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Research Article

Women Empowerment through Climate-Smart Agriculture in Southwest Region of Bangladesh

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A B S T R A C T

This study examines the adaptation practices of women farmers in the southwest region of Bangladesh, who received land assistance from the World Bank after being displaced due to cyclone *Aila.* For the study qualitative research approach was adopted, 12 women farmers were selected purposively residing in Kamarkhola Union of Dacope Upazila under Khulna district and in-depth interviews (IDIs) ,4 key informant interviews (KIIs) were done with local climate-smart agriculture (CSA) experts. The study identifies various CSA techniques like cultivating salt-tolerant crops, using eco-friendly fertilizers, and managing fish farms with identifying its role on women empowerment. The study reveals that CSA enables the majority of women work in agriculture sector becoming financially solvent, and contribute to the decision making process in the family and community. It also shows that CSA practices help to enhance their natural, physical, and human capital but identifies some challenges, such as training mismanagement, information gaps, family responsibilities, transportation issues, financial constraints, and market linkages that need to be addressed by the related government sector and non-government organizations (NGOs). The research also suggests that providing high-quality resources and financial aid can improve the benefits of CSA for women in the region. Above all, it contributes to the literature on CSA and women empowerment; and provides insights for further research and projects on the topic.

INTRODUCTION

Climate change is a global issue. Bangladesh is the worst sufferer of climate change, although it is emitting only 0.5 tons of Carbon dioxide per inhabitant per year (Molnar & England, 1990). The average temperature in Bangladesh has been rising in recent years (Basak *et al.*, 2013). The coastal zone of Bangladesh covers 32 percent of the country's surface area, and it is home to 28 percent of the people of the country (Islam, 2004). Coastal farming is becoming very difficult day by day due to the change in monsoon patterns. Tidal cyclones, soil salinity and natural disasters become a common issue (Zhongming *et al.*, 2017).

Climate-smart agriculture (CSA) is advocated to increase production while mitigating climate change (Pye-Smith, 2011). It is a long-term strategy that can increase agricultural production and revenue by implementing adaptation strategies that promote resilience to climate change and reduce carbon emissions (Engel & Muller, 2016). As a response to climate change and its adaptation and mitigation strategies, the scientists of the agricultural field have introduced several agricultural tools and strategies to make agriculture more sustainable. These sustainable agricultural methods are collectively known as CSA becomes popular all over the world (Ali & Hossain, 2019).

CSA is characterized by three goals: first, boosting agricultural productivity to promote higher incomes, food security, and growth. Secondly, enhancing adaptation capability at many levels and thirdly, reducing greenhouse gas emissions and raising carbon dioxide (Neufeldt *et al.*,

2013). A study conducted in the Kalapara sub-district of Patuakhali, Bangladesh found that farmers had implemented 17 CSA practices including saline-tolerant different crops, flood-tolerant cropping, drought-resistant crop varieties, high-yielding rice, vegetables in a floating bed, pond-side vegetable planting, watermelon, sunflower, or plum cultivation, relay crop management, urea deep placement, organic fertilizer, cover crops, pheromone trap use, rain-water harvesting, and seed stockpiling in plastic bags or glass containers (Hasan *et al.*, 2018).

CSA methods have gained gender focus as most of the women in rural areas are engaged with it but they face variety of significant structural impediments that limit their access to land, information, money, equipment, technology, and markets. Closing the agricultural gender gap through well-informed investments that eliminate these barriers represents a great opportunity for women's empowerment, economic growth, and societal stability which is Climate-Smart Agriculture (UN Women, 2016). Men are much more empowered than women, but descriptive analysis statistics suggest that females adopted CSA practices at a higher rate compared to the men (Oyawole *et al.*, 2020). Ali and Hossain (2019) also found that women are empowered through this CSA as the picking, cleaning, grading, and packaging of tomatoes is mostly done by recruited or own female labor.

Bangladesh has experienced notable growth in women's participation in agriculture from 20 percent in 1999–2000 to over 33 percent in 2005–2006, though agricultural practices frequently neglect women's contribution to agriculture (Sraboni *et al.*, 2014). The Climate-Smart Agriculture program examines the political, societal, and financial disparities in agricultural practices between men and women (Collins, 2018). Because of gender norms that regulate asset ownership, men generally have an advantage in holding assets (Meinzen-Dick *et al.*, 2019). The importance of women in agriculture has been underestimated over the time (Manchón & Macleod, 2010); despite the fact that women account for approximately 43 percent of the agricultural labor force in developing nations. CSA may have a greater impact on family well-being and women's empowerment, if women have equal participation in such technologies and practices and take responsibility for the benefits that result (Gutierrez-Montes *et al.*, 2020). Quisumbing *et al.* (2018) found that women are more likely to learn about CSA practices from their neighbors and on the radio, whereas few women use traditional agricultural information sources. Women can be empowered by improving their access to productive resources, financing, and information, increasing off-farm work and creating expertise on adaptation strategies (Huyer *et al.*, 2015).

