Investigating the Impact of Severe Cyclone Aila and the Role of Disaster Management Department - A Study of Kultali Block of Sundarban

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Abstract: Objectives: The present paper evaluates the impact of severe cyclone Aila in Sundarban area of West Bengal as well as to have greater awareness of community about the relevance of post-disaster management so as to face crisis situation. Background: Cyclone Aila hit coastal West Bengal on 25 May, 2009. Over 5.1 million people have been affected in 16 districts of West Bengal. The damage impact assessment carried out by the government of West Bengal and UNDP reported 96 deaths, out of which 25 were caused by a landslide in Darjeeling. The storm was especially devastating for farmers who were preparing to harvest rice and other crops. The cyclone, which was accompanied by heavy rainfall, flooding and landslides, had led to a situation which was precarious in South 24 Parganas and North 24 Parganas districts of the Sundarbans area. Approximately 9,20,000 houses have been damaged, the majority of them in Sundarbans. Methodology: The study is based on data related to cyclone has been collected from field survey and the response of the dwellers in 9 Panchayats having 46 Mouzas and 43 inhabited villages in the Kultali Block. Some secondary data have been collected from several publications of Bangiyo Bhugol Mancha of various years, Statistical hand book of different districts ,Bureau of Applied Economics & Statistics, Government of West Bengal, Economic Review, Human Resource Development Report, District Census Book etc. In the course of analysis, median and multiple regressions have been performed by using SPSS-17 software. Results and Analysis: Empirical results indicate that food security is ensured by providing assistance with enhanced livelihood activities. From the study it has been clear that peoples have increased access to improved drinking water and hygienic sanitation facilities and adopt more hygiene practices and have increased resiliency and capacity to reduce risk and prepare for future disasters. Policy Implications: Disaster relief and recovery efforts should be conducted within a framework that protects and improves human conditions. Community based disaster management is much needed in coming years with focus on disaster risk reduction.

Keywords: Aila, Sundarban, West Bengal, Kultali Block, Drinking Water, Hygienic Sanitation Facilities, Post-Disaster Management

1. Introduction

The people of Sundarbans believe that Mangrove can act as shield against high intensity cyclone in the region. But with the increased pressure of population in the Sundarban region ecological balance is being disturbed. As per dwellers of this block disaster as caused by cyclone like Aila occur in this region very frequently, though Aila occurred after a long gap. Table 1 shows the natural disaster in the Sundarban region in last 100 years.

Table 1. Natural Disaster in the Sundarbans Region.

Nature of Disaster	Year	Nature of Disaster	Year
Cyclone	1909	Cyclone	1956
Cyclone	1913	Cyclone	1960
Cyclone (Twice)	1916	Cyclone	1961

Nature of Disaster	Year	Nature of Disaster	Year
Cyclone	1917	Cyclone	1962
Cyclone	1919	Cyclone	1965
Cyclone	1922	Cyclone	1966
Cyclone	1927	Cyclone	1968
Cyclone	1928	Cyclone	1970
Cyclone	1929	Cyclone	1973
Cyclone	1932	Severe Flood	1976
Cyclone	1934	Cyclone	1978
Cyclone	1935	Cyclone	1981
Cyclone	1936	Cyclone	1982
Cyclone	1937	Cyclone	1985
Cyclone	1940	Cyclone	1988
Cyclone	1941	Cyclone	1991
Drought	1942	Cyclone	1994
Cyclone	1943	Cyclone(Aila)	2009
Cyclone	1948		

Source: Directorate of Meteorological Centre, Kolkata.

Table 2 shows the frequency of cyclone in the Sunderban Region during the last 100 years. The table shows that the Sunderban region is more vulnerable to severe cyclonic storms during the months of May, October and November. The region experiences less severe cyclones during the period April to December.

Table 2. Month-wise frequency of Cyclonic Storms in the region during 1909-2009.

Month	Jan	Feb	Mar	Apl	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less Severe	5	1	4	19	31	36	40	26	27	54	57	27	327
Severe	2	1	2	8	21	5	9	2	10	22	24	11	121

Source: Directorate of Meteorological Centre, Kolkata.

