

## Exploring Ways of Promoting Climate Adaptive Technology in Agriculture in South-West Region of Bangladesh

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## Abstract

The South-West region of Bangladesh including the districts of *Khulna*, *Bagerhat* and *Satkhira* is regularly ravaged by cyclone and various other natural calamities with massive intrusion of saline water from the sea that render fertile agricultural soil into uncultivable land and poses serious challenges to food security. In 2009, BRAC initiated the Agriculture and Food Security Programme (AFSP) and employed climate adaptive technology by introducing saline tolerant varieties of rice, sunflower and maize. The programme aimed to achieve food security and develop a sustainable agricultural production system in Bangladesh. BRAC advocacy and communication has a project named 'Promoting Climate Adaptive Technologies' (PCAT) that supports BRAC-AFSP. Despite the enormous potential of climate adaptive technology, a number of reasons are responsible for its lack of popularity among the farmers. Strong advocacy and communication through the PCAT project could improve the situations. Based on this, the study aimed to identify ways of promoting climate adaptive technologies in terms of its acceptability among the beneficiaries. Qualitative methods included Rapid Rural Appraisal, Participatory Rural Appraisal, In-depth interviews and Focus Group Discussion were employed for data collection. The study was conducted in two districts- *Khulna* and *Bagerhat*. The study found that crop intensity as well as crop diversification has been accelerated in the "blocks", a type of land acquired for cultivating and harvesting crops under the supervision of BRAC-AFSP. Some varieties of blocks have also been popularised in terms of producing high yielding crops, optimal germination capacity, saline tolerance facility, etc. However, different stakeholders including beneficiaries, non-beneficiaries, dealers, traders, etc. identified a number of factors such as financial constraints, labour intensiveness, availability of seed varieties, marketing strategies, communication and training facilities, etc. that need to be addressed for promoting climate adaptive technologies.

## Chapter 1. Introduction

Adaptation is frequently discussed in policy responses context. Without adaptation process, agricultural production seems to be problematic in climate sensitive areas. The vulnerability of climate affected community can be reduced with the aid of adaptation strategies (Nordhaus 1991; Easterling *et al.* 1993 and Rosenzweig and Parry 1994). Social barriers to climate change adaptation need to be understood with ecological, economic and technological limits in order to influence adaptations decision (Adger *et al.* 2009; Lorenzoni *et al.* 2007). Social barriers have been broadly defined as normative, cognitive and institutional. Normative barriers are related to cultural norms which influence response to climate change. Secondly, cognitive barriers are related how to psychology and thought process that influence individual attitudes towards climate change. Finally, institutional barriers relate to how both formal and informal influence the adaptation opportunities (Jones and Boyd 2011). About accepting climate adaptive technologies Gifford (2011) has identified several other factors for example lack of trust in and respect to the experts and authorities, perceived risk of change lack of knowledge about climate change impacts and adaptation responses. More specifically for saline prone agricultural farms, lack of fresh water supply, and deficiency in irrigation and drainage planning commonly as the most important determinants for lowering the adaptive capacity (Wang 2013). Cranea (2011) gives much importance on farmers' agency as technical actors who respond in real time to contingent environmental circumstances. Jones and Boyd (2011) suggest a need for greater recognition of the diversity and complexity of social barriers, strategic planning and incorporation at national and local levels, as well as an emphasis on tackling the underlying drivers of vulnerability and social exclusion.

Smit and Skinner (2002) identified four main categories of adaptation options in agriculture: (i) technological developments, (ii) government programmes and insurance, (iii) farm production practices, and (iv) farm financial management. For enhancing the adaptations implementation process, it is required to have a better understanding of the relationship between the potential adaptation alternatives, existing farm level and government decision making process and risk management frameworks. Wall and Smit (2005) also gave much importance on the relationship between government policies and sustainable agriculture in climate change context. In this perspective, number of climate adaptive strategies and actions were adopted towards achieving food production and uplifting socioeconomic condition of the farmers by the Govt. and NGO's in Bangladesh. Thus, climate adaptive technologies e.g. high yielding variety, salinity-tolerant crops, way of cultivation, using fertiliser and insecticides introduced in agriculture are enabling to cope with climate change and achieving sustainable agricultural production.

Agriculture of Bangladesh is facing various challenges in terms climate change and is being affected severely since one and half decades. Due to climatic change, farm lands are facing crises of irrigation water, salinity intrusion, loss of soil fertility, drought, water logging etc. Both drought and salinity have considerably higher impacts on crop production. The cultivable lands of these areas are affected with varying degrees of soil salinity (Haque 2006). Agricultural land use in these areas is very poor, which is roughly 50% of the country's average (Petersen and Shireen 2001). In Bangladesh the combination of frequent natural disasters, high population density, poor infrastructure, and low resiliencies to economic shocks makes this country especially vulnerable to climate risk. Side by side higher dependency on agriculture and natural resources

enhance these sufferings (MoEF 2009). According to MoEF (2009) Bangladesh government has taken some initiatives to reduce the vulnerability due to climate change: flood management schemes, flood protection and drainage schemes, coastal embankment projects, construction of cyclone centre, comprehensive disaster management project, irrigation scheme, initiating agricultural research programmes to introduce climate adaptive seeds and technologies.