From the above discussion it is highlighted the scope of women empowerment through CSA method as they often contribute a substantial portion in workforce but their contributions are unrecognized in the society. As Bangladesh is climate vulnerable zone, it's necessary to adapt climate resilience agriculture for advanced productivity and CSA is considering such a method in Bangladesh due to its weather and landscape. But there are no studies that specially focus on the significance of CSA in regard to women empowerment in the southwestern region of Bangladesh. Therefore, the topic was chosen for the study and it tried to explore the extent of practice of CSA among women, find out the changing scenario in their socio-economic condition due to practice of CSA, and to understand the effectiveness of CSA strategies to empower them.

MATERIALS AND METHODS

The study was descriptive in nature. It was conducted in the Kamarkhola Union of Dacope Upazila of Khulna district, which is situated in the southwest region of Bangladesh. It is one of the most vulnerable climate zones of the country due to surrounding seven rivers of this area, which brings saline water through increasing tidal waves and storm surges. Agricultural sector has been changed over time through an innovation process through scientific revolution. Many approaches are practiced there for agricultural production in salty land and water that was mostly impossible in past times. Therefore, the area was selected for the study mainly to know the role of CSA to empower women in this region.

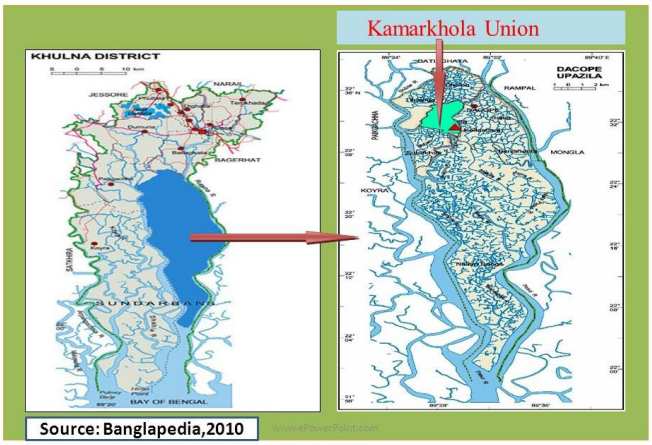

Figure 1: Study Area Map.

Following qualitative research design the study was conducted. The study adopted an open-ended, iterative, and inductive approach. Data were collected through In-depth Interviews (IDIs) and Key Informant Interviews (KIIs). For this 12 women were selected purposively for IDI, who were living in the study area for at least 5 years, engaged in agricultural work using CSA method. Besides, 3 non-government and one government official, who provide supports to the women farmer in using CSA method, were selected for KII. Data was collected in November 2022 using Semi-Structured Interview Schedule for IDIs and Checklist for KIIs.

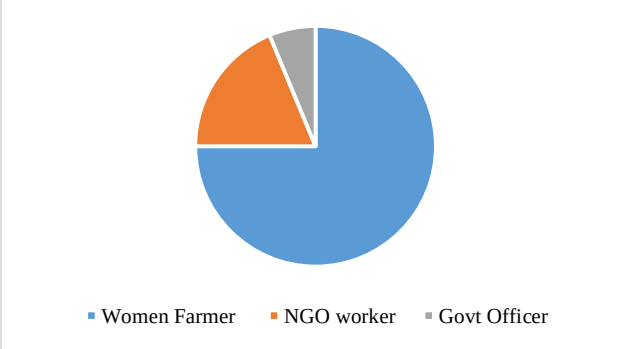

Figure 2: Participants of the Study.

A moderator helped to conduct the data collection session for reliable results. Each IDIs session was taken for 1 hour and KIIs were conducted to get more information from expert people conducting one and half hours. As the study followed an inductive approach, the number of participants were small and as CSA methods were practiced in a small range in the study region that generalized the results.

RESULTS

The results have been discussed on thematic analysis help to understand how CSA methods work play role to women empowerment.

Table 1: Thematic Distribution of the Study.

Themes	Sub Themes
Physical and Climatic condition of the study area	
Suitability for Agriculture	1. Reasons for participating in agriculture 2. Times of involvement in agricultural work 3. Knowledge about Climate-smart Agriculture (CSA)
Methods of the CSA	
Scope and barriers for CSA practice	1. Support for practicing CSA 2. Financial condition after practicing CSA 3. Social condition after practicing CSA 4. Natural capital after adopting CSA 5. Physical capital after adopting CSA 6. Human capital after adopting CSA
Life after CSA and Way Forward	
Women Empowerment through CSA	Suggestion for better outcomes

Physical and climatic condition of the study area

Agriculture is one of the basic sources of livelihood for most of the rural people of Bangladesh. South-west coastal region is not beyond it. But the area lacks of favorable climatic conditions needed for expected production. The land of our study area is salty due to the experience of natural disasters like cyclones and floods from the surrounding seven rivers in almost every year. Because of unfavorable climatic condition, traditional agricultural system can't contribute much in enhancing local people's livelihood. During data collection period almost every participant mentioned salinity as the major problem in the region. One IDI participant stated that,

> *"The rivers bear fresh water for six months of a year (during Ashar to Agrahayan), and the remaining six months they remain full of salty water." (IDI 1).*

