



IMPACT OF SOIL SALINITY ON LIVELIHOOD STRATEGIES: A STUDY ON TWO SELECTED VILLAGES OF SATKHIRA DISTRICT, BANGLADESH

Mohammad Zaber Hossain^{*1}, Mohammed Ziaul Haider², Razibuzzaman¹ and
Bina Rani Mojumder¹

¹Soil Science Discipline, Khulna University, Khulna 9208, Bangladesh

²Economics Discipline, Khulna University, Khulna 9208, Bangladesh

Abstract: This study analyzes the effects of soil salinity on the livelihood strategies of small farmers. It explores the responses of farmers to various technologies available for the agriculture sector to cope with the salinity problem. The study consists of two villages in Asasuni Upazilla of Satkhira District. The study finds that farmers try to handle salinity problem at their own level with traditional and costly methods. No new technologies are disseminated among the farmers. The application of lime, *fitkiri* etc. are the strategies adopted by the farmers. This study also considers the intensity of land use, income and the land fragmentation aspects and tries to relate the said aspects with salinity.

Key Words: Salinity, livelihood, strategy, *Satkhira* district

Introduction

Salinity has emerged as one of the major factors responsible for low crop production in Bangladesh. Various agricultural regions of the country have lost their productivity due to salinity intrusion. This situation is very alarming especially for the southern region which is producing a major share of crops for the whole country (Khan *et al.*, 1996). The economy of Bangladesh is heavily dependent on agriculture sector. But agricultural development is constrained by soil salinity (Karim *et al.*, 1990). According to salinity survey findings, about 1.02 million hectares, i.e. about 70 percent of cultivated lands are affected by various degrees of soil salinity (SRDI, 2003). In 1997, SRDI published a soil salinity map of coastal saline areas of Bangladesh. In that map salinity zone is shown up to Magura district which is the consequence of lacking sufficient ground truthing. In south-eastern part, soil salinity did not increase significantly. Present data shows that about 1.02 million hectares out of 1.459 million hectares of cultivated land in the coastal areas are affected by soil salinity of various degrees. Cropping intensity may be increased in low saline areas by adopting proper soil and water management practices with the introduction of salt tolerant varieties of different crops (SRDI, 2003).

The main factors that contribute towards salinity in the Satkhira district are: crop husbandry techniques, cropping mixes, irrigation technology and the geo-physical properties of the sub soil and soil (Elahi, 1998). Besides this, introduction of shrimp culture in this area is one of the major causes for enhancing salinity problem (Gafur, 1999). Both of the soil and water salinity have

Corresponding author: <zaberhossain74@yahoo.com>.

DOI: <https://doi.org/10.53808/KUS.SI.SESB.2010.43-48-ls>

Hossain, M.Z.; Haider, M.Z.; Razibuzzaman and Mojumder, B.R. 2010. Impact of soil salinity on livelihood strategies: A study on two selected villages of *Satkhira* district, Bangladesh. *Khulna University Studies Special Issue (SESB 2010)*: 43-48

adverse effects on people’s living standard, daily life activities and socio-economic conditions (Miah, *et al.*, 2004; Haque and Saifuzzaman, 2003; Tanwir, *et al.*, 2003). This study attempts to identify the impacts of soil salinity on the livelihood pattern of the people in the south-west region of Bangladesh.

Materials and Methods

The study area: This study considers two villages in *Asasuni* Upazilla of *Satkhira* district as the study area. One is located in low saline area of *Fingri* village at *Fingri* Union and the other is in *Sreeula* and *Moheskur* villages at *Sreeula* Union which is a high saline area.

Methods: A total of 100 respondents (farmers) are interviewed by taking 50 randomly selected respondents from *Fingri* village and 25 randomly selected respondents from each of *Sreeula* and *Moheskur* villages. Statistical techniques such as frequency distribution and correlation analysis are used to analyze the data. SPSS and MINITAB are used for this purpose. The distribution of 100 sample farm households on the basis of landholding size is less than two hectares (52%), 2 to 5 hectares (37%) and over 5 hectares (11%). A well designed interviewing schedule is used to collect information from the farmers. Face to face interviews are conducted for this purpose.

