

LAND USE IN SOME COASTAL SALINE AREAS OF BANGLADESH

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Abstract. One hundred and thirty farmers affected by salinity problems in three thanas of Barguna District were surveyed to evaluate the land use pattern of the area. Of the three thanas, the farmers in Patharghata have the highest amount of land per family, averaging 3.5 ha. 70% farmers of this thana possess lands measuring more than 2 ha while 51% of the farmers in Barguna have lands measuring lesser than 2 ha. Of the three thanas, F_1 to F_2 types of land are most widespread in Amtali (78%) followed by Patharghata (75%) and Barguna (62%). The S_4 type saline soils are mostly present (20%) in Patharghata. Depending on the inundation land types (F_1 to F_4) or the salinity types (S_1 to S_4) single, double or triple cropping are practiced. The single cropping includes *kharif-2*, local *Aman*, the double cropping includes *kharif-1*, local *aus* and *kharif-2*, local *aman* or *kharif-2* and *rabi* while triple cropping includes *kharif-1*, *kharif-2* and the *rabi* crops. Depending on the intensity of soil salinity, 78% farmers in Barguna, 22% farmers in Patharghata and 21% in Amtali practice triple cropping. However, double cropping is common in all these three thanas (100% in Barguna, 64% in Amtali and 61% in Patharghata). Of the *rabi* crops, the important ones are the sweet potato, chillies and grain legumes. The average yield of most crops is lesser than the national average. A few farmers harvest salt by traditional methods. No farmers were found to have prawn culture in any of the *thanas*.

Key Words : Salinity, land type, farm size, cropping intensity.

INTRODUCTION

The coastal and off-shore lands of Bangladesh cover an area of about 2.85 million hectares which is over 30% of the net cultivable area of the country. Of these 2.85 ha, about 0.833 mha is affected by varying degrees of soil salinity round the year (Karim *et al.* 1990). In Bangladesh soil salinity is of coastal type which is caused

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principally by inundation by saline water. Other ways of soil salinity are by rainfall, faulty irrigation and absence or inadequate vegetation covers (Imamul Huq and Iqbal 1982). Agricultural land use in these areas is very critical. Cropping intensity on average ranges from 62% in the Chittagong coastal region to 114% in Patuakhali region which is much lower than the national average of about 160% (Iqbal 1992). The main constraints towards a successful land use in the coastal areas have been identified by Imamul Huq (1990) to be as follows :

- a) lack of sweet water for irrigation, particularly during lean periods;
- b) non-availability of and / or ignorance about the appropriate germ-plasm;
- c) lack of sound fertilizer-crop water management system;
- d) uneven distribution of lands and possession of lands by the landlords;
- e) lack of marketing facilities for the produce; and
- f) lack of incentives among the farmers.

It is thus apparent that a substantial amount of land in the coastal saline belt is left unused not only during the peak period of salinity but also during a considerable period of declining salinity which could otherwise be utilized to alleviate the need of growing more food. A thorough study and identification of the problems of the coastal saline lands are some of the pre-requisites before they could be exploited for agriculture or other productive purposes. Unfortunately very little information is in hand as regards the land use— particularly agricultural land use of the coastal saline areas of the country. It is only after acquisition of sufficient knowledge of the present situation adequate plans for their utilization could be chalked out. Keeping these views in mind, the present study was undertaken to evaluate the present agricultural land use and the constraints thereof in three thanas of Barguna district through questionnaire survey and on the spot visit followed by soil and other analyses. The present paper deals mainly with the land use.

Material and Methods

The areas surveyed were the three thanas of Barguna district situated between 21°93'N and 22°43'N latitude and 89°12' and 90°45'E longitude at the south of Bangladesh.

Preliminary studies on the incidence of soil salinity were conducted over 25 unions in three thanas of Barguna district. Basing on the data thus obtained, the survey area was demarcated to be only those which are affected by various degrees of salinity so as to affect the normal agriculture at least during a substantial period in the year. Accordingly, 107 villages spreading over 18 unions in the three thanas were surveyed. A total of 134 farmers were surveyed.

The survey was conducted with a set questionnaires that had four sections viz. (i) general information including the amount of land under cultivation; (ii) information on land uses that included among others the present land use, crop/cropping pattern, cultural practices, land types, irrigation / drainage facilities or situations, water preservation facilities etc.; (iii) information on crop damages; and (iv) information concerning salinity having 22 different sub-questions on the aspect.

Soil, water and plant samples were collected from each spot for laboratory verification of farmer's response, particularly on the salinity question. The surveyed data were quantified to make them more meaningful. The data presented in the text are averages of the number of surveyed farmers for each thana which were 70 for Amtali, 40 for Barguna and 24 for Patharghata respectively.

