore, the necessity of char dwellers to maintain their livelihood is creating interest to diversify their livelihood.

## **9. Alternative Crop Diversification Strategy**

To adapt to the climate situation, char dwellers try to diversify their crops following different cropping strategies. Moreover, these kinds of cropping strategies are gendered.

### **9.1 Sack Gardening as crop diversification**

Sack gardening is like cultivating vegetables in a sack. It is possible to move later as anyone wishes. So, it's necessary to fill the particular sack with soil. The sack will be filled up with normal soil first then fertile soil will be used. Then creepy vegetable seeds will be implanted in this sack [16]. For instance, It could be bottle gourd, pumpkin, runner beans, ridge gourd, snake gourd, or yard-long bean. These kinds of cropping techniques are adopted during the flash flood season as there could be a big crisis for vegetables. From that period, the community people who do not afford to buy vegetables at a high cost usually cultivate these kinds of vegetables. To mitigate the scarcity of vegetables these kinds of sack gardening techniques are used. They also do it for their purpose. Those who are industrious do it for the commercial aspect. As most of the African countries are mainly dependent on agriculture, they are developing different techniques to cope with the adverse situation of climate change. In Kenya, Sack gardening got popular to maintain the daily consumption of the family. Bangladesh has no difference. During the flash flood season, the price of vegetables is super high, if they can sell only 10 pumpkins, it will help them to maintain their livelihood for at least four days. To do this they need to make a triangle in the sack. That time they give different kinds of vegetables like water and spinach.

After a certain time, these creepy vegetables will be set on macha which could be made of a bamboo stick. When the soil will be given, it is necessary to give a pipe till the end of non-fertile soil filled with brickbat, and stone to maintain the water drainage system. If there is more water, then there would be water logging and it will create a problem for the growth of production. Even, sometimes it is necessary to irrigate, to ensure the flow of water it is necessary to give something solid. To ensure the soil moisture and humidity, it's necessary to give this pipe. If this pipe is not given here, the soil would be compact and soil would not be able to take the nutrient. According to KII, Hafizur Rahman,

*As this sack gardening is based on homestead purposes we usually focus on women. In the recall project when they introduced it, it has been replicated in a different group. In climate-smart technology of RDRS, has been awarded as the best community practice all over the world.*

After using sack gardening technology 5a (35) (F), Dhusmara, said,

*We are doing sack gardening, especially for bottle gourd in our homestead garden. I do take care of this thing as I got training from Char Livelihood Programme on how to make good biofertilizers and how to use this inside the sack and cultivate good crops.*

Sack gardening is done by women. It's not that necessary in plainland so it's getting popular on sandbar island. Some people are also doing rooftop gardening as a hobby. During the covid time, this gardening becomes very popular. Sack gardening is helping community people differently. It reduces the scarcity of crops as well as increases the opportunity to get economic support. According to 6a (34), Araziharishwar, *"After adopting sack gardening technology for bottle gourd, lentils, snake gourd I produced a lot of vegetables which is enough to maintain my livelihood as well as I can also earn money after selling these by my husband."*

During this time, it is also noticed that if people go there with a pumpkin, it will also be sold out. People are willing to buy fresh vegetables. During a crisis time, these kinds of fresh vegetables are sold at a very high price

## **9.2 Raising bed and Creating Seedlings**

Even, the side of all houses is also used for crop production. Normally, short-term vegetables and creepy vegetables are produced in the aisle of the home. Sometimes, they also sprinkle the seed of red spinach nearside home. Using the same way of sack gardening, it is also possible to use the side of the home to produce crops. During the flooding time, community people try to raise bed for paddy and create seedlings to produce crops [17]. According to 6a (34), Araziharishwar, "

*We also raise seed beds as it is difficult to spread seeds during flooding times. Therefore, we raise small seedlings in the yard. I raised the seedlings' beds of paddy by using dung manure. I also learned many things from my parent as they used bio-fertilizers without any insecticides. As I was the president of Jagoronsomity I got to know how we can use cow dung and how it is useful for crops. I don't believe in creating a distinction between work. As my husband used to do business, I had to learn this thing which helped me to ensure food for my family.*