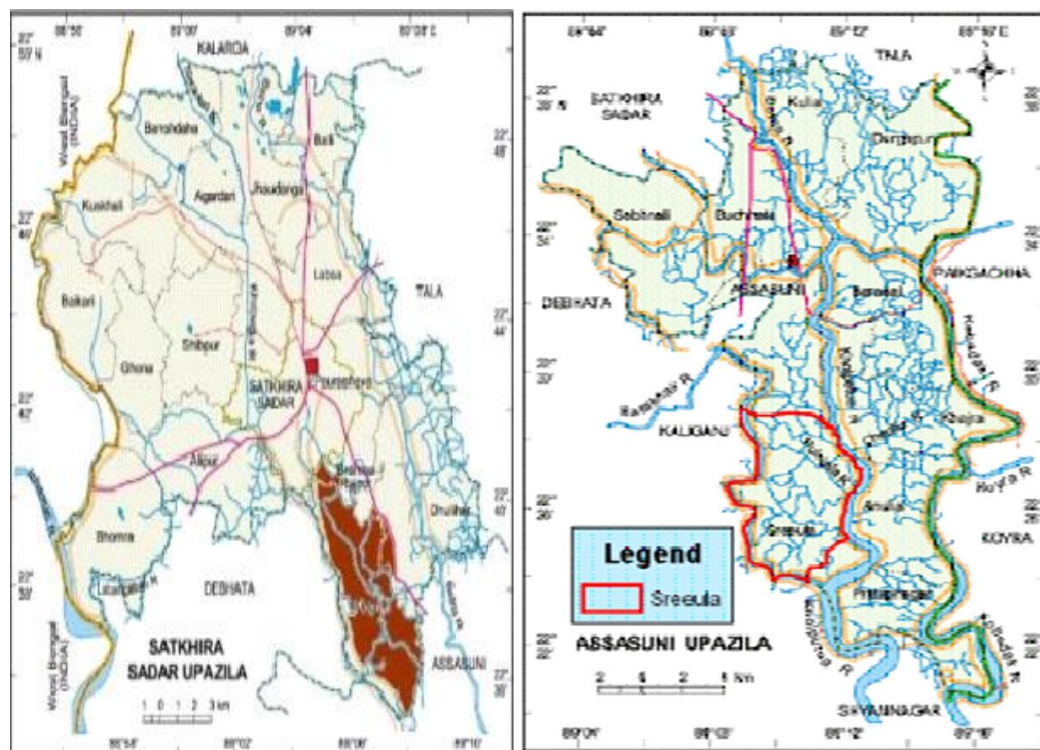


Fig. 1. The study area

Results

According to the study some important personal and socio-economic characteristics are given in the Table 1 and Table 2.

Table 1. Some important personal information of small farmers participated in this study

Area	Total land owned (ha)		Freshwater source		Distance from water source (km)	
	Low Saline	<2	56%	Gw	28%	<0.5
2 to 5		36%	Gw+R	46%	0.5 to 1.0	6%
>5		8%	O	26%	>1.0	26%
High Saline	<2	46%	Go	22%	<0.5	26%
	2 to 5	40%	Go+Kh	2%	0.5 to 1.0	76%
	>5	14%	Go+Gw	76%	>1.0	--

N.B.: Gw -Ground water, R- Rainwater, O - Others, Go- *Golghasia* river, Kh - *Kholpotua* river

Most of the farmers taking part in this study have small land ownership which belongs to 56% and 46% in low saline area and in high saline area respectively. In case of low saline area, their main freshwater source is ground water and rain water which are not very far from their land. Around 68% of the respondents in this area live within less than 0.5 km range. On the other hand, in high saline area main water sources are Golghasia and Kholpotua rivers both of which are situated at a moderate distance from their land. In this area around 76% respondents live within 0.5 to 1.0 km distance of their water source.

Table 2. Some important socioeconomic information of small farmers participated in this study

Area	Total Income (Lac Tk./year)		Total Expenditure (Lac Tk./year)		Land fragmentation		Intensity of harvest (times/year)	
	Low Saline	<0.5	42%	<0.5	48%	Agriculture	20%	Rice (2 times)
0.5 to 1		36%	0.5 to 1	26%	Shrimp culture	4%	Shrimp (18-20 times)	14%
>1		22%	>1	26%	Others	76%	Others	18%
High Saline	<0.5	8%	<0.5	8%	Agriculture	--	Rice (2 times)	--
	0.5 to 1	36%	0.5 to 1	34%	Shrimp culture	96%	Shrimp (18-20 times)	100%
	>1	56%	>1	58%	Others	4%	Others	--

