From Flood to Scarcity of Water:
Re-Defining the Water Debate in Bangladesh

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Water is one of the most precious resources on earth. It is indispensable for all human activities and for the sustainability of the ecosystems on which we depend. Without water there would be no life. Water resources, present as surface stocks such as ponds or lakes, flows (rivers) or groundwater reserves (aquifers or soil moisture) are all used directly in activities undertaken to sustain a livelihood or, to support ecosystems which in turn support a variety of livelihood activities. The utilisation of these sources by a variety of resource users or "stakeholders" means that multiple interests are operating at any one time. These uses often occur in harmony but can be incompatible, as one use lessens the resource's utility for others downstream.

These resource-use combinations take place within a local social and institutional setting that is crucial in defining how the resources are managed and allocated, and in particular the form that the rights and entitlements of access to the resources held by different sections of the community take. It also defines norms, customs and obligations that may be as important as the formal institutions in moulding the patterns of resource use and management.

GROWING AWARENESS OF THE WATER CRISIS

As a result of the unexpected recent slowing of population growth, organisations such as the United Nations (UN) have reduced their projections of the eventual size of future populations. Yet despite this, because of increased per capita and unit service, or product demand, renewable freshwater scarcity will become an increasing problem for millions of people around the world. There are currently more than 430 million people living in countries considered to be water-stressed, with adjusted projections suggesting that by 2050, the percentage of the world's population living in water scarce (stressed) countries will increase three to fivefold (Gardner-Outlaw and Engelman, 1997). Similarly, in the definitive study by Shiklomanov (Shiklomanov, 1997), it is suggested that "35% of the world's population suffer from very low or catastrophically low water availability". In several countries, per capita availability of water has fallen dramatically and there are concerns of potential conflicts over water.

As a result, the issue of water scarcity has risen to the top of the international political agenda. Water supply and demand was a major issue at the United Nations General Assembly Special Session (UNGASS) in July 1997 and is the focus of the activities of the Commission for Sustainable Development (CSD). The UN also sanctioned the establishment of the Global Water Partnership (GWP) and the World Water Council (WWC), international organisations given the task of evaluating

the world's water problems and trying to develop ways to best tackle the problem. Various governments, international agencies and NGOs have also prepared or are in the process of preparing position papers on water.

The debate regarding water scarcity has also led to the development of a variety of indicators for measuring scarcity which take account of the many factors influencing the adequacy of a nation's water system – storage-to-flow ratio, coefficient of variation of precipitation, use-to-resource ratio and average income. However, such methods all developed from a mould and, as a result, are cast with the same conceptual flaw: they view scarcity as a *water supply availability and demand problem*, when water scarcity is a problem where there is a *failure to gain access to the service* (or services) that water resources provide. Lack of a service may, in many cases, be defined by lack of water in sufficient quantity to undertake a function or complete a service but it could equally result from lack of water of a sufficient quality (for example, bacteria free water for drinking or bathing), incompatible uses of water from the same resource base (fishing in or drinking from a polluted lake, extraction of water for irrigation that dries up wetlands) social, institutional or economic barriers which limit access to water resources that may in themselves be both abundant and of suitable quality to provide the desired service (lack of funds to buy equipment to extract groundwater for irrigation or tenure rights that prevent the needy using private resources).

All these forms of scarcity are highly dynamic: water quantity, water quality and socio-economic conditions of stakeholders alter in space and time, often extremely rapidly, and in response to a wide range of factors that go beyond simple resource-use ratios. It is this more complex, subtle concept of scarcity that is the basis of the analysis of the situation in rural Bangladesh. It does not have the simple attractiveness or dramatic impact of many of the more sensationalist measures conventionally used, but it does have one over-riding advantage: it provides a basis for understanding local-level reality that the conventional measures do not.

