

## Drought and Public Policy Concerns for North-Western Region of Bangladesh

MD. ATIQUL ISLAM\*

A.N.K. NOMAN\*\*

**Abstract** *Drought is one of the many climatic hazards Bangladesh currently faces and the north-western region is particularly affected by it. It is changing the basic characteristics of this region slowly but permanently. The impact of other climatic hazards, such as floods and cyclones is sudden, devastating and shocking, and always draws more media attention. On the contrary, the impact of drought is slow and less appealing to the policy makers and few people are found to campaign for it. This article intends to put some light on this issue. For that purpose, policy and strategic documents of the government, journal articles, books and reports are thoroughly reviewed and actions taken by the government to meet the challenges of drought are highlighted. A comprehensive plan and action is required to face this challenge. Along with other interventions, investment in irrigation infrastructure is the foremost. It is suggested that development and utilization of surface water (SW) resources to maintain irrigation requirement is indispensable to reduce the growing pressure on the ground water (GW) reserves. Though huge investment is required, through this investment government will actually ensure the food security for the economy. Government should take appropriate policies to keep the agricultural activities of the region intact. Otherwise, it may be a serious problem to not only the north-western region but to the economy as a whole.*

**Keywords:** *Drought, Northwestern Region, Climate Change, Agriculture, Irrigation, Public Policy Concern, Bangladesh.*

\* Associate Professor, Department of Economics, University of Rajshahi

\*\* Professor, Department of Economics, University of Rajshahi

## **Introduction**

Bangladesh is situated in one of the most disaster prone areas of the world. The climate change is making the situation worse. Drought is one of the serious climatic hazards that Bangladesh faces these days. Floods and cyclones are sudden, devastating and shocking, and always draw more national and international media attention. This always puts additional pressure on the policy makers to act. This also attracts many nongovernmental organizations and pressure groups to campaign for policies and allocations for relief. On the contrary, the drought occurs slowly and from the risk perception point of view this event does not get much serious attention. As the impact of drought is slow and less appealing to the policy makers, few people are found to campaign for it. But it can cause a greater damage to crops and affect more people across the wider area than flood or cyclone. It may seriously affect our livelihood and even the existence of some plants and animals. So, the risk related with drought has to be taken seriously. This paper intends to put some light on that drought issue along with the public policy concerns for that in Bangladesh. More focus is given here to agriculture and irrigation issues in the north-western region.

## **Review of Literature**

Dey and others (2011) did a study on the biophysical and environmental issues concerning drought occurrence in NW region of Bangladesh. Using both primary and secondary data, the analysis showed that the rainfall was almost 46 percent lower than the normal period. Similarly, average monthly sunshine hours was about 7 percent higher and ground water level declined more than one meter during the drought period compared to that of the normal years. It concluded that among all these factors, shortage of rainfall was the dominant one for the occurrence of drought in the region.

Paul (1995) did a research on the drought of 1994-95 in Bangladesh. He analyzed the means through which the residents of the drought affected area (northwestern part of Bangladesh) coped with the situation. The analysis of the data suggested that both high and low income households were severely affected and the governmental responses were delayed and inadequate to provide financial and other assistance to the drought victims during the drought period. This study suggested that the government should prepare for drought long before the occurrence of such events.

Islam (2011) did a research on the dynamics of farmers' adaptation in Rajshahi district, which is in the NW region of Bangladesh, using case study method in a

very limited scale. It found that farmers were very much aware of the warming trends, water scarcity and weather variability related to drought in that area. One of the key conclusions drawn in that study is that government initiative, which should be the main driver to farmers' adaptation, was considerably lacking.

Islam (2013) reviewed the issues for developing countries in the face of climate change. This review paper showed that climate change poses threat to agricultural sector of developing countries. Therefore, a key challenge for the developing countries is to identify actions to reduce vulnerability in the agricultural sector. Through appropriate actions the impacts of climate change can be avoided or at least reduced. In this respect government intervention is very much needed to facilitate adaptation to because of market climate change (Aakre and Rübbelke, 2010).

Drought has received much less attention of researchers than floods and cyclones. In an annotated bibliography of social science literature on natural disaster in Bangladesh, only 11 titles on drought were found against 156 for floods and 54 for cyclones (Alam, 1995). Apart from that, to the best of our knowledge, there is no such research paper emphasizing public policy concerns related to drought especially in the NW region of Bangladesh. The present research is an attempt to fill that gap.