When a KII participant, the Agricultural officer of Dacope Upazila, stated that,

> *"The area experiences frequent disasters on an annual basis, water level rises particularly during the rainy season lead to flooding. Additionally, a significant concern is the increasing problem of salinity intrusion, land is getting saline. The period from March to June is challenging, as salinity levels extending from 13 to 30 days have a prominent impact on the area." (KII 4)*

Suitability for agriculture

The majority of the population in the region are dependent on agriculture as their primary source of income due to the lack of alternative livelihoods. However, the changing climate in the area poses significant challenges to agricultural activities. Many participants emphasized that they engaged in more effective farming practices compared to the past, getting support by various government and NGOs in adapting to the changing climate. One recounted their experience, stating,

> *"Following Cyclone Aila, we became homeless and lived on the streets for a long period. Subsequently, with assistance from the World Bank, we acquired land and constructed a house, sustaining ourselves through farming. Achieving success in farming has proven challenging the changing climate conditions." (IDI 2)*

Several participants expressed that the local climate is conducive to both fish farming and agriculture in salty land and water. The region is known for producing a variety of fruits and vegetables, including watermelon, spinach, cabbage, and potatoes. But local people are always afraid of potential threat like flood that can harm their efforts.

Fisherwomen shared their success in fishing. They are interested in cultivating diverse types of fish, such as *bagda* (shrimp farming in salty water), lobster, *rui, vetki, parse (local fishes)*, crab, etc. A fisherwoman expressed her preference for fish farming over cultivating vegetables and crops in the given climate. She and her husband cultivate various fish in brackish and freshwater, including lobster, *bagda shrimp, herring shrimp, vetki, parse, and rui.*

Participants in both IDI and KII concurred that the climate in the region was not entirely suitable for traditional cultivation. A representative from Heed Bangladesh (National-level NGO), participating in a KII, noted that the climate was moderately suitable for agriculture, with single-crop land being predominant, although some areas had now been cultivating two crops.

Reasons for participating in agriculture

Most of the women reported that they were involved in agriculture voluntarily. As majority in this area live beyond poverty line and engage with agricultural activities. Therefore the income of their family can be increased by cultivating a little more. One IDI participant said that

> *"I started farming in my homeland to support the family financially. Because,*

> *it costs 30-40 taka to buy a vegetable from the market. Now I support my family by growing vegetables at home" (IDI 3).*

Another IDI participant stated that,

> *"I farm to provide support for my family; and to make a little more funds so that I can have the ability to purchase something occasionally for my child" (IDI 6).*

KII participants also agreed with the IDI participants that local women were mostly involved in agricultural sector to provide financial support and ensure food security to their families through homeland cultivation.

Times of involvement in agricultural work

Most of the women migrated in this region after getting married and engaged in agriculture, another started farming after providing land to settle down in post-*Aila* period through the assistance of World Bank. Some women also said that they had been farming since their childhood. One of the IDI participants stated that,

> *"After enduring extensive devastation in the wake of the cyclone Aila, which encompassed widespread flooding and a long period of living on the streets, we were settled on land by the assistance of World Bank a few years ago. Then settling on this land many of us established farms. For the past three years, I have not only been residing on my small piece of land but also actively engaging in agricultural work" (IDI 9).*

KII participants also agreed that most of the women had become more involved in agriculture since getting land with the help of the World Bank to improve their economic condition.

Knowledge about Climate-smart Agriculture (CSA)

As to produce crops is tough in this region due to climatic condition, people here practice alternative methods of agriculture. Both Government agricultural office and NGOs play a significant role in providing extensive training on alternative agricultural systems.

One IDI participant reported that,

> *"I had no idea about it. I heard the name 'smart agriculture' in a NGO based training session and learnt from them on how to farm through this method. Now I use alternative farming under the harsh weather and changing climate of the area" (IDI 5).*

KII participants also were of the view that training is the main way to get them informed about climate-smart agriculture. A KII participant, who is a field worker of HEED Bangladesh, explained that,

> *"As an organization Heed Bangladesh works for women's farming. They first enlist extremely poor people and bring them under the training. It conducted a census on behalf of PKSF and listed 1400 people. After that, they went to the area and provided them with training on climate-smart agriculture." (KII 2).*

A KII participant, an Upazila agricultural officer, explained,

> *"We conduct diverse meetings with government assistance to enhance farming practices taking place at our upazila agriculture office field and farmers are trained on adapting to the local climate in agriculture there. Additionally, each union has three assistant agricultural officers who convey meeting details to field-level workers and inform the farmers involving both male and female farmers, adhering to government directives that must ensure 30% women participation among the total participants in every meeting." (KII 4)*

Methods of the CSA

Women in the study area commonly engage in climate-adapted farming on their home plots, using the techniques learned from various organizations. Many of them employ diverse approaches, including saline resilience vegetables, and creating homemade fertilizers like organic, compost, and earthworm fertilizers and vermicomposting also. To secure water for irrigation and agriculture, they store freshwater in ponds before the intrusion of saline from the rivers. By utilizing the pond's edge, they practically grow vegetables and construct a platform above the pond, enabling them to nurture both fish and vegetables simultaneously.

