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**A STUDY ON INDIGENOUS RICE VARIETIES IN
SUNDARBAN DELTA AND THEIR ROLE IN
ENSURING LOCAL FOOD SECURITY IN THE FACE
OF CLIMATE CHANGE THREATS**

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PREFACE

The present report entitled '*A Study on Indigenous Rice Varieties in Sundarban Delta and Their Role in Ensuring Local Food Security in the Face of Climate Change Threats*' is the outcome of a study initiated by Agro-Economic Research Centre (Santiniketan) during work plan 2016-17. This study is fully financed and approved by Directorate of Economics and Statistics, Ministry of Agriculture & Farmers' Welfare, Government of India, New Delhi.

The motivation of the study came from some previous field experience in the remote Sundarban delta region when it was found that many traditional cultivar varieties are in scattered existence in that region which has significant salt tolerance capability. The low lying Sundarban delta is one of the most vulnerable coastal regions in India in the face of Climate Change scenario which predicts future Sea Level Rise and increasing cyclonic activities in the Bay of Bengal. Both of these predictions imply increasing salinity ingress on agricultural lands for this densely populated area, which in turn is a grave threat to local food security. One viable adaptation strategy might be to promote the practice of salt tolerant rice among farmers in the region. It also calls for active research on production and promotion of such varieties. This in turn needs the creation of a knowledge bank on the existing such varieties.

Primary consultation with agricultural experts revealed that there is no systematic documentation about the existing practice among farmers in Sundarban regarding the traditional rice varieties. The local names of such varieties are also sometimes unknown to outside experts. There is no existing study that documents such rice varieties' performance at farmers' fields and farmers' experience and opinion about them. This study was taken up to fill this knowledge gap. This report is a step further towards informed policy making for enhancing local food security against Climate Change threats in Sundarban.

The task of completion of the study was assigned to **Dr. Santadas Ghosh**, Associate Professor, Department of Economics & Politics and **Kali Sankar Chattopadhyay**, Deputy Director of this Centre. Analysis and drafting of the Report was done by **Dr. Santadas Ghosh**. During field survey they were ably assisted by a Research team comprising the staff members of this Centre and **Saptarsi Chakraborty & Sreejit Roy** (*Research Scholar, Department of Economics & Politics, Visva-Bharati*). Typing of the report was done by **Munshi Abdul Khaleque** and **Nityananda Maji**. Secretarial assistance was provided by **D. Mondal, D. Das, P. Mitra and A.R. Patra**. **Bimal Singh** and **S. Hansda** helped in the office maintenances. The researchers had to take help of some NGO workers some of whom must be mentioned here. We convey our sincere gratitude to Mr. Sudhangshu Dey (*Society for Durbachati Social Action*

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Executive Summary

Sundarban is an archipelago of more than hundred islands in Indian side which is the largest mangrove dominated delta region shared with Bangladesh. It is a UNESCO heritage site and 48 islands in India constitute the reserve forest which is the habitat of the famous Royal Bengal Tigers. Another 54 islands surrounding the reserve forest is inhabited by more than five million people. For them agriculture is the primary livelihood and fishing and crab-catching come to the next. The low lying populated islands are surrounded by earthen embankments and a fresh water ecosystem is artificially created amidst surrounding salt waters of deltaic rivers. The region is identified as one of the most vulnerable region in the face of predicted Sea Level Rise due to global Climate Change (CC).

The islands were populated clearing the mangrove forests under the colonial expansion drive to earn more land revenue from new pastures. At that time of settlements (late 19th to early 20th Century), agricultural technology was not advanced and the rice varieties that were cultivated there were local salt tolerant varieties suitable for that particular soil and climatic condition. However, after the Green Revolution and introduction of HYV seeds, many

of the modern varieties had replaced local varieties due to higher productivity. This has been detrimental to the of food security for the region. The effect was visible after the infamous cyclone Aila, where the cyclonic storm surges had inundated almost every part of those islands with saline water. The total loss of agriculture forced a huge outmigration of working adults from those islands for outside labour jobs. It is this event that had triggered a new realisation among local people to make a trade off between high productivity and food security. They are now starting to revert back to salt tolerant local varieties to insure against a total loss of crops due to saline water ingress. Such efforts are being undertaken by individual farmers as well as being propagated by some local NGOs.