### **Objectives of the Research**

General objective of this research is to review the present scenario of drought and the status of actions taken so far from policy perspectives. However, for the analytical purpose several specific objectives are identified. These are:

1. To highlight the present status of climatic hazard Bangladesh is facing, especially the drought in Bangladesh.
2. To analyze the status of actions so far taken by government to fight against drought in the North-Western (NW) Bangladesh.
3. To have some policy suggestions to cope with the drought for NW region.

Before dealing with the research methodology and findings of the research, definitions of drought and its effects are conceptualized in the next section. The climatic hazard *Bangladesh is facing* because of *Droughts* and the *Impact of past droughts are discussed*. This is followed by a discussion of government actions to combat climate change. Different issues related with the drought, its future consequences, present adaptation and future need for the northwestern region with

respect to irrigation are discussed in the next section. The *policy suggestions* and the concluding remarks are presented in the final two sections.

## **Conceptual Issues**

### ***Drought and its impacts***

Various definitions are there for drought and they are used to meet specific goals such as agricultural development or water resource management (Paul, 1995). From the agricultural perspective, it can be defined as “shortages of water, which is harmful to our agricultural activities”. It occurs as an interaction between agricultural activities (i.e. demand) and natural events (i.e. supply), which results in a water volume or quality inadequate for plant and/or animal needs (Heathcote, 1974). In the context of Bangladesh, Brammer (1987) defines it as a period when soil moisture is less than what is required for satisfactory crop growth during a season when crops are normally grown. Non-availability of water resources as a result of less or no rainfall with more intense sunshine is the main climatic reason for less moisture in the soil or atmosphere (Dey et al., 2011). Apart from these climatic reasons, the human induced alterations resulting from vegetation loss and over exploitation of water resources are the other reasons for drought.

The impact of drought is diverse and its effect ripples through the economy. Overall, the impacts can be classified as direct (or first order) and indirect (or second order) (Kates et al. 1985). In an agricultural economy, the direct impact would be in the form of reduction of crop production via decrease in acreage and yield. The second order impact would be in the form of decrease in employment and income. Decrease in acreage reduces agricultural employment as it diminishes the need for preparing land, weeding, and harvesting. Further impacts can be felt through the rise of food grain prices because of reduced food production (Ghose, 1982). At this stage, the small farmers and landless labourers would be in a very difficult situation. They are then compelled to buy food by selling their assets (i.e. agricultural land, household goods, livestock and other valuables) at a distressed price (Reardon et al. 1988). Even at an extreme condition people start consuming those that are not normally eaten (Jallow, 1995) and this may lead to famine at the end.

### **Methodology**

This research is based on extensive library work. Literature review method is employed here by reviewing the secondary publications. These secondary materials are journal articles, books, policy and strategic documents of

Bangladesh government related to our research topic. The texts of these materials are reviewed thoroughly to have the findings related to our research objectives.

## Findings

### *Climatic hazards Bangladesh is facing*

The geographical setting of Bangladesh makes her more vulnerable to different natural disasters. Every year one or more calamities occur in different parts affecting her people's lives, property and livelihood. The main natural hazards that the country suffers and may suffer in future includes flood, cyclone and storm surge, flash flood, drought, tornado, earthquakes, riverbank erosion, and landslide National Adaptation Program of Action (NAPA, 2005). It is feared that the climate change will exacerbate the situation more intensely. It would also increase the

**Table 1 : List of Climatic Hazard Bangladesh is facing**

- |                                    |                                  |
|------------------------------------|----------------------------------|
| ➤ Flood & Flash Flood              | ➤ Drought, Extreme Temperature   |
| ➤ Cyclone & Storm Surge            | ➤ River Bank Erosion & Landslide |
| ➤ Erratic Fog, Hailstorm, Rainfall | ➤ Earthquake                     |