Sundarbans is a part of both North and South 24 –Parganas. Sundarbans of North 24-Parganas consist of 6 blocks such as -Minakhan, Haroa, Sandeshkhali I and II, Hansnabad and Hingalganj. Whereas Sundarbans of South 24-Parganas consists of 13 blocks such as - Sagar, Namkhana, Kakdwip, Patharpatima, Mathurapur I and II, Basanti,Canning I and II, Kultali, Jaynagar I and II, Gosaba. In comparison to North, its extent is much larger in the South 24-Parganas district (Lahiri, 1998). Out of total area of about 4,262 sq km, 1,700 km is occupied by water bodies in the forms of river, canals and creeks of width varying from a few meters to several kilometers. Rivers in the Sundarbans are meeting places of salt water and freshwater. Thus, it is a region of transition between the freshwater of the rivers originating from the Ganges and the saline water of the Bay of Bengal (The buffer zone between freshwater of upstream and salt water of sea is known as estuary). The present day estuarine boundary of river Ganga in India is well known as Hoogly-Matla estuary which also includes inter-tidal mangrove swamps popularly known as Sundarban. Twenty-six of the fifty broad mangrove types found in the world grow well in the Sundarbans. The Sundarbans provides a unique ecosystem and a rich wildlife habitat. According to the 2011 tiger census, the Sundarbans have about 270 Royal Bengal Tigers. The balance in the eco-system is often disturbed due to the cyclones. Because of large water bodies on all sides covering about 1700 Km the Sundarban area is inundated by cyclones. On May 25, 2009 Cyclone Aila struck the Sagar Island, West Bengal at around 12 noon, with wind reaching 120-140 km per hour accompanied by torrential rain of about 400mm. The storm badly affected four districts of West Bengal namely South 24 Parganas, North 24 Parganas, Howrah and Kolkata. All the nineteen blocks as mentioned above were severely affected by Aila. The major rivers like Matla, Gosaba, Piyali-Bidyadhari, Saptamukhi, Kalindi , Muri Ganga, Hugli and Harinbhanga were flooded and about 500 km embankments on the village side were washed out and have caused large scale flooding, leaving lakhs of people marooned in the area. The field camps were under 12 to 15 feet of water for around 12 hours and water logging was for almost a week , resulting in soil erosion and huge damage to mud houses , particularly in the Matla river bank.

Saline water gushed in through breaches in the river dykes and inundated houses and lands. Almost 60% of the area in these 2 districts has been rendered uncultivable and not suitable for making seedbed. It has caused a havoc in 5 Blocks (Sandeshkhali-I, II, Minakhan, Hasnabad and Hingalganj) of North 24 Parganas. In Canning II about 1300 bighas of land was under saline water. In South 24 Parganas all the 13 Blocks were affected by the saline water.

Only in North 24 Parganas, livestock loss amounts to a whopping 1,17,332. Loss of domestic animals was caused not only by the cyclone, but also by high tide that followed. In Sandeshkhali I & II and Hingalgunj blocks about 70-80 poultry farms got completely shattered. Among the 12 affected districts of West Bengal, the damage in North & South 24 Parganas has been the maximum. Out of the total crop affected area of 2,56,750 ha in all the 12 districts, the share of North 24 Parganas is 55, 600 ha and that of South 24 Parganas is 69, 150 ha.

The Disaster Management Department of the state mostly adopted relief centric disaster management measures; pre-