One of the IDI participants said,

> *"There is no cropland available for my farming, but there is a pond. I grow such vegetables that can be grown around the pond' (IDI 8)*

They also prepare high seed beds and try to convey vegetables on high land so that their crops accumulate in excess water. Many of them cultivated by adopting "*Bosta Poddhoti" (an indigenous process for cultivating).* Through this, without own land, one's can be able to produce crops. Another IDI participant stated that,

> *"Using Bosta Poddhoti I can cultivate crops in less space. Also, the benefit of cultivating vegetables is due to the extra water easily getting outs of it so that vegetables are not damaged." (IDI 6)*

Women who cultivate fish in the region mostly used *"gher"* which is the traditional way to fish farming and have at least one "gher" mentioned by participants. They cultivated lobster, different types of prawns, *vetki*, *parshe*, *crab* etc. in

the salty water, and *rui*, *pabda*, *koi*, etc in the freshwater, which they store in the pond.

KII participants were of the view that women learned different methods of farming which enhanced their capacity in adapting the climate. They, who have "*gher"* and pond, cultivate fish; and who have cropland, grow vegetables, paddy, and fruits by using the CSA methods.

Scope and Barriers for CSA practice

As stated earlier women in the region are significant part among the contributors in agriculture since either from their childhood or after the marriage. Though our society has deep rooted cultural norms which in many cases hinder women to work outside but the situation is gradually changing. Women were found interested in practicing CSA methods, but faced many constraints. As the land is salty here they cannot produce on a big scale and have to face water crisis to irrigate. Produced goods also are not transferred easily to the market due to communication and transportation problems. Additionally, information gap is found existed among the farmers regarding training facilities and other technical issues.

This region is not conducive to farming due to climate and disasters. There are also problems related to infrastructural support, water crisis, crop land, transportation issues etc. Most of the IDI participants said that they had to face various problems in working following the CSA methods. One IDI participant stated that,

> *"We face more problem in transportation. Due to lack of transport, we cannot reach a certain place to take training every time, also we cannot collect the necessary equipment for advanced cultivation" (IDI 4)*

Another IDI participant claimed that political nepotism among the fishermen existed there. For that reason, they couldn't get proper support. She stated that,

> *"By political influence one group of people get all the facilities every time and some people never get any facilities at all" (IDI 8)*

Consequently, the majority of the IDI participants identified some common challenges in implementing climate-smart farming methods. Primarily, they mentioned difficulties to participate in training programs for lack of information about the training program, occasional exclusion from participant lists, transportation constraints, and the incapability to attend due to familial responsibilities. They also highlighted that adopting alternative farming methods often required specific tools, unable to afford those items like nets, essential fertilizers, high-quality seeds, and agricultural equipment. One of the IDI participants stated that,

> *"I have planted saplings but now I cannot afford to buy the fertilizer it needs to grow well. Because of this I am workless for the last two months." (IDI 10)*

KII participants also mentioned that, it is not easy for women adopting CSA strategy in the study area. Women face various problems like information gap. Information gap arises because the organizations cannot reach to all the women in this region to train them about the CSA method because of transportation problem.

Moreover, women in the study area were found primarily involved in farm-related work, but lack of knowledge about market economy and less connections with any market. But market linkage is essential for improving agricultural development, facilitating the purchase of quality seeds, fertilizers, and necessary equipment for better cultivation as well as making them able to sell their products directly.

KII participants also agreed that women farmers received various types of training regarding CSA practices, but all of them couldn't go for work due to familial and religious reasons. Also, many women feel hesitant to go out for taking training. As women have no financial control, they can't afford agricultural equipment necessary for CSA practice.

Support for practicing CSA

Most of the women said that they do farming by their own choice and almost all of them do farming with their husbands. A few of them also told that even though their husbands are not involved in agriculture, they farm to provide financial support to their families. One of the IDI participants said,

> *"It is not possible for me to do agricultural work without the support of my husband. We both do all the work accumulated and take the decision jointly whether any work is favorable for the agriculture" (IDI 1)*

Another fisherwoman also stated that,

> *"I work with my husband in our fish farm. I started farming on my husband's advice and now we cultivate fish together with success. Currently my husband cannot work properly without my help. I feed the fish, pull the net, and catch the fish with my husband. Moreover, we stay in the 'gher' at night to guard the fish" (IDI 8)*

KII participants also told that both men and women of this area are engaged in agriculture. As men are traditionally active in this field, they provide support more to women so that the family can be financially supported. One officer from a NGO, Shushilon said that,

> *Many times, women receive training with their family members, even with their husbands. They also work with their husbands on the methods they learn in training" (KII 3)*

Financial condition after practicing CSA

All of the participant women acknowledged that their financial position had been improving after implementing CSA methods. They may now grow a variety of crops and fish throughout the year and become successful. They can meet their familial needs and rest of the crops are sold to market. A woman stated,

> *"I received CSA training and afterward used it to cultivate gourds. I grew a lot of gourds and earned a lot of money selling them in the local market. Our monthly income has increased by farming using this method. Now we earn 10000 taka per month which is much more than before." (IDI 3)*

Another IDI participant also noted that their financial status after practicing this method that is

> *"I cultivate different kinds of vegetables like pumpkin, gourds, spinach, cabbage, potato, chili, etc. We usually do not buy any vegetable from the market. We use two-thirds of my agricultural production at home and sell the rest in the market." (IDI 4)*

Majority of the IDI participants shared the common thought that CSA methods were helpful to make them financially empowered. By using this method, they are now able to meet the various needs of their children, to save some money for the future and to provide financial support to the family when in need.