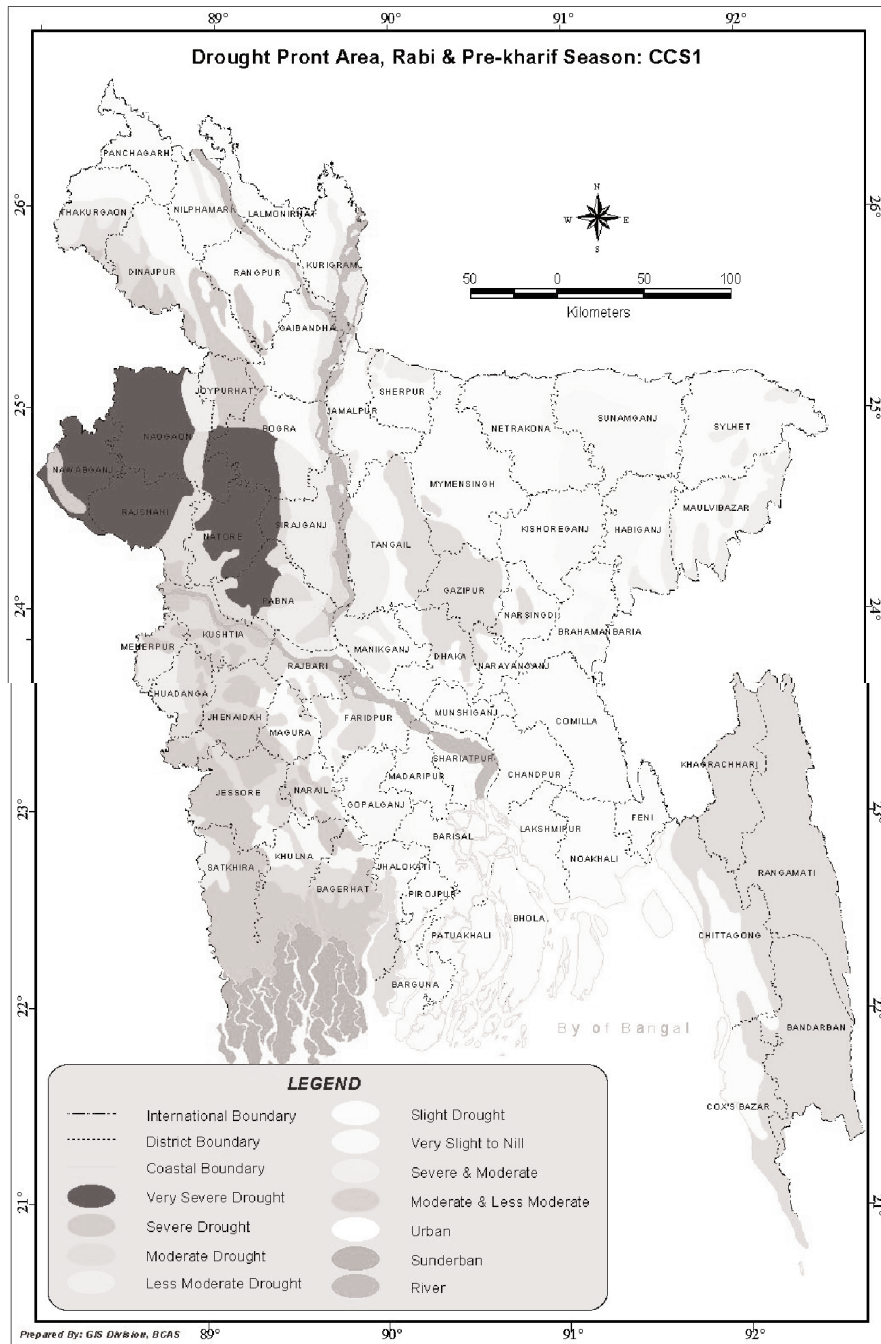
frequency and intensity of those calamities. It is also feared that climate change would cause a sea-level rise and as result some parts of Bangladesh's land area would be under inundation by 2050 (Nishat and Mukherjee, 2013a).

### *Droughts in Bangladesh and future scenario*

Drought is a recurring phenomenon in Bangladesh (Alam et al., 2013; Hossain, 1990). Every five years, Bangladesh is affected by major countrywide droughts. From 1960, drought occurred 20 times in Bangladesh (Dey et al., 2011; Banglapedia, no date). Very strong droughts hit the country in 1961, 1975, 1981, 1982, 1984, 1989, 1994 and 2000. There are strong evidences that climate change will change the rainfall pattern and consequently more frequent drought will occur. North-Western (NW) region, popularly known as North-Bengal, is characterized by high temperature and low rainfall compared to average condition of Bangladesh. The region is primarily prone to drought which is likely to become more frequent and severe due to climate change (Nishat and Mukherjee, 2013b; Habiba et al. 2013; NAPA, 2005).