disaster management activities were not that significant. The then, Chief Minister of West Bengal held a high-level preparedness meeting on May 25, 2009 and reviewed the situation with a group of ministers and senior officials. The CM announced that the Army had been asked to conduct rescue operations in the most difficult areas of the Sundarbans. High level state officials were deployed in the field for reviewing the situation. The State & District EOC (Emergency Operations Centre) was running 24/7. Additionally, Kolkata Police and the KMC (Kolkata Municipal Corporation) have opened control rooms to monitor and tackle the situation. The police in Kolkata kept boats ready for emergency evacuation of people from low-lying areas, while the Rapid Action Force and the Quick Response Team were also on alert. Civil Defence forces were already in the field. The disaster relief wings of the Indian Army were put on alert and Border Security Forces and police started rescue operations in the Sundarbans region. Dr. Manmohan Singh, the then Prime Minister of India, announced ex gratia relief of Rs 200,000 (US$ 4,000) for each of those killed in the cyclone in and other areas of east India. The State Government has allotted tarpaulin amounting to 20,000 for South 24 Parganas and 10,000 each for North 24 Parganas and Purba Mednipur districts. The State Government has allotted Rs 100,000 for South 24 Parganas district for relief contingency and Rs 500,000 each for North 24 Parganas and Purba Mednipur districts. Government's Public Health Engineering Department (PHED) had made arrangements to provide safe drinking water to the affected families through mobile purification units. As of May 25, 2009, PHED has distributed some 50,000 water pouches in South 24 Parganas. Disinfection teams have been mobilised to treat the contaminated water sources. Government's Department of Health Services constituted one control room at state headquarters and three medical officers were coordinating the preventing aspects of any outbreaks of epidemic in the affected areas.

The aim of the study is to establish necessary systems and guiding principles for reducing disaster risks and preparing for and responding to disasters and threats of disasters like Aila in the State of West Bengal in order to save lives and property and to avoid disruption of economic activity.

2. Review of Related Literatures

The review seeks to provide the social, economic, developmental and political consequences of different disasters and how the disaster management can be more effective through community based disaster management. A few reviews have also pointed out that disasters can disrupt both the physical communication networks and the social networks critical to efficient response and recovery. This review examines literatures related to the effect of disasters on individuals, communities and the social environment. A good number of literature reviews also includes disaster management in West Bengal mostly related to flood management. A brief review of the different efforts of

research in the field is attempted in the following paragraphs.

Sen (1999) investigated an overview regarding the different types of flood plain on the basis of capacity at peak flow and has also mentioned the aspects of regulations of flood plain use. The paper has also identified the methodology of flood plain zoning measures for flood management. The paper concludes with the suggestion on the regulations to be followed for types of buildings in the flood plain. Dutta (2005) highlighted the hardship of the two regions which are almost always affected badly every year, the lower Damodar Basin in south Bengal and the Ganga-Padma basin in the north. People of these areas have been living with annual floods for decades. The paper has also criticized the role of the media, so far as reporting in the pre and post disaster period ,West Bengal State Disaster Management Policy and Framework (2005) observed how to reduce disaster risks and preparing for and responding to disasters in West Bengal. Flood and cyclone storms occur in West Bengal almost every year, so there is need for proper disaster management policy implementation so as to reduce loss of life and property whenever any disaster strikes. The policy has been framed with the viewpoint that proper disaster management may help to minimize the disruption in the economic activity and damage to the environment and thus can ensure sustained development. Nath et al (2008) investigated predominant natural hazards in the West Bengal territory. A preliminary integrated perspective on the prevailing hazards has been qualitatively estimated as a first-order composite vulnerability distribution across the state. Consequently, a holistic outlook of disaster management is emphasized to incorporate (a) collaborations of different organizations, (b) local participation, (c) inputs from scientific and research institutions, (d) awareness and promotion, and (e) delivering appropriate regulations and policies. Multi hazard mapping has been adopted. Data analysis of different natural disasters and its management has been made but the man-made disasters in West Bengal have not been taken up for study in the paper. Mukhopadhyay (2009) observed South 24 Parganas; the Sundarbans Blocks that were badly hit by Aila were Gosaba, Basanti, Sagar, Namkhana, Patharpratima, Kakdwip. The total length of embankments severely damaged in these Blocks was 621.95 kilometers. Out of 308 sluice gates, about 125 were completely damaged resulting in saline ingress and flooding of the islands. The total area in South 24 Parganas inundated with saline water was 1,05,075 hectares. Individual ponds and rice fields were salinated. The devastation of Aila put the Government on red alert. As part of its short-term relief the government distributed food, clothes, water and medicines among the Aila victims. Local Sub-divisional, Block Development Offices and Panchayat bodies were mobilized for immediate relief activities. Government initiatives were supplemented by local, regional and even international NGOs. The paper highlighted the politics involved in the post disaster management, so far as vote-bank is concerned. The paper however has not given much emphasis on the need for community based disaster management. Report post Aila

