Title: Soil and water salinity dynamics and their impacts on land degradation in the coastal Bangladesh

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Introduction: Agrarian Bangladesh a deltaic plain, has a very flat and low topography in the southwest coastal region. It has a total land surface of 12.31Mha (NAP 2005) with a population size of 142.3 million. The per capita arable land (0.05ha) is diminishing with the increase in population and accelerated conversion of arable land for other uses. The extent of land degradation estimates that nearly 5.0Mha land falls below the threshold for sustainable cultivation.

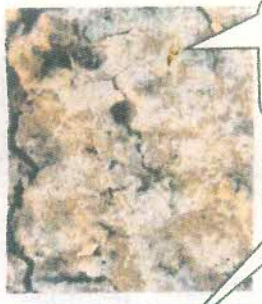
Out of 2.86Mha of coastal and offshore lands, about 1.056Mha arable lands are affected by varying degrees of salinity. Most of the lands remain fallow during dry season due to increased soil and water salinity (Karim *et al.* 1990, SRDI 2001). Further intrusion of saline water, by increasing salinity of some areas, made normal crop production very risky. Crop production and quality of livelihood are much inferior to that in other parts of Bangladesh (BBS 2001). The situation could deteriorate further due to climate change (Islam 2006).

Fig. 1: Soil salinity map of Bangladesh. Source: SRDI

Table 1: Extent of soil salinity in coastal areas (1973-2009)

Salt affected area (000'ha)			Salinity class and area (000'ha)											
			S_1 (very slight) 2.0-4.0 dS/m			S_2 (slight) 4.1-8.0 dS/m			$S_3 + S_4$ 8.1-16.0 dS/m			S_5 (very strong) >16.0 dS/m		
1973	2000	2009	1973	2000	2009	1973	2000	2009	1973	2000	2009	1973	2000	2009
833.45	1020.75	1056.26	287.37	289.76	328.43	426.43	307.20	274.22	79.75	336.58	351.69	39.90	87.14	101.92

S_3 (moderate) = 8.1-12.0dS/m, S_4 (strong) = 12.1-16.0dS/m; Source: SRDI, 2010



Deposition of salt on soil surface, SB forest

Barren crop field

Table 2: Water quality ratings

Water quality rating	ECw (dS/m)
Good quality water	<2.0
Marginal quality water	2.0-4.0
Poor quality water	>4.0

Source: Irrigation and crop management with brackish water, CSSRI Bull. No. 12, 19889

Results: From 1973 salt affected area significantly increased. During 2000-2009 periods, there was a speedy increase in salt affected area in each salinity class except S_2. In case of river water, there was a steady increase in salinity during dry season while salinity sharply declined in wet season. There was a significant ($P<0.001$, Oneway ANOVA) difference in salinity level between dry and wet season.

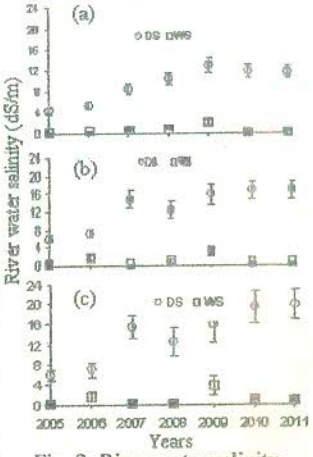


Fig. 2: River water salinity

Discussion: Rivers water possessed moderate to severe salinity in dry season. Surface and ground water salinity (by capillary rise) (SRDI, 2010), climatic factors combine to multiply the scale of land degradation in the coastal region. Due to high soil and water salinity cropping intensity reduced considerably (SRDI, 2010). Physiological dryness increases as salt concentration increases where water becomes increasingly difficult for the plant to absorb and thus, plant's death symptoms of salt injury resemble drought.

Quicker advancement of salinity front upward especially in the dry season further jeopardizes overall development. So, there is a big dilemma in the country's developmental manifesto and provide continuous challenges to the economic emancipation (NAP 2005).

Damaged rice plant in the salt affected rice field Bangladesh

Conclusion: High soil salinity and lack of good quality irrigation water severely constraining crop production in the coastal area that posses additional threat to food security. Regional / global cooperation is a must to address the issues of land degradation due to salinity through increased flow of transboundary rivers.

Note: Fig.1: (a) Bhoirab river, (b) Rupsha river, (c) Kakshiali river, DS= Dry season, WS= Wet season; SB= Sundarbans, the world heritage site

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