According to 7a (31), Arazi Harishwar, *Even when we plant pumpkin, we can also make a hole maintaining proper lengths and height creating a proper mixture of cow dung, and placing soil after the cow dung we plant pumpkin. Sometimes we also plant our crops in sacks. We also learned this technique from RDRS and Jagoron foundation. They told us that your house is on low land so that you can plant your crops in sack also. We are getting and updating ourselves with this knowledge for the last 15 years and trying to adjust to the situation.*

According to Muktar Ali Shahin, Farmer, KII, *Practical Action teaches us how to do the pollination. Earlier there were not that many bees and flies, but now. We have to do this in the morning. During the morning the flower remains open. With one male flower, we can pollinate 4 to 5 female flowers. However, we do it for 2 to 3 flowers only. Now we need not do hand pollination. Now there are many flies. They pollinate and it is helpful for the good productivity of pumpkins. The female flower has the young pumpkin. Male flowers bloom more near the stem. The male flower is for pollination only.*

Therefore, it has been noticed that exposure to the public sphere, access to climate-smart information, and ownership of the land make char dwellers confident to be engaged in agricultural activity.

### **9.3 Floating Garden with Banana Tree Sail**

During the flooding time community, people also do the floating garden. It is getting more popular day by day. This floating garden is done on the sail by a banana tree during the flash flood. On the banana tree sail, they used the first layer as water hyacinth and the second layer for soil [18]. After a certain time, the hyacinth will be festered and converted into organic fertilizer. As the banana tree sail can float, they stick that sail with an anchor to the riverside. They produce different kinds of short-term vegetables on banana tree sail. For instance: jute mallow, spinach, and red spinach are usually produced in the floating garden. Moreover, these kinds of floating gardens are done by men as it is necessary to be kept near the seaside. According to 8b (M) (75), Dhusmara, *“We used to do floating garden when we knew less crop diversification technique.”*

### **9.4 Utilization of Vermi-Compost**

Earthworms are valued by farmers because, in addition to aerating the soil, they digest organic matter and produce castings that are a valuable source of humus. Vermicomposting or worm composting is a simple technology that takes advantage of this to convert biodegradable waste into organic manure with the help of earthworms (the red worm *Eisenia foetida*) with no pile turning, no smell, and fast production of compost. The earthworms are bred in a mix of cow dung, soil, and agricultural residues or pre-decomposed leaf litter. The whole mass is converted into casts or vermicompost, which can be used as a fertilizer on all types of plants in vegetable beds, landscaping areas, or lawns [19].

Worms are so effective at processing organic waste that they can digest almost half their weight in debris every day. Vermicomposting is a simple composting process that takes advantage of what earthworms do naturally but confines the worms to bins making it easier for farmers to feed them and harvest their nutrient-rich compost. Since all worms digest organic matter, in principle, any type of worm can be used; however, not all are equally well adapted to living in bins since some worms prefer to live deep in the soil while others are better adapted to

living closer to the surface. The red worm (*Eisenia foetida*) is ideal for vermicomposting because its natural habitat is close to the surface and it is accustomed to a diet rich in organic matter, this makes it ideally suited to digesting kitchen scraps and to living in bins [20].

It is an eco-friendly practice. It has no chemical fertilizer option. It is organic so it is called eco-friendly. It's very popular in char island as normal euria does not apply to that place. Organic fertilizer has the capacity of water holding and this kind of fertilizer has a moisturizer. To keep the moisturizer, there are no other alternatives to vermicompost fertilizer in the char area. It is usually made by women for pumpkin and other vegetable cultivation as it is organic and full of nutrients.

