



Role of panchayat (Local self-government) in managing disaster in terms of reconstruction, crop protection, livestock management and health and sanitation measures

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Abstract

The Panchayati Raj Institution is a statutory body elected by the local people through a well defined democratic process with specific responsibilities and duties. It is the most appropriate institution from village to the district level. The role of Panchayats (local self governing institutions) is important in view of their proximity to the local community, universal coverage and enlisting people's participation on an institutionalized basis. Panchayat and municipalities are local governing institutions in countries like India, have a constitutional mandate under the 73rd and 74th constitutional amendments Act. Apart from the proper implementation of different ongoing developmental programmes, the panchayat system has to play pivotal roles in respect of natural as well as man-made disaster management. In India, Particularly in West Bengal the village level Disaster Management Committee is headed by ward members of gram panchayat. The Panchayati Raj Institutions provide adequate space to the weaker section of the communities at its three levels, i.e. village, block and district. Good governance can be an instrumental feature in poverty reduction. This study was undertaken in cyclone affected areas in West Bengal to assess the role of panchayat in disaster management. The empirical study revealed that main role performed by the panchayat in respect of disaster was reconstruction of damaged houses, crop protection measures, livestock management, health and sanitation measures. Besides these broad aspects, the panchayats officials also organized health camp, involved in rescue operation, arranging temporary shelters and so on as disaster management operation. Total 60 gram panchayat officials and 150 villagers were selected randomly as respondents for the present investigation. The data were analysed into mean score, rank position and spearman correlation coefficient to achieve the objectives. The findings of the study indicated that significant differences were observed on the opinion of the villagers and officials on reconstruction of houses and health and sanitation measures. The roles performed by the local self-government in disaster management were very poor. There was absolutely lack of involvement of people's representative. Therefore, adequate supports are suggested on these aspects from the representatives in association with higher authorities.

Keywords Panchayat · Disaster · Crop protection · Reconstruction · Spearman correlation coefficient · Health and sanitation

1 Introduction

India is the seventh largest country in the World and vulnerable to disasters. The country is susceptible to all types of disasters like drought, flood, cyclone, earthquake. In India, 72% area is drought prone, 65% earthquake, 15% flood and 10% cyclone prone area (Government of India 2009). The state of West Bengal has 23 districts and 3355 gram panchayats. Different parts of the state are vulnerable to disaster like flood, cyclone, drought.

Panchayati Raj in India is a three-tier system of self-governance which works at the level of village, block and district under the name of Gram Panchayat, Panchayat Samiti and Zila Parishad, respectively. There is an urgent need to shift from relief centric approach to more proactive preparedness and mitigation approach.

Panchayati Raj bodies are the most appropriate grass root level institutions for involving people in natural disaster preparedness. Panchayati Raj bodies have a role to play in all phases of disaster management (Jain and Polman 2003). The role of panchayat in managing disasters and thereby post-disaster activities are considered one of the major tasks performed by the panchayat. Panchayati Raj Institutions have already been recognized as capable and competent authorities (Taori 2005).

The role of Panchayati Raj Institutions in disaster management activities including both pre- and post-disaster response programmes have a significant place. The literature related to this study is comparatively less. So in this context, a study related to the effectiveness of local self-governments in disaster response programme is very significant. The researcher tries to find out the role and responsibilities of local self-government in the context of disaster especially cyclone Aila, 2009 in West Bengal. The importance of Panchayati Raj Institutions in disaster management is clearly established by the observation made by Madhava Rao and Hermon (2003). To quote them, 'The role of local communities and organizations particularly the Panchayat Raj bodies in managing natural disasters cannot be over emphasized. In the present situation, the government agencies take full responsibility for disaster preparedness, rescue, relief and reconstruction activities without providing adequate scope for local participation. This has not only increased people's dependency on the government but has also warned the capacity of the local communities to cope up with the natural disasters. Moreover, due to lack of the disaster preparedness and mitigation planning at the local level, especially at the gram panchayat level causes considerable problems in the management of disasters'. Goel (2006) opined that there is a need to define the role of PRIs in Disaster Management and sensitize local communities through them to develop coping mechanism in preparedness and mitigation measures of disaster to minimize its destructive effect on life and property at local level.