It is observed in Satkhira, Khulna and Bagerhat region, soil salinity generally increases rapidly in the winter months and reaches maximum level in dry season (Rahman and Alam 2003). Further, a vast area remains fallow in dry season, especially *Boro* season due to the prevailing salinity in soil, lack of irrigation water and salt tolerant rice varieties. Habibullah *et al.* (1998) describe that salinity intrusion is a major cause for crop loss under a moderate climate change condition. Asaduzzaman *et al.* (2010) argued that climate change declines potential production of crops. They projected that the southern sub region is more vulnerable in climate change and the average loss in Khulna region is projected as by the 2050s, 10 per cent for *aus*, *aman* and wheat and 18 per cent for *Boro* due in large part to rising sea level. Therefore, adaptation measures have to be looked at for the sustainability of agriculture.

Risk and vulnerability are key features of rural livelihoods and poverty, and are currently a focus of policy attention. There are numerous reasons behind the failure of the development programmes in the rural areas, identified as the limitation of participation in the policy formulation, lack of political will, unemployment and poverty, lack of strong network among the institution and incongruity in programmes (Coker and Obo 2012). Porter *et al.* (1991) identified two basic reported problems for rural development projects firstly, many of the interventions worked against the real interests of the intended beneficiaries, Secondly it is not considered the environmental and economic realities of the local people. It is argued that contemporary development practice must become more pluralist-oriented, accept the uncertainty and diversity, and address the current situation. Oakley (1999) emphasises on the participation of the rural people in decision making for the rural development. He argues that the rural people vastly depend on the rural elites for decision making so they have less contribution in development. Such situation argues that for stimulating sustainable rural development the idea of 'participation' is a leading principle. However it is certain that a conscious and meaningful implementation of a development programme in rural areas promote the overall development of the community.

In rural studies (Burton 2004a) the 'behavioural approach focuses on the motives, values and attitudes that determine the decision-making processes of individual farmers and it has become increasingly important in the investigation of farmer response to policy initiatives'. It is argued that behavioural approaches in agriculture could be improved by taking greater account of normative influences, self-identity, and perceived self-efficacy. Burkey (1993) argues self-reliant participatory development is the only foundation for true human, economic, political and social development. It is a slow and difficult process; one totally dependent on men and women themselves, assisted by those who are willing to live and work among them.

In 2009, BRAC initiated Agriculture and Food Security Programme (AFSP) in achieving food security in relation to increase environmentally sustainable agricultural production. Achieving that goal in 2012, BRAC promoted salinity tolerant hybrid seed and advance technology in cropping system. However, the endeavours of BRAC in terms of introducing advanced technology in agriculture leave whether congenial or deferral situation among the farmers. Therefore, BRAC Advocacy for social change becomes

interested to know the farmer's view on Promoting Climate Adaptive Technology (PCAT) in operating areas.

### **1.1 Relevance of the study**

Advocacy and communication requires some form of media or channel of communication (McKee 1992). Advocacy aims to change public perceptions. Advocacy also involves making a case in favour of a particular issue, using skilful influence and strategic actions. Thus, advocacy means supporting a cause or issue in order to bring about change and help others. In development approach, the discourse of "behaviour change" is linked to "social change". Behaviour change entails individual level change while social change seeks to create an enabling and favourable environment for change (McKee, Bertrand and Becker-Benton 2004). But, definition of social change is still being debated by international development agencies. The stimulating thinking of social change reflects as "social change is most commonly understood as a process of transformation in the way society is organised, within institutions and in the distribution of power within various social and political institutions" (Figueroa, Kincaid, Rani and Lewis 2002).

Despite the enormous potential of climate adaptive technology, a number of reasons are responsible for its lack of popularity among the farmers. Strong advocacy through the PCAT project could improve the situation. Based on this, the study aimed to identify ways of promoting climate adaptive technologies in terms of its acceptability among the beneficiaries. The roles of advocacy and communication will be valued as a means of achieving higher standards of PCAT through communicating with relevant stakeholders.

## **Chapter 2. Objectives**

### **2.1 Principal objective**

Identify ways of promoting climate adaptive technology in terms of acceptability among the beneficiaries

### **2.2 Specific objectives**

1. To identify social and individual behavioural challenges of farmers in relation to accepting climate adaptive technology
2. To look into group dynamics of the beneficiaries to explore opportunities for promotion of CAT
3. To understand the perception of non-beneficiaries in relation to climate adaptive technology
4. To understand the mechanism of AFSP in implementing climate adaptive technology , identify gaps and recommend actions to promote CAT

## Chapter 3. Methods

The study employed qualitative methods, including Rapid Rural Appraisal (RRA), Participatory Rural Appraisal (PRA), In-depth interviews and Focus Group Discussion (FGD) used for data collection. Firstly, social mapping were exercised to the blocks applying PRA in order to categorising the block farmers based on land occupancy in terms of ownership, sharecropping, leaseholders. Subsequently, In-depth interview and FGD were conducted following the categories of land occupancy in the blocks. PRA also helped to understand dynamics of blocks and constraints in different realms, especially social and cultural. RRA also were applied to non-block areas<sup>1</sup> in order to preparing farmers list based on land occupancy. RRA was enabled to categories non-block farmers for conducting In-depth interview and FGD according to land occupancy. Therefore, PRA conducted in the blocks while RRA carried out to non-block areas in order to matching categories of both groups in terms of land occupancy. Besides, personnel of AFSP, agriculture extension officers, dealers and local traders also were considered for interviewing with a view to understanding the endeavours of AFSP in studied areas.