KII participants noticed most of the people in the area who had been doing agricultural work were more successful than before. Along with men, economic status of women are also being improved through using CSA methods in agriculture.

Social condition after practicing CSA

As the adoption of CSA methods in farming has resulted in financial benefits for women and contribute to their family's betterment, it has also ensured an equal and significant role for women within their household, where their opinions are now valued alongside their male counterpart. A majority of the IDI participants mentioned that they enthusiastically engaged in making family decisions simultaneously with their husbands. Furthermore, their involvement in agricultural activities has developed their communication within their community, and other various social activities. One of the IDI participants stated that,

> *"I used to farm, but the output wasn't great. However, I am now having better success with my farming because of the CSA method. I now guide on both familial and financial matters. Before making any decision, my husband consults with me" (IDI 4)*

Most of the KII participants are of the view that women's position in the family and society is changed depending on their financial contribution to the family. Substantially women's communication with the community increases through different agricultural works and they get opportunity to take part in various social activities and decision-making of the community.

Natural capital after adopting CSA

It is found that the adoption of CSA methods in the study area has brought about remarkable financial and social changes in women farmers' life. To these aspects, they emphasized the capacity to build their natural resources and assets through their agricultural work. Most of the IDI participants became homeless due to cyclone *Aila*, and were bound to reside on the streets. Subsequently, with the assistance of the World Bank, they received land for residing and cultivation as well. On this land, their learnt skills gathered from agricultural training have been pragmatic, resulting in various methods of cultivation. The positive outcomes of CSA farming have enabled farmers to purchase land, excavate ponds, and develop poultry farming. Additionally, they engage in diversified crops cultivation, raising fish, and growing vegetables and fruits. One of the IDI participants said that,

> *"I have more cropland here than others, I was able to buy the extra land through the profit earned from agricultural work. I cultivate different kinds of crops, vegetables and fruits on my land. These are enough to fulfill my family need. I also cultivate fish in my home grounded pond" (IDI 1)*

KII respondents also mentioned that women in the study area have more or less natural resources. One KII respondent stated that,

> *"You will find crop fields and ponds in almost every household in the area, where they grow fish and store water for irrigation." (KII 1)*

Physical capital after adopting CSA

It is found that women farmers under the study have constructed houses through the profit of agricultural farming. By adopting the CSA methods they are using various tools and technology instead of traditional equipment. They use quality seeds and fertilizers, pesticides, and other necessary equipment for farming and are aware of their responsibilities for climate induced disasters. One IDI participant stated that

> *"We try to fix our houses safely before the time when usually disasters occur. And we take help of various tools and technologies for better cultivation under the changing climate and disaster" (IDI 12).*

In the same way KII participants also told that by adopting CSA methods women become successful in farming. One KII participant said that,

> *"Women are now able to construct their infrastructural resources like safe housing, roads, sanitation facilities etc., which are very important for a standard living" (KII 12).*

Human capital after adopting CSA

As stated earlier women are adopting CSA methods for agricultural work attaining knowledge through training provided by various organizations. The majority of the IDI participants agreed that these training sessions have meaningful contribution in improving their knowledge and skills in agriculture. Through these training sessions, they have acquired insights for adaptation of agriculture with the changing climate and exchanging information with others has empowered them to obtain knowledge about healthy life. One of them said that,

> *"Before taking the agricultural training I did not have any idea about the adaptability of agriculture. I thought only expensive food like meat and egg are nutritious. But now I know foods like vegetables and fruits are valuable for maintaining human health." (IDI 11)*

Most of the KII participants told that the women in the area were mostly uneducated, hence they didn't have scientific knowledge regarding different methods of agriculture. Through various training sessions, they now have become adaptive to cultivate in coherence with the changing climate. They are also able now to help other farmers by taking lead to improve their skills in cultivation following CSA methods.

Life after CSA and Way Forward

We know, for something better, starting in a different way is mandatory. CSA is a new approach in agriculture that can enhance capabilities of a farmer in agricultural production. Most of the women under the study, despite some constraints, are trying to cultivate following CSA methods. With different types of training they are currently able to solve agriculture related problems more easily and efficiently than before and getting expected production. One IDI participant stated that,

> *"By adopting the CSA method our vegetable production has increased a lot. Previously our vegetables used to rot in the field, and I could not understand its reason. After receiving training in CSA methods, I have now realized that overwatering in the vegetable field causes the vegetable rotting quickly. Therefore, now I give measured water to the fields and cultivate on higher land as per new method of farming learned from the trainings." (IDI 7)*

They were of the view that not only their financial status, but also their familial and social status had improved by adopting CSA methods. Also, they feel that their skills and knowledge about agriculture have been developing, and also communication skills, for which they are also getting the opportunity to play important roles in the family and in the society as well.