More erratic rainfall and temperature in the NW region are already felt in the grass root level (Islam, 2011). Scientific evidence shows that the temperature will rise, and there exists a strong possibility that the precipitation will decrease further, it

**Map 1 : Projected Drought Prone Areas of Bangladesh in 2030 (NAPA 2005, p 15)**



is likely that the moisture content of topsoil would decrease substantially (Nishat and Mukherjee, 2013b). Higher temperature would, furthermore, induce higher rate of evapo-transpiration leading to acute droughts in this region. One major impact would be availability of water for agricultural production in this region. As a result it is expected to be the most vulnerable rice-growing region in future (Basak, 2010).

### ***Impact of past droughts in Bangladesh***

Lower crop production is the main consequence of drought in Bangladesh (Rahman and Biswas, 1995). It may affect adversely all three rice varieties (*aman, aus, boro*) that grow in three different cropping seasons. The loss of rice production due to drought in 1982 was 52,896 metric tons (BBS, 1986, p. 287-290). This was about 41 percent of the total damage caused by all types of environmental hazards (cyclones, hailstorms, heavy rains, floods and drought) that occurs in that year (Paul, 1995). During the period of 1973-87, crop losses to drought were almost as severe (2.18 million tons of rice) as the losses attributed to floods (2.38 million tons of rice) (Hossain, 1990, p. 37). Sometimes the loss caused by drought is greater than the losses caused by the flood and cyclones (Paul, 1998; Selvaraju et al., 2007). Even, it can put people in a more defenseless situation than floods and cyclones (Shahid and Behrawan, 2008; Shahid 2010). Paul (1995) found that 15 different crops were affected by drought of 1994-95 and the loss in crops was attributed to both decrease in acreage and yield of crops. The percentage of total *aman* acreage damage was from 45 percent to 100 percent with average damage of 75 percent. Nearly 65 percent and 55 percent of the *aus* and jute acreage were, respectively, damaged by that drought. Overall, we can say that depending on the intensity of drought, the estimated yield reduction of different crops varied from 10 percent to 70 percent (Banglapedia, no date). Consequently, it lowers the employment opportunities, reduces the asset holding and raises the household's food insecurity in Bangladesh.

### ***Government initiatives so far taken***

There are several policies, strategic documents and projects in Bangladesh for the future improvement of the economy. Government's understanding of the drought issues of NW region and actions taken so far to fight against drought are discussed in the following.

1. National Adaptation Program of Action (NAPA) 2005: In response to the decision of the Seventh Session of the Conference of the Parties (COP7) of the United Nations Framework Convention on Climate Change (UNFCC)



Bangladesh was prepare a National Adaptation Program of Action (NAPA). The country launched the NAPA in 2005 which identified 15 priority activities. Though the risk of drought that the country would face in future was acknowledged, only one among the fifteen of those priority areas was related to drought and that one is to promote research on drought resilient variety of crops. Later on NAPA was further updated in 2009 and identified 45 adaptation measures but adaptation to the improvement in the irrigation system in the NW region did not get attention yet.

2. National Food Policy 2008: The Ministry of Food and Disaster Management prepared the National Food Policy, which serves as another important strategic document for adequate and stable supply of safe and nutritious food to the nation. Here a total of 26 areas of intervention were identified but nothing was mentioned to fight against drought.
3. Bangladesh Climate Change Strategy and Action Plan (BCCSAP) 2009: This is another comprehensive strategy paper prepared by the Government of Bangladesh to address climate change challenges. Forty four programs have been identified and prioritized within six thematic areas there. Among these 44 programs only one is directly related with drought. That program is related to research and development on climate resilient cropping system and drought management options for farmers. There is no specific program for the improvement of irrigation in the northwestern part of Bangladesh to fight drought.
4. Ministry of Environment and Forest (MOEF): The MOEF is one of the important agencies of Bangladesh government for planning, promoting, coordinating and overseeing the implementation of environmental and forestry programs. We find that 25 projects were implemented under this Ministry throughout the country during the period of 2009-2014. But it is matter of great concern that there is only one project that is related with forestation in Barind tract which can be related to drought.
5. Sixth Five Year Plan (SFYP) 2011-15: Sixth five year plan is another main strategic document for the country. It provides strategy, framework and guidelines for reducing regional disparity, developing human resources, managing resources, increasing agricultural productivity, increasing income and employment, and ensuring food security. Under the Environment, Climate Change and Disaster Management section of this document it has acknowledged the risks posed by increasing drought tendency in the northwestern region. Under this section 35 programs in total were proposed



but only two are related with drought. One of them is to develop the institutional capacity for research on climate resilient cultivars and another one is adaptation against drought. But no target was there related to the second one. There was no specific direction to fight against drought through irrigation either.