### 3.1 Field locations and Instruments

The study was conducted in six *Upazila* (*Dacope, Dumoria, Bhatiaghata, Bagerhat sadar, Chetolmari and Khachua*) of two districts, *Khulna* and *Bagerhat* in the south-west region of Bangladesh. Two blocks from each sub-district were selected purposively while individual non-block area was also considered purposively from the same jurisdiction. A total of 12 blocks and six non-blocks were selected from six sub-districts. Thus, the study required a number of qualitative tools and techniques such as PRA (12), RRA (6), In-depth interview (36), FGD (24) with view to achieving objects. The close reading of collected information and repeated interviewing mechanisms helped to triangulate the information regarding issues. Besides, a number of 12 research assistants with anthropological and sociological background who conducted field work in six *Upazila* (Sub-district) from September 28, 2013 to November 15, 2013.

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<sup>1</sup> A piece of land located to adjacent areas where AFSP programme was not implementing their endeavours.

## Chapter 4. Findings

### 4.1 Block selection

Several procedures and processes were considered prior to finalise a block. The programme prioritised the facilities in terms of local transportation system, irrigation facilities and a piece of land with average size between 20-30 more acres to be set up as a block. Besides, the characteristics of block land are almost high land with flat landscape in nature, which helped to remove water logging problem in cultivating the crops. The study also observed that water reservoirs were located at the edge of each and every block. Most of the blocks were situated beside roads or highways so that programme personnel could easily supervise the block due to possessing better communication facility. Agricultural office also provided information related to suitable land where BRAC-AFSP programme could installed their programme. Land holding or land possessions were also important determinants to be selected as beneficiary of the programme. Every individual farmer either landowners or sharecroppers must be acquired land size between 15 decimal to one acre to be eligible in the blocks (Annex-1). A survey was conducted to prepare a list of beneficiaries' farmers before finalising a block. Beneficiary farmer were entitled to receive an amount of money or grants for purchasing seed, fertiliser, irrigation, etc. In block, replacement is occurred in place of dropped out beneficiaries. A formal meeting was held with the presence of chairman, members and local influential members before embarking a block in an area. AFSP personnel were disclosed the vision of the programme in this meeting and agreement also dealt with farmers in this meeting. Obviously, interested farmers were always welcomed in the catchment of block.

### 4.2 Challenges of selecting a block

Initially, the farmers were reluctant to be involved as beneficiaries in a block. They had prejudiced perceptions about the activities of BRAC, particularly the AFSP programme. They thought and also believed that BRAC would convert them into Christian by providing financial benefits and agriculture training. However, their funeral ceremonies will be held according to Christianity. To some extent, their death bodies would be disfigured with wearing black cloths. Even, they were also perceived that BRAC is a foreign organisation, aims to convert people into Christianity by receiving money from respective foreign agencies. The study also found that one of proposed block has been cancelled under reason to be installed at Dumoria *upazila* in Khulna. The farmers asked purposes of BRAC-AFSP to providing agricultural tanning and inputs without return from them. So, staff of concerned programme dealt farmers with various questions and suspicious attitudes towards BRAC. In many cases, the farmers used to provide forged information related to actual land holding possessions while survey was conducted to select the beneficiaries. But, BRAC staff of AFSP programme collected valid the land related information through interviewing of the neighbouring framers of the surveyed farmers. Programme staff always held discussion with block farmers while the particular variety was selected for harvesting in the block.

### 4.3 Reasons that kept the farmers apart from involvement in block

The study identified a number of factors which discouraged the farmers to be involved in block. The factors are grouped in the following discussion. The farmers' belonged lower than 15 decimal lands in size; those who were not eligible to involve them in the

block. On the other, the farmers had fewer proportionate of land possession just over 15 to 20 decimal land in a block, who were also reluctant to include in the block considering their distance location, transportation costing and allocated time to reach for receiving facilities from BRAC office and dealers. A few blocks of studied areas were located at distance places from the BRAC office and prescribed dealers that made obstacle to the beneficiaries to receiving the agricultural inputs in time. In many cases, the farmers had to waste half day's wages with transportation costing to receive such facilities. On the other hand, the programme provided agricultural input to its recipients according to scheduled day for two more blocks' beneficiaries. So, in many cases, farmers had to stay at BRAC office until evening to receiving their entitlements i.e. agricultural inputs. However, prevailed misconception of the farmers towards BRAC, found greater challenges to be included the farmers in the block at very beginning. The nature of conflicts over landownership or land related cases filled under the jurisdiction of law kept the farmers or land owners away from involving in the block system.

The study also found that landowners received the block facilities on behalf of their sharecroppers or leaseholders as land agreement could be terminated between them after harvesting a particular crop in a year. Subsequently, landowners gave the amount to their sharecroppers or concerned persons that received from BRAC. Under this circumstance, landowners were preferred instead of sharecroppers or leaseholders to offer the block facilities. Influential farmers' were not interested to include in the block despite having land in block jurisdiction because of complicated formalities of the programme reported. Marginalised are always consider for the programme. Marginalised farmers were not capable to take large amount of land as sharecropping considering expenses of cultivation process.