### **9.5 Sandbar Cropping Technique**

In these techniques, farmers make lines. They make a hole in one and a half feet gap and they call it a pit. They keep the gap between the lines to walk for watering. The gap between the path is 2 and a half to three feet. Additionally, for the climbers of the pumpkin, it needs space of 20/22/18 feet. There is a gap between lines is 20 to 22 feet. They make the hole with an ax. If there is sandy soil in the hole then they need to put silt. It needs 8 to 10 kg of fertilizer in a hole, they kept it for 3 days. Then they put TSP, Potash, and Zink for 1 to 2 days, then put seed. Now they also give cow dung. After learning from pumpkin plus and practical action, they now do this approach by themselves. In the morning women work in irrigation. Water is kept in the house. They carry the water in the bucket and pour water into the plant [21].

Regarding storing water in sandbar cropping technique, Muktar AliShadhin, Farmer, KII mentioned,

*We made a hole. Some people make it for 10 feet, some people 12 feet, and some others make it for 8 feet. This one is 12 feet. We need to buy polyethylene from the market. We put and cover the hole with polyethylene. Now there is the solar machine. The solar machine helps us to pump water now.*

This technique is not getting that much popularity among people as these are considered expensive approaches which are not feasible for char people sometimes. Sometimes, they are also unwilling to learn new things. However, women are getting interested in sandbar cropping techniques whereas men prefer to work as a daily wager.

### **9.6 Relay Cropping Technique**

Relay cropping is a method of multiple cropping where one crop is seeded into a standing second crop well before harvesting the second crop [22]. Relay cropping may solve many conflicts such as inefficient use of available resources, controversies in sowing time, fertilizer application, and soil degradation. According to KII, Hafizur Rahman, an agriculture researcher, *"They do the relay cropping usually in homestead gardening basis. Normally they keep spices and vegetables together."*

According to the information of char areas, it has been observed that they are cultivating coriander, flax seeds, turmeric chili, and spinach together. The Relay cropping technique is very good what is ensuring the food

security of char households as well as diversifying the nutrients for char dwellers among the limited number of resources. According to 9a (31) (F), Dhusmara, *“Sometimes we cultivate in same field onion & garlic; maize & lentils; chilly & pumpkin so that we don’t need to prepare the land as well as we are also productively using our land.”*

### 9.7 Using Indigenous Knowledge

Farmers in these char areas are trying to adapt to the flooding situation using indigenous knowledge. For instance: they sow in the yard isle and cultivate coriander, spinach, and other spices nearside the yard. Even after the flooding disaster, they manually remove soil to cultivate crops. According to KII, Masudur Rahman, a community worker,

*After the flood, the people of char search the areas where there is silt. By seeing the silt quality, they can assume that there will new flood. Understanding this they sprinkle paddy seeds on the silt. This process is called “KrishokPadhati (framer’s technique).*

According to 10b (M) (61), Char Gonai, *After a flood, there is silt up to knee height. Doing seedling is not possible there. So, we sprinkle paddy seeds. If there is rain, sometimes we become successful to grow paddy. As there is a flooding situation, we also spread it in a scattered way. In-line seedlings require more seed and also the production of rice is very high.*

Using indigenous knowledge char dwellers try to cope with flooding situations and this indigenous knowledge is passed from generation to generation. There are fewer possibilities for cross-gender knowledge as char dwellers are maintaining almost the same gender role over the years.

**Table 2:** Gendered Crop Diversification Strategies of Char Dwellers.

<b>Crop Diversification Strategy by men</b>	<b>Crop Diversification Strategy by women</b>	<b>Crop Diversification Strategy by both</b>
Farmer’s technique of spreading seeds for paddy	Homestead Gardening in yard isle	Manually removing sandy soil
Floating gardening on banana tree sail	Sack Gardening	Using vermicompost
Raising bed for paddy	Raising bed for vegetables and paddy	Relay Cropping Technique Sandbar Cropping Technique Raising bed and creating seedlings for paddy, onion, and spinach