WATER RESOURCES AND THEIR USE IN BANGLADESH

Recent flood events in Bangladesh have served to highlight the devastating effect flooding can have on rural peoples' livelihoods. Government estimates put the number of dead during the 1998 floods at about 1000 and the area of the *aman* season's rice that has been damaged at over 600 000 hectares. Yet, it must be borne in mind that water is the mainstay of Bangladesh. The country's economy is still agrarian based, and therefore essentially water-dependent. Its great rivers: the Ganges-Padma, the Brahmaputra-Jamuna, the Meghna, and their associated tributaries discharge about five million cubic feet per second into the Bay of Bengal at peak periods (Rashid, 1991). The complexities and

scale of these rivers, linked to the country's physiography, extremes and variability in climate, and the socio-economic vulnerability of the population, means that the country's water resources form a double edged-sword, providing opportunity and benefit one minute and hardship and suffering the next. This fact is no better illustrated than by the events of the devastating 1988 flood, which led to nearly 2000 deaths and millions of dollars of damage. However, the succeeding seasons' rice harvest was one of the highest on record.

An empirical study, in central Bangladesh by a team of researchers from BCAS and the Environment Centre from the University of Leeds of UK, found scarcity of adequate quality water is the main problem in the county even during flood. It was learnt from the stakeholder groups consultation that ***Scarcity*** of monsoon floodwaters appeared to be the primary concern of the majority of livelihood groups. There was also a consensus of opinion regarding the consequences that result from this. These include a reduction in soil fertility due to lack of silt being deposited on their fields that replenish the soil nutrients. There is evidence they are right in terms of mechanism. The research suggests that we may re-think the prevalent paradigm in Bangladesh from how to cope with too much water in monsoon (i.e., flood) to how to cope with lack of water in future.

"Lack of adequate annual monsoon water, drawdown of ground watertable and depletion of fisheries resources are the three major problems affecting the life and livelihoods of millions", said the village people of central Bangladesh. The BCAS and Leeds study team consulted the major livelihood groups including farmer, waterusers, fishers, wage labour and women from eight villages of Tangail Sadar and Kalihati thanas. The primary findings of the study hinted that ***Scarcity*** of monsoon floodwaters appeared to be the primary concern of the majority of livelihood groups. There was also a consensus of opinion regarding the consequences that result from this. These include a reduction in soil fertility due to lack of silt being deposited on their fields that replenish the soil nutrients. There is evidence they are right in terms of mechanism but not the process. Raw alluvium is relatively infertile in the short term. It contains little organic matter and provides little useable phosphorus or nitrogen. The minerals contained in river alluvium weather relatively slowly and consequently contribute to soil fertility on a long-term basis rather than in the year of their deposition. According to Brammer (Brammer, 1995) and others the fertility associated with seasonal flooding comes mainly from the flooding itself, rather than the sediments. Algae, including blue-green algae that are nitrogen fixing, grow plentifully on the submerged soil and the stems of plants in the floodwater. The algae's organic remnants fall on the soil surface and decompose, releasing nutrients to plants. The main benefit is derived by the *rabi* crops when the soils become aerated after the flood recedes.

Another problem associated with a lack of floodwaters is the decline in the amounts of fish fry, fingerlings and fish reaching the tributaries and floodplain from the permanent water bodies where breeding takes place. This has in turn led to a major decline in open water fish catches, in terms of the range of species, the total volume of fish and the size of individual fish caught. The old truism that everyone in Bangladesh is a fisherman appears less certain in the study area and elsewhere, as the effort of fishing is not matched by the rewards. People now purchase more fish on the market and/or eat less fish, with important monetary and dietary consequences.

Low water levels in the rivers and canals also cause problems in relation to the bathing of humans and livestock, and hamper farming practices. Some of the descriptions given by the respondents went into great detail. For example, the groups involving agricultural labourers all pointed out the problems relating to the retting down of jute: the process of soaking cut jute in water, leading to a gradual decay and softening of the fibres of jute, enabling the farmer to separate the jute flax, used in textiles and rope production, from the hardy wooden core which is an important fuel source. Reduced flows means that the number of locations where these activities can be undertaken is limited. Furthermore, where water levels become too low the farmers (or their hired labour) have to move the partially retted jute to new locations, an unpleasant and physically strenuous task. Indirect problems occur as a result of the jute-retting problem. The sites where sufficient water is available to achieve this have become increasingly congested and polluted.

As a result, working in these river, canals and *beels* leads to skin irritations. A further indirect problem is that the stripping of the fibre from the sap stick is preferably undertaken in relatively deep water. This avoids farmers and farm labourers having to spend long hours bent over. With the declining water levels this is no longer possible and workers are increasingly complaining of backache.

