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Title : *Agro-Economic Impact of Tapping Tidal Water for Boro Cultivation: A Case Study in Narail Sadar Upazilla*

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The coastal region of Bangladesh comprises about 30% of the country's cultivable land. About 1.0 million ha of these coastal fields are affected by varying degrees of salinity. Farmers grow mostly low-yielding, traditional rice varieties during the wet season. Most of the lands remain fallow in the dry season (January-May) because of soil salinity and the lack of good quality irrigation water.

The idea of tapping tidal water in on-farm canal networks before it becomes too saline and thus increasing fresh water availability for HYV rice cultivation in the dry season has been in discussion among experts for quite a long time and some preliminary applications have also been found in the field. One such example is Zia Khal of Narail District of South-West Bangladesh that was excavated in early 80's. However, the excavation was part of the political campaign of the then Government and lacked quantitative analysis of hydrologic data and also the considerations of tidal hydraulics. As a result the canal is now almost silted up. The demand from the farmers for re-excavation of this canal to increase surface water availability in dry season is growing strong.

In assessing the agro-economic impact of re-excavation of Zia Khal, this study involved technical assessments of the physical system together with application of participatory tools (PRA). After demarcating the Zia Khal command area from the Mouza map, dry season water demand was estimated from the historical data of rainfall, temperature, wind speed, sunshine hour, and humidity with the help of CROPWAT software. Surface water availability by tidal actions for dry season irrigation in the Zia Khal was determined from the historical data. It was found that the water availability as percentage of water requirement ranges from 25% in the second half of January to 181% in the first half of May for the median flow and 3% in second half of January to 73% in first half of May for the 80% dependable flow. From the required dimensions to meet the demand considering 80% dependable flow, re-excavation volume was found to be 11,350 m<sup>3</sup> that will cost Tk 6,85,538 at the current rate of earthwork.

This re-excavation will result in total irrigation cost savings for the whole Zia Khal command area per season of Tk 84,365 for diesel pump and Tk. 5,18,717 for electric pump. However, Zia Khal will be subject to sedimentation due to residual sediment flux. Estimating the rate of sedimentation from the relationship of flow velocity and suspended sediment concentration (SSC), the total sedimentation in Zia Khal in one season was found to be 563 m<sup>3</sup>. At this rate of sedimentation, the estimated life of Zia Khal will be around 15 years for which benefit-cost ratio will be 1.05 for diesel pump and 5.48 for electric pump. It shows that adequate electricity supply must be ensured to reap the full benefit of re-excavating Zia Khal.

From the FGD and questionnaire survey, it came out that the farmers prefer surface water for its lower cost and, according to them, higher yield but to increase surface water use in dry season, its availability must be ensured as the dry season Boro crop is the most important crop of the year for the farmers and they do not want to take any chances with it. Adequate supply of fertilizer and seeds of right varieties need be ensured also so that the farmers can start the blocks early and harvest the crop before saline water comes in the river. In further studies, recommendations to overcome the limitations of this study are- using one hourly water stage data instead of three hourly data to capture the tidal cycle more accurately, developing the relationship of tidal prism and the dimensions of Zia Khal (instead of using the design graphs based on experimental data from the coast of California, USA) developing relationship of flow velocity and suspended sediment concentration (SSC) for Zia Khal and considering the wet season drainage requirement in designing Zia Khal.