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THE AGRICULTURAL TRANSFORMATION IN POST AILA PERIOD IN SUNDARBANS, WEST BENGAL: A SWOT ANALYSIS

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An attempt has been made in this paper to identify the challenges faced by the small holder farmers of an aila affected villages of North 24 Parganas district in Sundarbans, West Bengal. The primary data based on the field survey from household—based questionnaire and focus group discussion with the stakeholders has been incorporated in the analysis along with the relevant secondary sources of data collected. The study highlights the resulting socio-economic problems, the changing occupational pattern and the land use transformation. It also shows that farmers hit by aila adopted the approach from paddy to shrimp farming in their reconstruction strategy developed in a participatory way. The study will be greatly helpful for regional agricultural planning.

INTRODUCTION

From the review of empirical literature it is evident that the future of smallholder agriculture in Asia in general and in India in particular face several challenges. The shrinking size of farms, distress-induced rural-urban migration, persistent technological and institutional constraints, climate change with its adverse impacts and the emergence of genetically modified (GM) crops and problems relating to their adoption, etc. are some of the major challenges. These challenges are the outcome of socio-economic, demographic, structural and institutional factors; all these challenges have serious implications for food security and sustainable livelihoods in the smallholder sector. As per the Agricultural Census of 2010–11 in West Bengal the small and marginal holdings (below 2 hectares) taken together constituted 95.92% (national average being 84.97%). A very small negligible section comprised of medium sized (2 to 10 hectares) ones of 4.07% (national average being 14.30) and large sized 0.01% (national average being 0.73%). This is based on the number of operational holdings for all social groups as shown in Table number 5. The fragmentation of farmlands is responsible for the reduction in the size of operational holdings, and according to FAO (2009) the average farm size in India is 1.33 hectares. The Reconnaissance Study of five Blocks in Sunderbans, India under CCDRER project, 2012–2013 has classified farming communities based on land-holding pattern of Sandeshkhali-II Block into five categories. They are the small farmers (3880), marginal farmers (20664), bargadars (5866), patta holders (14146) and agricultural labourers (26164). The figures in parenthesis illustrate the number against each category. It is evident that the agricultural labourers (36.99%) and marginal farmers (29.22%) together form two thirds of the total farming community. This Block has a net cultivable area of 7730 hectares and according to 2011 Census the per capita land holding size is 0.05 hectares.

Agriculture in the district of North 24 Parganas of West Bengal has witnessed a gradual transformation from subsistence farming of early fifties to the present intensive agriculture. This widespread adoption of intensive cropping system particularly of rice in irrigated areas has increased

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remarkably the food grain production in the district. Although this district has been declared as an agricultural export zone on vegetables and fruits, the farmers are yet to reap the benefits. As a result this has become a serious challenge to the extension officials, the agricultural scientists and the policy makers to sustain food security in near future.

The climate of this region is sub-tropical. Cyclones and storm events tend to occur in between May and December with the incidence being highest in May and the post-monsoon months of October and November. These cyclones normally bring high winds, heavy rainfall and strong tidal surge. Cyclonic storm with heavy rainfall and tidal surge were the major characteristic features of Aila (2009). During the last part of the previous decade (2006–2009) the northern part of Bay of Bengal registered four cyclones viz. Sidr, Nargis, Bijli and Aila. On 25th May 2009 cyclone 'Aila' devastated the life and livelihood of the people living in Sunderban deltaic region. People living here mainly depend on agriculture and allied activities for their livelihood. Aila has deprived them of their only source of income. Among the twelve affected districts of West Bengal, the damage in North and South 24 Parganas has been the maximum. Out of the total crop affected area of 2,56,750 hectare in all the twelve districts, the share of North 24 Parganas is 55,600 ha (21.66%) and that of South 24 Parganas is 69,150 ha (26.93%). Saline water gushed in through breaches in the river dykes and inundated houses and lands. Almost 60% of the area in these two districts have been rendered uncultivable and not suitable for making seedbed. The inundation of land by saline water had practically made agriculture impossible in the next three years. It has caused havoc in 5 Blocks (Sandeshkhali-I & II, Minakhan, Hasnabad and Hingalganj) of North 24 Parganas. In most of these villages, the household grain storages (household level food security) that provide year-round food supply for the entire family was washed away along with the house, resulting in acute food crisis. The cooperation and assistance from voluntary organizations, clubs, the UNICEF, Ramakrishna Mission, Bharat Sevasram Sangha and donor agencies have helped in coping up with the situation.

