

Water: A challenge to agricultural development

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THE concept of watering regularly, at an optimum dose, the growing crop for increasing production was developed in 1960s as a component of the 'Green Revolution'. Bangladesh, along with other Asian and North and South American countries, where rice is the staple food, also applied seeds of high yielding varieties (HYV), chemical fertilizers and pesticides as other three components of the Revolution and achieved tremendous success in increasing agriculture production and productivity. Some countries like Brazil, China, India, Mexico, Pakistan, Philippines, Vietnam and Thailand have become food-grain exporters by applying the concept. Bangladesh has also achieved theoretical self-sufficiency in rice production. Farmers across the world replicated this concept also in producing high value crops including vegetables, fruits, pulses, oil-seeds and spices and earned huge dividend in those areas too. Synchronized application of the four components was the secret of the success.

Although irrigation got scientific recognition only 50 years back from now, the history of irrigation is very old. Evidence exists of irrigation in Mesopotamia and Egypt as far back as the 6th millennium BC. There is also evidence of ancient Egyptian pharaohs of the twelfth dynasty using the natural lake of the Fayûm as a reservoir to store surpluses of water for use during the dry seasons, as the lake swelled annually as caused by the annual flooding of the Nile. Developed in ancient Persia, the Qanat is among the oldest known

Irrigation can play a major role in increasing agricultural yields as researchers found that the productivity of irrigated land is about three times higher than that of rain-fed land. But it depends largely on investment in the harvest and control of water as irrigation contributes about 28 percent of the variable cost of production in Bangladesh.

irrigation methods developed and still used today. Irrigation works of ancient Sri Lanka were one of the most complex irrigation systems of the ancient world. The Sinhalese managed to build major irrigation schemes to support the agriculture which thrived at the time. The Sinhalese civilization is responsible for the invention of valve pit which remains unchanged to-date. In the Zana Valley of the Andes Mountains in Peru, archaeologists found remains of 3 irrigation canals radiocarbon dated from the 4th millennium BC, the 3rd millennium BC and the 9th century. The Indus Valley Civilization in Pakistan and North India in the 3rd millennium BC also has an early canal irrigation system. In ancient China the Dujiangyan Irrigation System was built in 250 BC which irrigated a large area and it still supplies water nowadays. Modern and high-tech version of the age-old irrigation system had been applied during Green Revolution era.

Due to spectacular achievement of the Green Revolution, some sort of fatigue has gripped the crop sub-sector; particularly the scientists and extension workers across the world including Bangladesh. Applied research has been nearly non-existent, resulting in stagnancy in agriculture production. The research work had been limited to tuning the side-effects of the Revolution including environmental and residual effect in applying chemical fertilizers and pesticides and salinity problem due to

sub-merged irrigation. Most of the countries including Bangladesh were engaged in looking for remedies of those side-effects and shifted to applying composite fertilizer replacing mono-nutrient manure to the soil, using less toxic pesticides and semi-manual 'Integrated Pest Management' methodology. As a result, farmers have been deprived of getting new varieties and technologies to increase the production more. This was continued up to 1990s. Then the world awakened, sensing production deficiency, to cope with the ever-increasing population. Bangladesh also followed suit.

In strengthening advanced agriculture research, the agriculturally developed countries specially Australia, Canada, China and USA have been involved in hybrid and bio-technological research since late 1980s to develop transgenic crops. They have developed hybrid and BT varieties of different crops including paddy, maize, vegetables, cotton and oil-seeds with 20-30% more yield than HYV. Bangladesh has also started moving, at a slow pace, in that direction. Hybrid varieties of rice, maize, potato, different vegetables are now growing in Bangladesh. Transgenic eggplant and potato are now on scientific trial. The government recently declared a national biotechnology policy to facilitate research and innovation in this area. The policy will also encourage the stakeholders taking immediate action programs for the

research and development of biotechnology in the country in various sectors like agriculture, health, industry and environment based on a priority plan. Whatever the case may be, water was, water is and water will remain inextricably linked to agricultural production and its produce. It is also crucial for sustainable development, including the preservation of our natural environment and the alleviation of poverty and hunger. It is indispensable for human health and well-being too.