### 10. Gendered Cropping Choice and Decision Making

The decision-making of char dwellers usually depends on different factors. There are several differences between men and women regarding the diversity of crop choices for example the knowledge regarding crops are different, choice of pesticides and seeds could be different. Also, the reason for crop choice could be different for men and women although they choose the same crops . First of all, it depends on the ownership of land. As men are the owner of the land in most cases, they usually take the decision. It also depends on the geographical



location. In char areas, the price of land is very cheap. In AraziHarishwar, both men and women have their land. In some cases, men also gave land to their wives as denmohor which is the commitment to provide valuables to a girl who has been given in marriage. In Dhusmara char, most of them are living there on a rent basis. Their cultivable land, as well as their household, are on rent as it is the situation in the mid of the river, those who have little affordability, don't like to stay here. Therefore, most of them in Dhusmara char do not have their land and all of the women do not have their land. In Char Gonai, in most the cases, char dwellers have land for their house only and they are taking cultivable land on a contract basis. Considering the land crisis in Dhusmara, it is understood that is very difficult for female farmers to raise their voices regarding agricultural decisions. On the other hand, there is a mixed reaction from Char Gonai. However, in AraziHarishwar women are taking part actively in the agricultural decision-making process. The decision-making and crop choice of different gender also depend on the need of char dwellers and their outer exposure.

According to 6a (34) (F), AraziHarishwar, *I want to grow crops from hybrid seeds but my husband would not be able to maintain them properly. He said that it would be very difficult for him to do irrigation on time so he is not willing to cultivate with hybrid seeds. Therefore, he is willing to do the cultivation with homely preserved seeds. However, we don't fight as there is no point in fighting or arguing. As I am taking care of the household activities and he is into business I take most of the agricultural decisions as we have bought this land after working together.*

According to 10a (40) (F), AraziHarishwar, *I want to grow groundnut whereas he wants to sow maize. According to his decision, we sowed chili last time. For that reason, we have to face a great loss. If we sow maize again, it will take a hell lot of effort and he cannot make many decisions as he lost control of his brain after a stroke I told him to sow groundnut as my son who lives in Dhaka love to eat groundnut. He listened to me and we sowed potato and onion this time.*

According to 11b (28) (M), Char Gonai,

*We jointly decide our decision depending on a lot of factors. It depends on the expenditure of crop costs. If we see that we have the capability to sow garlic, we sow garlic. If we cannot manage these things, we try to find the alternative of these crops.*

Sometimes, it has also been noticed that female farmers think that men know well in comparison with her. According to 12a (27) (F), Dhusmara,

*We take cultivable land on a contract basis. If we want to sow anything. We always try to keep a combination of two crops so that at least one can sustain and bring profit for us. For instance, we keep potatoes and chilly together. If one is bringing us loss, at least other crops can be profitable for us. I believe that men are more knowledgeable regarding crops in comparison to women so we should act according to their decision as they have more exposure than us.*

According to the statement of 13a (F) (35), Dhusmara,

*Sometimes, we cannot take a joint decision together so I just followed her decision. For instance: I told him to sow garlic but he imposed me to sow onion. If I don't listen to him, he will beat me so I listened to him. We bought garlic seeds 100 per 40 kilos and sold cultivated garlic for 20 takas per 40 kilos. It was a great loss. If I don't listen to him, I have to go back to my home. Where should I go? I am with him just because of my children.*

Therefore, it's clearly understood that agricultural decision-making is not a separate thing. It is related to the gender and patriarchal culture of our society where access to land and resources determine the value of one's decision. Despite being landowners, the decision of women can be undervalued just because of their gender. In this capitalist society, agricultural decision does not depend on men and women. It also depends on the market price and peer groups.

## **11. Discussion**

The agricultural activities of char areas are influenced by the socio-cultural factors of any society. In these char areas, the char dwellers try to adapt to the changing climate situation. Because of the geographical vulnerabilities of char areas, char dwellers are trying to diversify their cropping strategies. However, these cropping strategies are based on gender differences. The agricultural activities of char areas are driven by gender roles and relations.