#### **4.4 Challenges of block farmers**

Block farmers were not allowed to cultivate their land avoiding the rules and regulations of block. The block farmers' are remained under the observation of block's procedures, consisting of set methods in preparing land with the mechanism of seedling, irrigation, fertilisation, etc. To some extent, a few blocks were farmers violated the procedures of the block in cultivating crops. The study found two more block members were excluded from the block under the reasons. Thus, violation of block procedures in terms of cultivating crops overwhelmingly led to terminate one's membership or entitlements as beneficiary regarding block. However, the block farmers also raised their voices against the misdeed of concerned block farmers who tried to evade the procedures of the block. Under such circumstances, they also demanded the cancellation of one's entitlement as beneficiaries from the block. So, the rules and regulation of block played crucial role to keeping them in united to cultivate the crops. Each block has individual representative, who is in position to communicating with block farmers. The representative tried to dominate over other block farmers and tried to receive more benefits from the programme. The study found that few block farmers, particularly landowners who were not engaged directly in cultivating their own land earlier. After introduction of block in regarding areas, some landowners became involved with the block in order to receiving financial benefits framed by AFSP programme. Under the circumstances, sharecroppers became vulnerable in terms of losing landholding positions for cultivating. Many farmers were not interested to be included in the block despite having land in the block because some people did not feel comfort nor to cultivate crops by following directions of outsider like BRAC. The study also found a block where two different landscapes observed in terms of high and low land. In low land, block farmers cultivated sunflower while rice variety e.g. *Sathi* (hybrid) were grown for low land in winter season called *Robi* and *Boro* season respectively. The paddy was

growth abundantly while sunflowers inflicted with virus resulted damaging the crops. That was why; four more block farmers who were sharecroppers left the block as they did not get optimal crops. So, block farmers' encountered challenges under the circumstances.

## **4.5 Analysing the varieties of block**

### **4.5.1 Rice**

The claimed that BR 49 seed variety found as saline tolerant and also able to tolerate water intensity in terms of water logging. High yielding also resulted with average of 75 mounds in an acre of land. They also informed that local farmers beyond the block farmers also were enthusiastic to cultivate the same variety seed in their respective lands. The farmers found good quality of varieties of BRAC, including BR-28, BR-49 as the pattern of seed found identical in a packet. The seed varieties of BRAC, including BR-28, BR-49 were possessed good quality considering its identical pattern in terms of equal size of seed, which supported better sprouting. On the other hands, these seed enabled farmer to yield more crops in a season.

*Sathi* and *Alloran* have been demonstrated as doubled productivity crop compared to other indigenous varieties, including *Bhojon*, *Maynamati*. The seed varieties of BRAC found better in quality with optimal sprouting capacity and higher yielding in nature compared to other companies of seed varieties, including ACI, Ispahany, Gattco. To some extent, the seed varieties of BRAC could tolerate adverse climate conditions in terms of water logging, flooding, torrential raining, etc. The popularity of *Alloran* has been increased in some areas of Bagerhat district because of crop intensity made possible through the variety. The farmers of non-blocks were encouraged to cultivate these varieties finding better results of block areas. Most land in the area remained fallow in *Aus* and *Aman* seasons before introducing the variety, particularly *Alloran*. However, previous year, *Sathi* in *Boro* season yielded the paddy abundantly with the average of 110-120 mounds in per acres in block. The farmers of the local areas, especially Bagerhat areas became interested to cultivate *Alloran* and *Sathi* considering its high yielding nature compared to other indigenous varieties. The block farmers ranked *Shakti-2* as number one among other block varieties. On the other hand, a few farmers dealt problems with *Shakti-2* and *Sathi* considering its lower market price with lower rice quality.

### **4.5.2 Sunflower**

The sunflower is believed to have a higher tolerance capacity against adverse soil conditions in terms of salinity. The dealers also revealed that sunflower oil found to be delicious as well as beneficial, particularly to the diabetic patients, who could control their sugar by intake sunflower oil on regular basis. The residual portions of the sunflower could be used as fodder for the cattle. A few farmers became enthusiastic to cultivate sunflower which helped to shifting cultivation from single crop to multiple crops in the same land. The block farmers reported that sunflower demonstrated higher saline tolerant variety because they cultivated sunflower in the land where salinity prevailed. Residual portion of sunflower blossom was used as by-product for fodder of cattle. Organic fertiliser is derived from the rotten leaves of the sunflower. Sunflower plants can be alternative sources of fuel in terms of cooking meals. Tastiness of sunflower oil is recognised undeniably by the block members. The sunflower is grown abundantly compared to sesame. Sunflower is yielded almost 8-10 mounds in per *Bighas* while sesame found 4-5 mounds in a *Bighas*.

But at the same time block and non-block farmers and other people showed interest to take it as edible oil significantly. They have been learned about sunflower quality and benefits from the advertisement sources, including different cooking programmes of satellite channel are broadcasted. Now, they are aware that sunflower oil contains nutritional value and beneficial for the health and it reduces heart problem. They are also informed that sunflower is useful for heart patients, because it does not raise the cholesterol level in blood. Farmers opined that they have interest to cultivate only to fulfil their household demand.

#### **4.5.3 Maize**

Maize is the third most important cereal and nutritious crop in Bangladesh, after rice and wheat. It can be cultivated year round. Mostly, it is grown in cool winter Rabi season. The crop is high yielding, rich in nutrition, and has diversified uses. This production focuses on proper cultivation practices: seed bed preparation, planting time, fertiliser use, irrigation timing, weed and insect control, harvesting time, post-harvest processing, and different end uses. Maize also used as animal fodder. Therefore, a great deal of farmers prefers growing maize as it requires less irrigation and cultivation cost lower compared to rice. It is also observed that maize consumption at household level is minimal and a large portion is sold to traders and the remainder goes directly to poultry farm and the feed mills. Starting maize cultivation in this area promotes few poultry farms. Interestingly few businessmen took initiative to launch small poultry firm initially besides their business. The demand for maize as feed ingredient is growing fast in the country with the establishment of new poultry, dairy and fish farms. Women were willingly involved in sun dry maize grains in a yard at Kachua in Bagerhat. Also the lower cultivation costs and higher prices have attracted more farmers to cultivate maize.