Eight hundred fifty-two million people in the world are chronically hungry today. The global population is expected to increase by an additional 2 billion people by 2030 from the present 6.2 billion. Rice production has to be nearly 771 million tons as opposed to the present production of 618 million tons. 'Grow more' will then be the only way to feed the growing population and to reduce hunger and poverty. Most economies do not have the strength to import rice, wheat, pulses, edible oil etc. This is the reality for Bangladesh and all other Least Developed Countries. Irrigation can play a major role in increasing agricultural yields as researchers found that the productivity of irrigated land is about three times higher than that of rain-fed land. But it depends largely on investment in the harvest and control of water as irrigation contributes about 28 percent of the variable cost of production in Bangladesh. The FAO assessment

shows that 2700 liters of water is required to produce one kg of rice. But the rate of water consumption is over 4200 liters for one kg of rice production in Bangladesh. In other products also, Bangladesh is using more water than the FAO standards. It is revealed that agriculture is the largest consumer of the earth's freshwater, responsible for around 70 percent of all freshwater withdrawals.

Since the Green Revolution era, the freshwater scarcity has got a new dimension. In 1960s, the advent of diesel and electric motors led for the first time to systems that could pump groundwater out of major aquifers faster than it was recharged. This can lead to permanent loss of aquifer capacity, decreased water quality, ground subsidence, and other problems. Agriculture production in North China Plain, the Punjab, and the Great Plains of New Orleans and Louisiana of the US have been threatened for pumping out water faster than it was recharged. Areas like Pabna, Comilla, Kustia, Naogaon, Mymensingh, Chittagong, Joypurhat along with another 24 districts of Bangladesh have also been facing similar problems. The shallow tube-wells which cover about 68% of the irrigated land in these districts lose ability to extract groundwater during March-April period, the peak season to irrigate Boro land, due to a decrease in ground water-level. Farakka-like embankments have also been aggravating the



situation.

The major challenges of irrigation in Bangladesh are 1) insufficient surface water 2) steep competition for surface water rights 3) depletion of underground aquifers 4) ground subsidence 5) build-up of toxic salts like arsenic salts on soil surface in areas of high evaporation 6) over-irrigation because of poor distribution uniformity or management 7) inequality among farmers (caused by sharp difference in diesel and electricity price as 85 percent of about 1.3 millions water-pumps are diesel-driven).

The country's water resources are our lifeline for survival and for sustainable development. We need to increase the availability of

surface water. We need to increase irrigation coverage. We need to increase irrigation water efficiency. The concerned government agencies should take the lead to address the challenge as it needs substantial investment to build infrastructure, improve technology and development and water managers' technical capacities. The agencies should act on water harvesting through canal digging, re-excavation of the derelict canals, setting up of reservoirs etc, increasing water efficiency by applying drip, center pivot, sprinkler, lateral move irrigation replacing flooding entire fields, leaching to remove surface toxic salts, harnessing of water with upper

riparian and improving water management efficiency. It will help encourage the private sector to invest in this area in an organized way. Both public and private sector have to realize that enough water and efficient irrigation management are needed to increase agricultural production in a sustainable way. It is the growth engine for rural as well as the economic development of the country.

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TECHNOLOGY CHALLENGING POVERTY

Opportunity for the resource poor living on riverbanks

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PRACTICAL Action-Bangladesh, a UK based international NGO, has recently tested and implemented an innovative low cost technology 'Pit Cultivation' to support the river-eroded people (communities) in Gaibandha under its 'Disappearing Lands' project in collaboration with local government and administration and five local NGOs. This initiative has brought a remarkable success in food production by the resource poor households living on the edge of river -- producing a huge amount of vegetable through alternative use of the barren, infertile and unused sandbar close to the water channels as a means of alternative disaster risk reduction.