KII participants also opined that the economic condition of the women farmers had improved adopting CSA strategy in agriculture. As a result, their familial and societal status has also changed. Some women are now participating in leadership and playing important roles in decision-making process regarding agriculture related issues. One KII participant mentioned that.

> *"A woman took training from our organization on vermicomposting. After that she started cultivation and later succeeded in this field. Currently, she is a leader in the locality to support and encourage local women in farming" (KII 2)*

Another KII participant stated that,

> *"I know a woman, who cultivate following CSA methods, is a decision-maker in her family. She told me that she was tortured in married life by her husband and mother-in-law. As a result, she returned to her parents and started cultivating there. She used to cultivate poultry and vegetables with training on agricultural work and was benefited. Later she bought a trawler from the profit of her production and taking a small loan. Currently, she is the main earner of her family and decides on all familial and economic matters" (KII 3)*

Women Empowerment through CSA

Empowerment is a multifaceted concept and measured by some indicators like control over personal decisions including choices related to education, career, health and relationships; domain- specific autonomy like having influence and control over economic decision making, reproductive health, or participation in community activities; having a say in familial matters like financial decisions, family planning, and resource allocation; ability to change aspects of life including advocacy for change, challenging norms and participating in social and political processes and so on.

As our study area is a climate vulnerable zone, economic condition of the women is worse. If the situation is needed to develop, women empowerment is a must. For empowering women in this area, many initiatives have already been taken by different GOs and NGOs, training of CSA method to women is one of them.

Our IDI participants told that their overall situation is being positively changed through implementation of CSA method. Now they are financially solvent, contributing to their families, increasing participation in decision making process both in family and community level. They are confident of their view that becoming homeless through the cyclone *Aila*, their fate is being turned to development through practicing CSA methods in agriculture and fish farming.

Suggestion for better outcomes

Most of the IDI participants told that CSA methods provided anonymity for them. But all of them didn't get the

opportunities of proper training. One of them in this regard said,

> *"Many times, it happens that the one who needs training in vegetable farming is trained in fish farming and the one who needs training in fish farming is trained in vegetable or paddy farming" (IDI 10)*

Again, according to some participants only getting training is not very effective for them. They are of the view that along with training some other cooperation from government and non-government organizations are needed to earn more benefit from CSA method. They identified the necessity of getting good quality seeds, fertilizers and equipment for cultivation and some financial assistance for implementing CSA methods.

In this regard most of the KII participants opined that there was apathy among local women to empower themselves. Also, many women are less interested to give less time in housework and come out for taking training in agriculture. So, firstly they need to get interested in it. For this it is needed to make them aware of the benefits of CSA method and women empowerment through local examples and bring them under the umbrella of various trainings arranged by GOs and NGOs.

DISCUSSION

The study found that the people of the Kamarkhola union have to live with salinity problems in soil and water that mostly sustained for a long time, which also revealed by previous studies (BARAI, 2019). Due to salinity and several natural disasters, the people here cannot make profit from farming (Rabbani *et al*., 2013). The study reveals that women are now engaging in agriculture willingly, as they feel that it is possible to farm more successfully than in the past due to the assistance of various GOs and NGOs. Some of them have started farming in collaboration with their husbands or families and their family income has been enhanced through this effort. After the cyclone *Aila*, people in the study area suffered a lot, and the World Bank provided them land assistance to settle down. Then, many of them took training from different GOs and NGOs and were aware of the CSA methods for cultivation. A study of Khalil *et al.* (2021) also supports this findings.

The current study reveals that women's contribution in agriculture was earlier limited to homesteading and post-harvesting. Now they are getting agricultural training mostly from NGOs and these organizations bring Upazila agricultural officers and other experts to teach them alternative methods of agriculture. And in this way women is getting involved in agriculture and cultivating following CSA methods. Adopting the CSA method women are trying to use the best quality seeds, fertilizers, pesticides, and various equipment for farming, that ultimately helps them in good production. Again, in turn it leads to bring change in their socio-economic status.

The study also reveals that most of the women typically utilize various CSA methods such as producing salinity-suitable vegetables, using the proper fertilizers to increase production, and making various types of homemade fertilizers such as organic fertilizers, compost fertilizers, *kecho* fertilizers, and so on. They also manufacture vermicomposting. Also, many of them use CSA methods like *"Bosta Poddhoti*" for vegetable cultivation and using "*gher"* for fish farming. Our findings resembles with a study, conducted in Patuakhali district of Bangladesh, in which it was found that farmers were practiced saline-tolerant crop varieties, flood-tolerant crop varieties, drought-resistant crop varieties, early maturing rice, vegetables in a floating bed, '*sorjan'* method of farming, pond-side vegetable cultivation, the cultivation of watermelon, sunflower or plum, relay cropping, urea deep placement, organic fertilizer, mulching, use of pheromone trap, rain water harvesting and seed storage in plastic bags or glass bottles for good production (Hasan *et al*., 2018). A study of Khatri-Chhetri *et al*. (2020) also found that CSA practice and use of smart technologies reduced the drudgery work of women and increased the productivity of women in a large scale. But for doing agricultural work by the women various support are needed. In this regard it is found that only 30 percent women adapted CSA technologies where men have adapted 70 percent, so a proper monitoring and gender concentration need to ensure the productivity of women (Chibowa *et al*., 2020).