Mondal et al. (2014) showed that primarily, six types of activities were carried out by the gram panchayats in disaster management. The hierarchies of role of gram panchayats were repair of river embankment, arrangement of disaster shelters, forecasting early warning system, arranging awareness camp, protection of vulnerable groups of the people and providing relief materials.

In rural areas, there are certain problems which can be solved efficiently only by the local people. More than eighty per cent of the Indian people live in villages and the welfare of the people implies an all round improvement in the Indian village. Panchayats is the one and only grass root institutions who deals directly with the villagers, and the panchayat members are the first to respond to a disaster in the local community. They are the first to start rescue and relief operations.

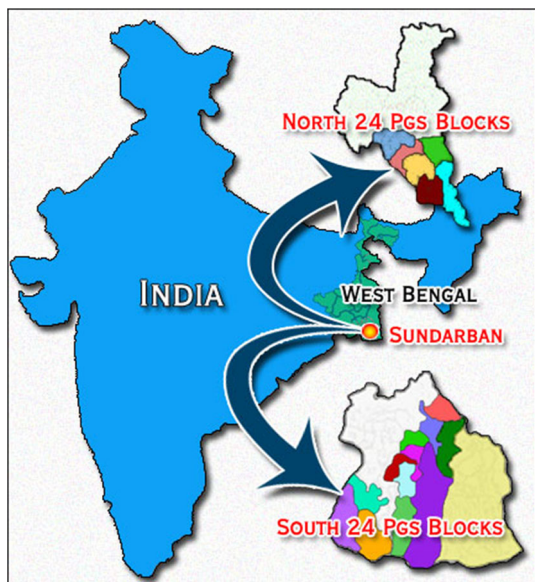
2 Materials and Methods

The present investigation was carried out in North and South 24 Parganas districts of West Bengal (Fig. 1). West Bengal has geographical area of 88.75 lakh hectares and net cropped area 54.5 lakh hectares, which is about 3% of the country. Such meagre cropped area has to provide food of 9% of the total population of the country. Its total population is about 8,022,1171, and the density of population, 924 people per sq. km (in 2011 census), is the highest among all the states. The state's population is predominantly rural (74%). West Bengal agriculture is dominated by small and marginal farmers. Ninety percentage of agriculture holdings and 63.6% of operational area belong to small and marginal categories.

South 24 Parganas lies in the South and south-eastern part of west Bengal, the total area covered by the District is 9960 km². South 24 Parganas is bounded on the north by the district of North 24 Parganas and the metropolis of Kolkata (Fig. 2) on the South the Bay of Bengal, on the east by Bangladesh and on the west by the tidal river Hooghly—a distributary of the Ganga, which separates the district from the districts of Howrah and Medinipur. The district of South 24 Parganas is vulnerable to disasters—both natural and manmade. Contiguous to the district of Kolkata, it has a unique urban–rural continuum in its human settlements.

North 24 Parganas district is a district in southern West Bengal, India. North 24 Parganas extends in the [tropical zone] from latitude 22°11'6" north to 23°15'2" north and from longitude 88°20' east to 89°5' east. It is bordered to Nadia by north, to Bangladesh (Khulna Division) by north and east (Fig. 2) to South 24 Parganas and Kolkata by south and to Kolkata, Howrah and Hooghly by west. Barasat is the district headquarters of North 24 Parganas. North 24 Parganas is West Bengal's most populous and economically backward district. It is also the tenth largest district in the state by area and second most densely populated district (3781/km² as of 2011 census) (Table 1).