OBJECTIVES AND RESEARCH METHODS

There are very few regional studies that try to understand the complexities of agricultural transformation and their long-term implications for the smallholder sector in Asia. Further, the rapid changes that have taken place in the socio-economic and demographic aspects of smallholder livelihoods call for a detailed review, especially given the emerging global development scenario (Viswanathan et al, 2012). For the exploration of local knowledge and livelihood perspectives and in the understanding of micro-level livelihood dynamics the participatory approach can be successfully applied (Basu, 2011). The village of Dwarir jangle has been considered as the basic unit for in depth study to highlight the experiences of farmers undergoing agricultural transformation. Data on annual agricultural profits are not available and so this study will be helpful to those concerned with such an issue. The problems and prospects of green revolution have been purposely omitted in this paper and instead focus is on the transformation. A critical assessment of agricultural transformation in the village of Dwarir jangle reflects the similar scenario in the entire the *aila* affected region on account of depletion and degradation of natural resources. This study's main limitation is that it does not show the impact of fishing which is intended to be done as a sequence of the ongoing research work.

A cross section of farmers varying in age and experience, and across different socio economic segments of the study area participated in the Focussed Group Discussion conducted in 2013 and again in 2014 under the guidance of the first author. The venue and logistics required in connection with the meeting was arranged by the second author who also helped the first author in the pre-field survey. He also acted as a key informant being a resident of this village. A total of 82 households was purposively selected and surveyed by him. The selected sample population was

392: the number of persons below 15 years was 91 (23%), in the 16–30 age group 116 (30%), between 31–45 age group 106 (27%) and above 45 were 79 (20%) persons. The data on actual field outcomes have been collected and analyzed to meet the objectives of identifying the socio-economic and demographic challenges, the changing occupational pattern, change in the pattern of land utilization and the land use transformation in the village and its impact thereof. With the help of a SWOT (strengths, weaknesses, opportunities and threats) analysis recommendations are put forward before developing a strategic plan. Such an analysis is necessary to provide direction to the next stages of the change process (Birkenmaier 2001). Deep gratitude is expressed towards the officers of the Block Development Office, the Panchayat Office, the Agricultural Department and the NGO Joygopalpur Youth Development Society (JYDC) who helped in providing with relevant secondary data and materials. The Census including the Agricultural Census, the Village Level Directory, and several other online websites are also referred to for a greater insight. The supporting hypothesis of this paper is that rice yields are reported to be stagnating, mainly because of climate change/weather-related factors rather than technology-related ones. A significant determinant of agricultural output is the exogenous factor of climate change/ weather.

THE STUDY AREA

Dwarir jangle happens to be the largest village (with an area of 1863.98 hectares) falling in the jurisdiction of Sandeshkhali Gram Panchayat of Sandeshkhali Block II in North 24 Parganas district of West Bengal. The Block is in the south-western part of the district. The Sandeshkhali Gram Panchayat is surrounded by Barakalagachia and Dansa rivers. Agriculture is the mainstay of the people which counts to 70% followed by fisheries 20% and the rest earn their livelihood as service providers, small businessmen, van pullers, crab catchers, honey collectors, with a very few in the service sector. In 2011 a total population of 11,155 persons lived in the village of which SCs & STs comprised of more than 80%, their share being 4893 (43.86%) and 4123 (36.96%) respectively. The literacy rate of 61.47%, although having risen slightly from the previous decade of 52.91% is a dismal figure. The workers (numbering 5000) in 2011 formed 44.82% of the total population, in 2001 they were 34.54%. The number of dependents on the working population is therefore high; however the dependency has reduced with more alternative job opportunities credited to this village through the government interventions.