(2009) - A workshop was organised on Consultation for Regeneration of Agriculture and Livelihood system in Aila affected areas. In this workshop issues related to alternative methods of producing crops and the alternative means of livelihood were discussed. Some experts in the fields were invited to deliver lecture on the topic. In this saline condition the integrated models were suggested to be adopted for the regeneration of land. These trials must be conducted in as many places as possible and for that awareness to adopt these models must be developed. Low-cost technologies must be adopted in a way that does not affect the socio-economic condition of the poor underprivileged people. Choudhury et al (2010) tried to highlight the issue concerning the need for integration of management of river basin in West Bengal. The first integrated river basin plan of India in Damodar, resulted the formation of Damodar Valley Corporation (DVC). Examination of actual inflow and outflow data for the two terminal dams of DVC at Maithon and Panchet show that significant flood moderation has been achieved during the past years due to the construction of the dams, reservoirs, barrage in Damodar- Baraka river system. It has been noticed from the available data that the performance of these reservoirs in terms of flood moderation has been achieved to the extent of 53 % to 80% in the high flood years. Annual Report (2010-11) of the Government of West Bengal, Irrigation and Waterways Directorate highlighted the various issues concerning erection of dams and the myths regarding the release of water during heavy rainy season. The report seeks to provide detailed information about the achievements of the irrigation department in West Bengal during the last decade. It also gives an idea regarding the challenges ahead for the irrigation and waterways directorate. Pal and Pal(2012) In their research paper entitled , "Flood Intensity and potential flood loss estimation in Dwarka river basin of Eastern India" has discussed in length the flood intensity, and flood trend in Dwarka river basin. In this paper the authors have tried to draw a simple cost-benefit analysis. Mukherjee et al (2013) discussed how Sundarban was rampaged by a severe tropical super cyclone designated as BOB 02 or more popularly as "*Aila.*" The Hooghly estuary was chosen as the study site since it is the largest estuary of the River Ganges. This study was of immense significance and could very well serve as reference to all the future works on phytoplanktons in the North Eastern Bay of Bengal land-ocean boundary. The natural disasters such as severe cyclones actually reshuffle all the existing eco-regions. Study should also help to understand the shifting of community composition of the global phytoplankton assemblages after natural catastrophes. Debnath (2013) examined the agricultural production system is totally hampered after Aila due to high salinity and pH condition of soil. Paddy, Wheat, Sugarcane, Chilli and Pulses production is highly destroyed. Mainly two types of paddy are cultivated in this region. One is Aman paddy which cultivated in Monsoon season and another is Boro paddy which is cultivated in winter season. Before Aila Average production of Boro Paddy was 34671 kg/ hectare in 2008-09, which reduced to 20833 kg/hectare. Agricultural production system was totally hampered after Aila due to high salinity and pH condition of soil. Paddy, Wheat, Sugarcane, Chilli and Pulses production was highly destroyed. The paper concluded with suggestion that soil management is very much needed for increasing agricultural productivity.

2.1. Research Gap

The decisive quantity of this traditional review of related literature produced till date on the offered subject divulges wide room for the validity. Nor has any previous research assessed the effectiveness of the disaster management department and the role and responsibilities of disaster management department in addition to disaster management strategies in West Bengal. District-wise disaster management analysis in the perspective of West Bengal has also not been made in any of the papers reviewed above. Disaster management analysis in the perspective of Kultali Block of South 24 Parganas of West Bengal has also not been made in any of the papers reviewed above. In almost all the papers there is further scope for more empirical research.

2.2. Objective of Study

The objective of this study is to assess the following
a. To analyse the impact of severe cyclone Aila in Sundarban Area.
b. To review the impact of ever increasing population in the Sundarban Region.
c. To identify the highly affected areas by saline water in the above mentioned area;
d. To focus on disaster preparedness with emphasis on mitigation measures;
e. To have greater awareness of community about the relevance of pre and post disaster management so as to face crisis situation.