Fig. 1 Map of India



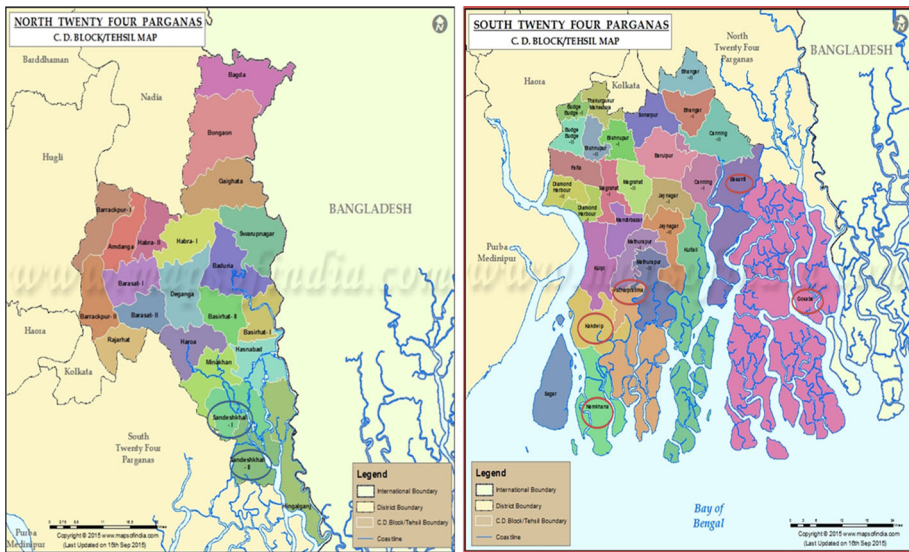


Fig. 2 Map of North and South Four Parganas. The circle in the map indicates the study area

Table 1 Demographic features of the study area. *Source:* CCDRER project report 2012–2013 and Government of West Bengal (2011–2012)

Block	Population		Scheduled Caste	Scheduled Tribe	Sex ratio	Density	Literacy (%)	No. of households
	Male	Female						
Basanti	162,684	154,911	122,666	19,907	952	786	67	31,635
Gosaba	113,827	108,937	146,060	22,561	956	779	68.93	44,478
Kakdwip	144,272	137,226	86,042	1,941	959	947	71.35	44,876
Namkhana	82,234	78,396	43,591	1,466	952	707	78.40	29,842
Pathar-Pratima	168,324	160,445	77,874	1,926	953	674	72.8	50,764
Sandeshkhali-I	82,035	78,107	51,651	41,596	952	878	62.8	20,900
Sandeshkhali-II	80,107	75,295	69,392	34,444	940	788	59.3	21,677

The livelihood of the study areas was based on agriculture, fishing and collection of non-timber forest produce (NTFP), all natural resource-based activities. Agriculture offers livelihood to about 60.32% of the population, consisting of both cultivators as well as daily wage labourers. About 17% were engaged in fishing, which includes those who own their boats and nets and those who work as daily labourers in the fishing trawlers. The other organized and unorganized sectors—which include people with regular employment such as petty jobs with the government, labourers and the self-employed (like artisans and hawkers)—make up 22.3% of the workforce. Of this, just about 9% on an average work in the organized sector, such as at petty government jobs with the public distribution system or the post office. About 6% hold regular jobs in the unorganized sector, such as in cottage industries (Ghosh 2012).

Fisheries are the second major occupation of the respondents in the study area. Close proximity to the sea and regular tidal waves bring good fishing opportunity to the people

and provide gainful employment all the year round. Saline water gushed in through breaches in the river dykes and inundated pond and sea.

Researcher prepared a scale to measure role of panchayat in managing disaster.

In this study, role is defined as the behaviour expected of an individual who occupies a given social position or status. A role is a comprehensive pattern of behaviour that is socially recognized, providing a means of identifying and placing an individual in a society. Disaster management is a collective term encompassing all aspects for planning and responding to disasters, including both pre- and post-disaster activities. It refers to the management of both the risks and consequences of disasters. Reconstruction refers to the full restoration of all services, and local infrastructure, replacement of damaged physical structures, the revitalization of economy and the restoration of social and cultural life. Reconstruction must be fully integrated into long-term development plans, taking into account future disaster risks and possibilities to reduce such risks by incorporating appropriate measures. Damaged structures and services may not necessarily be restored in their previous form or location. It may include the replacement of any temporary arrangements established as part of emergency response or rehabilitation. The following sectors can be vulnerable to disaster impact, and which, therefore, will require rehabilitation and reconstruction inputs. Buildings, Infrastructure, Economic assets (including formal and formal commercial sectors, industrial and agricultural activities etc.) and Social, Cultural and Environmental.

