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Impact of Cyclone Aila on Paddy Cultivation in Gosaba Island of the Indian Sundarban Region

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Abstract

On 25th May 2009 morning severe cyclone Aila hit the Bay of Bengal coast of the Indian Sundarban region with tidal surges up to 6.5 m high, affecting 11 coastal districts. This damaged and washed away over 1,743 km of embankments, removing the only protection available to many people along the coast. This tidal surge caused floods over the entire region which brought high salinity and pH, thereby affecting the crop production that markedly reduced after this severe cyclone. In the present study the author tries to explore the effect of a super cyclone like Aila on the rice cropping of Gosaba.

Introduction

The estuarine system of the Ganga- Brahmaputra deltaic region forms the largest mangrove eco-system in the world shared between India and Bangladesh approximately in the proportion of 60:40. It has been declared as a World Heritage Site by UNESCO. The extension of the region is between 21° 30′ N to 22°30′N and 88°10′E to 89°10′E covering about 104 islands of which 54 have been completely deforested. The 'Dampier-Hodges Line' named after the two Surveyor-General of India, Mr. William Dampier and surveyor Lt. Alexander Hodges, marks the northern limit of the Sundarbans, running in a slightly zigzag pattern from Basirhat in the north-east to Kulpi along the Hugli in the west. Politically the Sundarbans in North-24 Parganas falls within the six Blocks of Minakhan, Haroa, Sandeshkhali-I and II, Hasnabad and Hingalganj while in South 24 Parganas it extends over thirteen Blocks of Gosaba, Basanti, Canning-I, Canning-II, Joynagar-I, Joynagar-II, Kultuli, Patharpratima, Namkhana, Sagar, Kakdwip and Mathurapur-II. The entire Indian Sundarban covers an area of 9630 sq. km bounded between estuary of river Hugli in the East, Bay of Bengal in the South, Ichhamati-Raimangal in the East and the Dumpier and Hodges line in the North.

Study Area

The Gosaba Block (22°9′47″N, 88°48′10″E) consists of 51 mouzas with an average area of 5.6 ha. According to the District Statistical Handbook, Government of West Bengal, 2000-01, the decadal population growth rate is 11.2% (1991-2001) with a population density of 799 persons/sq. km. There were total 222822 people in the Gosaba Block living in 44478 households with 5254 persons in Gosaba village alone. Of the 16896 cultivators about 2.44% are bargadars, 7.1% small farmers, 20.96% pattaholders and 40.53% marginal farmers.

Cyclone Aila and it's Impact

Cyclone Aila was the second tropical cyclone to form within the Bay of Bengal in 2009. The cyclonic disturbance that was to become CycloneAila formed on 21 May 2009. Over the following days the disturbance slowly intensified into a cyclonic storm, named Aila, and located approximately 350 km offshore. Cyclone Aila became a severe cyclonic storm on 25 May morning.The system maintained a cyclonic intensity for approximately 15 hours after making landfall. Hitting during high tide, the cyclone brought with it tidal surges of up to 6.5 m, affecting 11 coastal districts. This surge of

water damaged and washed away over 1,743 km of embankments, removing the only protection available to many people along the coast. In many areas the damage to the network of embankments has resulted in a prolonged continuation of what affected communities faced in the immediate aftermath of the cyclone flooding. Breeches in the embankments, which become severe during daily high tides, and particularly during periods of full moon, have prevented the high levels of self-recovery normally seen in Bangladesh following disaster events. The severe tropical cyclone Aila, the landfall of which coincided with spring high tide at Indian Sundarban on 25 May 2009, caused most widespread inundation of the region in recent times.

With this tidal surge huge amount of salty water came into the agricultural land and was stagnant for a long time. Due to this flood, salinity of the soil increased highly which affected agricultural production. Agricultural system was totally damaged due to high salinity of the agricultural field. Before this disaster, where the production of rice was 640 800 kg per bigha , it got reduced to 320-400 kg per bigha. Economy of this region was totally hampered due to this severe cyclone Aila. Stalinization resulting from water logging destroyed agricultural fields and fresh water quality.