#### **4.6 Constraints in cultivating varieties**

##### **4.6.1 Rice**

The dealers are usually reluctant to keep the seed varieties in their supply, particularly sunflower and maize, which are not popular varieties among the farmers in the region yet. The farmers of the region also were not familiar how to cultivate such crops. The farmers were always facing challenges in procuring fertiliser in time for cultivation. They identified fertiliser was precious one in terms of availability and higher costing involved. Seed price of BR-49 variety found higher compared to other varieties like BR-28 (Foundation). Market price of BR-49 variety valued of five hundred taka for a packet containing 10k.g each while other seed varieties were available at cheaper rates only with of three hundred taka. The farmers claimed that varieties BR-49 and BR 11 are usually cultivated in higher land. But, dominating landscape of the agricultural land in the studied areas found mostly lower land in nature. So, water logging remained for longer period in lower land. On the other hand, life time of BR-49 and BR-11 noticed shorter longevity that lasted only from 90 to 95 days. So, the farmers faced many challenges in cutting the paddy from muddy land due to presence of water logging in some block. For that reasons, farmers faced damaging the paddy and required more labours force with higher transportation. The farmers were preferred to cultivate the varieties that have higher longevity, particularly for the low land so that they could avoid water logging problems faced for harvesting the paddy, especially BR-49 and BR 11. The study found some blocks areas where water logging was constant problem, particularly in winter season due to absence of exit gate of logged water. In many cases, it took several times ranging from 4 to 5 months to evaporate lodged water completely from the cultivated land. Earlier, block farmers of some areas used to cultivate BR-28 in

*Boro* season. Previous *Boro* season (2012-2013 crop calendar year), they were cultivated *Shakti-2* instead of BR-28 in block according to the suggestion of AFSP. *Shakti-2* took longer duration more than 15 days compared to BR-28 to mature the grain. So, seasonal natural calamities in *Boro* season appeared with forms of torrential raining and storms that damaged *Shakti-2* due to its delayed maturation. Possible damaged of the paddy could be retained minimally under the condition. A few farmers also claimed that AFSP sanctioned required amount belatedly to them for purchasing pesticides and fertilisers to cultivating block land. So, block farmers had to purchase the pesticides and fertilisers in credit from the dealers.

#### **4.6.2 Sunflower**

The cultivation of sunflower required rigorous process in preparing land with the mechanism of repeated plowing with three more times. However, Irrigation process ranging from three to four times was adopted to be cultivated sunflower. In few localities, Irrigation facilities were hardly found. But, the block lands were located at favourable conditions in terms of managing water from neighbouring canals or river banks. So, the farmers had to irrigate their land through fetching water from neighbouring sources. Even, individual sunflower plants were considered to be nursing for irrigation process. The cultivation of sunflower followed several steps in terms of preparing land with column and row methods. Even, higher costing in terms of irrigation, fertilisers, extensive labours were required to cultivating sunflower. Initially, a couple of sunflower seedling is ripped together prior to cultivating sunflower. Consequently, single individual seedling of them is kept in the field considering better quality in terms of sprouting and rest of individual plucked out from the field. They were not aware about the process to extracting oil from sunflower plant and techniques of conservation. Besides, they also claimed that sunflower oil became sour if extracting process would be undertaken delayed. The harvesting of sunflower is required spacing methods for seedling in the field, may be wider, say 18×30 inches following procedure of column and row. However, individual sunflowers plants are to consider for nursing in order to irrigation process. Drilling method is applied while individual sunflower plants become adult so that these plants could be stand straight. Repeated agriculture activities are required to withdraw the malicious weeds from the sunflower field. So, the block farmers had to expense more in order to hiring additional labours to undertaking the endeavours. BRAC was supposed to purchase sunflower from the block farmer. Finally, BRAC did not purchase the sunflower because of natural calamity destroyed optimum productivity of sunflower. So, block farmers were deprived of getting profit under the reason. A few block farmers also have positive attitude towards cultivating sunflower for their household consumption as marketing of the sunflower is not promoted yet. The seedlings of sunflower were fluently damaged by mouse after few days of harvesting. So, seedling is required to ripe replaced seed in the vacuum place of earlier seedling. The size of sunflower plant is almost 7 feet in height. So, farmers were facing problem in spraying the pesticides in the field. Data found that farmers have little interest to cultivate sunflower in that region. They considered it as a troublesome cultivation due to its extra effort, time and finance. The farmers raised question why BRAC provided sunflower instead of maize or other crop. Removing sunflower plant root from the field is very difficult. Many farmers faced toe injury while they were working field to withdraw the roots. Even cows plunged into *khura* diseases. Some tractor owners were reluctant to provide their tractor for withdrawing the roots. All of these issues farmers became worried. Women played a great role in sunflower processing. Women usually involved in crop threshing, drying and perfect activities. Unfortunately they have very little interest in sunflower cultivation as they have to pay extra time in sunflower field. During flowering time as farmers involved in other earning activities women were asked to protect

sunflower field. During flowering time, some flowers were stolen by the passer by. Some flowers were damaged by the cattle and cows. Therefore, sometimes women have to engage them in sunflower field. This activity made them overburdened with other household chores. Data found that some labourers infected blistering while they were working on bare body in the maize field. Thus, labourers lost their interest to work in the sunflower field. Blistering fear has spread among the farmers and labourers over the regions. Therefore, block farmers faced difficulties to cultivate the sunflower.

