The keys to unlocking production ...

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zone of Bangladesh is rich in water resources that could be used to greatly increase the land and water productivity of the coastal zone.

Productivity and food security

Most of the world's rice production takes place in the Asian mega deltas, where large areas of rice land are subjected to stagnant flooding: 0.3–0.5 m water depth for prolonged periods (several weeks to several months) during the monsoon. Due to stagnant flooding, most farmers of the coastal zone of Bangladesh grow a single rice crop (aman) during the rainy season using tall, photoperiod-sensitive, local landraces, which can survive stagnant flooding, but have low yield (2.0-3.5 t/ha) and mature late (growth duration: 155-170 d). The aman crop is often followed by a late sown, low input and low yielding rabi crop (0.5-1.0 t/ha), but with severe damage or crop failure in about 40% of the years due to the pre-monsoon rains and cyclones in May. Thus, much of the coastal zone remains as fallow land for 3 to 7 months every year. However, there is huge scope for increasing cropping system productivity in the coastal zone.

Salinity is commonly perceived to be the main reason for non-adoption of improved agricultural technologies in the coastal zone. In reality, most rivers in the south-central coastal zone (Barisal division) remain non-saline throughout the year, while that in south-west Khulna and Bagerhat Districts remains suitable from July to mid-February. Research results showed the feasibility of intensifying high yielding aus-aman-boro and aus-aman-rabi cropping systems in the south-central, and aman-boro, aman-rabi and aman-shrimp cropping systems in the south-west zone of Bangladesh, yielding 2-3 times higher (10-15 t/ha/yr) productivity than the current farmers' practice of utilising river water resources of the coastal zone.

Since the cropping intensity and productivity in other parts of Bangladesh are already high, the under-utilised agricultural lands of the coastal zone may well be the only region where significant gains in food production can be made to address future challenges of food security in Bangladesh. Achieving this will require a new paradigm with fundamental changes in thinking about the polders and their roles, with due attention given to infrastructure inside the polders and special emphasis on drainage from the coastal polders of Bangladesh.

Major challenges of adopting improved technologies for food security

The major constraint of adopting improved agricultural technologies is the water-logging, not the salinity. The researchers have developed salt-tolerant crop varieties and high water salinity is the blessing for shrimp farming. The key pre-requisite to enable cultivation of high yielding rice and rabi crops is drainage during the aman season and in early November prior to aman harvest and community co-ordination to facilitate wide scale adoption of improved agricultural technologies in polder ecosystem of the coastal zone of Bangladesh. This can easily be achieved by systematic operation of sluice gates in the coastal polders, synchronising with high and low tides. At low tide (twice daily), river water levels are usually lower than the land level within the polders, creating the opportunity for drainage by gravity of excess water to a level, which would allow good growth and yield of HYV aman rice. Drainage shortly prior to aman harvest would allow the soil to dry sufficiently for timely establishment of rabi crops. Late establishment results in damage or destruction of the rabi crops by pre-monsoon rainfall and cyclones in May, that usually occur at least once in 2-3 years. However, these opportunities have not yet been recognised.

The hydrology of the coastal zone is quite different from other parts of Bangladesh. It is governed by the lunar tidal phenomenon and man-made sluice gates in the polder ecosystem. In the coastal zone, high and low tides occur twice daily. Management of huge volume of tidal water is beyond the control of an individual demands for community coordination. In contrast, management of groundwater and rainfall is relatively easy for an individual farmer in other parts of Bangladesh. Research results demonstrated that individuals alone cannot successfully modify their cropping system schedule and adopt improved agricultural technologies due to the prevailing hydrology in the polders. Adoption of improved technologies requires synchronised cropping patterns among farmers within community water management units and community coordination at a range of scales – within small hydrological units, within a sub-polder based on the catchment area of a sluice gate, and finally at the polder scale. Until this is addressed, farming communities of the polders of the coastal zone will not be able to adapt and benefit from the green revolution technologies that much of Bangladesh benefits from.

The Bangladesh Water Development Board (BWDB) is responsible for water resources management in the coastal zone through community participation and formatting of Water Management Organizations (WMO). The WMOs need to be empowered with improved knowledge on both water management and appropriate agricultural technologies for their sustainability. They could be linked with the Department of Agricultural Extension (DAE), who have a wide network at the grassroots level for nurturing and empowering WMOs for adopting improved and climate resilient agricultural technologies that might enhance food security and improve livelihoods of the coastal zone communities of Bangladesh.

Concluding remarks

While tens of millions of dollars are invested in improving the infrastructure of the polders of the coastal zone each year, the cropping intensity and productivity of this zone is much lower than other parts of Bangladesh. However, over the past 50 years there have been tremendous improvements in agricultural technologies. Bangladesh has achieved self-sufficiency in rice using these green revolution technologies. But the coastal zone has been left far behind the rest of Bangladesh with the misperception that green revolution technologies cannot be adopted due to salinity.

But it is possible to greatly increase cropping system productivity of the coastal zone, using improved agricultural technologies and good water management, in particular, drainage. The possibility of reducing drainage congestion for growing HYV aman, and for advancing and diversifying rabi cropping, has not yet been recognised by policy makers, water management and agricultural extension authorities, and the millions of farming families living inside the polders. Research proved that with appropriate operation of the sluice gates, excess water can be drained from inside the polders during low tide within a few days to enable the cultivation of HYV aman. Furthermore, timely drainage shortly before rice harvest hastened soil drying and allowed early establishment of rabi crops. Early sowing meant that the rabi crops were harvested by the end of April, before the onset of the pre-monsoon rains and the May cyclones. Moreover, fresh tidal water in the south-central coastal zone can be utilised for aus and aman rice cultivation though systematic operation of the sluice gates by the WMOs. Thus the yearly productivity could be increased 2-3 times more than the present farmers' practice.

To harness the production potential of the polders of the coastal zone, the catchment area of each sluice gate needs to be delineated and hydrologically separated from other catchments of the polder, taking advantage of existing infrastructure (roads) and separating lands of different elevation with small levees. Crop and water management need to be synchronised based on the hydrological units and management of the sluice gates with particular emphasis on empowering WMOs and communities to enable them to take advantage of the available water resources and agricultural opportunities for food security and improved livelihoods of the vulnerable coastal zone communities of Bangladesh. Community water management and cropping system synchronisation are therefore essential to harness benefit from the tremendous opportunities of the coastal zone of Bangladesh. Since cropping intensity and productivity in other parts of Bangladesh are already high, the under-utilised agricultural lands of the coastal zone may well be the only region where significant gains in food production can be made to address future challenges of food security in Bangladesh.

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