On the agricultural fields thin veneer of salt was observed and the water bodies were heavily contaminated. So Aila has altered the livelihood of the peoples of Sundarban and Satjelia is not an exception. A questionnaire has been prepared and the villagers were asked to rate the listed problems they have faced after Aila. The study shows that according to them salinization, agricultural losses, loss of property, degradation of water quality are the major concerns.

Landuse and Land Cover Change

With the help of LANDSAT image Landuse and Landcover map of before Aila (January, 2009) and after Aila (January,2010) has been prepared. It is found that maximum area under Gosaba island has been converted into fallow land due to impregnation of salinity, which previously was a tract of fertile agricultural land.

Effect on Vegetation after Aila

With the help of GIS platform NDVI of the Gosaba Island of before Aila and after Aila has been calculated. It has been found that proportion of stressed vegitation decreased into 5.83 % in 2010 from 7.65% in 2009, moderate vegetation decreased into 5.29% from 5.48% and healthy vegetation decreased into 3.61% from 4.50%. While soil cover increased into 74.97% in 2010 from 71.18% in 2009 due to conversion of agricultural land into fallow land.

Effect on Paddy Cultivation

Paddy is the main crop of Gangetic West Bengal. In Gosaba island mainly two types of paddy are cultivated. One is Aman paddy which is cultivated in monsoon season totally based on rain water. And the other is Boro paddy which is cultivated in winter based on irrigation water. Paddy (*Oriza sativa*) is moderately tolerant to salinity and production remains unhampered when salinity lies below 2.01ppt. It becomes almost half with a salinity level of 4.824ppt and a total failure when salinity rises above 7.00 ppt.

After the tidal surge on 25th May, 2009 maximum salinity increased in Gosaba Mouza from 0.9ppt in 2005 to 6.01ppt in 2011 followed by Rangabelia, Choto Mollakhali, and Pakhirala mouza. Maximum area under Gosaba block flooded due to the tidal surges of Aila and there was no proper drainage system to remove the salty water from agricultural field. That is why salty water was over stagnant in agricultural field for a long time and increased soil salinity and pH. Before Aila, the average production of Aman paddy (Monsoon crop) was 28004 kg/ha in 2008-09 which reduced to 14525 kg/ha in 2012-13.

A maximum rate of reduction in Aman paddy production is found in Gosaba, Rangabelia, and Hentalbari and Amalmethi mouzas due to saline soil. On the other hand before Aila average production of Boro paddy (winter crop) was 34671 kg/hec in 2008-09 which reduced to 20833kg/ha in 2012-13. Maximum reduction of Boro paddy production occurred in Gosaba, Luxbagan, Rangabelia and Manmathanagar Mouzas.

Effect on Local Livelihood Pattern

Aila has massively damaged the embankment along the creeks and rivers. Due to the lack of proper drainage system, the surge water could not fall back into the river, thus leaving a thick layer of salt on the top soil. Fertility was markedly reduced which destroyed the production system. The production of food crops have vastly reduced since 2009 till date, leaving the poor farmers with neither the money nor the means of substances. This has changed the occupational structure of this region. Migration has highly increased after this disaster. Maximum working male population migrates from this region to urban area for searching of jobs. Most cultivators can cultivate only one crop a year. Many have become wage labours and have left for other places in India in search of jobs. The women folk, back at home ,have to do all the work on field and home. Children hardly find time to go to school. Aged does not want to leave their ancestral home even if in dilapidated condition and susceptible to further hazards.

Recommendations

Aila has massively damaged the agricultural system of Gosaba Island. Due to lack of proper drainage system the surge water could not flow back into the river and hence left a thick layer of salt on the top soil over agricultural plots. Consequently, fertility was markedly reduced. To increase the fertility of the agricultural land soil must be frequently ploughed and use of fertilisers

with organic matter for root development is necessary. Soil management is very much needed for both plant growth and mineralisation of organic matter. Iirrigation system should also be developed for betterment of production.

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Table-1: Salinity of Water Bodies in and around Gosaba.