#### **4.6.3 Maize**

A few farmers, who also worked as labourers, claimed that allergy diseases infected or increased into their different portion of the body while farmers were working on grown maize field. Even few labourers were reluctant to work further in maize field for the fear of infecting allergy. This incidence appeared among the farmers. The fear was prevailed among the farmers to cultivate maize.

#### **4.7 BRAC'S Dealer experiences dealing with varieties**

The dealers have identified a numbers of factors, which constrained to cultivate different agricultural crops according to cropping seasons. The constraints can be categorised into several dimensions, including behavioural or social and market management in terms of seed availability of various crops. The dealers found that sunflower and maize have limited demand in marketing of these seed varieties among the local farmers. Therefore, the dealers were also reluctant to keep the seed varieties in their supply chain. However, most of farmers were not aware about how to cultivate sunflower and maize. The farmers were also ignorant whether market situation of the varieties was lucrative. BRAC was only welcomed and invited to the dealers, who could meet selling targets of seed varieties among the farmers. Thus, other dealers became demoralised to find such strategies set of BRAC. On the other hand, BRAC's dealers had to collect seed from Dhaka by following different procedures that made constraints to supplying seed among the farmers on time. Consequently, the block farmers could not cultivate on time following crop calendar. The dealers urged to set up seed storage in district level so that they could easily supply the seed among the farmers on time.

#### **4.8 Evaluation of Block from the views of non-block farmers**

##### **4.8.1 Rice**

The block ideas enabled farmers to harvest multiple crops in a year. The productivity of their land has been increased with the aid of new technology in terms of seed, rules and regulations introduced by BRAC. Even, poor farmers benefited through receiving financial incentives, seeds as well as training for preparation of their field that was provided by BRAC. The block farmers can easily prepared their land for their nursing their crops regarding season following sets of procedures of BRAC. But, no-block farmers became interested to cultivate the BR-49 and BR-11 that are cultivated in block considering its high yielding varieties. They also believed that local varieties were more energetic than the high yielding varieties. The quality of cooked rice of local varieties lasted for long time and did not easily fall down in terms of presence of wet in cooked rich. The varieties of BR-11, 22, 23, 47, 49, 51, 52 were not available as the dealers are not prefer to keep their commerce. Local varieties like *Moynamoti*, can be used for puffed rice. But, Local rice varieties took longer time to be boiled with requiring more fuel while hybrid varieties like *Sathi* easily boiled to be cooked. So, fuel cost can be saved to cook hybrid rice. Frequent irrigation facilities must be ensured to harvesting

the *Sathi*. *Sathi* has two folded productivity than Aloran. On the other hand, Hira can tolerate higher salinity than the *Sathi*. In suitable land, Hira also has yielded higher productivity with 10 mounds in acreage compared to *Sathi*. Seed of BR-49 variety can be preserved for harvesting next season. So, farmers become interested to cultivate the BR-49.

#### **4.8.2 Sunflower and Maize**

The advantages of sunflower are many folded in terms of preservation of its seed while vegetable and other seasonal fruits like watermelon cannot be persevered at home. On the other hand, the non-block farmers believed to have higher market for maize. The process of cultivation of maize are found comparatively easily one. The maize is highly demand for shrimp and poultry industry. In block areas, farmers were benefited commercially to cultivated maize.

#### **4.8.3 Sesame**

The farmers were interested to cultivate sesame due to presence of higher demand in market and demand among the traders and consumers. On the other, lower labour cost is required to clean the weed from the land. This process followed once after harvesting the seed. The irrigation and pesticides were not required to cultivate the sesame. The availability of sesame seed in local market encouraged farmer to harvest each year. But, sesame could not tolerate salinity that damaged the crops. The non-block farmers were capable to harvesting their crops in six months of a year as the prevalence of salinity in soil. In *Aman* season, BR-23, 11 are cultivated in high land while indigenous varieties, including *Morishail*, *Benapol*, *Bhaismoti*, *Chaplaish*, etc. are cultivated in low land. The non-block also believed indigenous varieties are valued higher compared to BR-23, 11. Even, cultivation process is easier with requiring less fertiliser and pesticides. The local varieties also can tolerate water logging to cultivate. In *Boro/Robi* season, the level of salinity has been increased and small land holding farmers, especially sharecropper were reluctant to cultivate because of unavailability of tractor. Besides, agricultural inputs are available on time to cultivate the crops. On the other hand, they are always facing problem with the scarcity of better quality of seed, fertiliser, etc. The solvent farmers also reluctant to cultivate crops in the *Boro* season due to the majority of landscape remained fallow regarding catchment. So, the crops would be damaged by cattle under the circumstances. Irrigation was the major change of their land as river and canal are not located beside every piece of land. In *Mugh* month, canal and ponds became dried. Therefore, scarcity of water was the prime concern to remain the land as fallow. It would take time to accept the technologies of BRAC. On the other hand, the farmers always were dealing problem with low quality of seed resulting poor germination with the lower growth seedling. Excessive usages of chemical destroy the benevolent insects of the different varieties. The non-block farmers also revealed that supervision and management system were quite good.

