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Unlocking the farming potential in Bangladesh' polders.

Lessons from community water management initiative for improved food security, nutrition and livelihoods in the polders of the coastal zone of Bangladesh

Overview

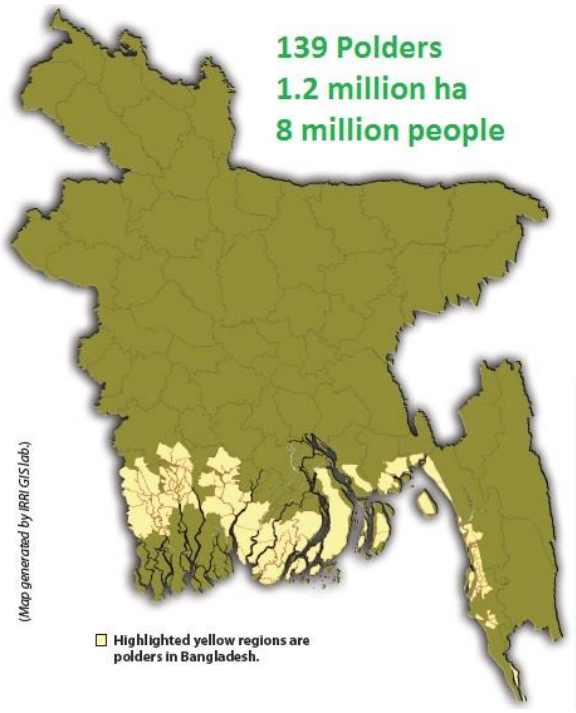
About 8 million people live in the 139 polders constructed in the 1960/70s in the Ganges delta in Southern Bangladesh. These represent 1.2 million hectares of low lying farmland highly vulnerable to flooding, saline water intrusion and other cyclones. Despite huge investment in the polders, agricultural productivity is much lower here than the rest of the country and farming families suffer from food and nutrition insecurity and poverty.

Opportunities exist for increasing food security in the polders through enhanced water and crop management. A pilot project in Katakhali sub-polder demonstrated that a community-managed drainage system significantly reduces water logging risks due to the frequent excessive pre-monsoon rainfalls in farmers' fields. This improved water management in the polder zones enables the use of high yielding (HYV) early maturing rice varieties to replace traditional varieties, followed by the cultivation of dry season crops like sunflower and maize. The integration of fish culture with rice during the wet season could also improve food production and household incomes.

Such improved farming systems offer livelihood opportunities for youth and women, with for instance the establishment of rice mat nurseries, use of rice transplanters and homestead sunflower oil production.

Recommendations

- Promote a community-based drainage system, organized by catchment area for each sluice gate, for all 139 polders.
- Work with communities to form at least one water management group federated around a clearly delimited "sluice gate watershed", to develop a tailored plan for an improved drainage system. This includes sluice gate operation timing and mobilization of each farmer to dig field drainage channels.
- Once the drainage system is implemented, support demonstrations for improved cropping systems (HYV rice, maize/sunflower rabi crops).
- Set up at least one community group per polder to be trained for rice-fish integrated systems for demonstration purposes.
- Improve market access to ensure polder communities benefit from the productivity increase.
- Support initiatives to scale up new livelihoods opportunities for women and youth. Further action research needed to test business and organization models that engage with vulnerable groups including women, and overcome local barriers against them.



Research aims

The population living in the Ganges delta are highly vulnerable to multiple climate risks from sea levels rising due to climate change, floods and cyclones. In the 1960-70s, the Bangladesh government constructed 139 polders with embankments, sluice gates and other infrastructure to better control tidal flooding, and boost the productivity of over 1 million hectares of low lying farmland. Despite such investment, most of these farmers continued having poor harvests of traditional long-maturing rice varieties.