Waterbody	Salinity (before Aila) (ppt)	Salinity (after Aila) (ppt)
River	15.0	15.8
Pond	2.0 – 3.0	30.0
Creek	15.0	30.0
STW	20.0	28.0

Source: Oceanography Department, Jadavpur University

Table-2: Damages caused by Aila

Summary of the Damages (caused by Aila)	
No. of Villages affected	4249
Population affected	2,562,442
Persons missing	8000
No. of Deaths	Official = 70 Unofficial = 300
Embankment breached	400 km
Cattle lost	212,851
Agricultural Land affected	125,872
Financial Loss (agriculture)	Rs. 337 crores
No. of Houses fully damaged	194,390
No. of Houses partly damaged	194,701
Total Loss	Rs. 1496 crores
Source: GoWB, 2010 (Rudra, K: Forced Migration, MCRG, Kolkata. pp86-93)	

Table- 3: Soil pH in different Mouzas of Gosaba

Villages	Pre-Aila		Post-Aila	
	Salinity (ppt)	pH	Salinity (ppt)	pH
W. Radhanagar	1.20	4.90	1.42	6.60
Mitrabari	0.59	4.9	1.93	6.32
Sukumari	0.55	4.05	0.50	6.48
Jhaukhali	0.60	5.90	0.13	6.25
Sadhupur	1.30	4.50	2.23	4.67
Pakhirala	1.30	4.90	2.20	5.06
Basanti	0.80	5.54	2.05	5.50
Luxbagan	0.67	5.82	3.40	4.53
Dayapur	1.90	4.62	1.63	7.20
Rangabelia	3.53	5.25	5.25	6.02
Lahiripur	3.90	4.80	2.50	3.05
Chhota Mollakhali	2.10	5.20	3.42	4.96
Kumirmari	0.36	5.58	2.14	5.65
Amtoli	2.80	4.35	4.45	6.65
Birajnagar	1.10	4.80	0.82	6.14
Chimta	2.10	5.21	2.36	5.27
Gosaba	0.90	5.05	6.01	3.44
Manmothanagar	1.50	5.16	1.17	5.71
Chandipur	3.10	7.47	1.63	7.20
Dulki	2.60	5.30	1.35	4.95