#### **4.8.4 Advice**

BRAC should disseminate their message to the local farmers so that all of them could avail the facilities of the technologies of BRAC for producing high yielding varieties. BRAC can take initiative to promote irrigation facilities for the farmers. They perceived that BRAC's initiative will help to ensure food security. Therefore, BRAC should make availability of their seed to farmers so that they could easily get the facility in receiving from the respective dealers. To some extent, they have eagerness to cultivate the sunflower. Sunflower oil could prevent some disease including diabetics, heart

diseases, blood pressure because of containing lower cloistral and free from adulteration.

#### **4.9 Understanding the block from the point of views of GO (agricultural extension officer) and NGOs**

BRAC introduced some innovations in terms of line, logo and pursing methods (annex) in harvesting crops that enabled farmers to cultivate various high yielding varieties. Government officials urged to make aware the farmers about the benefit in terms of economic, health and soil productivity of sunflower and maize. They prioritise in frequent meeting arrangement including farmer, local businessmen, dealer and land owner. Thus, farmer either tenant or land owner emphasises more to cultivate those seeds. BRAC also provided different facilities, including fertilisers, seed, pesticides, etc. that enabled farmers to cultivate various crops in the block. Government and BRAC staff demonstrated outstanding outcome of AFSP of BRAC despite of huge expenditure required to harvesting. Crop diversity and intensity made possible through introducing high yielding varieties in the block. BR-11 are infected less by malevolent insects compared to other rice varieties. (*Boro* Season). Cycle of food security has been strengthened through the varieties of AFSP. Block farmers are becoming profitable trading their grain with considerable price.

##### **4.9.1 Constraints**

Initially, the block farmers thought their land might be seized and they might be converted into Christianity. Earlier, the block farmers of some areas were not habituated to harvesting crops in *Boro* season. The salinity increased in the *Robi* season. Local farmers hardly believed that multiple crops (crop diversity and crop intensity) in years are possible to yield in their areas due to presence of salinity. To some extent, the staff of AFSP worked hard to convince them regarding endeavour of the programme. Therefore, non-block lands remained as fallow land where cattle were grazing and occasionally these cattle damaged the crops of blocks, particularly sunflower grain. Local influential controlled over the water gate of the streams. Thus, marginalised farmers faced problem in getting water to cultivate their land in time. Sunflower was not lucrative crop due to natural calamity hit some areas of the studied areas. The price of seed varieties of BRAC are expensive in terms of higher market values almost three two more times compared to other companies' seed varieties.

BR-49 is an advanced crop in terms of duration. The presence of water logging was found in some block where sunflower and maize were harvested. Sunflower and maize were cultivated after harvesting *Aman*. The farmers experienced monsoon raining while they were processing *Aman* from the field. So, wet land was not favourable to cultivate the maize and sunflower. The block found limited market in terms of trading their cultivated maize and sunflower. The hatchery areas where paddy is cultivated once in a year and modern equipment can hardly send to process of the paddy due to water logging remain the field in the winter. The tendency of salinity has been increased due to embarking hatchery project regarding areas. The farmers were hesitated whether new varieties would be productive and lucrative. Some local counterfeit traders sold adulterated seed. Block farmers' have tendency to apply more fertiliser in getting more crops. Excessive use of urea fertiliser damaged the crop. They frequently tried to violate the rules of block in terms of following log methods in absence of BRAC staff. Government official perceived goal post shaped perchings is not effective where bird did not feel comfort to take on. BRAC are offering the seed varieties for high land. The block farmers expressed their inconvenience in getting irrigation facilities for their

cultivated land in time as electrical wire and water pump frequently have been mugged by some miscreants.

#### **4.9.2 Advice**

Repeated cultivation process would be beneficial in terms of removing salinity from the agricultural land. Farmers need to be encouraged to use organic fertilised instead of pesticides. Seasonal calendar should be scheduled to cultivate their land so that the farmers may be encouraged to cultivate various crops around the year. Bamboo is used for pursuing purpose in the block. Bamboo is hardly found in some localities. Therefore, they prefer to use braches of trees instead of bamboo. AFSP programme should only provide seed to the farmers so that coverage could be extended through the endeavours. Thus, larger number of farmers will be benefited. Local market should be created for the sunflower and maize in relation to popularising the varieties. Irrigation facilities are prime concern to harvesting crops in the areas. BRAC should provide irrigation facilities for promoting the crop diversity and intensity. Block farmers felt disturbed if meeting held frequently as most of them depend on wage labours. The availability of seed should be ensured as farmers always look for better quality of seed.

## Chapter 5. Conclusion and recommendations

The study found crop intensity as well as crop diversification accelerated in the blocks. Agricultural productivity increased after induction of climate adaptive technologies, including logo methods which also helped the farmer in the region. Farmers' required to the BRAC office and selected dealer in collecting benefits and seeds. But, they had to face problems in several ways to get these provisions. These processes they were considered as time consuming, lengthy and waste of labouring time. Advocacy programme can undertake following strategies in terms of promoting the Climate adaptive technology toward the farmers.