Measures relating to this study were collected from respondents. More than one hundred measures were collected. These were then grouped into four components in disaster management on the basis of prima facie emphasis on each measure.

The measures were then scrutinized and edited as per objective of the study. After pretesting the measures twice with the respondent, a total of 40 measures were retained. A schedule was then prepared with these 40 measures (10 in each measure) and sent to 80 judges who were experts, to determine the validity of the measures to a particular component of disaster management. Each measure was provided with two response categories 'agree' and 'disagree'. Irrespective of the measures being in positive or negative form, the judges were asked to indicate by a tick mark whether the statements relate or not, to the particular measures under which they have been grouped.

Responses from 50 judges were obtained. The statements for which twenty per cent of the judges were on the disagreement side were rejected. In the final construction of scale, eight measures each for reconstruction of damaged houses and health and sanitation measure and nine measures each for crop protection and management of domestic animals (total 34 measures) were retained for which eighty per cent judges' agreement.

The scale for administration was provided with four response categories: 'Strongly agree', 'agree', 'disagree', 'strongly disagree' with scores 4, 3, 2, 1, respectively. The scale consists of set of items (measures) to which the subject is asked to react. Measures that seem to be either definitely favourable (strongly agree) or definitely unfavourable (strongly disagree) to the attitude under study are used. The respondents indicate their agreement or disagreement with each item. The individual's total score indicates his or her position on a scale of favourable–unfavourable attitude towards the object.

Reliability was established using a pilot test by collecting data from 20 respondents, not included in the sample. Data collected from pilot test can be analysed using SPSS (Statistical Package for Social Sciences, by IBM incorporated). The values of Cronbach alpha (α) are 0.64.

3 Results and discussion

The Panchayati Raj Institution (PRI) members played a crucial role in all stages (Pre-disaster, during disaster and post-disaster) of disaster management, right from the disaster phase up to the mitigation and preparedness phases for disaster risk reduction (Mondal et al. 2016).

The various measurements as carried out by the concerned gram panchayat regarding the reconstruction of damaged house are listed in Table 2 in which ‘separating affected produce from the lot’ ranked first with a mean score of 3.01 followed by ‘getting support from government’ with a mean score of 2.51 (A). In case of official respondents (B), majority had strongly agreed that they took supports from the government followed by separating affected produce from the lot. Most of the officials negatively opined on the statement of repair of house, ranked last. The last column gives the differences in opinion in between two types of respondents. It can be observed from Table 2 that, the significant differences of opinions were observed among the affected people and officials for ‘provided financial assistance for damaged houses’ (41% disagreement) and ‘removal of debris and cleaning of household area’ (25% disagreement). Thus, it can be concluded from Table 2 that there was considerable gap among the affected people and the panchayat officials with respect to repair/reconstruction of damaged houses. There was absolutely lack of involvement of people’s representative. Rank-order correlation [ρ (rho) value] is used to find out the major differences of opinions were observed among the villagers and official respondents. From Table 2, ρ value indicates that there exist contradictory opinions on some aspects of management support. Therefore, the researcher concludes that the role performed by the panchayats is low for reconstruction of damaged houses.

It is observed from Table 3 that panchayats provided sufficient quantity of medicine and safe drinking water and foods to the villagers as perceived by the people (A), wherein the majority of the official respondents (B) had strongly agreed for ‘providing safe drinking water and foods to the victims’, ranked first followed by ‘attention given to the diseased and old aged person’. Rank position also indicated that the last position in measurement was ‘providing financial aids for health treatment’. However, the mixed responses were obtained on other aspects viz. health care and sanitation as mentioned in Table 3. The last column in Table 3 indicates that major gaps were observed on the opinions of people and official respondents towards latrine and bathroom facilities after occurrence of disaster which needs further strengthening of the support. Though there was no major difference of opinions on other aspects, the least difference was obtained in terms of viewpoint of people and official respondents on attention given to old-aged and diseased persons. Rank-order correlation ρ value indicates that there exist contradictory opinions on some aspects of management support. There is significant difference in perception of villagers and officer about the role of panchayats in disaster management. Therefore, the researcher concluded that the role performed by the panchayats is low for health and sanitation measures.

