

The keys to unlocking production potentials of the coastal zone

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The coastal zone of Bangladesh is the most vulnerable region of the Ganges basin. Occupying about 30% of the country's land area, it is home to the world's poorest and most food-insecure people, whose livelihoods primarily depend on agriculture and aquaculture. It comprises of low lying lands with a dense network of rivers and canals (khals). The rivers of the coastal zone of Bangladesh are tidal, exhibiting two high tides and two low tides per day. The tidal range is two to three metres during spring tide in the dry season. The tidal effect penetrates up to 150 km inland, resulting in the inundation of adjacent lands. Therefore, about 1.2 Mha of the agricultural lands of the coastal zone of Bangladesh were poldered during the 1960s and 1970s to prevent inundation and saline water intrusion, creating scope for increasing agricultural productivity through improved water management. Despite huge investment in the polders of the coastal zone over the past 50 years, crop productivity remains much lower than in most of Bangladesh. However, there are tremendous opportunities to increase the productivity of the land and water resources within the polders through the use of improved and climate-resilient agricultural technologies and practices.

What is polder?
Poldering involves building large embankments around the perimeter of the islands formed between the criss-

cross of rivers in the delta. Inside the polders, there are also dense, natural networks of canals, and some of the large internal canals are connected to the surrounding rivers by sluice gates installed in the polder embankment. Thus a polder typically has three elements—the embankment surrounding it that keeps the water out from the surrounding rivers, the drainage canals inside the polders that remove the excess water at low tide and store fresh water at high tide for irrigation, and sluice gates that are opened to drain out water from the polder at low tide and to take in water at high tide for irrigation during times of water shortage or drought.

River water resources in the coastal zone
Rivers are the life and livelihood of the coastal people of Bangladesh. The south-central region (Barisal division) receives a huge volume of water from the lower Meghna river through the Tentulia, Bishkhali and Burishwar (Payra) rivers. The area also receives water flow from the Padma river through Arial Khan river. Khan and co-authors reported that salinity in the lower Meghna remains less than 3 dS/m during the dry season, considered suitable for crop irrigation. It will remain suitable for irrigation even under moderate climate change scenario A1B and with 22 cm sea level rise until 2030. The flow in the lower Meghna during the dry season is enormous since it carries the combined flow of the Ganges, Brahmaputra, and upper Meghna rivers. The average daily flow from February to March is about



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24,000 m³/s. In contrast, the main source of fresh water in south-west (Khulna division) is the Ganges river. The dry season flow in the Gorai river depends on the available flow from the Ganges. The average daily flow rate in the Gorai river during November 2011 to April 2012 was 261 m³/s, while the maximum instantaneous rate was about 693 m³/s. The flow during November to April is vital in pushing the salinity front downstream and enhancing the fresh water areas in the river for dry season irrigation, domestic and industrial uses. Water availability and salinity are considered the major constraints to crop productivity in this

region in the dry season, but can effectively be used for shrimp farming. Field observations showed that the river water salinity remained below 1 dS/m throughout the year in much of Barisal division and the same is true of the simulated salinity. Khan and co-authors reported that the simulated monthly mean daily flow in the Burishwar (Payra) river varied from 5,400 to 6,300 m³/s. It is thus evident that much of Barisal division has abundant fresh water available for irrigation, aquaculture, industrial and domestic uses throughout the year. In contrast, simulation and monitoring data showed a limited area with avail-

able fresh water in March in Khulna division. Salinity in most rivers of Khulna and Bagerhat districts started to increase from December and reached the peak (20-25 dS/m) in April/May, decreased rapidly in June and remained below 4 dS/m until mid-February. The simulated monthly mean daily water flow rate in the Kazibacha-Passur river ranges from 3,700 to 5,300 m³/s. The river water can thus be used for irrigation from June to mid-February directly from the river during high tide. In addition, non-saline river water can be stored in the internal drainage canals inside the polder to irrigate crops in the later part of dry season. It is reported that 25-30% of the cultivable area in polder 30 in Batiaghata upazila could be brought under boro rice cultivation in the dry season using the internal storage of the polder. The cropped area could be much higher if low water-requiring rabi crops or salt-tolerant HYV rice are grown in the dry season. Scarcity of fresh water is acute in Satkhira district. River water salinity remains above 4 dS/m throughout the year and the peaks to about 35 dS/m. Such high salinity is due to the absence of the freshwater flow from the upstream since the Kobadak and Betna rivers have been cut-off from the Ganges. Thus, the river water is never suitable for irrigation of dry season crops; however, it is a valuable resource for shrimp cultivation. It is therefore, evident that the coastal

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