3. Methodology

3.1. Data Source

This study is based on primary as well as secondary data. The secondary data has been collected from several publications of Bangiyo Bhugol Mancha of various years, statistical hand book of the districts, Bureau of Applied Economics & Statistics, Government of West Bengal, Economic Review, Human Resource Development Report, District Census Book etc. To strengthen and develop the Secondary Data the primary data has been collected mainly from the dwellers of almost all the villages of the Kultali Block with structured questionnaires. Generally the inquiring was performed during my two months visit to the Kultali Block of Sundarbans region of South 24-Parganas in the post Aila period.

3.2. Sample Design

The present study is based on Kultali Block of South 24 Parganas, West Bengal out of 19 blocks in Sundarban region.

Total areas in Sundarban are 9630 sq. km, in which Kultali Block having 239.48 sq. km. Table 3 signifies the snapshot of the Sundarban region and the Kultali Block.

Table 3. Snapshot of Sundarban and Kultali Block.

Particulars	Sundarban	Kultali Block
Geographical location	21º12' and 22º44' North Latitudes and between 80º05' and 89º00' East Longitude	21°54′ North Latitudes 88°24′East Longitude.
Total number of blocks	19	Kultali is one of these 19 Blocks having 46 Mouzas and 43 inhabited villages
Total Area	9630 sq. km	239.48 sq. km
Total number of households	6,69,669	45,099
Average family members	6.60	5.08
Total Population	44,22,038(22,75,418 are males and 21,46,620 are females)	2,28,988 (1,17,775 are males and 1,11,213 are females)

Source: Census Reports, 2011; Block Development Office & Author's Survey.

All 9 Gram Panchayats (Deulbari, Gopalganj, Gurguria Bhubaneswari, Jalaberia I, Jalaberia II, Kundakhali Godabar, Maipith Baikunthapur, Meriganj I and Meriganj II) as well as all the 43 villages of the Block were more or less affected by the cyclone Aila, accordingly all the Gram Panchayats have been taken as sample for the present study. Then the study selects purposively 100 respondents from all the 9 severely affected Gram Panchayats, that is, overall 900 respondents were taken as sample for knowing mental health status and needs of the survivors after two years of disaster due to Aila (name given by Maldwip for separate identity), that occurred on May 25, 2009 in the Southern parts of West Bengal and Bangladesh because of formation of devastating cyclone in the Bay of Bengal, which is shown in table-4 below.

Table 4. Data of population and sample taken for study in the 9 GP of Kultali Block.

Name of Gram Panchayat	Population at Risk	Sample Taken
Deulbari	24605	100
Gopalganj	34804	100
Gurguria Bhubaneswari	26044	100
Jalaberia I	24786	100
Jalaberia II	24223	100
Kundakhali Godabar	25650	100
Maipith Baikunthapur	24630	100
Meriganj I	23070	100
Meriganj II	21241	100

Source: District Disaster Management Plan, South 24 Parganas, 2013,pp78 and Author's Survey

Table 5 shows the total proportion of labourers engaged in cultivation. In the 13 blocks of Sundarban area (including Kultali Block) 16.15% of the total labourers are cultivators and 26.04% are agricultural labourers. So, almost 40% of total labourers are directly dependent on agriculture. Whereas in the Kultali Block percentage of cultivators is 30 and that of agricultural labourers is 41.61 % .Therefore, if the agricultural lands are affected by saline water, 40% people are directly economically affected in the Sundarban areas of South 24 Parganas and same in Kultali Block is even much higher at 71.61%.

Table 5. Proportion of labourers engaged in cultivation in the Kultali and Sundarbans Region of South 24 Parganas.

Block	Class of Workers									
	Total Workers		Cultivators		Agricultural Labourers		Household Workers		Other workers	
	No.	%	No.	%	No.	%	No.	%	No.	%
Kultali	58841	31.3	17650	30.	24485	41.6	1451	2.47	15255	25.9
South 24 Parganas (Sunderban area)	2242760	32.5	362110	16.2	584016	26.04	136177	6.07	1160457	51.7

Source: Census 2001 and District Statistical Handbook-South 24 Parganas, Bureau of Applied Economics & Statistics, Govt. of West Bengal. P14-15.

3.3. Tools Used

In the course of analysis in this study, median, multiple correlation have been performed by using SPSS-17 software.