The crop choices are determined by different factors like income choice, gender, and cash flow. After analyzing my study findings, I have also found that the choice of crops is not only determined by gender but also by cash flow, income choice, and profit calculation. For instance, women like to sow groundnut, spices, chilies, or other vegetables as they are actively engaged in these kinds of crops sowing and harvesting whereas men like to sow paddy, potato, maize, etc. The crop choice are also determined by the cash flow when they have savings to sow or buy seeds, what kinds of seeds are sowed by neighbors or peer groups, what is sustainable with the flooding situation as well as what could be harvested before the flooding time. People always consider these things before sowing seeds. In different phases of the agricultural cycle, women and men are doing different work based on their gender. The presence of women is very less in the preparation of soil as most of them believed it was men's work. However, the presence of women is more in adding bio-fertilizer and manure though they believe that spreading chemical fertilizer in paddy fields is men's job. The presence of women in the agricultural cycle of storage is more in comparison with men as storing is considered as women's work and connected with the private sphere. Moreover, the sack gardening technique is very popular among women as they can easily do it without going to the public sphere. The popularity of any crop diversification technique depends on the connectivity with the public and private spheres as well as decided by gender roles and relations. Overall, the patriarchal mindset of char areas is preventing women to take part in different activities and creating gender-based discrimination in terms of decision-making also. Moreover, it is also based on the community's perception of any work and how they perceive gender roles.

## **12. Conclusion**

The crop diversification strategies of char dwellers and activities during the agricultural cycle are gendered.

Though the changes are happening day by day, changes are also following a stereotype of men's work and women's work. Here, the preferences of men and women regarding crop diversification and agricultural decision-making are also determined by political, economic, and socio-cultural factors. It's not only between men & women rather it is determined by the power structure of society, what kinds of seeds are given by the government, what kinds of information they are receiving and who is receiving the information. Therefore, it is necessary to understand the position of women in a society where their interaction with other peer groups is also determining what kinds of crop choices or diversification strategies are getting popularity among what gender. Considering the climate crisis of char areas, go and NGOs are focusing on women to let them know about different kinds of crop diversification approaches as they are more reachable in comparison with men because of their availability in the household. In most cases, men are choosing crops based on the market price prediction whereas women are choosing crops based on their family's daily consumption. The differences in their work in the agricultural cycle, crop choice, and crop diversification strategies are influenced by the socio-culture understanding of gender roles and responsibilities. However, there were some gender-neutral activities like removing sandy soil together, raising beds for paddy and vegetables, sandbar cropping, and relay cropping techniques followed by both. Interestingly, women with agricultural knowledge are respected among their community members and acknowledged by their partners as well.

## References

- [1]. Djoudi, H. & Brockhaus, "Is adaptation to climate change gender neutral?: Lessons from communities dependent on livestock and forests in northern Mali". *International Forestry Review* 13 (2) :123-135. ISSN: 1465-5489, 2011.
- [2]. Food & Agriculture Organizations of The United Nations, "Crop Diversification in The Asia-Pacific Region. Food & Agricultural Organization of The United Nations, Bangkok, Thailand.", 2001.
- [3]. Islam, A. R., Shill, B. K., Salam, R., Siddik, M. N., & Patwary, M. A., "Insight into farmers' agricultural adaptive strategy to climate change in northern Bangladesh. Environment", *Development and Sustainability*, 23(2), 2439-2464. <https://doi.org/10.1007/s10668-020-00681-6>, 2020.
- [4]. Khatun, M., Rashid, M., Miah, M., Khandoker, S., & Islam, M. "Profitability of sandbar cropping method of pumpkin cultivation in char land areas of northern Bangladesh." *Bangladesh Journal of Agricultural Research*, 42(4), 647-663. Available: <https://doi.org/10.3329/bjar.v42i4.35792>, 2017.
- [5]. Reliefweb.int, (2021) Bangladesh. Available: <https://reliefweb.int/report/bangladesh/csa-country-profiles-asia-climate-smart-agriculture-bangladesh>
- [6]. Nidumolu, U., Lubbers, M., Kanellopoulos, A., Van Ittersum, M. K., Roth, C. H., Mishra, P., Bagchi, N. S., Majumdar, S., Carter, L., Rahman, M. W., Das, M., & Gaydon, D. S. (2022). Integrating gender and farmer's preferences in a discussion support tool for crop choice. *Agricultural Systems*, 195, 103300. <https://doi.org/10.1016/j.agsy.2021.103300>