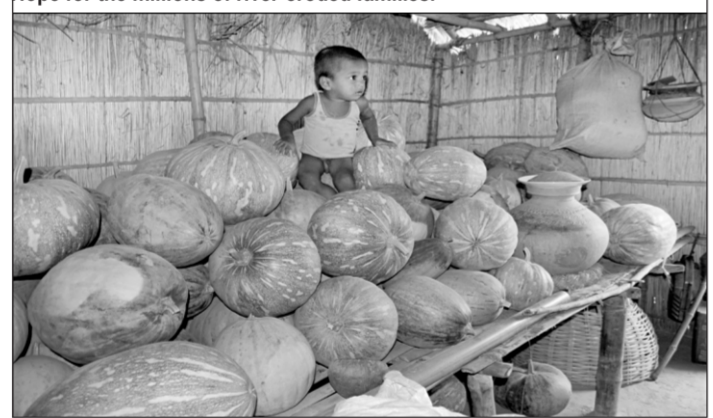
Case of Aminul

Aminul Islam is an example of success in sandbar cropping, the newly innovated technology by the project for the resource poor households. He is now an icon in the community who kicked off poverty within a season.

Aminul is now 45 years old, living with his wife and three children (one son 6 years and 2 daughters 10 years and 1 year old) in Kuruarbata village in the union of Sreepur under Sundarganj Upazilla of Gaibandha district for twelve years. Previously he lived in their own land in the same village with some arable land and other assets to earn a livelihood. Twelve years ago all his land and assets were engulfed by the river



Hope for the millions of river-eroded families.



Tista.

The nature and poverty threw him and his family in a helpless condition and there was none to seek help and assistance. He took shelter on the nearby flood protection dam in a 10-12 decimal space

without any preparation or source of finance to face the crisis. The whole family depends on his earning. He tried to sell his labour but it could not be on regular basis. The wage rate

was also very poor (Tk 40-50 per day). Some days they had to pass without food and had no access to medicine even during serious illness. Sometime he had to take loan on high interest from local money lender for family expenditure and go to sell labour outside of the district as a coping mechanism.

In this situation one day in early 2005 Aminul met with a staff of Akota, a local NGO and came to know about the project work. He expressed his desire and enlisted his name as a sand bar cropping farmer. Further he went through day-long training by the Practical Action expert and was assisted with very low cost demonstration inputs i.e. a jute sac, compost and seeds.

With technical and financial support from the project he prepared 250 pits in the sand bar. He used mainly organic fertilizer to grow vegetables/crops. On an average the estimated cost per pit is taka 50/- (including labour cost, material cost and operational cost). His cultivated crops were mainly sweet gourd and a few others i.e. squash bottle gourd, ash gourd and bitter gourd. All the time he was found very active and tried heart and soul to obtain best result by applying all he learnt from the training. He followed very carefully all the suggestions provided by the project staff and experts.

Now he is confident to continue with the sand bar cropping and very keen to reduce poverty through more earning by proper use of technology and feels free to share it with others to assist. He says, "This new technology is hope for me and my family to find ways towards better future. The project comes as a blessing for me and our helpless community."

It is noted that a total of 177 households were directly involved with the technology promotion activities from November 2005 to March 2006.

For the demonstration he provided cow dung, good soil and own labour. Seeds, quick compost and jute bag have been supported by the project. He used handmade botanical pesticide (learnt from training) for pest management. Aminul is now confident and finds out ways for additional earning to support his family with more care.

A good number of farmers come to visit his sandbar field and want to know the techniques. He feels proud to share it. He envisions that next time he would work as a community extensionist. In this regard he comments, "This technology is a grace to us. There are hundreds of hectares of unused sandbar all over the country and on the other hand, there are thousands and thousands of the landless poor living on the river banks. If these landless people use this land for crop production, it may create a revolution and can contribute significantly to national economy and also play a vital role in poverty alleviation.

The authors are directly working in the field with the communities.

Cost: Benefit Ratio: 1 : 5.95

Women should be at the centre of water supply and sanitation

MD SAIFUL HAQUE

LACK of basic sanitation and safe water is an acute problem for the women and girls who live in poor and overcrowded urban slums and in the rural areas of Bangladesh and other developing countries. Many of them have to wait to relieve themselves until dark, sometimes facing harassment and even sexual assault. In many countries including ours, school attendance by girls is lower and dropout rates are higher in schools that have no access to safe water and no separate toilet facilities for boys and girls. If these challenges are not focused on, it will negatively affect the chances of realising a number of Millennium Development Goals (MDGs).