Results and Discussion

The average salinity of the three thanas are : Amtali — 6.7 dS m^{-1} , Barguna — 5.0 dS m^{-1} and that of Patharghata — 14.8 dS m^{-1} . These are peak period salinities, i.e. , during the driest months of the year. The evolution of salinity at different times of the year in the three thanas are shown in the figure. It became apparent from the soil salinity evaluation that S_2 type salinity prevails in Amtali and Barguna while S_3 type exists in Patharghata. The salinity increases in such a way that it affects principally the cultivation of *kharif-1* and in certain cases the *rabi* corps.

Distribution of Land Types

The distribution of various land types in the three thanas are shown in Table 1. It can be seen from Table-1 that medium high lands (F_1) and medium low land (F_2 - F_3)

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dominate the area. They comprise 70% or more of the lands. Only a small portion of land in Barguna (7%) is low land (F_4).

Table 1. Distribution of various land types in three thanas of Barguna (percent of total area surveyed)

Land Type	Amtali	Barguna	Patharghata
High Land (F_0)	22	24	25
Med. High Land (F_1)	48	32	46
Med. Low Land (F_2 - F_3)	30	37	29
Low Land (F_4)	-	7	-

Table 2 depicts the distribution of various salinity types in the three thanas. The category of salinity types are based on the classification as described in Karim *et al.* (1990).

The prevalent salinity type is S_1 and S_2 . About 65% of lands are having these type of salinity in the three thanas. S_4 type salinity is prevalent in Patharghata.

Table 2. Distribution of salinity category in three thana of Barguna (percent of total area surveyed)

Salinity category	Amtali	Barguna	Patharghata
S_4 (E_{c_e} , >16 dS m^{-1})	18	15	20
S_3 (E_{c_e} , 8-16 dS m^{-1})	25	20	23
S_2 - S_1 (E_{c_e} , > 2-8 dS m^{-1})	57	65	57

Distribution of Farm Sizes

Of the three thanas, farmers of Patharghata are relatively well off, possessing 3.5 ha of lands on an average followed by Amtali (3.2 ha) and Barguna (3.0 ha). The

average farm size, distribution of farm size among the farmers and proportion of cultivable land to total land owned are presented in Table 3. It is seen from the Table that 39% of the surveyed farmers possess more than 4 ha of lands followed by 22% in Amtali and 13% in Barguna. Between 80% and 85% of total land owned by the farmers are cultivable, the higher proportion being for Patharghata and the least for Barguna.

Table 3. Average farm size, distribution of farm sizes and proportion of cultivable land to the total land in three thanas of Barguna.

Average Farm Size (ha)	Amtali 3.2 (0.4—10.0)	Barguna 3.0 (0.6—12)	Patharghata 3.5 (0.7—16.0)
Farm size distribution			
less than 2 ha	35%	51%	29%
between 2—3 ha	15%	17%	14%
between 3—4 ha	28%	20%	18%
more than 4 ha	22%	12%	39%
Proportion of cultivable land to total land :			
less than 2 ha	80%	85%	83%
between 2—3 ha	80%	82%	80%
between 3—4 ha	85%	78%	82%
more than 4 ha	78%	80%	85%
Average for the area	82%	80%	85%

Figures in parentheses indicate minimum and maximum values.

Cropping Pattern and Crops

The cropping pattern, the crop itself, crop intensity, yield of individual crops, crop damages or failures in the coastal areas are principally governed by the extent and degree of soil salinity in the particular area. In low salinity areas, subject to availability

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of residual soil moisture (i.e., land types) three crops, *kharif-1* (L-*Aus*), *kharif-2* (L-*Aman*) and rabi crops are cultivated. The distribution of cropping pattern in the three thanas are presented in Table 4. It is apparent that double cropping predominates in all the three thanas, while triple cropping is mostly practiced in Barguna. Under mono-cropping the main crop is L-*Aman* (*kharif-2*), while under double cropping system *rabi* and *kharif-2* are grown and under triple cropping, *rabi*, *kharif-1* (L-*aus*) and *kharif-2* are grown. The percent distribution of the various crops grown under double and triple cropping systems are presented in Table 5.

It has been found that of the three thanas, Patharghata is the most saline followed by Amtali and Barguna. The impact of this is reflected in the dominant cropping patterns of the three *thanas*.

Table 4. Distribution of dominant cropping patterns in the three thanas of Barguna.

Cropping pattern	Amtali	Barguna	Patharghata
Mono-cropping	16.50%	Nil	17.85%
Double-cropping	63.25%	100%	60.69%
Triple-cropping	20.28%	78%	21.46%

In the low salinity areas of Amtali, 96% of the surveyed farmers were found to grow *rabi* crops while at higher salinity areas 80% of the farmers were found to grow *rabi* crops. In low salinity area 100% of the farmers cultivate *kharif-1* and *kharif-2* rice while in higher salinity areas only *kharif-2 Aman* rice is grown by all the farmers. The practice of monoculture (*kharif-2* rice) is limited to areas of very high salinity.

The incidence of salinity is the lowest in Barguna among the three thanas. As a result, no farmer was found to practice monoculture there. In the higher salinity areas 100% of the surveyed farmers practice double cropping system while at the sites where salinity is low, triple cropping is popular.