- [7]. International Food Policy Research Institute. (2011). 2010 annual report. Available: <https://www.ifpri.org/publication/2010-annual-report>
- [8]. Pinto, A. D., Seymour, G., Bryan, E., & Bhandari, P., “ Women’s empowerment and farmland allocations in Bangladesh: evidence of a possible pathway to crop diversification.” *Climate Change*, 163, 1025. Available: <https://doi.org/10.1007/s10584-020-02925->, 2020.
- [9]. Tithi, T. K., Chakrabarty, T. R., Akter, P., Islam, H., & Sabah, A. K., “Context, design and conveyance of information: ICT-enabled agricultural information services for rural women in Bangladesh.” *AI & Society*, 36, 277-287, 2020.
- [10]. Char Livelihood Programme. (2010, August). Available: [https://assets.publishing.service.gov.uk/media/57a08b1c40f0b64974000984/brief\\_background\\_rangpur.pdf](https://assets.publishing.service.gov.uk/media/57a08b1c40f0b64974000984/brief_background_rangpur.pdf)
- [11]. Nordhagen, S., Pascual, U., & Drucker, A. G. (2021). “Gendered differences in crop diversity choices: A case study from Papua New Guinea.” *World Development*, 137, 105134. Available: <https://doi.org/10.1016/j.worlddev.2020.105134>.
- [12]. Mormons, gender roles and. (2009). *Encyclopedia of Gender and Society*. Available: <https://doi.org/10.4135/9781412964517.n288>.
- [13]. Doss, C. R. (2002). “Men’s crops? Women’s crops? The gender patterns of cropping in Ghana.” *World Development*, 30(11), 1987-2000. Available: [https://doi.org/10.1016/s0305-750x\(02\)00109-2](https://doi.org/10.1016/s0305-750x(02)00109-2).
- [14]. Karim, M. A., Quayyum, M. A. Samsuzzaman, S., Higuchi, H. and Nawata, A., “Challenges and Opportunities in Crop Production in Different Types of Char Lands of Bangladesh.” *Tropical Agriculture and Development*, Volume 61, Issue 2, 2017.
- [15]. Contzen, S. and Forney, J., “Family farming and gendered division of labour on the move: a typology of farming-family configurations”, *Agriculture and Human Values*, Vol 34, pages 27-40, 2017.
- [16]. Gallaher, C. M., *Livelihoods, food security and environmental risk: Sack gardening in the Kibera slums of Nairobi, Kenya*, 2012.
- [17]. Georgiev, G. (2022, September 27). *Raised beds make it possible to grow during the rainy season*. Available: <https://www.ews-kt.com/raised-beds-make-it-possible-to-grow-during-the-rainy-season/>.
- [18]. Turan, M., & Yildirim, E. , *New generation of organic fertilizers*. BoD – Books on Demand, 2022.
- [19]. Landers, L. (2022, May 27). *Vermicomposting for beginners (Composting with worms)*. Available: <https://gardening.org/vermicomposting/>.

- [20]. Practical Action Bangladesh. (2018, November 14). *Sandbar cropping - Practical action Bangladesh - Securing water for food*. Available: <https://securingwaterforfood.org/innovators/practical-action-sandbar-cropping>.
- [21]. Jayaraman, S., Dalal, R. C., Patra, A. K., & Chaudhari, S. K., “Conservation agriculture: A sustainable approach for soil health and food security”, *Springer Nature*, 2021.
- [22]. Margaret. (2021, November 7). *9 ways to keep your garden beds from flooding*. Available: <https://crateandbasket.com/ways-to-keep-your-garden-beds-from-flooding/>.