They also struggle to cultivate a second crop during the dry season. Consequently, the 8 million people living in these polders experience serious food and nutrition insecurity and extreme poverty. Youth often do not see a future in agriculture and there is significant outmigration from this region. This research aimed to study what low-cost, community-based solutions could boost farm productivity and livelihoods prospects for the farming communities of these polders.

Research Findings:

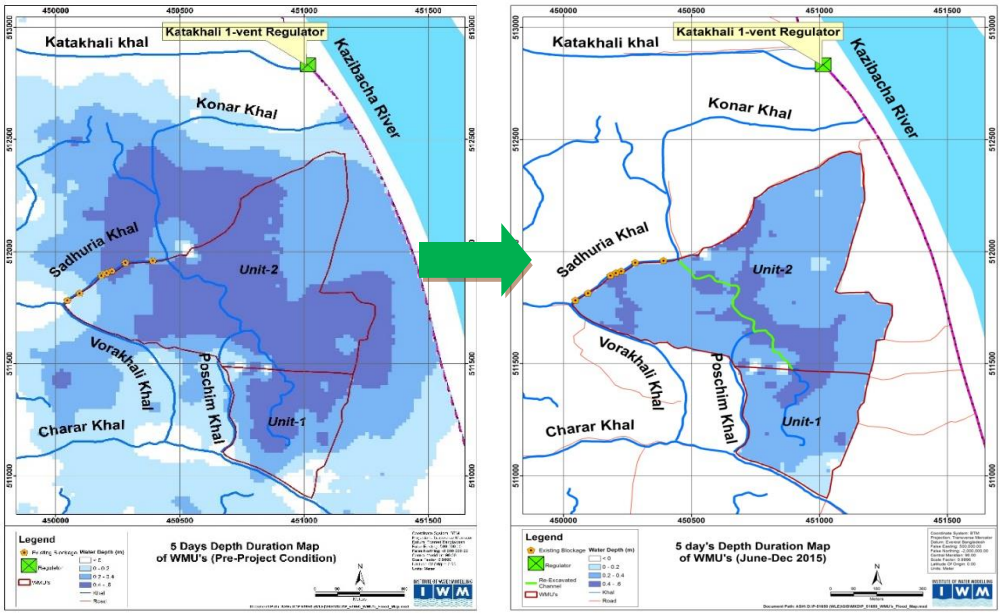
Local cropping systems expose farmers to severe dry season crop losses from waterlogging:

Figure 1Traditional rice transplanting in knee-high flooded polder fields.

Farmers grow traditional rice varieties (Fig 1) during the wet season from July to December with an average 2 to 3 ton/ha yield. As fields do not dry quickly, they sow a second crop (usually sesame and mungbean) from March to June, after a 2 month fallow period. This dry season crop is often damaged by pre-monsoon rainfalls (2-3 times every 5 years). In the last 4 years, all second crops were destroyed. This research study found that poor drainage, rather than salinity intrusion, is the main cause of the poor productivity of these farms.

Community-based drainage system enables adoption of improved farming systems

Katakhali sub-polder was selected to test an improved community-managed drainage system, as the Dutch-funded Blue Gold Development Programme works there to establish Water Management Organisations (WMO) with the community. Training and mentoring of WMO officials allowed systematic sluice gate operation at low tide, and farmers were encouraged to dig field drainage channels. Collaboration between Blue Gold and the WLE project allowed desilting of the original drainage system and repair of existing culverts.



From 60% land with over 40mm water depth to less than 20%

Fig 3 Managing water level in WMO4 for HYV aman rice culture

Figure 2 Farmers digging drains in waterlogged sunflower field on 25 Feb 2016

Rice yield gain of over 2 ton/ha and a second crop is possible in the dry season.

High yielding *aman* rice cultivation is now possible as excess water is drained out. 4 to 5.5 ton/ha of rice was harvested one month earlier than usual, at the end of November. Soil drying is fast, allowing early establishment of dry season crops in early December without a fallow period. The 100mm excess rainfall experienced at the end of February 2016 was drained out in less than a week. Sunflower and maize crops were saved, while other rabi crops were destroyed.