It has been observed that many of such local varieties of rice, which historically their ancestors used to grow in that agro-climatic conditions, had actually survived in small quantities in some corners of those remote islands. Local people are rediscovering them and bringing them back to their practices. The motivation behind the present study arises from the fact that there is no systematic documentation of such practices among the farmers in Sundarban delta. There has been scientific documentation of salt tolerant rice varieties regarding

their physical characteristics which have been carried out in controlled field experiments and laboratories. But existing studies do not provide a clue to whether or not these varieties are performing well in actual field, and what is the trend in such practices.

Study objectives

This study has been taken up to build a database on such varieties that are being practiced and preserved in isolated pockets in Sundarban through a primary survey. It is aimed at the documentation of such rice varieties and their productivity performance in actual field by untrained farmers. The findings can be helpful for the policy authority to decide the direction of help that can be extended to propagation of such rice varieties as a significant adaptation policy against Climate Change threats. It will cater to the State and National Bio-diversity Board and Agricultural Directorate for providing proper guidance to the farmers in regular manner. With this database, agricultural and soil scientists could enhance their capacity of prescribing suggestions for better production of indigenous rice varieties with modern techniques in coastal regions.

With the above background, the specific objectives of the study are as follows:

(i) To create a database of the existing local rice varieties in Sundarban Delta and their salt tolerance capability as experienced by the cultivators.

(ii) To create a database on time duration and productivity of such rice varieties

(iii) To understand the socio-economic profile of the respective farmers and their motivation to opt for such varieties

(iv) To examine the role of such indigenous varieties in ensuring local food security

(v) To provide policy prescription to promote the practice of growing such indigenous paddy varieties as an adaptation policy against Climate Change threats

Data and Sampling

Field visits for this study had taken place during the monsoon season of 2016 (July-November). The study covers the Sundarban delta islands which are populated by human settlements. They fall under the Gosaba, Kakdwip, Patharprtima and Sagar Blocks in South 24 Parganas district and Hingalgunj and Sandeshkhali Block in North 24 Parganas district.

The sample selection for this study has been done in a special way, which is formally called 'snowball sampling'. The six CD blocks that has been covered in this study are very densely populated with farming households and the cultivators of local varieties are thinly dispersed across them. There is no secondary database to identify who

cultivates what. Also, for productivity, the study needed to identify the farmers who had actually cultivated at least one of these varieties in the monsoon of 2015, for which the complete information regarding yield could be obtained. So, as a starting point, a local organization that has been undertaking activities relating to preservation and propagation of salt tolerant local rice varieties has been approached. From their membership list and other acquaintances, a list of such farmers residing over different Gram Panchayet areas has been prepared. Those farmers constituted the first set of samples. At the end of the interviews, each of the respondents was asked to provide names of families in his neighbourhood who also cultivated some such variety in 2015. A second set of samples could be created this way after eliminating the repeated names. Repeating the selection procedure in this way, after several visits in different parts of Sundarban over five months, the study could complete 157 interviews of such households spread over 15 Gram Panchayet area in six CD blocks as mentioned before.

Findings

The study finds that there are many traditional varieties of rice being cultivated by farmers in Sundarban delta which are known for their salt tolerant property. Though the sample is purposive, yet the number of different varieties is found to be more than what

was expected. From 157 farming households that has been interviewed, as many as 32 such varieties has been identified which were cultivated in the monsoon of 2015. The distribution of such farmers is found to be thin across different islands without much communications among themselves. So, except a few commercially successful such varieties, other varieties are found to be locally concentrated in practice. The seeds of such varieties are not commercially available in the market. They are preserved and continued across family lines or neighbourhood.