According to the socioeconomic conditions of the farmers, the total yearly income and expenditure are low in low saline area whereas in high saline area it is moderate which ranges from 0.5 to 1 lac. In low saline area farmers have fragmented their lands for a variety of cultural practices so that they can suit their livelihood in a better way. On the other hand, in high saline area farmers have no choices for cultural practices without shrimp production. In low saline area farmers try to intensify the harvest for a variety of crops like rice, shrimp production etc. In this area they showed their tendency to harvest maximum yield such as two times rice in a year and 18-20 times shrimp production. But in high saline area small farmers have no choices except for shrimp cultivation. Most of the farmers (around 100%) in this region engaged in this practice.

Hossain, M.Z.; Haider, M.Z.; Razibuzzaman and Mojumder, B.R. 2010. Impact of soil salinity on livelihood strategies: A study on two selected villages of *Satkhira* district, Bangladesh. *Khulna University Studies Special Issue (SESB 2010)*: 43-48

Discussion

Insignificant factors: A number of correlations are exercised to identify the variables which are (are not) associated with the salinity. The variables with no relationship with the salinity are: (a) total land owned, (b) total land managed, (c) educational level of the farmers, (d) number of family members, (e) and frequency of interaction with extension agent.

Factors having significant relationship with salinity: The variables associated with salinity are: (a) intensity of harvest, (b) location of the water source, (c) total income, (d) land fragmentation, and (e) total expenditure (Table 1 and 2).

The study finds that, in low saline area, farmers have tendency to intensify their production by a number of agricultural practices such as production of rice, white fish and shrimp culture, where as, in high saline area they only produce shrimp. From the study it can be said that in low saline area farmers are trying to cope with the increasing salinity by various ways, but in high saline area farmers have no choice except the shrimp culture. In case of water source location, majority of the farmers in the non- saline area utilize ground water and rain water as freshwater sources. On the other hand, in high saline area it is Golghasia river and groundwater which serve as their freshwater sources.

Table 3. Correlation matrix for selected variables in low saline area

Variables	1	2	3	4	5
1. Land (ha)	0.213				
2. Distance from water source	0.176	0.031			
3. Total Income	0.322*	0.490**	0.148		
4. Total Expenditure	0.430**	0.576**	0.348*	0.841**	
5. Total Salinity	-0.110	-0.105	-0.015	-0.232	-0.275
N.B.: *p<0.05 **p<0.01					

Table 4. Correlation matrix for selected variables in high saline area

Variables	1	2	3	4	5	6
1. Location of the water source	0.339**					
2. Distance from water source	0.161	0.387**				
3. Total Income	0.623**	0.258	0.034			
4. Total Expenditure	0.702**	0.343**	-0.034	0.466**		
5. Land fragmentation	0.313**	0.113	0.061	0.333	0.166	
6. Total Salinity	-0.176	-0.111	-0.210	0.067	0.028	-0.121
N.B.: *p<0.05 **p<0.01						

The study finds that location of the water source is a major determinant of salinity. It means that, farmers are helpless as they are unable to change the location. Income is important as they are able to adopt technologies to handle salinity problem. In low saline zone it finds poor correlation between soil salinity and income, as the farmers have tendency to earn from a variety of sources. Most of the sources they use have negative effect on their income because they don't get enough return from their activities they adopt due to salinity. In high saline area, farmers are bounded for shrimp culture and they had a low tendency for doing other jobs. Therefore, their chance for getting loss from other sources of income is low. That's why in this area soil salinity shows a positive correlation with income source. Similarly, land fragmentation appears to be a blessing for the farmers. It reduced their disability of having a single piece of land at a particular location on the watercourse.

Farmer strategies to salinity: Farmers' responses to salinity are not very encouraging. It indicates that no consistent strategy is adopted by the farmers to cope with the situation. There appears to be no significant pattern in farmers' responses to soil salinity. Farmers are obtaining additional lands that are more favorably located with minimal soil salinity and intensifying production of existent agricultural lands. Farmers also emphasize the need for a larger government action against the problem. When asked to state measures to tackle the problem of soil salinity, a majority of the farmers stated that they prefer to apply lime and *fitkiri* (Alum) and other farmers have other measures for reclaiming salinity (Table 3). Moreover, in high saline area over fifty percent of the farmers use lime and *fitkiri* to reclaim their saline land. Except this technique farmers of high saline area also apply lime and urea. But in low saline area most of the farmers apply lime, *fitkiri* and urea for this purpose.