Since farming is the main occupation of the respondents in the study area, optimum approaches have to be taken for management of crops for the livelihood support. Various management approaches taken by the respondents for the crops are presented in Table 4 as per the analysis of the data collected. The data in the table depicted that majority of the respondents (A) strongly disagree with the measure that panchayats installed soil testing laboratory and also on removal of silt from the field. Official (B) opined that they provide financial assistance for crop failure after the disaster. The last column in Table 4 indicates that major gaps were observed on the opinions of people and official respondents towards

Table 2 Role performed by panchayats for reconstruction of damaged house. [$n = 150$ (A) and 60 (B)]

Measures	Opinion towards extent of measures								Mean score	Rank position	Difference (%)		
	Strongly agree		Agree		Disagree		Strongly disagree						
	A (no)	B (no)	A (no)	B (no)	A (no)	B (no)	A (no)	B (no)					
Repaired damaged houses	00	03	21	04	12	20	117	33	1.36	1.61	VIII	VIII	15.52
Remove debris and cleaning of household area	12	16	08	12	78	18	52	14	1.87	2.50	IV	IV	25.20
Attention given to the household articles	15	03	18	04	66	12	51	41	1.98	1.84	III	VI	07.07
Separating affected produce from the lot	58	21	47	18	34	09	11	12	3.01	2.80	I	II	06.97
Getting support from government	33	24	41	28	46	04	30	04	2.51	3.20	II	I	21.56
Were there any political biasness while providing financial assistance	09	02	06	06	84	26	51	28	1.82	1.70	VI	VII	06.59
Helped while shifting the articles/documents	09	11	12	07	75	15	54	27	1.84	2.03	V	V	09.35
Provided financial assistance for damaged/loss of articles	00	16	00	20	85	12	65	12	1.57	2.67	VII	III	41.19
Overall ρ (rho) value—0.6667													

(Maximum obtainable score=4) 'A' denotes respondent (villagers) and 'B' denotes panchayat official

Table 3 Role performed by panchayats for health and sanitation measures. [*n* = 150 (A) and 60 (B)]

Measures	Opinion towards extent of measures						Mean score	Rank position	Difference (%)					
	Strongly agree		Agree		Disagree					Strongly disagree				
	A (no)	B (no)	A (no)	B (no)	A (no)	B (no)				A (no)	B (no)			
Provided sufficient quantity of medicine	63	26	52	12	14	12	21	10	3.04	2.90	I	V	04.60	
Attention given to the diseased and old-aged person	46	26	51	22	28	04	25	08	2.79	3.10	III	II	10.00	
Always served health officer	39	22	48	22	43	06	20	10	2.71	2.93	IV	IV	07.50	
Provide financial aids for health treatment	05	00	11	00	74	34	60	26	1.74	1.57	VIII	VIII	09.77	
Vaccination against contaminated diseases	32	24	41	14	37	10	40	12	2.43	2.83	VI	VI	14.13	
Arrange latrine and bathroom facilities	10	20	05	26	72	12	63	02	1.75	3.07	VII	III	42.99	
Provided safe drinking water and foods	59	30	51	30	21	00	19	00	3.00	3.50	II	I	14.28	
Provided appropriate medicine at proper time	33	16	42	18	48	18	27	08	2.54	2.70	V	VII	05.92	
Overall ρ (rho) value—0.5476														

(Maximum obtainable score=4) ‘A’ denotes respondent (villagers) and ‘B’ denotes panchayat official

Table 4 Role performed by panchayats for management of crops. [$n = 150$ (A) and 60 (B)]