Source: Tagore Society, Rangabelia, Gosaba

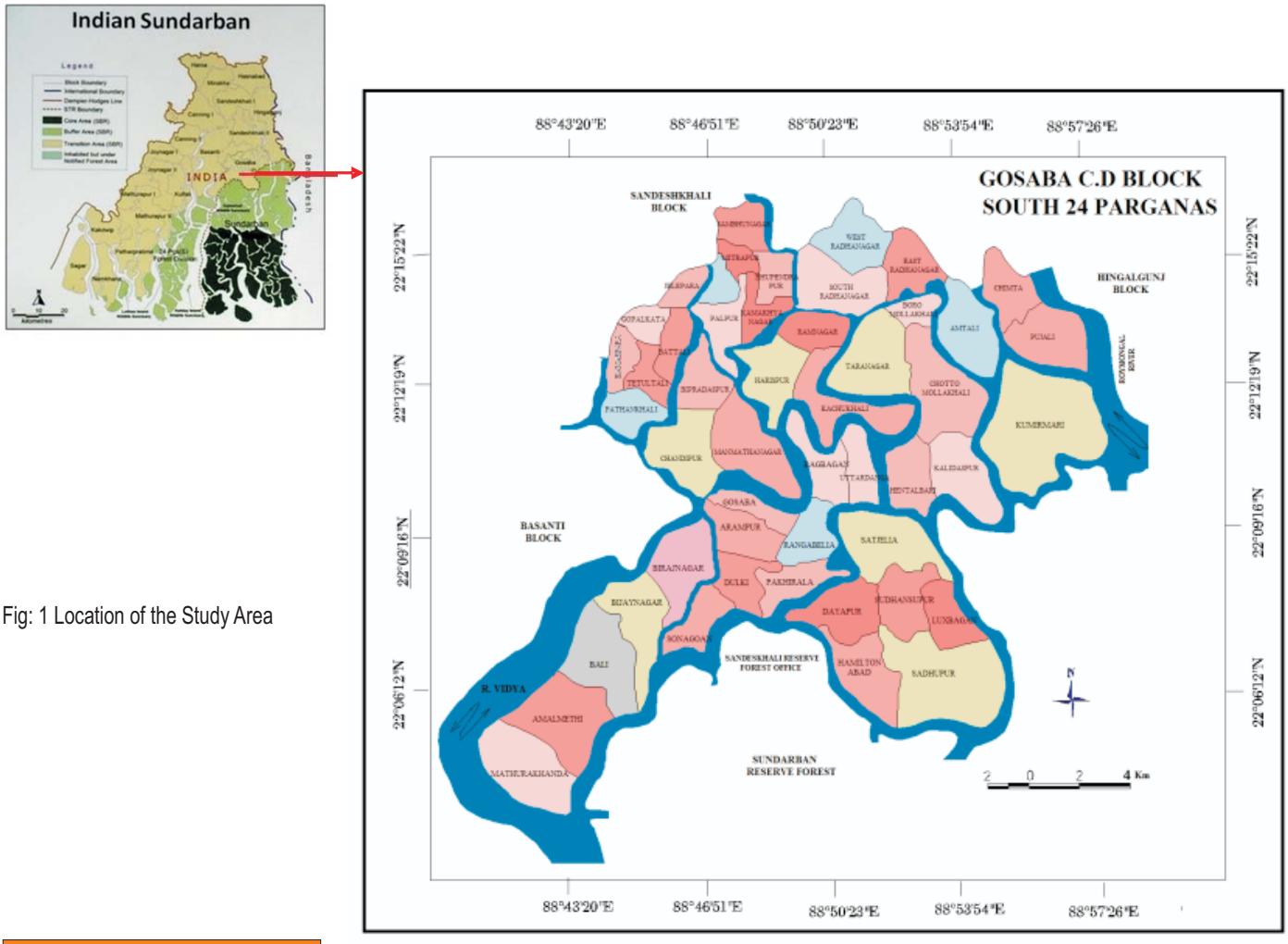

Fig: 1 Location of the Study Area

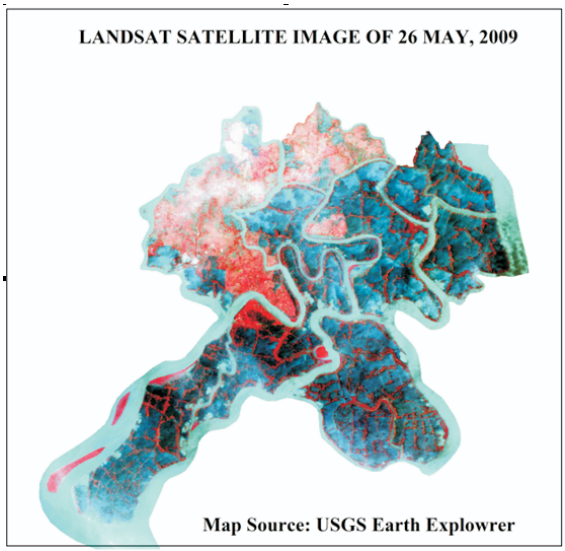

Fig. 2: Floods in Gosaba, 26.05.2009

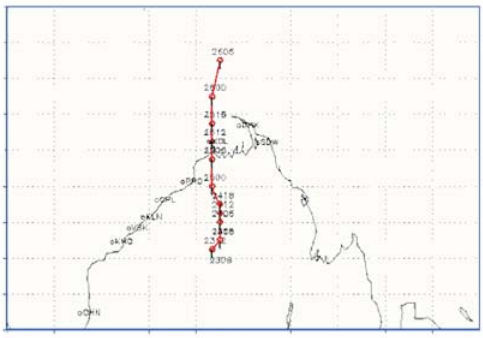