Application of SWOT Analysis in Agricultural Sector

A SWOT analysis (alternatively SWOT matrix) is a structured planning method used to evaluate the strengths, weaknesses, opportunities and threats involved in a project or in a business venture. It can be carried out for a product, place, industry or person. It involves specifying the objective of the business venture or project and identifying the internal and external factors that are favourable and unfavourable to achieve that objective (Wikipedia, the free encyclopedia). Identification of SWOTs is important because they can inform later steps in planning to achieve the objective. The elements to consider in a SWOT analysis include understanding of the concerned community which are done via public forums, listening campaigns, and informational interviews. Data collection will help inform the community members and workers when developing the SWOT analysis. The needs and assets assessment are the tools that can be used in order to identify the needs and existing resources of the community. When these assessments are done and data have been collected, an analysis of the community could be made. A SWOT analysis is best developed in a group setting such as a work or community meeting. A facilitator can conduct the meeting by first explaining what a SWOT analysis is as well as identifying the meaning of each term. A SWOT meeting allows participants to creatively brainstorm, identify obstacles and strategize possible solutions to these

limitations. With increasing salinity, declining soil fertility, decreasing agricultural productivity and increasing income through diversion to fishing a SWOT analysis was felt essential to evaluate the strengths, weaknesses, opportunities and threats involved in the change in the agricultural sector. The strengths and opportunities in the agricultural sector are depicted in Table 1.

Table 1: Strengths and Opportunities in the Agricultural Sector

Strengths	Opportunities
The area is blessed with natural resources like ample rainfall, suitable soil and topography, surface and ground water resources and good climate for production of variety of crops, both agricultural and horticultural.	Scope for increasing cropping intensity with water harvesting measures and crop diversification.
Responsive soils to different inputs and management practices.	Fertile old and new alluvium soil rich in organic matter offers good prospect for increasing productivity and cultivation of various types of crops.
High cropping intensity	Soil amelioration measures through adoption of organic farming, vermi-composting offer a good scope.
Huge availability of untapped ground and surface water for irrigation. (e.g. ponds/ tanks, rivers).	Enough scope for increasing irrigation potentialities due to the presence of numerous ponds.
Fairly good survey of agricultural credit from the banking sectors, NABARD, NGOs.	Scope for engagement of progressive farmers into contract farming and establishment of agro-based industries.
Strong Panchayati Raj System for effective planning and implementation of development schemes at grass root level (seeds, fertilizer and subsidy to agriculture machinery)	Wide production base with availability of raw material during a major part of the year offering good scope for multi product based fruit and vegetable processing units.
Providing knowledge support to the agricultural development programs by the two state Agricultural Universities Bidhan Chandra Krishi Viswa Vidyalaya (BCKV) and Uttar Banga Krishi Viswa Vidyalaya (UBKV)	Increasing scopes in deployment of womenfolk in agricultural activities especially to Self Help Group, Farmers Interest Group, Commodity Interest Group which already exists in the district.
Close proximity to urban areas, dense population (and hence demand), good transport network.	Close proximity to urban areas can maximise the potentialities of the existing agricultural marketing system.

Source: Analyzed by the authors based on literature review and field survey.

Focus Group Discussion with the tillers of the soil helped in looking into the pre and post *Aila* agricultural production, cost and profit scenario in one *bigha* (0.33 acres) of agricultural land. The analysis is put up in Table 2 and 3; the money value in rupees is at the time of second survey (Feb-March 2014).

The yield of paddy from one *bigha* of land in pre-*aila* period was on an average of 14 *bostas* (gunny bags), its monetary value being rupees 7800/-; its cost calculated to be of rupees 4050/-,

hence the net profit earned being rupees 3750/-. The *bigha* is the normal unit of measurement cited by the local farmers and so this unit has been kept as the reference unit in this study. The capacity of one *bosta* is normally equivalent to 60 kilogram by weight of paddy they said. According to a local farmer Arup Mondol in Sandeshkhali the income is to the tune of Rs. 6,000 per acre against an investment of Rs. 4,000 per acre each sowing season.

Table 2: Production Scenario pre-*Aila* in One *Bigha*

Stages in Agricultural Production	Money Value in rupees
Preparing the land	680/-
Sowing	290/-
Tilling with tractor	580/-
Transplanting	840/-
Insecticide & fertilizer application (if required)	540/-
Harvesting & transporting	1120/-
Hay/straw (earnings from its sale)	1500/-

Source: Primary survey based on FGD with villagers.

Table 3: Production Scenario post-*Aila* in One *Bigha*

Stages in Agricultural Production	Money Value in rupees
Preparing the land	960/-
Sowing	581/-
Tilling with tractor	810/-
Transplanting	1260/-
Insecticide & fertilizer application (if required)	905/-
Harvesting & transporting	1440/-
Hay/straw (earnings from its sale)	2000/-

Source: Primary survey based on FGD with villagers.

