



Krishi
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TECHNICAL BULLETIN

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Adaptation of Suitable Crops in Saline Soils of Noakhali District

Project Code	: C-CA-117
Principal Investigator	: Dr. Mohammed Amin, Principal Scientific Officer
Implementing Organization:	On-Farm Research Division, Bangladesh Agricultural Research Institute (BARI), Noakhali
Duration	: May 2009 to May 2011

Introduction

Stretching from Satkhira to Teknaf, coastline in Bangladesh is 710 km long. More than 30% of the country's cultivable land lies in the coastal area of which 1.0 million ha is affected by soil salinity to different degrees. Most crops are not suitable for growing in salt affected soils, particularly during dry season. Salinity renders the land fallow in Subarnachar and Noakhali Sadar upazila of Noakhali district after the harvest of aman rice for a prolonged period and hence cropping intensity and the system productivity in the area is low. The major cropping patterns in Noakhali are: (1) Direct-seeded rice (DSR) Aus/T.Aus-T.Aman-Fallow (2) T.Aman-Fallow-Fallow and (3). DSR Aus/T.Aus-TAman-Rabi. In the rabi season (winter), the salinity level increases remarkably reaching a peak of 20 dS/m and beyond. During monsoon farmers grow low yielding local varieties of rice under rainfed condition. However, all crops are not equally affected by salinity; certain crops can tolerate salinity to a fair degree. Scope of enhancing crop production exists provided salt tolerant crops and varieties are planted. Few farmers do grow soybean, groundnut, chili, cowpea, grasspea, sweet potato, watermelon etc. during dry season; but no one knows for sure which crop can withstand a moderate to high degree of salinity. Success of crop growing under high salinity in the area during post-rice dry season has not been reported.

With financial and technical assistance from KGF, a team of BARI scientists led by Dr. Mohammad Amin carried out a series of on-farm trials and scientific studies in implementing a CGP project for two years beginning June 2009.

The objectives of the project were

- To find out crop specific critical salinity level affecting at different growth stages, and
- To test and validate crops and crop varieties that withstand moderate to high salinity during dry season in charlands of Noakhali district.

Approach and Method

A set of trials were performed in the farmers' fields of four upazilas: Noakhali Sadar, Subarnachar, Hatyia and Kamalnagar of Noakhali district for two years. In the first year, field trials of 11 crops and varieties (sunflower, wheat, barley, linseed, soybean, sweet potato, chilli, groundnut, mungbean, cowpea and sugarbeet) were carried out to evaluate their yield performance at different levels of salinity. Based on first year's observations, four promising crops (grass pea, soybean, sweet potato and cowpea) were selected for further trials at low-moderate levels of soil salinity. Seasonal changes in soil salinity were monitored throughout the growing season at regular interval collecting and analyzing soil samples following standard procedures.

Results/Outputs

Crops were grown in the field and with the progress of season soil salinity developed naturally; no exogenous salinity treatment was imposed. Heterogeneity of soil salinity was observed across the trial fields. Crops were planted on the same dates but did not experience salinity uniformly because of spatial and temporal differences in crop growth and phenological development. Stand establishment of sugarbeet and sunflower was not markedly affected even at moderate level salinity (3.0-6.90 dS/m); but seedlings of wheat, soybean, and mungbean hardly survived at salinity level past 5.00 dS/m. Soil salinity increased over time and crops responded differently to increased salinity levels. Crops attained at flowering and maturity stages at different dates encountering variable salinity levels. Most crops are affected at the early stages of growth due to higher soil salinity. In all the test crops, yield decreased with increased level of salinity. Sugarbeet and sunflower performed better producing yield at moderate to high levels of salinity (12.5-18.6 dS/m) followed by barley. Most crops were highly sensitive to salinity at flowering stage. Chili, cowpea and sweet potato can withstand moderate salinity level within 12 dS/m. Based on the tolerance to soil salinity, the crops were ranked as sunflower> sugarbeet> barley> linseed>chili> sweet potato> cowpea>groundnut. .

Benefits/Outcomes

- Results obtained would help select appropriate crops for cultivation in coastal areas at varying degrees of soil salinity and improve productivity.
- Critical soil salinity level of soybean, groundnut, sweet potato, mungbean, cowpea, sunflower, chilli wheat, barley, sugarbeet, grasspea and linseed have been determined. This would benefit researchers and farmers to develop crop production strategies in coastal areas suffering soil salinity.

Recommendations

- More field trials coupled with on-station experiments should be conducted to screen crops and varieties with high tolerance to soil salinity for growing in the coastal areas.
- Department of Agricultural Extension should organize the demonstrations of the selected saline tolerant crops in the coastal areas.
- Sunflower, sugarbeet, barley may be grown in area prone to high salinity level (>12 dS/m) while sweet potato, cowpea, groundnut, linseed and local variety of chili may be recommended for growing in medium saline (6-12 dS/m) areas.

Table 1. Crop response to levels of soil salinity encountered at different growth stages

Crop	Growth stage	Salinity level (dS/m)	Plant mortality (%)	Yield at highest salinity level at most critical stage		% yield reduction relative to highest salinity at most critical stage
				Salinity level, dS/m	Yield (t/ha)	
Barley	Seedling	6.31	68.4			
	Flowering	14.34		11.13		67
	Maturity	14.62				
Chili	Vegetative	10.15	67.39			
	Flowering	12.52	69.41	12.52	.11	87
	Ripening	16.5	85.54			
Cowpea	Seedling	5.45	44.44			
	Flowering	13.45	74.39	9.19	.14	84
	Maturity	15.51	75			
Groundnut	Vegetative	11	60.49			
	Flowering	14.35	60.49	14.35	0.43	79
	Maturity	11.95	62.16			
Linseed	Vegetative	9.46	80.23			
	Flowering	14.5	86.9	12.96	0.12	82
	Maturity	18.7	89.29			
Mungbean	Seedling	5.4	68.18			
	Flowering	13.7	96.25	12.90	0.092	89
	Maturity	13.46	100			
Soybean	Vegetative	9.32	97.53			
	Flowering	12.42	0	9.45	0.14	94
	Maturity	0	0			
Sugarbeet	Vegetative	9.15	48.89			
	Root swelling	18.55	60.49	18.55	5.23	80.4
	Maturity	6.47	62.96			
Sunflower	Seedling	10.62	56.18			
	Flowering	12.49	56.47	10.77	0.64	81.7

Sweet potato	Maturity	20	54.43			
	Vegetative	13.61	71.26			
	Root formation	15.1	78.48	15.10	2.31	87
Wheat	Maturity	17.65	78.48			
	Seedling	6.5	74.36			
	Flowering	14.34	x	7.54	0.35	83
	Maturity	16.21	x			



On-farm trial at Subarnachar



Principal Investigator explaining test features to the monitoring team

Expected Impact

- Results would help the farmers plan crop schedules in the coastal areas and cultivate the tested crops during winter/dry season when a vast area of land remains fallow due to medium to high-level of soil salinity.
- Results would help the framers grow triple crops in the saline areas raising cropping intensity and improving productivity. The result is expected to create a great impact on coastal agriculture increasing income and improving farmers' livelihood.

Note: This bulletin has been prepared based on a completed CGP Project entitled “Adaptation of Suitable Crops in Saline Soils of Noakhali District” implemented under GoB-World Bank funded NATP Phase-I.

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