Fig. 3: Track of Cyclone Aila

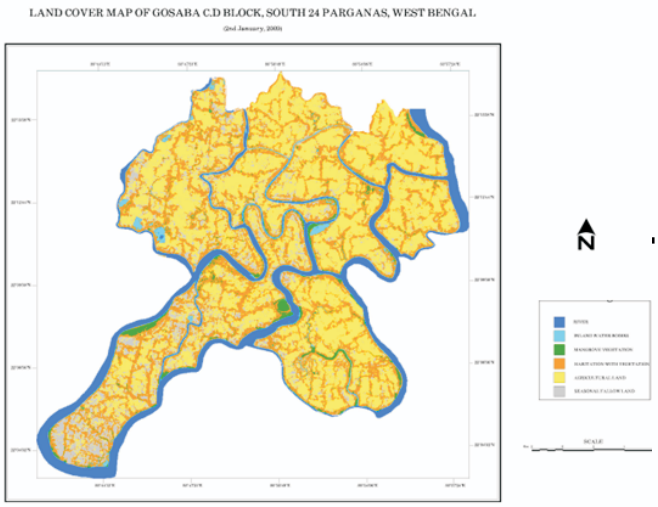

Fig. 4: Land Cover Map January, 2009

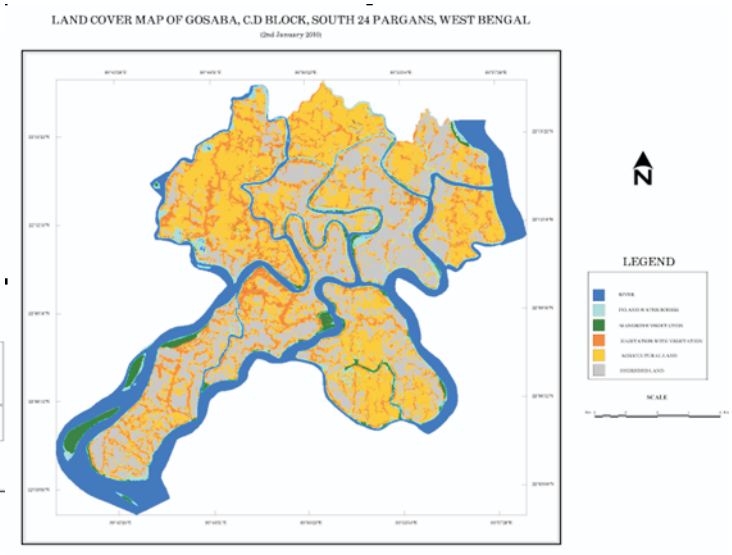

Fig. 5: Landcover Map January, 2010

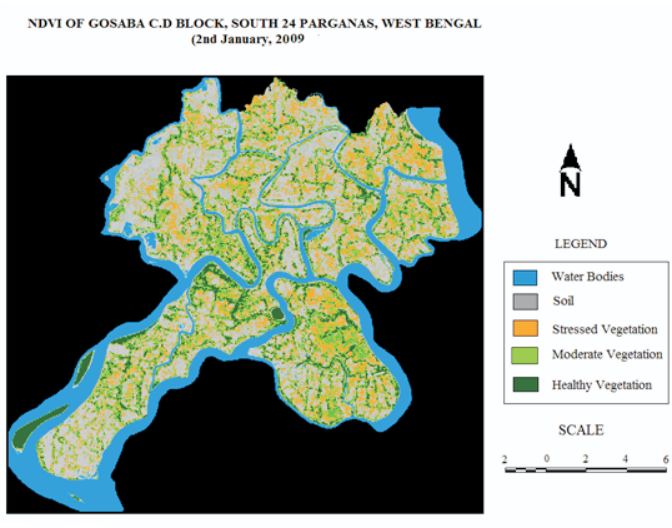

Fig. 6: NDVI, January 2009

