Irrigation water distribution through underground pipelines in Barind area (ShoaibJU)

Halting seasonal drought in Barind through efficient water resource management (Bangladesh)

Barendra elakay Khara proshaman

DESCRIPTION

Introduction of sustainable water usage to prevent impacts of seasonal droughts in Barind region, Bangladesh

Barind is a drought-affected area of Bangladesh. It covers about 7,770 sq. km, that is 41% of the North Western part of Bangladesh, spreading over 16 districts of Rajshahi and Rangpur Division. It is one of the driest areas in Bangladesh with comparatively high temperatures - though cooler in the wet season from mid-June to October. Rainfall in the area varies from about 1500 mm to 2000 mm per annum. Temperature ranges from 4 degree Celsius to 44 degree Celsius. The area is at a comparatively higher elevation than the adjoining floodplains. There are two main terrace levels - one at 40m and the other between 19.8 and 22.9 m above mean sea level. The total cultivable area of Barind is about 583,000 ha, of which 34% is loamy, 10% is sandy, and 49% is clay: the remaining 7% is of other composition.
In the 1980s, the area was predominantly single cropped, and yields were poor and subject to seasonal drought, from late February to early May (up to the onset of pre-monsoon). No crops could be grown during the "rabi" season (November to May). The impacts of drought were severe and affected food insecurity and livelihoods. To address the situation, the Bangladesh Agricultural Development Corporation (BADC) under the Ministry of Agriculture (MoA) initiated two projects. One in 1985: The Barind Integrated Area Development Project and subsequently in 1992, the Barind Multipurpose Development Authority (BMDA) as a separate institutional entity. Both the projects focused on a new approach to water extraction, distribution and management practices at institutional level. Deep tubewells were installed and maintained by BMDA, rather than privately (which is often practiced in other parts of the country).
Deep tubewells (DTWs) were installed to abstract water from 15-20 meters, and water was initially distributed through open channels. Later, these were fitted with smart card–operated electric/solar pumps to develop a drought-resilient irrigation system Both projects have helped the Barind region reduce poverty and achieve self-sufficiency in rice. Without supplementary irrigation, there would be crop failure.
Since it was established, BMDA has focused on halting seasonal drought in Barind, and increased cropping intensity by providing irrigation through 15,800 DTWs in different districts. That reduced the cost of irrigation water for one bigha (0.1ha) from about $40 to <$20. On the other hand initiation of smart cards and buried pipelines for water distribution increased the efficiency of water use and facilitated revenue collection by the BMDA. However abstraction of groundwater (GW) for irrigation triggered another issue - drawdown of GW in the area, which even led to abandoning shallow tubewells (STW) used for drinking water.
In 2004 BMDA initiated another project, to lift surface water from the Padma river to ponds/canals/rivers in the main land after re-excavation. These sources are used as reservoirs and at the same time contribute to GW recharge generally. At the same time, usage of solar power instead of electricity is another means of reducing the cost of pumping

LOCATION

Location: Rajshahi, Bangladesh

Geo-reference of selected sites

- 88.34253, 24.48579
- 88.45635, 25.02787
- 88.46016, 25.02759
- 88.5005, 25.0698
- 88.59865, 25.11608

Initiation date: 1992

Year of termination: n.a.

Type of Approach

- ☐ traditional/ indigenous
- ☐ recent local initiative/ innovative
- ☑ project/ programme based

water.
BMDA again installed 490 dugwells where STW or DTW could not be constructed. These dug wells are used for safe drinking water and small-scale irrigation. These measures have meant that, at present, the area avoids seasonal drought in most of the locations. Potatoes, "boro" and transplanted "aman" occupy more than 50% of the cultivable land. In addition, provision of safe drinking water and improved communications have boosted the local economy. The approach embraces various technologies including (1) tapping river water (from the Ganges, Mahananda and Tangan rivers0; (2) storing water in creeks or ponds; (3) distribution to farm land through subsurface irrigation pipes (buried pipelines); (4) use of low lift pumps (LLP) with solar energy support ; (5) prepaid water metering - usage of smart cards; (6) conversion of derelict water bodies to become effective water reservoirs ; (7) dug wells with solar power for water abstraction; (8) orchard plantations where both surface or groundwater are limited; (9) plantations of trees and horticultural crops along road and channels to change the land cover; (10) usage of compost to improve soil health. All of these contribute to land degradation neutrality (LDN) in one way or another.
Finally BMDA's approach is to boost productivity in the drought affected Barind through its projects, and encouraged communities to adopt diversified land use: previously much land remained fallow during most of the year outside the monsoon. Institutions like Department of Agricultural Extension (DAE) and many NGOs promote a variety of seasonal, annual and perennial crops in the area, the use of balanced fertilizer, plantation of high density fruit crops. The impact of the BMDA approach has greatly changed the drought-affected Barind.