The study also exposes that households in the study area have less land to practice CSA cultivation, hence they use the crop land with ponds for growing fish and store water for irrigation. Due to salinity in water, access to water supply for irrigation are the main barrier of agriculture in the area. Hasan *et al*. (2018) suggested that rainwater harvesting, and irrigation can improve the crop production which can lead food security for the farmers living in coastal Bangladesh. We have found some constraints regarding training issues for women like information gap, not listing properly, transportation problems as well as household works. Besides, they need more cooperation than their male counterpart in every case due to their inferior socio-economic position in the society. Quality seeds, fertilizers, necessary equipment for cultivation and financial assistance may help them a lot to practice CSA. This findings resembles to the study of (Murray *et al*., 2016), conducted in Malawi which depicted that in order for becoming more resilient for women to climate change, gender concentration needs to be given more serious consideration in order to assign the barriers to basic agricultural technologies. This should be done in conjunction with participatory approaches to develop and adapt CSA tools and technologies to meet the needs of women farmers in future agro-ecologies and climates. GO and NGO officers suggested that training in CSA practice have to be ensured for all women. They should be aware of empowerment and how they can benefit themselves by applying CSA methods. There are also some barriers to selling the products due to proper market linkage. These constraints negatively impact on their production system. A study in Southern Belize also found that traditional land tenure system and less access to market, farmers were deprived from the actual benefits of CSA (Kongsager, 2017).

In regard to empowerment of women through CSA methods, it is found that CSA practice has a great role in empowering women in the study area. It ensures their sustainable livelihood components including financial, social, physical, and natural and human resources. Besides men, they are also playing important roles in family decision making. The study found that using the CSA method, the majority of the women work in agriculture to earn money to support their families and now they are capable enough to save money for the

future. As a result, they get importance in the decision-making process of the family and sometimes of the community. Previous studies also found that women contribute to the family and community decision making while they are empowered through CSA. Even in some household they are holding higher status than men (Duffy *et al.*, 2017; Huyer & Partey, 2020; Shahbaz *et al.*, 2022; Tesfaye *et al.*, 2023). KII participants saw women's contact with the people of the community is increasing through various agricultural works. It resembles the study which found that through CSA women were better at connecting with friends, family and community (Friedman *et al.*, 2023).

CONCLUSION

Climate change poses a significant global threat in developing countries like Bangladesh, particularly its southwest regions, being severely impacted by rising sea levels and recurrent natural disasters. In this context, the agricultural sector faces challenges such as escalating salinity levels, decreasing soil fertilities etc. Despite adversities, innovative approaches like CSA are being adopted to mitigate these effects, with a focus on empowering women who play a pivotal role in CSA by contributing their time, labor, knowledge and expertise. Through CSA adoption, women are enhancing their financial condition, social status, bringing changes in their natural, physical, and human capital, with an expression of satisfaction by the majority. However, obstacles like inadequate training, information gaps, familial responsibilities, transportation constraints, financial limitations, and a lack of market connections hinder their full participation. Proactive intervention from GOs and NGOs is essential to address these challenges. The findings emphasize the need for concerted efforts from relevant authorities to overcome barriers and create an environment conducive to women's empowerment through CSA.

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REFERENCES

Ali MY, & Hossain ME 2019: Profiling climate smart agriculture for southern coastal region of Bangladesh and its impact on productivity, adaptation and mitigation. *EC Agriculture* **5**(9): 530-544.

BARAI KR 2019: Changes in land-use/cover over 30 years in southwestern coastal Bangladesh and socioeconomic status of rural settlement in relation to salinity issue: a case study of comparative analysis in shrimp-and rice-production areas Iwate University.

Basak JK, Titumir RAM, Dey NC 2013: Climate change in Bangladesh: a historical analysis of temperature and rainfall data. *Journal of Environment* **2**(2): 41-46.

Chibowa TK, Synnevag G, Maonga B, Mainje M 2020: Gender differentiation in the adoption of climate smart agriculture technologies and level of adaptive capacity to climate change in Malawi. *Climate impacts on agricultural and natural resource sustainability in Africa* 507-526.

Collins A 2018: Saying All the Right Things? Gendered Discourse in Climate-Smart Agriculture. *The Journal of Peasant Studies* **45**(1): 175-191.

Duffy C, Murray U, Nowak AC, Girvetz EH, Corner-Dolloff C, Twyman, J, Huyer S, Jarvis A, & Spillane C 2017: National level indicators for gender, poverty, food security, nutrition and health in Climate-Smart Agriculture (CSA) activities. CCAFS Working Paper.