3.4. An Insight into the Database so far as Damages Due to Aila is Concerned in the Area Under Study

Kultali block being situated in the bank of Maltla River was highly affected by the cyclone Aila. All the 43 village of the block were adversely affected by Aila. Though there was no loss of life but agricultural land was heavily damaged because of gushing saline water and loss of livestock was also huge. The extent of damages in the Sundarban area and Kultali block is depicted below in the table 6 and table 7 respectively.

Table 6. Extent of total damages due to Aila on May 25, 2009, in Sundarban area.

Sl. No.	Particulars	Extent of Damages
1	Number of villages affected	4249
2.	Size of affected population	25,62,442
3.	Number of people missing	8,000
4.	Number of death	70
5.	Length of embankment breached	400 Kilometres
6.	Number of cattle lost	2,12,851
7.	Total area of agricultural land affected	1,25,872 hectares
8.	Estimated financial loss in agriculture	Rs. 337 Crores
9.	Number of houses partially damaged	1,94,701
10	Total loss	Rs. 1,495.63 crores

Source: Unpublished Records of the Government of West Bengal (2009-10)

Table 7. Extent of total damages due to Aila on May 25, 2009, in Kultali Block.

Sl. No.	Particulars	Extent of Damages
1	Number of villages affected	43
2.	Size of affected population	1,35,567
3.	Number of people missing	10-15 appox.
4.	Number of death	Nil
5.	Length of embankment breached	20 Kilometres appox.
6.	Number of cattle lost	17,954
7.	Total area of agricultural land affected	12,256 hectares
8.	Estimated financial loss in agriculture	Rs. 15 Crores
9.	Number of houses partially damaged	6000 appox.
10	Total loss	Not available

Source: Author's Survey and Block Development Office.

4. Results

4.1. Public Perception about Disaster Management in the Kultali Block in the Pre and Post-Disaster Phase of Aila Which Occurred on 25th May, 2009

About 38.44 % and 82.55% of the respondents did not know concerning the significance of insurance against flood and flood proofing respectively in the pre-disaster and during disaster phase. So far as disaster preparedness is concerned as high as 87.67% of the respondents have hardly any idea and rest of the respondents i.e. 12.33% have no idea about disaster preparedness. The respondents were more or less quite satisfied with the post disaster measures taken by the authority concerned. Most of the respondents reported that they were given a lump-sum compensation of Rs.10,000 per family for reconstruction of damaged houses. Ram Krishna Mission did a remarkable job immediately after the disaster in the block. Most of the respondents took shelter in the Ram Krishna Mission during the disaster period and many of them stayed there for more than one month. Tables 8 and 9 given below depict the perception of affected people during the pre and post disaster phase.

Table 8. Public Perception about Disaster Management Variables of Kultali Block in Pre-disaster Phase using 5-point Likert Scale.

Pre Aila–Disaster Management Initiatives	Strongly	Fully	Fairly	Hardly	Not at all
Flood Control and Management Initiatives Flood inundation mapping	0	0	0	167	733
Flood plain land use information	0	0	102	798	0
Flood/Cyclone susceptibility	0	0	0	771	129
Disaster warning	0	120	106	583	91
Hygienic sanitation facilities	0	95	798	7	0
Flood proofing	0	0	157	0	743
Flood /cyclone forecasting	0	0	105	711	84
Disaster preparedness	0	0	0	789	111
Response planning	0	0	436	464	0
Flood fighting	0	900	0	0	0
Flood insurance including crop	0	0	79	575	346
Median	0	0	102	575	91
Range	0	900	798	798	743

Source: Author's Survey

Table 9. Public Perception about Disaster Management Variables of Kultali Block in Post-disaster Phase using 5-point Likert Scale.