There is a growing body of evidence that demonstrates the crucial importance of water, sanitation and hygiene (WASH) not only for human health but also for the economic and social development of communities and nations around the world.

Since 1990, over one billion people have gained access to improved drinking water and sanitation services. However, there are still 2.6 billion people who do not have sanitation facilities, and 1.1 billion people are still using water from unimproved sources.

In Bangladesh, the water supply sector in district towns and villages is mainly tubewell (hand pump) water or groundwater-based. Arsenic, a toxic element, has long been discovered in the groundwater in all the 64 districts of the country. The excessive level of arsenic present in groundwater that is widely used as drinking water and in other irrigational purposes is redefining water from 'life saver' to a 'threat.' So the nation is desperately looking for alternative sources of safe water.

And the state of sanitation is also deplorable, particularly, in a lot of metropolitan slums. These impoverished slum dwellers even do not have access to safe drinking water, let alone sanitation. They have a poor understanding of the link between poor hygiene and disease, as these people are mostly illiterate and ignorant.

The government however is claiming 72 percent sanitation coverage (as of March, 2006) in the country, which considers only latrines in the households. However, the government has committed to achieving 100 percent sanitation coverage by 2010. But in many areas the sanitation coverage is yet much below this estimated government figure.

Surprisingly, the government has almost ignored the importance of the safe water supply and sanitation (WSS) sector in the national budget 2006-07, which could aggravate the situation and delay meeting the national water supply and sanitation target (by 2010). NGOs and civil society organisations working in Bangladesh pointed out there is no separate head for WSS sector in the national budget despite it's being a crucial element in the PRSP, which has been the guiding framework of the national budget 2006-07. WSS chapter has been put in the budget merely as a sub-sector under Physical Planning, Water Supply and Housing. But there is no indication of placing women's needs, interests and perspectives at the centre of decisions about WASH promotion programmes and activities in the budget while the government is always campaigning for women empowerment.

The Annual Development Programme (ADP) shows Tk 7383.48

million as total WSS allocation, which is only 2.58 percent of the total ADP, and is equivalent to only 28 percent of the annual WSS sector investment requirement as per national Sector Development Programme (SDP). Usually, the implementation rate of the ADP is around 70 percent, which would further decrease the sector allocation. On top of all this routine widespread systemic corruption by the government ministers and people here cuts largely into public and donor funds.

WSS sector together with placing women at the centre of decisions about all WASH programmes and activities should be prioritized in the national budget as a key component of PRSP. And WSS sector allocation has at least to be doubled from its current allocation with special focus on small, remote towns. And as the level of success or failure in achieving the national WSS target and the MDGs is strongly related to the availability of local and national capacities, capacity development at national and local levels is a must in our country for maintaining and achieving the viability of investments in the sector as well as for full implementation of the ADP.

And corruption, which is the biggest barrier to the country's sustainable development, must be checked and punished severely by the Anti-Corruption Commission for the sake of the country's future sustainability.

It is usually the women and girls who suffer most. Poor hygiene, sanitation and water exacerbate poverty by reducing productivity and elevating health costs. Safe water sources near homes reduce the drudgery of fetching water for women and girls, who disproportionately bear the burden of this time-consuming activity, several hours each day.

In rural Bangladesh, urinary and vaginal infections are common amongst women who use nekra (rags) instead of sanitary towels. These are torn from old saris and are washed in unclean water before being dried in a dampened unsanitary place. It is known that laundering underclothes during menstruation requires more

water than usual.

Women's health and well being

Water, sanitation and hygiene interventions result in widespread health improvement for the whole community, by lowering the incidence of water-borne and infectious disease. This is advantageous for women, not only with regard to their own health but also because of their very important role as care-givers. Furthermore, there are specific health benefits to women, including those relating to menstruation as discussed above. Other benefits include avoiding the damage inflicted by carrying heavy loads of water over long distances, and having a more comfortable and safe experience of pregnancy and childbirth.

