Impact of drought on food crop production in a selected area of Bangladesh

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Abstract: The study shows rainless period, shortage of ground water, water crisis in irrigation, crop loss due to drought, household needs and its impact on environment. Household survey and field visit data indicated a harmful impact and economic loss in a selected area of Bangladesh. Data used in this paper were collected during the summer of 2008-2009 from six drought affected villages located in the northern part of Bangladesh. While rich, medium, poor and very poor households were affected by the drought.
Key words: Drought, food crop, water crisis, economic loss.

Introduction

The environmental and social challenges that face the world as a whole are very complex and diversified. The diversity of ecosystems, people and use of natural resources makes it impossible to reach clear conclusions about the threats posed by the impacts of natural resource use and the exogenous factors relevant to sustainable development. These factors are diverse and the composite impact of these is threatening the ecosystems and the life support system. Drought is one of them that already have started it rules. Adoption of modern agriculture, high and increasing costs of inputs and lower return from land and market turned the land users poorer and poorer with time (Evenson and Gollin, 2003). With this was added the problems arising from the environment, drought, sudden floods, repeated inundations, untimely rainfall, storms and cyclones contributed to loss of production and intense poverty. All these generated an immerse pressure on the natural resource base. The main problem posed by the large and increasing population and continued poverty and under-development. Introduction and adaptation of new technologies and the influence of market also have impact on natural resource base and environment (Janvry and Garcia, 1998).

Droughts are recurrent features in Bangladesh. This affects plant growth, leading to loss of crop production and food shortages. The main objective of this study was to examine the means of a drought affected area of Bangladesh cope with this hazard. Drought was the lone environmental factor to cause severe crop damage in Bangladesh in 1994. The northwestern region of the country, popularly known as North Bengal, experienced one of the most severe droughts of the century, which started in October 1994 and was broken in July 1995 with the onset of monsoon rain (Rahman 1995). The continued drought in the northwestern districts of Bangladesh led to a shortfall of rice production of 3.5 million tons (Rahman and Biswas 1995). Despite the recurrent and devastating nature of drought in Bangladesh, it has received much less attention from researchers than floods and cyclones (Brammer 1987; also see Alexander 1995). In a recent annotated bibliography of social science literature on natural disaster in Bangladesh, Alam (1995) listed only 11 titles on drought as against 156 for floods and 54 for cyclones.

The adjustment strategies adopted by the people in rural Bangladesh will be studied using a structuralized political-economy approach (Emel and Peet 1989; Zaman 1989). This approach claims that people affected by environmental hazards respond in different ways, depending on their economic position, social and political linkages. Variables important in this context are occupational characteristics, landholding size, tenancy status and years of schooling. Some of these variables make some people more vulnerable to drought than others (Liverman 1990). Since independence, Bangladesh has experienced droughts of major magnitude in 1973, 1978, 1979, 1981, 1982, 1989, 1992, 1994, and 1995 (Adnan 1993; Hossain 1990). Although droughts are not always continuous in any area, they do occur sometimes in the low rainfall zones of the country. As listed above, Bangladesh experienced consecutive droughts in 1978 and 1979, 1981 and 1982, and 1994 and 1995. The 1973 drought was labeled 'the worst in recent history,' 1979 drought was dubbed 'the worst in living. memory,' (see Murshid 1987) and 1994-95 drought 'the worst in this century' (Rahman 1995).

Thus, any appraisal of a natural resource base of a selected area and in a selected society must consider the socio-cultural and technological-economic factors as constraints and possibilities. The overall objective of this research has been to identify the impacts of natural resource utilization and economic development in Puthia Upazila of Rajshahi District, a flood plain of Bangladesh. The aim is to contribute to the typical understanding of the factors, both exogenous and local, that impact on the resource base, resulting in constraints for sustainable development.

A number of research and survey have been done in Bangladesh which were similar to this study and many of the trends in the natural resource system are documented with same trend as in the present study. Some are Hughes et al. (1994), Rahman et al. (1994), Pagiola (1995), Alam (1996), Zuberi (1996). Most of the trends e.g. decline in various components in the natural resource system, are generally in agreement with the outcomes of the present study.

Materials and Methods

The study area including the two different types: the marshy (Lowland) and the high land (Upland) have been further divided into several sub-areas or villages as they were maintained there along with homestead, crop fields, ponds, roads etc. associated with each village. Several procedure likes- household survey, field visit, mapping, photograph, group discussion, PRA, RRA etc. used for data collection.

The rural appraisal survey were made, the results of survey were checked by triangulation of other data from other sources e.g., secondary data, memory recall data and national/ regional data. The impacts of resource use and exogenous factors can only be assessed through a holistic

approach. This will enable one to determine the interrelations among ecological, economic and socio-cultural factors affecting sustainable development (Chambers and Conway, 1991, DFID, 2001).

Results and Discussion

Shortage of water and droughts: Last few years (2005-2009) the villagers reported that duration of annual periods of drought in the study area has increased. A numbers of hand tube wells and shallow wells became dry. For this reason, farmers of this study area depend on irrigation from ground water.