Measures	Opinion towards extent of measures										Mean score		Rank position		Difference (%)
	Strongly agree		Agree		Disagree		Strongly disagree		A	B	A	B	A	B	
	A (no)	B (no)	A (no)	B (no)	A (no)	B (no)	A (no)	B (no)							
Removal of silt from the field	33	30	48	14	22	10	06	47	06	2.44	3.13	VIII	II	20.04	
Supply of quality inputs	08	16	24	18	66	12	14	52	14	1.92	2.60	V	VII	26.15	
Assessing damage after the disaster	33	20	51	22	24	14	04	42	04	2.50	2.97	VI	IV	15.82	
Provided financial assistance for crop failure	50	26	55	34	35	00	00	10	00	2.97	3.43	III	I	13.41	
Regular supervision and monitoring	61	24	50	08	24	14	15	14	14	3.04	2.70	II	V	11.18	
Drawing up of a contingency action plan	52	16	41	12	22	18	35	14	14	2.39	2.50	VII	VIII	04.40	
Seeking government help	72	26	48	16	20	10	10	10	08	3.21	3.00	I	III	07.00	
Arrange short-term loan from credit institution	43	16	59	20	24	12	24	12	12	2.81	2.67	IV	VI	04.98	
Installing soil testing laboratory	00	04	00	04	86	24	64	24	28	1.57	1.73	IX	IX	09.24	
Overall ρ (rho) value—0.6666*															

(Maximum obtainable score=4) 'A' denotes respondent (villagers) and 'B' denotes panchayat official

*Indicates significant at 5% level

supply of quality inputs (26.15%) followed by removal of silt from the field (20.04%). No major differences were observed on the opinions of both people and official respondents. The least differences were on drawing up of a contingency action plan (4.40%).

The ρ (rho) value indicates that there exist a homogenous trend/high level of consistency between the affected people and panchayat officials. Test of significance indicates whether the opinion of both types of respondents is homogenous or not. Here the ρ (rho) value is significant which means the role performed by the panchayats in management of crops is high.

Domestic animals are also equally affected by the disasters like flood and cyclone. Sometimes there is shortage of fodders, and animals are affected by various diseases after occurrence disasters for which due care and management become essential. Majority of the respondents (A) opined that they were seeking for government support in favour of animals after occurrence of flood and cyclones. From the Table 5 it is seen that respondents were seeking government support that means they demanded more support/ help from the government as it (measure) got the highest mean score followed by organize veterinary aid teams for taking care of livestock (as the respondents opined that the panchayats organized veterinary aid team for taking care of livestock). At the same time, majority of the respondents opined that panchayats did not provide financial assistance for death animals. Majority of the gram panchayats (B) strongly agreed that the government support for management of domestic animals after the occurrences of disaster as shown in Table 5. In last column, maximum (12.75%) difference was on opinion to organize veterinary aid teams for taking care of livestock followed by assessing loss or damage of any animals (12.01%).

Rank-order correlation is used to find out the major differences of opinions were observed among the villagers and official respondents. From the table, it is evident that there exist a homogenous trend/high level of consistency between the affected people and panchayat officials. Test of significance indicates whether the opinion of both types of respondents is homogenous or not. Here it is significant. Therefore, the study concluded that the role performed by the panchayats in management of domestic animals is high.

4 Recommendation

- (i) The district administrators, planners and executors can refer the recommendations for prevention and mitigation of the disasters.
- (ii) The findings can serve as a basis for conducting survey/research in similar situations/places or other disasters elsewhere in the country.
- (iii) The findings can serve as a guideline for the National Disaster Management Agency, Ministry of Home affairs, Govt. of India while developing National Disaster Management frame work.
- (iv) The opinion/perception of the affected people and the official of institutions (i.e. PRI) is a definitive indicator of the ground situation or facts essential for management of natural disaster in the study areas. The information can be effectively utilized for precaution, management and mitigation of disasters in those areas and other similarly located areas or for other type of disasters.
- (v) Multi-sectoral approach to flood mitigation as opposed to single sector should be promoted as there are inter-linkages in terms of flood impact on various aspects of society.