Buried pipeline in Barind. (ShoaibJU)


Solar powered dug well, used to support small-scale irrigation and safe drinking water for the community (ShoaibJU)

APPROACH AIMS AND ENABLING ENVIRONMENT

Main aims / objectives of the approach

To provide irrigation water for cropping in dry season.
To increase cropping intensity in drought affected areas of Barind.
To manage land use or land cover in Barind.
To mobilize community on rational usage of soil and water resources.

Conditions enabling the implementation of the Technology/ ies applied under the Approach

- **Social/ cultural/ religious norms and values**: Increased livelihood options and access to education, marketing, health services.
- **Availability/ access to financial resources and services**: Increased access to financial institution.
- **Institutional setting**: All technical support provided by BMDA.
- **Collaboration/ coordination of actors**: BMDA supports all action in related to irrigation, maintenance, water supply etc.
- **Legal framework (land tenure, land and water use rights)**: Lands owned by land users
- **Policies**: Land users are in the line of BMDA policies.
- **Land governance (decision-making, implementation and enforcement)**: Traditional approach.
- **Knowledge about SLM, access to technical support**: Community has access to technical support.
- **Markets (to purchase inputs, sell products) and prices**: All inputs are available in the area.
- **Workload, availability of manpower**: Available, people are getting work now.

Conditions hindering the implementation of the Technology/ ies applied under the Approach

PARTICIPATION AND ROLES OF STAKEHOLDERS INVOLVED

Stakeholders involved in the Approach and their roles

What stakeholders / implementing bodies were involved in the Approach?	Specify stakeholders	Describe roles of stakeholders

local land users/ local communities	Men and women are involved in the process	Growing crops as of their choice, for example: rice, fruits, vegetables or orchard trees.
community-based organizations	Farmers have societies,	Influenced in choice of crops, etc.
NGO	Several NGO s are functional in the area.	Most of them are supporting credit and marketing facilities
local government	Local institutions involved in the process	Capacity building, advisory services on fertilizer usage, crop selection etc.

Lead agency
BMDA is working as lead agency

Involvement of local land users/ local communities in the different phases of the Approach

	none	passive	external support	interactive	self-mobilization	
initiation/ motivation		✓				Farmers are using irrigation water for their crops supplied by BMDA and they pay revenue
planning		✓				Farmer nor the community are involved in the planning process
implementation		✓				Land users allow to set buried pipelines under their fields.
monitoring/ evaluation		✓				Land users are not involved in the M&E but they participate in the events organized.
None	✓					Land users only choose their crops to be grown

Flow chart

Barind Multipurpose Development Authoroty (BMDA) is the symbol of development in Barind area also of the Tista floodplain and the Old Himalayan piedmont plain.

Author: ShoaibJU

Decision-making on the selection of SLM Technology

Decisions were taken by
- land users alone (self-initiative)
- ✓ mainly land users, supported by SLM specialists
- all relevant actors, as part of a participatory approach
- mainly SLM specialists, following consultation with land users
- SLM specialists alone
- politicians/ leaders

Decisions were made based on
- ✓ evaluation of well-documented SLM knowledge (evidence-based decision-making)
- ✓ research findings
- ✓ personal experience and opinions (undocumented)

TECHNICAL SUPPORT, CAPACITY BUILDING, AND KNOWLEDGE MANAGEMENT

The following activities or services have been part of the approach
- ✓ Capacity building/ training
- ✓ Advisory service
- ✓ Institution strengthening (organizational development)
- ✓ Monitoring and evaluation
- Research

Capacity building/ training

Training was provided to the following stakeholders
- ✓ land users
- ✓ field staff/ advisers

Form of training
- ✓ on-the-job
- farmer-to-farmer
- ✓ demonstration areas
- public meetings
- courses

Subjects covered

Buried pipeline maitenance, good seed production, marketing etc.

Advisory service

Advisory service was provided
- on land users' fields
- ✓ at permanent centres

BMDA has field offices at each upazila to look after the system

Institution strengthening

Institutions have been strengthened / established

- [ ] no
- [ ] yes, a little
- [ ] yes, moderately
- [x] yes, greatly

at the following level

- [x] local
- [x] regional
- [ ] national

Describe institution, roles and responsibilities, members, etc.

BMDA has it headquarters at Rajshai city and sub-offices at all "upazila" to where the pipeline extended.

Type of support

- [ ] financial
- [x] capacity building/ training
- [x] equipment

Further details

Monitoring and evaluation

BMDA monitors groundwater levels regularly, and also the pipelines and other operational activities.

FINANCING AND EXTERNAL MATERIAL SUPPORT

Annual budget in USD for the SLM component

- [ ] < 2,000
- [ ] 2,000-10,000
- [x] 10,000-100,000
- [ ] 100,000-1,000,000
- [ ] > 1,000,000

Precise annual budget: n.a.