Table 5. The dominant crops and their percentage wise distribution in the three thanas of Barguna under double and triple cropping.

Crop	Amtali	Barguna	Patharghata
Under double cropping			
Pulses	80.0%	-	82.32%
Chili	55.2%	-	52.92%
S. Potato	60.3%	-	52.92%
Potato	15.0%	-	35.28%
Mustard	7.8%	-	5.88%
Vegetables	6.5%	-	5.88%
Aman (L)	100.0%	100%	100.00%
Aus (L)	-	100%	-
Under triple cropping			
S. Potato	96.0%	86.0%	100.00%
Chili	75.0%	63.0%	83.00%
Pulses	80.0%	71.0%	83.00%
Potato	15.0%	6.0%	32.00%
Mustard	12.0%	11.0%	10.00%
Aman (L)	100.0%	100.0%	100.00%
Aus (L)	100.0%	100.0%	100.00%

In Patharghata, it was observed that in the low salinity areas about 88% of the farmers cultivated *Aus* (L) and equal numbers cultivated rabi crops while almost cent percent farmers cultivated *Aman* (L) rice. But, in areas of higher salinity *kharif-1* cultivation is limited (0-20%) while *kharif-2* is the principal crop followed by *rabi* (60%).

Crop Yields

The yield levels of rice and rabi crops are relatively lower than the average yield in the country. A list of average yield distribution of the various crops in the three thanas is shown in Table-6.

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Table 6. Average yield ($t\ ha^{-1}$) of the major crops grown in the three thanas of Barguna.

Crops	Amtali	Barguna	Patharghata
Aus (L)	0.9–1.4	1.3–2.3	1.0–1.1
Aman (L)	1.5–2.7	1.5–3.0	< 1.3
S. Potato	> 2.0	> 4.0	> 2.0
Potato	2.0–3.0	1.0–1.5	2.0–3.0
Pulses	0.5–0.7	0.5–0.7	0.5–0.7
Chili	0.5–0.7	< 0.5	0.5–0.7
Mustard	0.6–0.85	< 0.5	0.5–0.7

Yield decrease due to salt injury is more frequent in Amtali and Patharghata thanas while in Barguna, the main reason for yield decrease is pest infestation. Between 20 and 50 per cent of crops are damaged due to salinity in Amtali and Patharghata thanas. Comprehensive information on yield decreases and the reasons thereof is shown in Table 7.

Table 7. Yield decrease and reasons for yield decrease in the three thanas of Barguna.

% yield decrease	% farmers responding		
	Amtali	Barguna	Patharghata
10–20	10	6	7
20–30	48	82	50
30–50	38	12	40
>50	4	-	3
Reasons for yield decrease			
Salt injury	69	20	71
Pest attack	31	97	29
Natural calamity	31	91	29
Lack of irrigation	-	11	-

It was revealed from the survey that there is a bright prospect of *rabi* crop cultivation in the area. Eighty per cent farmers of Amtali, 87% farmers of Barguna and 82% farmers of Patharghata opined that there was a possibility of *rabi* crop cultivation in their areas provided appropriate technologies and know-how's were made available to them.

Conclusion

A vast area in the coastal saline zone of Bangladesh is left unused, particularly during the dry season when the incidence of salinity in those areas is high making it practically impossible for the farmers to make a better use of their lands due principally to a lack of technological know-how about the management of salt affected soils. Non availability of improved and resistant varieties of crops are some of the factors underlying the major land uses of the areas. The farmers depend on the age-old indigenous methods by taking advantage of the natural fresh water sources and the residual moisture for their crops. In fact, they depend on the rain water to wash the salts away to make the lands suitable for *Kharif-2* crops. Prawn culture is not practiced in the area. Some farmers (ca. 40%) cultivate salts by traditional methods.

Research needs must be directed towards improving the land use by incorporating location specific appropriate technologies and soil-water-crop management practices.

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Notes

1. Depending on the land levels in relation to seasonal flooding (depth of flooding and duration of flooding) six broad land types are recognized in Bangladesh (FAO, 1988). These are : F_0 type : lands which are above normal flood level; these are known as high lands; F_1 type: lands which normally are flooded up to 180 cm. deep during flood season, the medium low lands; F_3 type : lands

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which normally are flooded up to 300 cm deep during flood seasons; duration of flooding is < 9 months : the low lands. **F₄ type** : lands which normally are flooded deeper than 300 cm during flood seasons; duration of flooding is >9 months; the very low lands.)

2. S₀ is non saline having an E_{cθ} (electrical conductivity value of the saturation extract of soil) value of < 2 dS m⁻¹; S₁ is slightly saline having E_{cθ} values between 2 and 4 dS m⁻¹; S₂ is moderately saline having E_{cθ} values of 4–8 dS m⁻¹; the S₃ category is considered saline having E_{cθ} values 8-16 dS m⁻¹ whereas S₄ category of soils are highly saline with E_{cθ} value >16 dS m⁻¹.

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