Table 5: Farmer's strategies to reclaim saline lands (percentage)

Strategy	Frequency of application (%)	
	Low Saline Area	High Saline area
Applied lime and <i>fitkiri</i> (Alum)	26	52
Applied lime	32	30
Applied lime, <i>fitkiri</i> and urea	32	16
Others	10	2
Total (n=100)	100%	100%

The methods adopted by farmers failed to meet the sustainable standards from both economic and environmental perspective. It seems that farmers don't have any systematic understanding about the side effects of lime and *fitkiri* application on their soils. Similarly, land fragmentation is a good temporary solution but in broader terms it places limitations on the adoption of new technologies.

Conclusion

The salinity intrusion is an alarming phenomenon for the south-west region of Bangladesh. Soil salinity has emerged as a problem which is not only reducing the agricultural productivity but also putting far reaching impacts on the livelihood strategies of small farmers. The most significant impact of soil salinity is the changes in land use activities. This study finds that farmers in the low saline area are looking for a number of land use activities. They cannot stand for long in same cultural practice due to unavailability of knowledge and necessary technology to adopt for mitigating the problem arisen from soil salinity. The temporary solutions being adopted by the farmers seem to have adverse effects in the long run. These will not only put more pressure on the small farmers who are already at the cutting edge but will also spoil the soil and ultimately the whole agricultural set up.

This study is based on direct conversation with the small farmers in saline and non saline area of the south-western part of Bangladesh. The age, occupation, land ownership, educational qualifications are the main points considered to generate diversity in responder selection. However, a joint action by government, NGO's and the farmers is immediately required to control the situation. Moreover, to understand the long-run consequences of salinity, an in-depth, integrated and dynamic study is needed.

References

- Elahi, K.M. 1998. Geography of Coastal Environment: A Study of Selected Issues. In: Bayes, A, and Muhammad, A. (eds.) *Bangladesh at 25: An Analytical Discourse on Development*. Dhaka, UPL

- Hossain, M.Z.; Haider, M.Z.; Razibuzzaman and Mojumder, B.R. 2010. Impact of soil salinity on livelihood strategies: A study on two selected villages of *Satkhira* district, Bangladesh. *Khulna University Studies* Special Issue (SESB 2010): 43-48
- Ghafur, A. 1999. *Socio-Economic and Environmental Impact of Shrimp Culture in South-Western Bangladesh, An Integrated Approach, Part 1*. Nijera Kori and IDPA (Proshika), Dhaka
- Haque, M.Z. and Saifuzzaman, M. 2003. Social and Environmental Effects of Shrimp Cultivation in Bangladesh: Notes on Study Methods. In: Rahman, M. (ed.) *Globalization, Environmental Crisis and Social Change in Bangladesh*. UPL, Dhaka
- Karim, Z.; Hussain, S.G. and Ahmed, M. 1990. *Salinity Problems and crop intensification in the coastal regions of Bangladesh*. BARC Soil Pub. No.33. BARC, Dhaka- 1215. Bangladesh: 1-21
- Khan, H.R., Ahmed, I.U. and Blume, H.P. 1996. Effects of Gypsum and Zn on Uptake Ratios of Na, K, and Growth-Yield of Rice Grown on a Coastal Saline Soil. *Journal of Plant Nutrition Saline Soil Science*, 159(1-6): 351-356
- Miah, M.Y.; Mannan, M.A.; Quddus, K.G.; Mahmud, M.A.M. and Badia, T. 2004. Salinity on Cultivable Land and Its Effects on Crops. *Pakistan Journal of Biological Sciences*, 7(8): 1322-1326
- SRDI, 2003. *Soil Salinity in Bangladesh 2000*. Soil Resource Development Institute (SRDI), Government of The People's Republic of Bangladesh, Dhaka
- Tanwir, F., Saboor, A. and Nawaz, N. 2003. Soil Salinity and the Livelihood Strategies of Small Farmers: A Case Study in Faisalabad District, Punjab. *Pakistan. International Journal of Agriculture & Biology*, 5(4): 440-441