Many of these varieties are studied and documented by specialized institutions and agencies growing them in small experimental plots under ideal conditions. However, their performance in the field under natural conditions has not been studied.

The study finds that the average productivity of these traditional varieties is significantly less than that of the other High Yielding varieties. This is the major reason why these newly introduced varieties could displace the local varieties and are mostly cultivated by the modern Sundarban farmers.

Still, the survival of traditional varieties was possible because of some special features in them. One dominant reason for survival of the low yielding varieties is their high capability to withstand land salinity. There are pockets in

Sundarban islands which are very susceptible to salinity ingress because of their proximity to saline rivers and the bad condition of the protective embankments. In such locations, farmers hedge their risk of total crop loss during a season by compromising with low productivity.

Another major reason for their survival is farmers' taste and preference for these local varieties. Most of them are having their special taste and flavour which the farmers grew accustomed with from their childhood. Most of the farming households produce their monsoon rice for self-consumption. So, even if their land is location wise not much vulnerable to salinity, many large landholders keep a certain part of their land for production of these varieties for their year-long consumption.

Yet another reason for cultivation of these varieties is their low cost of production. The seed cost is almost nil for such varieties as they preserve the seed from their previous year's production. These varieties require very little fertiliser and pesticide also. So, the total monetary costs for production of these varieties are much less than that of the modern introduced varieties. Poor farmers have a natural tendency to opt for it, specially when they face a continuous threat of crop loss due to salinity ingress.

A couple of these varieties are in fact increasing the area under them due to

market signals. Dudhersar and Gobindobhog are two such varieties which are being propagated throughout the region in recent years as they could fetch a premium over other varieties in selling price. This was possible due to their fine grain quality and a tilt of urban consumers' taste in their favour. So, in spite of their low productivity, they are successfully competing with other HYV seeds in expanding their market share through better realised price. Among these two, Dudhersar is of medium salt tolerance and Gobindobhog is of low salt tolerance as reported by the farmers. This finding helps us to understand that the preservation and propagation of more salt tolerant rice varieties can be easily achieved if a differential procurement price system can be put in place in favour of more salt tolerant rice varieties.

The traditional varieties are found to be more organic in nature as they require very little chemical fertilisers or pesticides compared to their HYV counterparts. They require mostly organic manures like cow dung and hence such households practicing traditional varieties almost invariably has some livestock holding with them.

Cyclone Aila in May 2009, which devastated all of these islands with salt water overflowing from surrounding rivers to the agricultural fields, has ushered in a new realisation among island dwellers regarding their food

security. They realised, after that painful experience, that preserving and practicing local salt tolerant varieties is a viable coping strategy against such threats in future. The realisation translated into, even without any outside support or counselling, renewed interest among farmers to organize themselves to create local seed banks for such rice varieties.

However, remoteness of these islands prevented the percolation of many institutional benefits that are being delivered to other well-connected parts of India. For example, crop insurance and soil testing are almost absent on these islands due to absence of institutions and official visits in this remote area. Very few of the farmers are in fact aware of the benefits and services that they are entitled to get freely or at a negligible cost.

This study by AERC (Santiniketan) has tried to cover the information gap and bring to light certain aspects of paddy cultivation in Sundarban islands that cannot be generated through laboratory experiments. Household level data from 157 farming households spread over 15 Gram Panchayet area, highlights the following points:

- The inaccessibility and remoteness of the area hindered the penetration of formal institutions to render some crucial services to Sundarban farmers. Whatever services they receive comes mostly from local NGOs and some

outside agencies who can earn profit from particular types of services.