### 5.1 Rice

1. The dealers believed to have limited number of saline tolerate varieties available in their localities. Therefore, saline tolerant varieties are prerequisite to get more crops as farmers have bitter experiences dealing with lower quality of seeds in their jurisdictions i.e. local markets.
2. Financial benefits, including loan allocation without interests or minimal interest rate should be considered so that the farmers could adopt climate adaptive technology, which are identified as more expensive in terms of availing seeds and methods required for cultivating.
3. BRAC staff should be arrange different types of meeting, including yard, local bazaar with the farmers and day labourers for dissemination of adaptive climate technologies so that farmers could understand innovation of BRAC with participatory approach.
4. Initially, BRAC should be marketing the seeds with minimal price as the farmers always are preferred to obtain good quality of seeds with minimal price compared to other popular seed variety in the market.
5. BRAC should supply seed to the dealer in credit so that financial constraints could not be subjected to conduct their business in relation to promoting climate adaptive technology initiated by BRAC.
6. People were not aware about the meaning of the climate adaptive technology yet. Therefore, BRAC could initiate dissemination session in village level in relation to promoting climate adaptive technology and its impact on agriculture.
7. The farmers will be beneficial if advocacy would arrange visual presentation in relation to disseminating methods in terms of preparing land, using manure, fertiliser and pesticide and cultivating crops and preservation for particular crops.
8. BRAC should involve government official, especially local agricultural officers in their discussions or meeting where local farmers will be present so that everyone could share their experiences in relation to identifying agricultural problem regarding areas.
9. BRAC's endeavour will be reflected more among the local farmers if the number of block would be increased in number regarding areas for visualising among other farmers.

## 5.2 Sunflower

1. The seed of sunflower was found to be higher in price. Seed prices should be reduced so that farmer can become inclined to cultivate sunflower. The price of sunflower seed is higher, BDT 1,300 for per kilogram while sesame seed price is cheaper and availability only with BDT 50 per kilogram.
2. Grinding machine is needed to be removed seed from the sunflower plant in order to extracting edible oil from its seed. The study found that whole process followed manually by the farmers because of absence of the processes observed.
3. Access to market of sunflower is limited. However, the traders are reluctant to purchase the sunflower from local market. Therefore, sunflower market should be accelerated in terms of developing market networks by relevant endeavours of BRAC.
4. Availability of seed should be ensured prior to promoting regarding varieties so that the farmers could easily manage seed from local market or neighbouring *hat*. So, time constraints and distance locations in availing seed is prime concern to the farmers, which induced them to cultivate regarding crops according to seasons.
5. Seed conservation is another mechanism that minimizes purchasing same seed varieties in every year. Thus, the farmers' prefer to learn the techniques of seed preservations, particularly sunflower.
6. The beneficiary farmers' are considered to cultivate the sunflower is expensive in terms of financial burden as well as labour intensive. Therefore, financial intensive should be continued more tenures ranging from 5 to 6 years. This process will be habituated to the farmers cultivating sunflowers.
7. The block farmers' perceived that promotion of sunflower would be greater challenge in respective regions. Therefore, BRAC should initiate another new variety instead of sunflower in the same crop calendar.
8. It is important to make farmers aware that sunflower oil good for health and helps to reduce salinity from the soil.
9. Applying theatre engagement may enhance the extent the use of CAT.
10. Information sharing workshops are another way to promote CAT. These may be presented in collaboration with Farmers, dealers, businessmen, agricultural extension officer and obviously BRAC people. The success of the workshops often hinge around addressing a issue that people are highly motivated to learn and practice.
11. Farmers may be supported with sample written materials such as pamphlets and posters.

## 5.3 Maize

Farmers are more interested to cultivate maize for gaining more profit than sunflower. The process of cultivation of maize is found to be comparatively easy. The maize is highly demanded for shrimp and poultry industry. Both in block and non-block areas, farmers were benefited commercially to cultivated maize. Block farmer considered maize is as more profitable seed. Though they think maize is time and labour intensive cultivation. It attacks frequently by the insects. Also maize creates demand towards businessmen. In the community level the advocacy requires minimal activities for increasing the use of maize.

1. Farmers make aware of use of quantity of manure.
2. Farmers to be aware of allergy reaction and fearing by showing the visual presentation.
3. Farmers to be aware of the amount and use of time of pesticides.
4. Businessmen and dealer should include training session for creating market demand.
5. Arranging different types of local meeting in where female and agri labourer and non-block farmer will be encouraged to participate.

To promote the climate adaptive technologies among the farmers it is required to make sure that the knowledge regarding climate adaptive technologies is properly disseminated. It is crucial to make farmers well aware about its' advantages and disadvantages so that farmers can take proper decision. Involvement of the government officials, UP chairman and members within the whole knowledge dissemination process and other activities is required to enhance the social acceptability. Furthermore, availability of required inputs for instance sunflower seeds and saline tolerant rice seeds should be ensured.

Non-block farmers have the perception that only block farmers are eligible to get sunflower, maize or rice seed. Even they think becoming a VO member would be the opportunity in getting all types of seeds. Thus it should be reduced by advocating the proper message by advocacy programme.

To make all these things work, rigorous training is required. Visual training would be more suitable than theoretical training. Visual training on cultivation process, seed preservation mechanism and pest management will help the farmers to utilise the technologies in their fields as well as in production process. In the training session participation of farmers from block and non-block farms, agricultural labours and female members of the farm households will enhance the possibility of accepting the climate adaptive technologies. In addition, if it is possible to ensure the involvement of businessmen and dealers in training session then it would help create the market for the outputs.

Additionally, some health and social issues should be considered to promote the climate adaptive technologies. Fearing of health problems should be reduced through awareness building workshops or campaign. Group cohesion among farmers is another important thing to be considered. So group approach cultivation would help to strengthen group cohesion.

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## Annexures

**Annex 1. Perching method used in the paddy field where birds were preying insects**



**Annex 2. Logo method**