Engel S, Muller A 2016: Payments for environmental services to promote "climate-smart agriculture"? Potential and challenges. *Agricultural Economics* **47**(S1): 173-184.

Friedman RS, Mackenzie E, Sloan T, Sweaney N 2023: Networking for gender equitable climate-smart agriculture. *Climate and Development* **15**(3): 229-239.

Gutierrez-Montes I, Arguedas M, Ramirez-Aguero F, Mercado L, Sellare J 2020: Contributing to the construction of a framework for improved gender integration into climate-smart agriculture projects monitoring and evaluation: MAP-Norway experience. *Climatic Change* **158**: 93-106.

Hasan MK, Desiere S, D'Haese M & Kumar L 2018: Impact of climate-smart agriculture adoption on the food security of coastal farmers in Bangladesh. Food Security, **10**: 1073-1088.

Huyer S, Partey S 2020: Weathering the storm or storming the norms? Moving gender equality forward in climate-resilient agriculture: Introduction to the Special Issue on Gender Equality in Climate-Smart Agriculture: Approaches and Opportunities. *Climatic Change* **158**(1): 1-12.

Huyer S, Twyman J, Koningstein M, Ashby JA, Vermeulen SJ 2015: Supporting women farmers in a changing climate: five policy lessons. CCAFS Policy Brief.

Islam MR 2004: Where land meets the sea: a profile of the coastal zone of Bangladesh. University Press.

Khalil MB, Jacobs BC, McKenna K 2021: Linking social capital and gender relationships in adaptation to a post-cyclone recovery context. *International Journal of Disaster Risk Reduction* **66**, 102601.

Khatri-Chhetri A, Regmi PP, Chanana N, Aggarwal PK 2020: Potential of climate-smart agriculture in reducing women farmers' drudgery in high climatic risk areas. *Climatic Change* **158**(1): 29-42.

Kongsager R 2017: Barriers to the adoption of alley cropping as a climate-smart agriculture practice: Lessons from maize cultivation among the Maya in southern Belize. *Forests* **8**(7): 260.

Manchón BG, Macleod M 2010: Challenging gender inequality in farmers' organizations in Nicaragua. *Gender & Development* **18**(3): 373-386.

Meinzen-Dick R, Quisumbing A, Doss C, Theis S 2019: Women's land rights as a pathway to poverty reduction: Framework and review of available evidence. *Agricultural Systems* **172**: 72-82.

Molnar P, England P 1990: Late Cenozoic uplift of mountain ranges and global climate change: chicken or egg? *Nature* 346(6279): 29-34.

Murray U, Gebremedhin Z, Brychkova, G, Spillane C 2016: Smallholder farmers and climate smart agriculture: Technology and labor-productivity constraints amongst women smallholders in Malawi. Gender, *Technology and Development* **20**(2): 117-148.

Neufeldt H, Jahn M, Campbell BM, Beddington JR, DeClerck F, De Pinto A, Gulledge J, Hellin J, Herrero M, & Jarvis A 2013: Beyond climate-smart agriculture: toward safe operating spaces for global food systems. *Agriculture & Food Security* **2**: 1-6.

Oyawole FP, Shittu A, Kehinde M, Ogunnaike G, Akinjobi LT 2020: Women empowerment and adoption of climate-smart agricultural practices in Nigeria. *African Journal of Economic and Management Studies* **12**(1): 105-119.

Pye-Smith C 2011: Farming's climate-smart future: placing agriculture at the heart of climate-change policy, CTA Policy Pointer.

Quisumbing AR, Kumar N, Behrman JA 2018: Do shocks affect men's and women's assets differently? Evidence from Bangladesh and Uganda. *Development Policy Review* **36**(1): 3-34.

Rabbani G, Rahman A, Mainuddin K, Shoef IJ 2013: Loss and Damage from salinity intrusion in Sathkira District, coastal Bangladesh. Loss and damage in vulnerable countries initiative, *Case Study Report*: 8-10.

Shahbaz P, Ul Haq S, Abbas A, Batool Z, Alotaibi BA, Nayak RK 2022: Adoption of climate smart agricultural practices through women involvement in decision making process: Exploring the role of empowerment and innovativeness. *Agriculture* **12**(8): 1161.

Sraboni E, Malapit HJ, Quisumbing AR, Ahmed AU 2014: Women's empowerment in agriculture: What role for food security in Bangladesh? *World Development* **61**: 11-52.

Tesfaye A, Radeny M, Ogada MJ, Recha, JW, Ambaw G, Chanana N, Huyer S, Demeke G & Solomon D 2023: Gender empowerment and parity in East Africa: evidence from climate-smart agriculture in Ethiopia and Kenya. *Climate and Development* **15**(9): 768-778.

UN Women 2016: Women Empowerment through Climate-Smart Agriculture Flagsship Programme,

Zhongming Z, Linong L, Xiaona Y, Wangqiang Z, Wei L 2017: Fragmented Rights and Tragedy of Anticommons: Evidence from China's Coastal Waters.