Rice-fish integration can improve family nutrition and incomes

Fish naturally occur in rice fields but productivity is very low as they are considered public goods and there is no incentive for individuals to practice improved aquaculture. Usual practice is that landless fishermen catch fish with small hanging nets and bamboo traps called *bana*.

The project demonstrated that collective fish culture within a well-defined Water Management Unit (WMU), can produce significantly more fish, is a profitable activity for men and women of this community, improves nutrition and reduces weeding costs in rice production (eg carp species that feed on rice weeds).

Such WMUs should have canals and depressions where fish can take refuge when the water level in rice fields is low. A fish production plan has to be defined with the beneficiary group, with roles and responsibilities for each member, eg supplementary feeding done by women (fig 4) or night watch teams made up of men. In the 18 ha Bhennabunia village WMU, 63 families were trained including 35 land owners, 13 landless and 15 tenant farmers. They stocked about 4 tons of carp and tilapia fingerlings in the canals two weeks after rice transplanting. They harvested 3.5 tons fish, sold about 3 tons and distributed 500 kg for home consumption for 150 households, including neighbouring villages. Some fish were left in the internal canal for natural restocking for the next season.

Such rice-fish integration is simple to implement. However, the community group has to function well so that every member plays his/her role and that benefit-sharing is fair and transparent.

The main challenge is to convince the target community beforehand, on profit sharing and yield distribution to all, including landless. There is a great potential for increased fish production as there are many suitable WMUs with canals and depressions and the fish market is well developed in this region.

Figure 4 Distribution of supplementary fish feed (rice husk) by woman – women can be involved in fish culture as a new livelihood opportunity

Need to develop opportunities for women and youth

Figure 5 Rice mat nursery preparation. A potential business model for youth and women in polders adopting modern rice culture.

Women in these polders have very limited livelihood opportunities because of heavy homestead workload and societal norms that restrict their engagement in public life (eg marketing produce is seen as socially unacceptable). Young men are now reluctant to work in agriculture migrating out of their villages and causing labour scarcity.

The adoption of rice transplanting machines and rice mat nursery preparation will help address the current labour scarcity, free some time for women and make farming more attractive to the young generation. New income-generating activities such as sunflower oil production and marketing, fish culture, vegetable farming, setting up of rice transplanting machinery cooperatives open to women and youth have to be explored and tested.

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Conclusion and recommendations

"Whatever science brings, you cannot save the crops!" This was the overall feeling from the community when the research started. The project results have since contradicted this initial statement. It is possible to grow early maturing high yielding rice varieties followed by successful *rabi* crops like maize and sunflower in the low to mid salinity polders. To adopt this improved farming system, community groups have to be mobilized and trained to timely and efficiently manage the drainage of excess water at key stages, like pre-monsoon rains, to speed rice harvest and save dry season crops. Organising farmers by catchment area of each sluice gate enables more efficient water management. When "the watershed" is bounded on all sides, it also helps improve the fish culture system as it ensures efforts from the community are fairly shared.

There is a high potential for impact if this approach is scaled up to other suitable polders, as many communities face the same challenges of poor drainage, waterlogging risks and the need to wait a long time for the field to dry out after paddy harvest before planting the second crop. Successful scale up relies on good collaboration between research and development organisations to tailor the appropriate technologies to each polder zone, and the capacity of the community to work together.

Opportunities exist to improve family nutrition and livelihood prospects for youth and women. Attention should be given to find the appropriate business and organisation models to extend the pilot activities demonstrated during the project like sunflower oil production, mat nursery, use of transplanting machinery and fish production and marketing.

Impact of community water management in the polders

Early maturing HYV rice (4 to 5.5 ton/ha): 2 more tons of rice per hectare compared to the traditional way

Collective fish culture during wet season (200kg/ha)

Waterlogging avoided: farmers could harvest dry season crop of maize (6 ton/ha) & sunflower (1 t/ha)

Successful community management

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