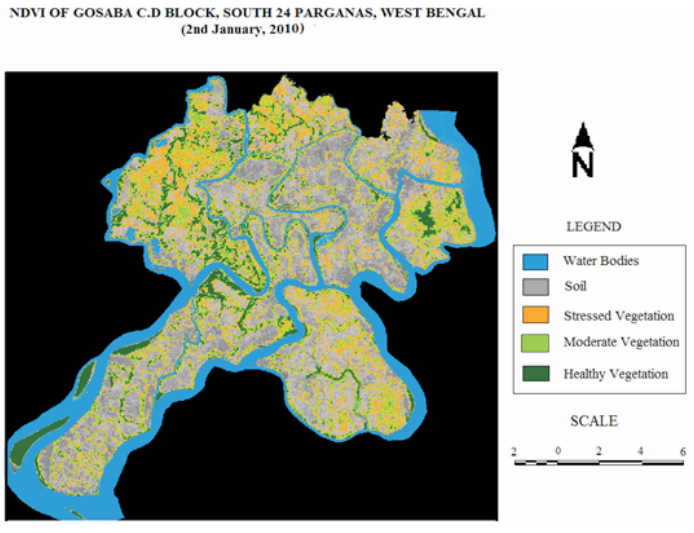

Fig. 7: NDVI, January 2010

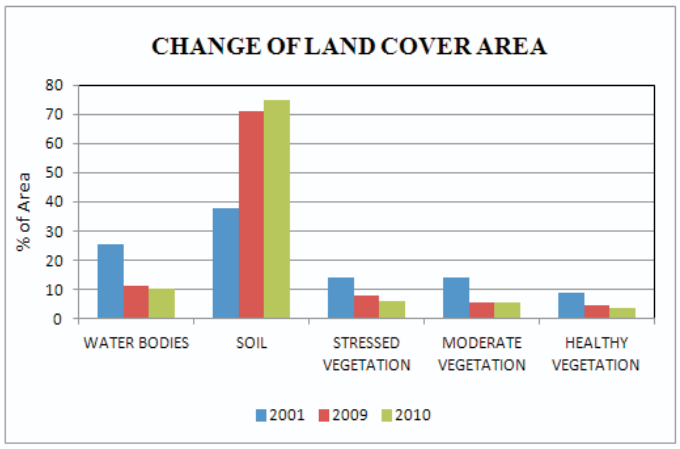

Fig. 8

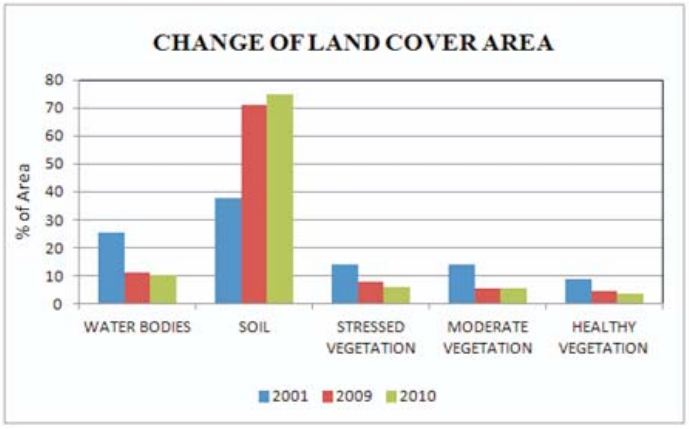

Fig. 9

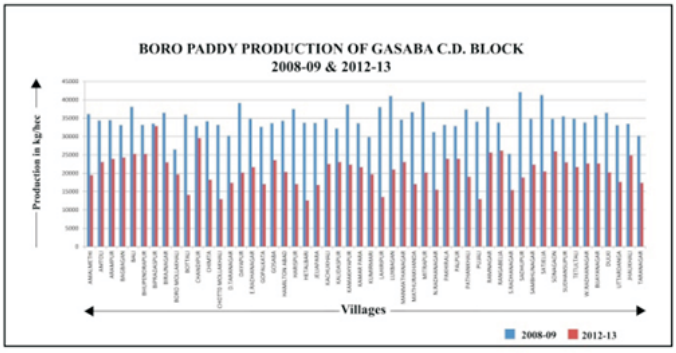

Fig. 10

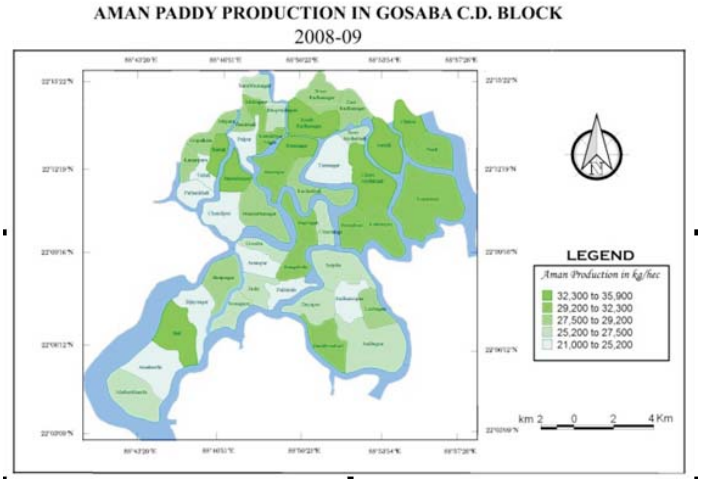