6. National Agriculture Policy (NAP) 2013: The Ministry of Agriculture has acknowledged the climate change issue in its National Agriculture Policy 2013. Though it was intended to conduct the research and extension service to support climate change adaptation, not much emphasis was given to drought or to improve irrigational facilities to fight against drought in northwestern part of Bangladesh.
7. Ministry of Agriculture (ADB projects 2013-14): The Ministry of Agriculture is one of the key ministries of Bangladesh government. It is responsible to implement agricultural policies, plans, projects, programs and regulations for the betterment of our agricultural sector. Under ADB Projects 2013-14, there are 62 projects in this ministry and only 3 of them are under Barind Multipurpose Development Authority (BMDA). They are basically related with routine work like to establish new deep tube well (DTW), and repair existing damaged DTWs and canals. Though we may consider these as projects related to drought, there was no other project to fight against drought.
8. Perspective Plan 2010-21: The government has prepared a Perspective Plan covering the period from 2010 to 2021 which aims at implementing *Vision 2021*<sup>1</sup>. Though “achieve food security” and “pursue environmental friendly development” have been specially mentioned under the broad development goals, the drought of NW region does not get much serious attention there. In the fourth chapter (Strategy for Food Security: Agricultural and Rural Development) of this document under the subheading of *crop sector* and *water resource management* it has mentioned 25 strategies but not a single one is there related to drought or irrigation to face the challenges of drought. Like the same, chapter thirteen (Environmentally Sustainable Development) does not include any strategies related to irrigational development in the northwestern region to fight against drought, though it acknowledged the threat of drought in the face of climate change. Under these two chapters only one strategy among the 44 related to improving climate resistance crops can be indirectly related to the drought.
9. Bangladesh Climate Change Trust Fund: To reduce the impact of climate change a trust fund was created to finance the projects in 2010. Since then the

**Table 2 : Government initiative so far taken related to drought in the North-Western region**

Policy & Strategic Documents/ Action plan	Projects/Strategies/ Objectives/ Priority Activities (Total)	Related with droughts	Focal Point
NAPA 2005	15 (Priority Activities)	1	Promote of research on drought resilient crops
National Food Policy 2008	26 (Area of Intervention)	0	Nothing on drought
BCCSAP 2009	44 (Programs)	1	R & D on the climate resilient cropping system and drought management option for farmers
Ministry Of Environment & Forest (MOEF)	25 (Projects for the period of 2009-2014)	1	Related to forestation in 'Barind Tract'.
Sixth Five Year Plan (SFYP) 2011-15	35 (Proposed Program)	2	Related to research on climate resilient cultivars and adaptation to climate change, even no specific target was set and no concern on irrigation
National Agriculture Policy (NAP) 2013	9 (objectives)	0	Nothing to fight against drought
Ministry of Agriculture	62 (Projects of ADB on 2013-14)	3	Related to irrigation under BMDA and these are routine projects. Nothing is there emphasizing the drought.
Perspective Plan 2010-2021	44 (Strategies to attain food security & Sustainable Dev.)	1	Only acknowledged the need of drought resilience seeds and efficient irrigation but no specific or concrete action.
Bangladesh Climate Change Trust Fund	207 (Projects for 2014)	4	Research on drought resilient crops, excavation and re-excavation of water-bodies & forestation. Only 0.9 percent of total expenditure.

*Source: Own documentation, 2014*

fund is utilized to prepare, implement and finance the projects that are somehow connected to climate change mitigation and adaptation projects all over Bangladesh. We find that there are 207 projects approved by the fund to be implemented in the year 2014-15 by the different ministries, organizations, and agencies, both government & non-government. Again it is surprising that only 4 projects are there which are related to drought in northwestern part of Bangladesh. These are again related with research on drought resilient crops, forestation, excavation and re-excavation of water bodies and the expenditure on those are below 1 percent of the total expenditure on all projects.

Government initiative so far taken that is discussed above is summarized in table 2. It can be seen there that the initiatives are very few to deal with the drought issues of NW region and there is no firm steps regarding the improvement of the irrigation in this respect.