Pregnancy and childbirth

"Improving maternal health" is MDG five and has the target of reducing the number of women dying in childbirth by 75 percent by 2015. Easy access to safe water is known to improve maternal health, simply as pregnant and nursing women no longer have to struggle with heavy loads of water several times a day. It is known that carrying traditional water pithers on the hips can cause difficulties during pregnancy. Sickness through water-borne diseases is also avoided through use of clean water and better hygiene. Pregnant women face greater risk of hookworm infestations, which has been linked to low birth weight and inhibited child growth. A recent WHO/UNICEF study highlights the fact that access to adequate supply of good quality water for pregnant women is vitally important to protect them from serious diseases such as hepatitis. Hygienic childbirth techniques used by skilled birth attendants can avert half of all infection-related deaths.

There is evidence to show that water and sanitation services are generally more effective if women take an active role in the various stages involved in setting them up, from design and planning, through to the ongoing operations and maintenance

procedures required to make any initiative sustainable besides dealing with these technical and practical issues, women have an important role in educating their families and the community about hygiene practices. Again, evidence suggests that their involvement makes these ventures more likely to succeed.

A World Bank evaluation of 122 water projects found that the effectiveness of a project was six to seven times higher where women were involved than where they were not. The results of involving women in the design and planning stages are multiple, from reducing corruption, increasing management transparency, to better financial management and empowering women by example.

In Indonesia and Malawi, women overcame deeply entrenched prejudices about their lack of technical understanding, showing that, as primary users of water, they were the most qualified to comment on an appropriate design for a water system. And the benefits were extended to others.

Awareness raising

A key component of any WASH project is to raise awareness about the importance of carrying out safe hygienic practices. Women play a vital role in awareness raising about these issues, as they take the main responsibility for domestic duties and for developing safe and hygienic habits in children. Women also cope with the additional burden of caring for households members who become sick as a result of unsafe water and poor sanitation.

Girls' school attendance

Water and sanitation-related diseases can affect children's physical and mental development. The diseases also prevent them from going to school. 41 percent of primary school aged girls worldwide who are not enrolled at school live in South Asia, and 35 percent live in Sub-Saharan Africa. And the picture is more severe, particularly in our male-dominated Bangladesh, where girls of the impoverished segment of society are extremely deprived and exploited not only in society, but also often in their own families. These girls struggle for survival, for two meals a day. Attending school is a distant dream for them. The effect of this lack of schooling is that two thirds of all those who are illiterate in the world are women. This is despite the fact that female illiteracy has fallen worldwide from 32.6 percent in 1998 to 29.9 percent in 2002.



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General Statistics for nine sand bar spots in the project locations (harvest statistics by PNGOs):

SI	Name of NGOs	No of beneficiary	No of Sweet gourd Pit	No of Harvested Sweet gourds	No of sold Sweet gourds	No consumed by families	No distributed to relatives and friends	No of stored Sweet gourds
1	Akota	43	4070	49858	32978	3150	3060	10670
2	GUK	20	290	1300	900	287	113	0
3	PBKS	19	171	1232	385	620	129	98
4	SKS	85	1235	2223	567	1158	300	198
5	S-SUS	10	35	119	64	34	05	16
Total		177	5801	54732	34894	5249	3607	10982
Additional second harvest @ 2 sweet gourds per pit from 4000 pits of Akota				8000				
Grand Total				62732				

Production and return statistics:

Harvested cycle of sweet gourd	Total harvest of sweet gourd (in number)	Total weight in kg	Total market price @ 5 tk/kg
First harvest	54732	328392	1641960.00
Expected second harvest	8000	16000	80000.00
Total	62732	344392	1721960.00

Total production cost 50.00 x 5801 = Tk 290050.00
Net return 1721960.00 - 290050.00 = Tk 1431640.00
Average gross profit/ household 1721690/177 = Tk 9727.00
Average net profit/ household 1431640/ 177 = Tk 8088.00

Cost: Benefit Ratio: 1 : 5.95