Availability of surface water during the dry season: Sources of above ground water, amount and quality, has been declined in the study area during (2005-2009). The ponds and canals, which are man-mode and the beel area, are important sources for storage and availability of surface water. The rural appraisal and group interviews reveals that both amount and quality changed during the period. Though the number of ponds increased slightly but availability during the dry season decreased substantially. The increase in population and demand of water resource are emphasized by the local community (Fig. 1A).

Surface water levels in the water bodies during dry season: Collected information show that there has been a substantial decrease in water levels of all surface water bodies in the study area form 2005-2009. The local people mentioned the reasons were: (i) siltation and filling up of water bodies, (ii) increased water use during the dry season and (iii) reduced recharge and water storage.

Ground water resources

Number of tube wells in the study area: The number of shallow, deep and hand- tube wells has increased in the study area during 2005-2009. The use of ring well and surface water for drinking and domestic use has declined. In recent years, only deep wells supply water during dry season.

Level of ground water table: The rural appraisal information (Table 1) indicated that the minimum level has sunk and a number of wells become dry during the summer months. Many of the hand tube wells become dry and remain dry for longer periods during the summer months in the last decade. Also, the irrigation wells (shallow tube wells) fail to supply water, many of these have to be sunk in deep pits for lifting water. The local people and well operator informed that level of ground water table sinks rapidly during the dry season. Hand tube wells draw water from 20-30 ft. in wet season but 80-90 ft. in dry season. Shallow wells supplies water from 20-25 ft. in wet season but maximum failed to supply water during the dry season. Now maximum of the crop area is covered under deep wells and supplies water from 180-200 ft. during 2007.

Table 1. Level of ground water table during 2007

Tools name	Wet season	Dry season
Hand tube wells	24-30 ft.	80-90 ft.
Shallow wells	20-25 ft.	60-80 ft.
Deep wells	180-200 ft.	180-200 ft.

Rainfall during the dry season (November – May): The rainfall data in the Upazila is given in (Table 2) during the dry season (November – May) over the period of 2004-2008. Though a definite trend cannot be traced, the variability of rainfall during the dry season is remarkable.

Total annual rainfall: The total rainfall in the study area during 2004-2008 is given in Table 2. Likewise, it is not possible to establish a trend in the rainfall, wide variation was the rule. Table 2 indicates December month was rainless and November; January; February and March months had little rainfall. May-October was the heavy rainfall months in the study area during 2004-2008.

Table 2. Total annual rainfall in the Puthia upazila during 2004-2008

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
2004	10	-	-	63	85	503	304	217	361	152	-	-	141.2
2005	13	1	101	34	105	92	493	147	115	268	-	-	114.0
2006	-	-	7	37	191	185	120	217	304	36	10	-	92.5
2007	-	27	59	14	126	310	363	218	340	112	1	-	130.8
2008	13	1	-	30	125	245	264	223	176	113	-	-	99.1

Source: Meteorological area office, Rajshahi

Table 3. Estimated crop loss due to drought in the study area during 2008-2009

Crop name	2008		2009	
	Quantity (acres)	Total loss (TK.)	Quantity (acres)	Total loss (TK.)
Rice	25	400000	300	1560000
Maize	50	900000	150	2400000
Onion	20	600000	50	5250000
Wheat	100	1600000	25	40000
Chili	50	1400000	30	360000
Sesame	40	240000	15	45000
Others	20	150000	10	1000000
Total	305	5290000	550	10615000

Source: Household survey and field visit data collection

Rain-less month and dry tube wells: The duration of annual periods of drought in the study area ranges from mid February to mid May as reported by the villagers. In last few years like 2005, 2006, 2007, 2008 and 2009 the drought lasted for 9 months. In recent years, the numbers

of dry tube wells and shallow pumps became the major cause of drought and water crisis in the area.

Crop loss due to drought: The irrigation dependent Boro-paddy during March- April, and Aus and B-aman to some extent, are affected badly by drought during April – May. Crop of both upland and lowland were damaged. An estimate of crop loss by drought in the study area during 2008 and 2009 was given in Table 3. Here, about 305 acres of crop fields were affected during 2008 and 550 acres in 2009. The survey data shows that as many as 12 different crops were affected by the drought of 2008-2009. A large number of crops were damaged because the drought period corresponds with 2009 sowing period of aus, aman, boro rice, onion, wheat and summer crops maize, sesame, chilies and others crop; 2008 sowing period of boro rice, wheat, maize, chilies and others crop affected seriously by this drought Table 3. Boro rice was the most affected crop by the 2008-2009 droughts and it is the main rice crop of the study area. Another reason for widespread damage of boro rice was attracted by green grass hopper during 2009 and harvesting periods of the crop correspond with the drought period.

Other Damages: In addition to crop loss, 30% respondent households experienced other types of damages due to the 2008-2009 droughts. The extreme heat and lack of moisture caused loss of fruit trees such as banana, mango, coconut, jackfruit, litchi, jujube garden etc. and some wood trees like mehogani, sisso and some local plants seriously affected by drought during these years (Fig. 1B, 1C & 1D).