- Only about 10% of owners of these plots has reported that they had conducted, through the help of NGOs, some soil testing on their plots within last 10 years. It seems that there is very little penetration of the idea of having an up-to-date soil health card in this region.
- There are a large number of salt tolerant varieties of rice that are being preserved and being cultivated in nooks and corners of Sundarban island, the performance details of which are not yet known and there is knowledge gap in this regard.
- The cost of cultivation of these varieties is significantly less and farmers don't need to depend on outside agencies or government departments for obtaining the seeds.
- The cultivation practice for these varieties is mostly organic in nature and requires little or no chemical fertilizers or pesticides.
- These varieties are mostly of low productivity, but are important for the local food security and hence needs to be propagated among local farmers through policy measures.
- Farmers are mostly aware of the vulnerability of the HYV seeds which are of higher productivity but of low salt tolerance. The experience of cyclone Aila has made

them aware of the positive side of local rice varieties.

- *Getting enough good quality seeds of local salt tolerant varieties is a problem these days as they are confined in pockets of Sundarban. There are demands for such seeds which the local farmers are failing to meet.*
- *Varieties like “Dudhersar”, due to its special quality, fetches a premium in the market over other varieties. So, in spite of low productivity, farmers get over-compensated through realized price. That is why this variety is found throughout the delta.*
- *Dudhersar is of medium salt tolerance quality. There other highly salt tolerant rice varieties (like Darsal, Nona Bokra, Talmugur), as was identified by scientific community and is in practice in Sundarban, that cannot fetch the price premium in the market. These varieties are existing in pockets of Sundarban but are confined within farming households that are in close neighbourhood of each other.*

Policy Implications

In the backdrop of these findings, the main points that this study throws up for informed policy making are as follows:

- *The inaccessibility and remoteness of the area forbids formal*

institutions and their officials to come and visit Sundarban farmers and provide institutional support. Whatever services they receive comes mostly from local NGOs and some outside agencies who can earn profit from particular types of services. So, there should be a differential treatment for locally operational NGOs and agencies, in terms of increased financial incentive, to provide services like Crop Insurance.

- *Similar situation exists for development of a comprehensive knowledge in the farmers about their soil condition. There is very little penetration of the idea of having an up-to-date soil health card in this region. It calls for an intensive campaign among farmers making them aware of the benefits of soil testing and calls for organizing special camps with mobile soil testing units in this remote rural area.*
- *The cultivation and propagation of these varieties needs government’s active help. In terms of motivating the farmers, cyclone Aila paved the groundwork already. Getting enough good quality seeds of local salt tolerant varieties is a problem these days. There are demands for such seeds which the local farmers are failing to meet. There should be seed banks specialized for such salt tolerant varieties and more seed*

distribution centres in this remote area.

- *Varieties like “Dudhersar”, due to its special quality, fetches a premium in the market over other varieties. So, in spite of low productivity, farmers get over-compensated through realized price. One efficient policy measure can be to devise differential (favourable to salt tolerant varieties) procurement price for these varieties, as farmers have a selling objective over and above their own consumption. If procurement prices are enhanced for more salt tolerant rice varieties in Sundarban, locals will invariably be inclined to propagate their cultivation*

Way Forward

This study was undertaken with limited resources and manpower in a difficult and remote location. In absence of plant specialists in the study team, the findings could not shed much light on the bio-physical characteristics of the reported rice varieties. The exact soil characteristics of the plots could not be matched with the productivity as almost no farmer had a recent soil test report of their plots.

Such local varieties are to be unearthed in greater numbers that would enrich the plant genetic base for future cross-breeding of new species. For this, more large scale surveys in such remote locations are needed, coupled with

efficient funding for recruiting plant biologists and soil scientists. Sundarban is one of the most vulnerable regions in the face of Climate Change and Sea Level Rise predictions. A widespread survey in this line will enhance the knowledge base for effective adaptation policy for this region’s future food security. It remains an open research agenda for future - both for AERC (Santiniketan) and for any other interested agency.