The yield of paddy from one *bigha* of land in post *aila* was on an average of 8–9 *bostas* (gunny bags), its monetary value being rupees 8750/-; its cost calculated to be of rupees 5956/-, hence the net profit earned being rupees 2794/-. This indicates that the profit gained has reduced by about one thousand rupees against per *bigha* of land in spite of the fact that the price of paddy has increased (750–450) by 300 rupees, and selling price of straw has increased (2000 – 1500) = 500.00 rupees. It has been noticed that the yield has reduced considerably by 4 *bostas* per *bigha*.

The future prospects of agriculture in Asia are threatened by climate change and food security challenges. Changes in average temperature, shifting patterns of rainfall and changes in the frequency and intensity of extreme weather events affect agriculture in the ways that are unpredictable (Viswanathan et al 2012) and similar scenario is to be found here. Before *aila* the total land under agriculture in the village was 177 *bigha* (single crop-148 *bigha*, double crop-29 *bigha*) and land under fisheries was 48 *bigha*. After *aila* the land holding size has changed, the total land under agriculture is 133 *bigha* (single crop- 115 *bigha*, double crop-18 *bigha*) from 177 *bigha* and land under fisheries has increased to 84 *bigha* from 48 *bigha*. The double crop agricultural land has decreased by 11 *bigha* and single crop agricultural land by 33 *bigha*. The fisheries land has increased 2014 onwards by 36 *bigha*.

Table 4: Annual Average Daily Wage Rate of Male Labourers in Agriculture

Name of District	Daily Agriculture Wage Rate (Rupees)				
	1993–1994	2003–2004	2008–2009	2009–2010	2010–2011
North 24 Parganas	30.07	61.75	85.78	102.81	133.0
South 24 Parganas	38.13	67.97	96.66	115.69	129.0
West Bengal	28.36	59.48	82.45	95.44	119.0

Source: Dept. of Agriculture, Govt. of West Bengal.

Table 4 reveals that the agricultural labour wage rate has increased as per the department of agriculture, Govt. of West Bengal. There is increasing cost in seeds and fertilizers as well. All these are responsible for loss in interest in agricultural activities by the local farmers and hence a search is on for alternative source of earnings and economic activity.

Based on the above findings a SWOT analysis on the weaknesses and threats detected in agriculture has been summarised in Table 5.

Table 5: Weaknesses and Threats in the Agricultural Sector

Weakness	Threats
Small and fragmented land holdings: around 95% of the total land holdings belong to marginal and small farmers.	Lack of interest among young farmers in the agriculture and allied activities due to increasing avenues in other occupations.
Mono cropping and growing paddy as subsistence farming.	Reluctance of poor income group farmers to adopt modern agricultural technologies.
Financial weakness of farmers.	Diversion of agricultural land to other non agricultural economic activities.
Inadequacies and untimely credit flow from financial institutions.	Decreasing trend of agricultural labour force due to migration.
Lack of ICT facility among farmers.	Degraded environment and ecosystem, erratic behaviour of monsoon, Deterioration in quality of surface water and depletion of ground water due to over mining.
Lack of scientific attitude and laggardness of farmers makes it difficult to introduce advanced technology in farmers' fields.	Increasing salinity in soil in the Sandeshkhali block II area.
Inherent climatic and soil problems (flood, storm, salinity).	After Aila adequate support to land reclamation process was lacking.
Fast deteriorating soil health and productivity due to excess application of chemical fertilizers and low application of organic inputs.	Decline in agricultural productivity.
Unavailability of quality seeds in remote parts, low seed replacement rate, lack of awareness regarding seed treatment facilities.	Increase in cost in agriculture.
Improper drainage system in low-lying pockets resulting in prolonged water logging affecting crop productivity.	Rapid urbanization leading to low land-man ratio.
Inadequate irrigation facilities, agricultural extension services and input delivery system.	Fisheries are too profitable to agriculture.
Poor post harvest management and value addition.	
Inadequate market infrastructure and predominance of intermediaries.	

Source: Analyzed by the authors based on literature review and primary survey.

