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Agrarian Straightjacket: Constraints to Achieve Yield Potential in Rice

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Abstract

The coastal zone of Bangladesh is the most vulnerable region of the eastern Ganges basin, occupies about 30% (46,000 km²) of the country's land area and is home to some of the world's poorest and most food insecure 39 million people, whose livelihoods depend primarily on agriculture and aquaculture. Key challenges to both agricultural and aquacultural productivity include excessive flooding during the rainy season, lack of access to fresh water and soil salinity during the dry season, and severe cyclonic storms and tidal surges throughout the year. These challenges will be exacerbated as a result of climate change and is expected to leave the communities most vulnerable and food insecure in the coming years.

The government of Bangladesh (GoB) has constructed 135 polders in the coastal regions of the country 50-60 years back to prevent tidal surge and saline water intrusion to facilitate traditional aman rice cultivation that generally do not need appreciable drainage and fertilizer application for optimum yield (about 3 t/ha). But with the increase in population, the demand for food has increased and the role of the polders needs to be redefined for higher land productivity. The good news from research over the past few years is that there is tremendous potential to improve food security and livelihoods through the adoption of new varieties, timely crop establishment, improved management, and cropping system intensification and diversification. However, these new options cannot reach their potential unless there is a fundamental change in how polders are viewed and managed, and as a result, how investments are allocated. The four key investment needs identified are:

1. Invest in polder water management, especially drainage – this is the key to increasing the productivity of both agriculture and aquaculture.
2. View each polder as an integrated water management unit – each polder needs to be considered as an integrated water management unit, serving the production systems, rather than simply as a structural unit comprising the surrounding embankment and sluices. With the changing scenarios, the polder functions should be changed to satisfy the water requirements for improved production which include good drainage to avoid prolonged deep inundation of the aman crop, to allow rapid drainage prior to aman harvest for timely establishment of rabi crops and to allow adequate leaching of salt from the shrimp ghers prior to transplanting the aman crop; ability to intake and conserve water of the desired quality for dry season irrigation by dredging of canal networks within the polders this will serve to improve drainage as well as increase storage capacity; and provision of access to brackish water in regions where this can be a beneficial resource rather than a constraint to productivity and livelihoods.
3. Develop land use zones – investment is needed in zoning according to the resources, socio-economic profiles, and production systems that prevail in individual polders.

4. Improve institutional arrangements for water management – investment is needed to create a single identity in charge of water management for each polder, servicing the community within the entire polder and their production systems.

CPWF, through on-farm participatory research has shown that productivity the coastal Ganges basin can significantly be increased by adopting appropriate crop and water management practices. For example, where freshwater is available in the rivers almost year round, such as in parts of Barguna District, the low yielding aman-grasspea system can easily be replaced by triple cropping (aus-aman-boro or aus-aman-rabi) with high yielding and stress tolerant rice and rabi varieties of suitable duration. In moderately saline areas where freshwater is limited during the dry season, such as parts of Khulna District, the productivity of the traditional aman-sesame system can be increased many-fold through adoption of high yielding aman varieties followed by high yielding rabi crops such as sunflower and maize, or by boro rice in lower lands. And in areas where water salinity is too high for dry season agriculture, such as parts of Satkhira District, the productivity of shrimp culture can be greatly enhanced by new technologies for higher shrimp yield with reduced risk of disease. Brackish water shrimp monoculture can be replaced by more resilient systems of shrimp/fish polyculture grown in rotation with high yielding salt tolerant aman rice plus fish. Further, a comprehensive GIS database and the methodology for identifying production system zones in the coastal Ganges basin is under development through collaboration between several Bangladeshi institutes (IWM, LGED, BWDB, SRDI) and IRRI under the CPWF Ganges program. Once developed, this is expected to guide the policy makers and extension personnel to adopt appropriate HYV rice varieties, crop and water management policies for higher productivity and improved livelihoods of coastal communities of the eastern Ganges basin.

Since rivers surrounding the polders are very prone to silting-up, the most important challenge is to keep the peripheral rivers alive/active to drain-out flood water from the large polder areas within shortest possible time. In future, the farmers of the coastal Ganges basin may have to grow rice under partial submergence or waterlogging conditions to maintain their livelihood. Therefore, determination of rice varietal response to different degrees of water stagnation, rice varietal improvement best suited under above scenarios and optimisation of drainage design for cost-effective rice cultivation are the critical needs to continue productive rice culture in the coastal Ganges basin.