The following services or incentives have been provided to land users

- [x] Financial/ material support provided to land users
- [x] Subsidies for specific inputs
- [ ] Credit
- [x] Other incentives or instruments

Financial/ material support provided to land users

All infrastructural establishment cost were born by BMDA

	partly financed	fully financed
equipment: machinery		✓
equipment: machinery: tools		✓
construction: stone		✓
infrastructure: roads		✓

Labour by land users was

- [ ] voluntary
- [ ] food-for-work
- [ ] paid in cash
- [ ] rewarded with other material support

Other incentives or instruments

Installation and maintenance cost borne by BMDA, but farmers have to pay for water through smart cards (Pre-paid).

IMPACT ANALYSIS AND CONCLUDING STATEMENTS

Impacts of the Approach

	No	Yes, little	Yes, moderately	Yes, greatly
Did the Approach empower local land users, improve stakeholder participation? Farmers are using irrigation water for their crops				✓
Did the Approach enable evidence-based decision-making? As of now buried pipe lines for irrigation water supply are being adopting in many areas of the country.				✓
Did the Approach help land users to implement and maintain SLM Technologies? Usage of water rationally: BMDA installs control meters for each of the land user.			✓	
Did the Approach improve coordination and cost-effective implementation of SLM? The approach has changed the Barind ecosystem at large.				✓
Did the Approach improve knowledge and capacities of land users to implement SLM? Land users enable to use irrigation water for growing crops of their choice				✓
Did the Approach improve knowledge and capacities of other stakeholders? Other local institutions in Barind area are involved in the system.				✓

Did the Approach build/ strengthen institutions, collaboration between stakeholders?
Adoption of the irrigation system at all areas of the Barind.

Did the Approach mitigate conflicts?
Stakeholders are enable to use water as they like.

Did the Approach empower socially and economically disadvantaged groups?
The area was resource poor before the 1990s. Now livelihoods of the community improved largely.

Did the Approach improve gender equality and empower women and girls?
Man and women are engaged themselves in their land and crops.

Did the Approach encourage young people/ the next generation of land users to engage in SLM?
Interventions with new crops, specially high value fruits etc in the area.

Did the Approach improve issues of land tenure/ user rights that hindered implementation of SLM Technologies?
Land tenure system is traditional, where large areas are sublet or leased to the individuals or groups by the land owners.

Did the Approach lead to improved food security/ improved nutrition?
The area produces a large amount of cereals, potatoes, vegetables, fruits etc.

Did the Approach improve access to markets?
Fruits and paddy rice have good markets.

Did the Approach lead to improved access to water and sanitation?
Safe drinking water where tubewells do not function, and sanitation also developed as the system.

Did the Approach lead to more sustainable use/ sources of energy?
Using solar power to abstract dug well water greatly facilitates the community.

Did the Approach improve the capacity of the land users to adapt to climate changes/ extremes and mitigate climate related disasters?
Vegetative cover in the Barind has changed the ecosystem at large.

Did the Approach lead to employment, income opportunities?
Local people are having work everywhere of the Barind.

Main motivation of land users to implement SLM

- [x] increased production
- [x] increased profit(ability), improved cost-benefit-ratio
- [x] reduced land degradation
- [x] reduced risk of disasters
- [ ] reduced workload
- [ ] payments/ subsidies
- [x] rules and regulations (fines)/ enforcement
- [x] prestige, social pressure/ social cohesion
- [ ] affiliation to movement/ project/ group/ networks
- [x] environmental consciousness
- [ ] customs and beliefs, morals
- [ ] enhanced SLM knowledge and skills
- [ ] aesthetic improvement
- [ ] conflict mitigation

Sustainability of Approach activities

Can the land users sustain what hat been implemented through the Approach (without external support)?

- [ ] no
- [x] yes
- [ ] uncertain

Buried pipeline irrigation has changed the Barind area greatly.

CONCLUSIONS AND LESSONS LEARNT

Strengths: land user's view

- More crops could be grown throughout the year,
- Crop diversity is possible, annual, perenial or seasonal
- Secure crop production

Strengths: compiler's or other key resource person's view

- Minimum loss of irrigation water
- Surface (river) water usage minimize stress on ground water usage
- Improved ground water recharge
- Safe drinking water where tubewell is not available.
- Usage of solar power for lifting water from dug well or for lifting water to buried pipeline
- Introduction of water meters reduces misuse of irrigation water

Weaknesses/ disadvantages/ risks: land user's viewhow to overcome

- The system could be implemented at single farmer level Developing community approach with the support of the government

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's viewhow to overcome

- Very high pressure on land and soil resources Lower water consumptive crops could be introduced
- Severe soil nutrient depletion may develop Use of manure/ compost or organic matter or crop rotation to enrich soil

REFERENCES

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Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/approaches/view/approaches_6143/

Linked SLM data
n.a.

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Links to relevant information which is available online
- Baring Multipupose Development Authority: http://www.bmda.gov.bd/site/page/2ea693ba-ac10-4ada-b304-111d72a72105/-#
- Pro-Poor Groundwater Development: https://openknowledge.worldbank.org/bitstream/handle/10986/33246/Pro-Poor-Groundwater-Development-The-Case-of-the-Barind-Experiment-in-Bangladesh.pdf?sequence=5