**Table 3 : Importance of Northwestern region in Bangladesh**

	Area under cultivation for rice in 2008 (%)			Rice Production (%)	Population (%)	Labour Force 2010 (%)
	Aus	Aman	Boro			
Bangladesh	100	100	100	100	100	100
Northwestern region	20	42	35	32	24	27

*Source: BBS, 2012*

## Discussion

Concerns over the drought issue in the NW region and suggestions in that regard are discussed here.

This region is one of the important areas of Bangladesh providing agricultural products in the whole economy. The gravity of the situation can be seen from table-3 also.

<sup>1</sup> Vision 2021 is the political manifesto of the Bangladesh Awami League, the present ruling party in the government, before winning the National Elections of 2008. It still stands as a major political vision of Bangladesh for the year 2021, the golden jubilee of the nation. This would be implemented through successive five years plans.

This region contributes one third of the total rice produced in the country. The total population of the region is less than one fourth of total population. Hence, it appears that this region provides its surplus produces to the rest of the economy. So, overall we may deduce from the agricultural production perspective that this region needs more attention. Anything that happens to the agricultural sector in this region will affect the economy through unemployment, income deficit, and instability of agricultural production.

Most of the crops are produced at the very marginal level of profit all over the country especially in this region. Irrigation is one of the important parts of crop production, which contribute to food security by producing high yield varieties. In the face of future drought its importance will definitely increase further. The cost of irrigation is very high in Bangladesh. This cost can be as high as 40 percent of farmer's total production cost, and lack of timely irrigation leads to a 37 percent average decrease in yield of rice and other crops (Chowdhury, 2012; Katalist, no date). Conversely, efficient irrigation can increase both the productivity and profitability of the agricultural farm. This cost would increase with the level of drought and as a consequence this would reduce the profit margin. An assessment on irrigation shows that the major hindrance in the efficient irrigation system in Bangladesh are a) lack of knowledge of farmers on crop specific water management system; and b) unavailability of efficient low-cost irrigation system. For example, in Northern Bangladesh, the Boro rice farmers use three to five thousand liters of water to produce one kilogram of paddy, while the actual requirement is only about 1500 liters (Chowdhury, 2012). This over usage of water not only impacts negatively on environment by depleting water levels, but also increase farmers' production cost and thus decrease their net income.

Agricultural adaptation in the form of agricultural transformation would be expected without any intervention under the drought circumstances. Evidence also suggests that farmers are adopting new crops like sugarcane, maize corn, potato, wheat, different types of pulse and oil seeds (Habiba et al., 2013). One of the important transformations that is occurring here in some part is the transformation of paddy field to mango orchard. Water scarcity is one of the main factors that influence the decision making process in this transformation (Noman et al. 2011). Scarcity of water increases the cost of irrigation in the production and influences the profit to rice cultivation. On the other hand mango orchard requires less irrigation and the return is much higher. Apart from that, some policies at the public as well as NGO level are also promoting different adaptation. Projects jointly funded by the Food and Agriculture Organization (FAO) and Government of Bangladesh under the supervision of the Department of Agriculture Extension

in the name of Livelihood Adaptation to Climate Change (LACC) and Disaster and Climate Risk Management in Agriculture (DCRMA) advocate this sort of transformation. Along with the mango orchard they are promoting different drought resistance cultivars like wheat, chickpea, maize corn and different pulses. Some NGOs are also promoting this sort of transformation by providing credit.

One of the major impacts of this transformation is that less area would be available for the rice production in some parts of NW region. Noman and others (2011) found that 41 percent of their study area of Porsha thana under Noagoan district have already been transformed and is going to be 80 percent within the next 10 years. As a consequence, there would be a fall in rice production up to 70 percent which means this region would no longer be the surplus producer of rice and even no longer be able to produce its own demand for rice. Apart from the mango transformation, let us consider the other crops which are producing like maize corn, wheat and so on, which are drought resistance crops. If these crops substitute the rice production then another concern is there. If our food habit changes from rice to whatever we are producing then we may have no problem. If it is not, then it will put Bangladesh in a great difficulty to maintain its food-population balance. Though, some may argue that she would import more and more rice from the international market that she is even doing now. But in that case we have to remember that the international food supply is also under constant threat at the changing climatic condition and growing population worldwide. Uncertainty of food supply in the international market is also increasing. Depending on the international market for domestic food supply would make us more vulnerable to both food as well as national security perspective.