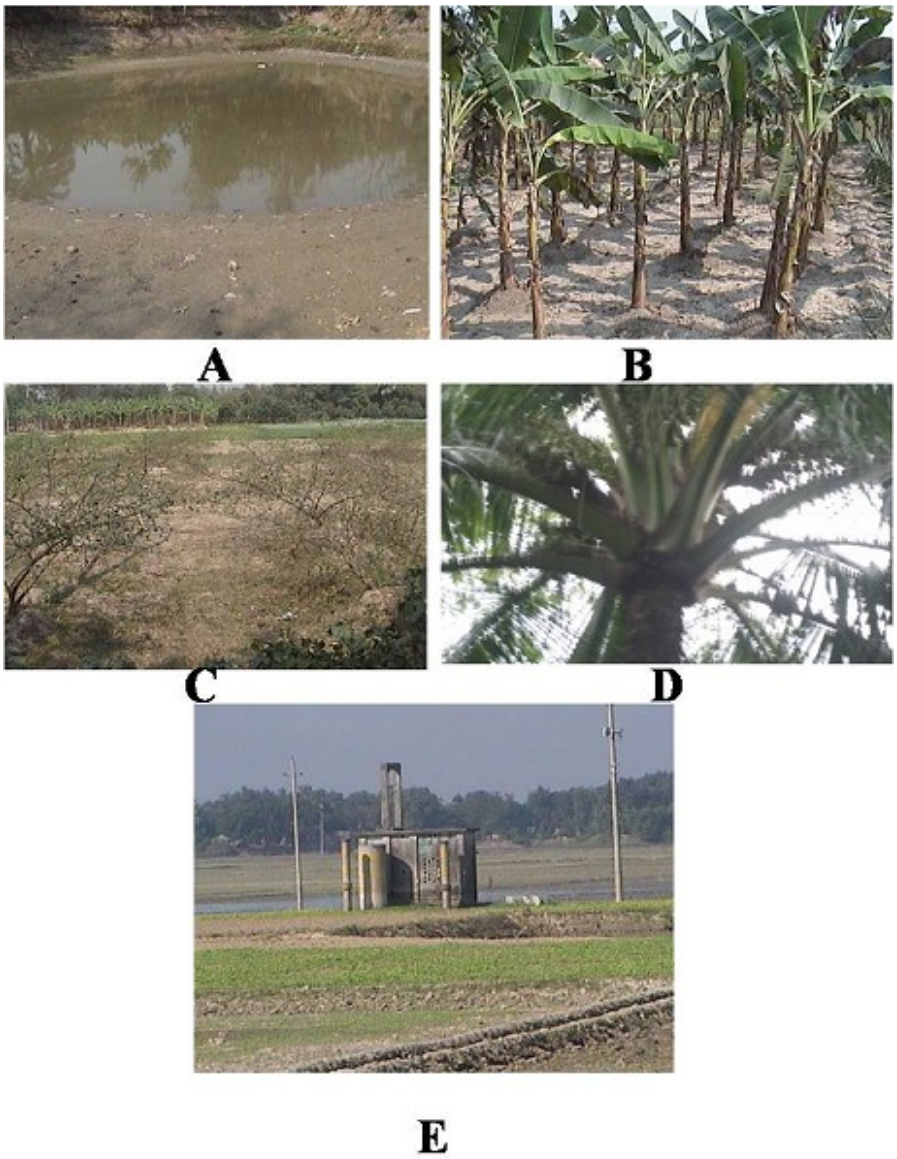

Fig. 1. (**A**) Pond became dry effects of drought during 2009, (**B**) Effects of drought on banana garden during 2009, (**C**) Effects of drought on jujube garden during 2009, (**D**) Coconut tree does not bear fruit (effects of drought in the year 2008) in the study area, (**E**) Irrigation controlled by Deep tube well (Ground water) in the study area in recent years.

Area irrigated by ground water: Before 1970, all irrigation was done using surface water from beels and ponds, by 1980s a number of shallow tube wells and in 1990s deep tube wells were introduced. The number of tube wells increased rapidly; currently most of the irrigation water comes from the ground water. A large

number of hand operated tube wells provide drinking water, the number of which also increased rapidly (Table 4). Total irrigation covered by shallow wells 125 acres and deep wells 675 acres in upland and 60 acres and 380 acres in lowland at present respectively (Fig. 1E).

The present thesis is primarily an investigation into the resource base and impacts of the drought in the Danga (Upland) and Beel (Lowland) ecosystem, which already have contributed to the economic development. In order to alleviate worse effects of drought, the government should be prepared for the hazard before it occurs. Projects to be implemented during drought periods should be developed in advance of drought. It is intended the study will provide insight in the planning for sustainable development of the village ecosystem in future.

What to be done?

It is very difficult to suggest for solving this environmental problem but we would be accepting some remediation steps. 1) Stored of rainwater during rainy season and can be use in dry season, 2) River or surface water used for irrigation by canal, 3) Ground water used for a submerged layer, 4) High irrigated plants should be reduced and non-irrigated plant based production system be expanded.

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