Post Aila–Disaster Management Initiatives	Strongly	Fully	Fairly	Hardly	Not at all
Local administration (Panchayat/B.D.O.) appropriately involved in the disaster management	0	0	830	54	16
Need to move to other place to take shelter	0	400	300	120	80
Satisfied with the dry foods/other foods provided during hazard	0	40	770	57	33
Drinking water is provided by local authorities (in pouch)	0	900	0	0	0
Awareness so as to protect yourself if there is a snake-bite	0	0	0	900	0
Initiative taken by administration /NGO to save livestock	0	0	734	76	90
Median	0	20	517	66.5	24.5
Range	0	900	830	900	90

Source: Author's Survey

4.2. Analysis

4.2.1. Based on Percentages

Of the total agricultural land affected by Aila , 21.65% were affected in North 24 Parganas and 26.93% land were affected in South 24 Parganas, so 48.58% of the total affected agricultural land fall in the Sundarban area. That proves that this area was mostly affected. Since 1981 the population in the region under study has increased by almost 100% (24 Lakhs to 45 Lakhs) and that has forced the poverty driven people to localize in the vulnerable areas which has increased the chances of severe loss and damages to human life and property whenever any severe disaster like Aila strikes. In the 13 blocks of Sundarban area 16.15% of the total labourers are cultivators and 26.04% are agricultural labourers. So, almost 40% of total labourers are directly dependent on agriculture. Therefore, if the agricultural lands are affected by saline water, these 40% people are directly economically affected for at least two to three years. About 91.02 per cent of the respondents did not know concerning the significance of crop insurance against flood and cyclone in the pre-disaster and during disaster phase. So the affected community fails to get any compensation from insurance companies.

As per 2011 census, the density of population in Kultali block is 956 as against 460 in Sundarban area, therefore, poverty driven people in this block are localized more in number in the vulnerable areas which has increased the chances of severe loss and damages to human life and property in the block. In this block of Sundarban area 30% of the total labourers are cultivators and 41.6% are agricultural labourers. So, more than 70% of total labourers are directly dependent on agriculture. Therefore, if the agricultural lands are affected by saline water, more than 70% people in the block are directly affected by disaster like Aila.

4.2.2. Based on Median and Correlations

Median statistics indicate crop production, food security, drinking water, hygienic sanitation facilities and other hygiene practices have been seriously damaged as observed from the median value in Kultali Block being greater than grand median value (Sundarbans) of the selected indicators under the study. Multiple correlation test confirms (R = 0.5147) that all the selected indicators are moderately positively associated with Severe Cyclone Effect. The results also indicate that severe cyclone have significantly affected the food security position, drinking water, hygienic sanitation facilities, other hygiene practices, resiliency, capacity to reduce risk and prepare for future disasters, which indicate that food security is ensured by providing assistance with enhanced/alternative livelihood activities. However, peoples have increased access to improved drinking water and hygienic sanitation facilities and adopt more hygiene practices and have increased resiliency and capacity to reduce risk and prepare for future disasters.

5. Conclusion

The primary findings of the study is that Aila have significantly affected the food security position, drinking water, hygienic sanitation facilities, other hygiene practices, resiliency, capacity to reduce risk and prepare for future disasters that point toward that food security is ensured by providing assistance with enhanced/alternative livelihood activities.

Aila has massively damaged the agricultural system of Sundarban Island owing to lack of proper drainage system the surge water could not be flow back into the river and hence leaving a thick layer of salt on the top soil over agricultural plots and fertility was markedly reduced. To increase the fertility of the agricultural land soil must be frequently ploughed and use of fertilizer with organic matter for root development is necessary.

The District Disaster Management Department needs to not only formulate disaster management plans only in paper rather there is an urgent need to carry out the plan under the overall guidance of the District Magistrate. However, it is impossible for the Relief Department alone to formulate the plan without the co-operations of the various Line Departments that are concerned with Disaster Management. Prominent among such departments are – Irrigation & Waterways, Public Health Engineering, Health, Animal Husbandry, Agriculture, Food & Supplies, Public Works Department, Telecommunication, Electricity etc. Last but not the least the Police Department has a very major role in carrying out the plan. People should be made aware to have increased capacity to reduce risk and prepare for future disasters.

Due to time constraints the study is restricted to 9 panchayats of only 1 Block out of 19 Blocks of Sundarban areas.

There is further scope for carrying out research work based on a comparative study of all the 19 Aila affected blocks of Sundarban. Research work may also be taken up to investigate the long-term impact of saline water flood on the crops production in the Sundarban region.

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