Exploitation of groundwater (GW) has already been implemented under the Barind Multipurpose Development Project (BMDP). After the introduction of BMDP in 1986, 6000 deep tube wells (DTW) have been installed in the area. In addition to that about 66000 shallow tube wells (STW) were also installed in private sector by the year 2000 for the exploitation of GW for the irrigation. Barind Irrigation Projects is located within the Barind Tract area, which covers most part of Northwestern districts. All rivers and canals of this region dry up during the dry season, and make the people completely dependent on GW, especially for the irrigation. About 75 percent of water for irrigation in the region comes from GW (Bari and Anwar, 2000). To protect the GW the BMDP have taken measures so that the annual withdrawal is less than the annual recharge to keep the GW level in position. But the estimation of GW recharge is not certain. Asaduzzaman and Rustome (2006) estimated that GW recharge in the area is at least one third of annual rainfall, and that is about 500 mm per annum. A

government report suggests that recharge to GW in the northwestern part varies between 210-445 mm (Shahid & Hazarika, 2010). Again Islam and Kanungoe (2005) estimated the long term annual average recharge at 152.7 mm. It is also revealed from their research that the sustainable yield of GW (204 mm per year) is somewhat higher than the long term annual average recharge (152.7 mm per year) to the GW reservoir. Overall, it has led to an overexploitation of the GW and GW-based irrigation system in the area has reached a critical phase. A report on GW zoning map published by BADC (2005) shows that 60 percent of irrigated croplands in Noagoan district, and 10 percent in Rajshahi and Chapainawabganj districts have become critical for STW operation. Another study in the Noagon district within the Barind Irrigation Project shows a significant declination of GW table because of extensive GW withdrawal, which indicates that GW drought is a regular occurring events here (Adhikari et al., 2013).

At the end of our discussion we may say that if the situation continuously prevails like this and government does not take any serious action then it would create a serious threat to not only the agricultural production of this region but also create other problems through out the economy. So, the government has to take initiative to improve irrigational facilities here. As the GW facilities are in a critical stage, attention should be given to the surface water availability. In this respect China could be the model for us. China began to develop its irrigation system in 1949. During 1949 to 1980, the Chinese government invested heavily in irrigation projects such as canals, reservoirs, dams, and wells (Zhu et al., 2013). To fight against drought, they are now putting emphasis on water saving irrigation, optimizing irrigation management, and modernization of large scale irrigation. Water-saving irrigation like the sprinkler irrigation, micro-irrigation, low-pressure pipe irrigation, and canal lining irrigation are now being implemented there.

### **Policy suggestions**

Related to agriculture in the face of drought in the NW region certain policy suggestions are presented below:

We find that the government did not take the drought issue in the NW region seriously. It has to be taken seriously and will need a proper planning. With the support of FAO Bangladesh government have already prepared a master plan for agricultural development in the Southern region. Similar type of plan for the overall agricultural development for the NW region is required.

Proper planning requires knowledge on different issues from the grassroots level as well as available technology. to get information on grassroots situation (like the

soil, weather, water availability, cultivation practices and so on) there is the need to create a data base at the union level and it has to be updated from time to time. NGOs who are working on the area can be used for that purpose.

Irrigation facilities have to be improved, for which there is no alternative. There is the need to develop irrigation infrastructure and flexibility to cope with available technology. A comprehensive plan should be adopted to develop integrated irrigation approach, which could include rain water harvesting, flood water harvesting and sustainable level of underground water use and also change in the cropping pattern.

Ground water irrigation is no longer a dependable means for future drought scenario. We need to improve the surface water availability. To improve the water reservoirs a huge investment is required. The infrastructural and other system development related to the NW region is needed. Investment done in China can be a model for that.

### **Conclusion**

Drought is one of the main challenges that the NW region is facing now and the severity of the problem is likely to increase more in future. It seems that though the government is aware of the issue, they lag in terms of actions. A comprehensive plan and action is required to face this challenge. Along with other interventions, investment in irrigation infrastructure is the foremost requirement for this region. It is suggested that development and utilization of SW resources to maintain irrigation requirement is indispensable to reduce the growing pressure on the GW reserves. Through this investment government will actually ensure the increase in food production, increase in farmers' income, stabilize food prices, and maintain food supply to the whole economy. Otherwise, it may be a serious problem not only the region but also for the whole economy. We hope that the Bangladesh government would take this issue seriously and take necessary actions as early as possible.



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