Fig. 11

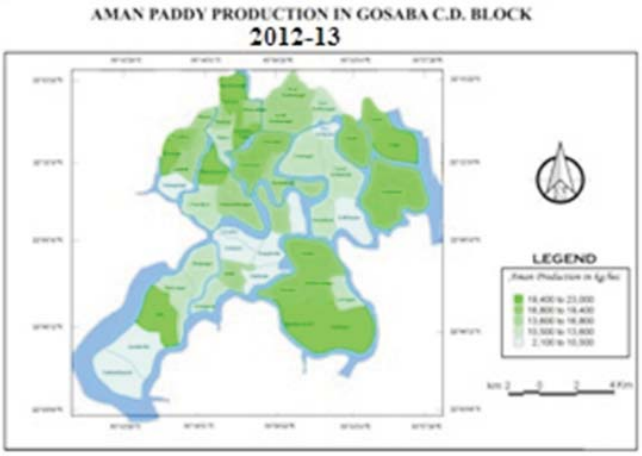

Fig. 12

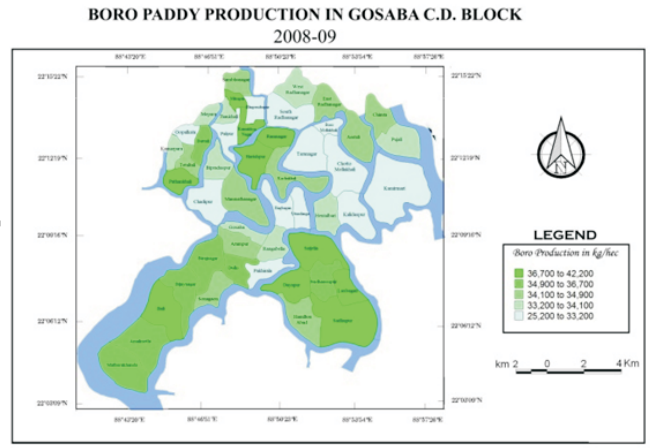

Fig. 13

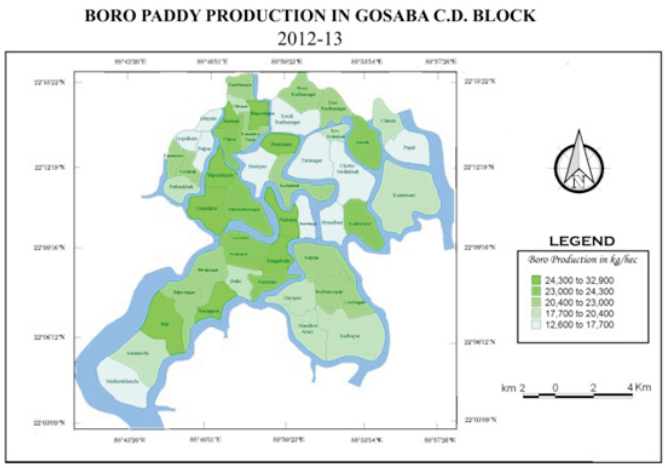

Fig.14

Plate - 1

Plate - 2

Plate - 3

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