Another priority problem linked to scarcity of water, and one that was mentioned by every livelihood group and ranked in the top three, is drawdown of the water table. Again, there seems to be a consensus as to the consequences and causes of the problem and these problems are inextricably linked to those associated with the lack of floodwaters. A consequence frequently referred to is the fact that many more ponds and khals are becoming seasonal, drying up towards the end of the dry season making it difficult to bath or wash livestock. Respondents also frequently referred to this being a serious problem for people involved in fish culture, as they have to catch and eat or sell stocked fish before they fully mature.

Farmers and water sellers, the owners of shallow tubewells (STWs) and providers of irrigation water, both referred to the fact that it now takes longer to pump sufficient water to irrigate the same area of

land and therefore was more costly in terms of diesel or electricity depending on the type of pump. They said that in many cases they have had to reduce each STW's command area, the area of land supplied with irrigation water from the irrigation pump, and that drawdown often gets so bad that it is necessary for the owner to move the pump to other tubewell points within the season. As a consequence there are increasing tensions between water sellers and farmers over the amounts of irrigation water they receive.

The problem, going down of watertable, was also the primary problem identified at the FG meetings with women. All the women FGs placed this as one of the top two problems. As a consequence, the women now find it increasingly difficult to pump water out with handpumps towards the end of the dry season. The causes of this problem appear to be well understood by the community with many Focus Group Discussion highlighting over-extraction by STWs for irrigation as the prime culprit. The other reason many respondents mentioned was the lack of floodwater on the floodplain to replenish aquifers. However, this is not something that is appreciated at the national level, where conventional wisdom appears to be that there is not need to be concerned over the sustainability of groundwater supplies.

A further problem highlighted by both the male livelihood groups and the women's groups was the high levels of iron in the groundwater. This was the other most pressing issue highlighted by the women's FGs, and was mentioned by 34 out of the 42 FGs held. The women's groups ranked this as the biggest problem for them in both areas. The iron is said to result in a multitude of problems: food becomes discoloured and develops an unpleasant taste and clothing is harder to wash, becomes coloured by the iron and wears less well. Health were also cited: some people talked of gastric problems, others of the colouring of teeth whilst every group mentioned that hair washed in tubewell water becomes matted and dull.

Most farmers mentioned that use of groundwater for irrigation leads to the soil becoming coloured, hard and gradually less fertile. Iron is an important element, necessary for plants' oxidation-reduction reactions. It is also a structural component of plants. Problems related to soil iron are usually associated with lack of iron as opposed to excess and are closely linked to pH, with ferric iron solubility decreasing about 1000-fold per pH unit rise. Iron can cause problems when hydrous oxides of iron are concentrated and precipitate and eventually lead to the development of an iron pan or plinthite.

COPING STRATEGIES AND SOLUTIONS TO WATER SCARCITY

The livelihood groups went on to outline the responses or "coping strategies" that they have developed in an attempt to deal and live with the water related problems they face. All the FGs stated that the best solution to the problem of insufficient floodwater on the floodplain would be to excavate or dredge the rivers and canals leading from the Jamuna River to the two areas. Associated with this, respondents said infrastructure such as sluice gates needed to be widened and operated more effectively. Such complaints are frequent and are difficult to resolve. They are especially hard for local people, as they entail actions outside of their immediate locality and in relation to structures not under their jurisdiction. As is often the case with water resources, there are clear limits to what can be achieved through local-level interventions only.

Various coping strategies have been developed to deal with the problems associated with lack of monsoon floodwaters. Farmers with higher land have adapted new cropping patterns and now tend to plant crops such as sugarcane, bananas and timber that require less water where they previously grew rice.

Fishermen and part-time fishermen now have to go further afield to fish and tend to be concentrated on fewer water bodies, adding to competition for ever declining fish stocks and leading to disputes between village communities and professional and part-time fisherfolk. Several professional fisherfolk appear to have given up and switched primary livelihood activities, with many becoming fish traders and buying in fish from elsewhere. Others have abandoned fishing completely and own small shops and tea stalls or operate cycle rickshaws. The need to get more floodwater on the floodplain was also one of the suggestions of ways to reduce the level of drawdown of the watertable.

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