Drivers and Outcomes of Agricultural Transformation

The challenges confronting Indian agriculture are multidimensional. Mounting demographic pressure on farmlands has resulted in the fragmentation of holdings. Small and marginal holdings now constitute 84.97% of the farmland in India. Besides fragmentation of holdings, there is now a high incidence of rural landlessness as highlighted in the National Sample Survey Office (NSSO) surveys. Landlessness has been caused by poverty or natural disasters (floods, cyclones and riverbank erosion) or land-grabbing. There is also high work participation rates (55%) among those more than 60 years old in rural areas (Rajan 2009). Rural-urban migration is high in most Asian countries due to lack of employment opportunities both within agriculture and outside it. It is also due to low profitability of agriculture. The feminisation of agriculture has been one of the major aspects of rural transformation in most parts of Asia including India. The increase of women in agriculture is attributed to a variety of factors such as male outmigration, the growing number of women-headed households, and the increase in labour-intensive cash crops and persistent poverty in rural areas (UNIFEM 2008). The decline in investment in agriculture is all the more worrying as it has happened in the face of rising rural poverty in Asia (World Bank 2008).

CONCLUDING REMARKS

A critical assessment of agricultural transformation in the village of Dwarir jangle reflects the regional scenario of the *aila* affected areas. SWOT analysis is a useful technique for understanding the strengths and weaknesses, for identifying the opportunities open and the threats faced in agriculture. Identifying the strengths helped in getting to know of the advantages this agricultural activity has over other livelihood opportunities in the study area and in appraisal of what this activity does better than anyone else. Identifying the weaknesses helps in thinking of what could be done to improve the situation and what should be avoided. Identifying the opportunities from the trends could help in thinking of ways and means of making agriculture sustainable in the long run. By identifying the threats faced in agriculture with the environmental changes it helped in realising the obstacles faced and in getting to know what the competitors (fishermen) are doing. The effects of climate change, including frequent natural calamities has serious implications for food security in the village which falls within a vulnerable region.

The villages are affected by the cyclonic storm of *aila* resulting in salinity increase, loss of agricultural land and fruit trees. The area houses the marginalised sections who reside under poor living conditions (very few living in pucca houses). Many respondents didn't enjoy the benefits availed from having BPL (Below Poverty Line) cards and most were without KC (Kissan Credit) cards. Agricultural land is no longer beneficial to the people due to salinization of land decreased productivity of land, the dramatically increase cost of agriculture; besides the labour shortage problem. With the costs of agricultural inputs escalating, many farmers do not find agriculture a viable profession. The future of the smallholder agriculture faces serious challenges and the potential threat of climate change exerts pressure to adopt alternative sustainable ways of livelihood opportunities. Many changed their occupation from agriculture to shrimp farming due to salinity increase, loss of agricultural land, poor water drainage facility, less hard work required in shrimp farming and better economic benefit. This is a long-term adaptation technique adopted by the community initially started by a few and seeing the positive outcome was consequently adopted by a large section of the agricultural community. The utilization of agricultural land is thus being diverted. Fisheries have become more profitable and at the present time fisheries based economy is the major livelihood strategy adopted. The increased adoption of shrimp farming and fishing is expected to benefit poor rice growing households in Dwarir jangle thereby helping to mitigate the

problems of food insecurity, malnutrition and abject poverty. The future of these smallholders may not lie in farming alone. Rather, it calls for measures to stimulate rural non-farm sectors and create more employment opportunities.

Agricultural development policies and programmes as well as technological and institutional developments in India have so far heavily focused on planning from macro perspectives (*planning from above or the top down approach*) without understanding the importance of micro environments and the socio-ecological systems that shape smallholder livelihoods. Evolving policies and strategic interventions may be difficult because there is a clear lack of empirical understanding about the micro-level implications of many of the challenges discussed above. Hence, a major challenge that the country has is evolving new policies based on local needs and priorities, investing in Research and Development and implementing technological and institutional development strategies for agriculture from the perspective of regional "agro-socio-eco-systems". This makes it important to understand the various adjustment mechanisms, including changes in cropping systems and farming methods being adopted by farmers (at the regional level) to overcome such adversities; and the existing interventions or policies/programmes (if any) to check migrations, and their success at the local-regional level. Region specific agricultural Research and Development is required. Increased and sustained investment is needed in agricultural research and development, to develop new technologies, management systems, and seed varieties designed for higher yields or resistance to disease, drought, and pests. On an all India level, current public spending on agricultural Research and Development (R & D) is only 0.46 per cent of India's agricultural GDP!

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