Table 5 Role performed by panchayats for management of domestic animal. [$n = 150$ (A) and 60 (B)]

Measures	Opinion towards extent of measures						Mean score	Rank position	Difference (%)				
	Strongly agree		Disagree		Strongly disagree								
	A (no)	B (no)	A (no)	B (no)	A (no)	B (no)							
Repairing of damaged shed	04	02	03	04	70	28	73	26	1.59	1.70	VIII	VII	06.47
Evacuation livestock should start immediately after final warning	13	06	10	04	66	22	61	28	1.83	1.80	VI	VI	01.63
Organize veterinary aid teams for taking care of livestock	59	30	47	26	20	00	24	04	2.94	3.37	II	II	12.75
Regular health care to the animals by specialists	22	12	18	10	74	18	36	20	2.17	2.23	V	V	2.70
Assess loss/damage	51	28	55	26	27	04	17	02	2.93	3.33	III	III	12.01
Provide compensation for death animals	00	00	00	00	84	34	66	26	1.56	1.57	IX	IX	00.63
Providing additional nutrients in the usual feed.	06	02	13	02	77	26	54	30	1.81	1.60	VII	VIII	11.60
Disposal of dead bodies and prevention of the spread of epidemics	33	20	41	08	46	14	30	18	2.51	2.50	IV	IV	00.39
Seeking government support	78	36	72	24	00	00	00	00	3.52	3.60	I	I	02.22

Overall ρ (rho) value—0.9833**

(Maximum obtainable score=4) 'A' denotes respondent (villagers) and 'B' denotes panchayat official

**Indicates significant at 1% level

Suggestion:

- (i) Government and local institutions should engage communities in order for them to move permanently to higher grounds as they have expressed willingness to relocate. The relocating should go with the provision of all the necessary social amenities such as schools, hospitals, infrastructure, water and agriculture support for a period of 3 years to enable the households settle. Consideration should also be made to introduce alternative livelihood strategies in the new area of settlement.
- (ii) Government and key stakeholders should engage the communities and local authorities in making them aware of disaster risk in view of climate variability.
- (iii) Communities should be encouraged to increase area cultivated on the upland in order to enhance food security and household level.

5 Conclusion

The major functions of gram panchayat during the post-disaster were identification of victims for compensation, relief and rehabilitation work, monitoring and supervision of relief works as well as damage assessment. As part of its short-term relief, the government distributed food, clothes, water and medicines among the cyclone victims. There was major difference of opinions on health and sanitation measures. Poor support revealed from the study suggested for all possible measures on all these aspects for providing good support to the flood and cyclone affected people. Both affected people and officials had opined in the same manner towards measures taken on management of crops except on assessing damage in crop followed by opinion on drawing up of a contingency action plan. Comparative analysis of the opinions of both the affected people and official respondents indicated the contradictory opinions on some aspects of management support were emerged since mean score value of the official respondents were at higher side than the affected people. However, poor supports were provided on removal of silt deposits from the existing crop, provide financial support as well as arranged soil testing facilities. The panchayat officials have to develop strategy to create facilities and organized the disaster-affected communities accordingly to overcome the ill effect of disaster. Disaster relief operations have consistently demonstrated the need for community-based structures to oversee the implementation of emergency interventions, which also ensure that interventions are culturally acceptable. The pivotal role of gram panchayat in India particularly in the state of West Bengal is awfully significant in pre- and post-disaster approach to act as a leading force to deliver the best for the betterment of the community.

It is concluded from this study that the role performed by the local self-government in respect of disaster management is in moderate amount. The main role performed was arrangement of disaster shelters, protecting the vulnerable group of people, providing relief materials and forecasting early weather system. The roles performed by the local self-government in disaster management were very poor. There was absolutely lack of involvement of people's representative. Therefore, adequate supports are suggested on these aspects from the representatives in association with higher authorities.

References

DRCS (2012–2013) CCDRER project, Collective Action to Reduce Climate Disaster Risk and enhancing Resilience of vulnerable coastal communities around the Sunderbans in Bangladesh and India, p 7

- Ghosh A (2012) Living with changing climate–impact, vulnerability and adaptation challenges in Indian Sundarbans. Centre for Science and Environment, New Delhi
- Goel SL (2006) Policy and administration. Deep and Deep Publications, New Delhi, p 404
- Government of India (2009) Disaster risk management programme, New Delhi, p 21
- Government of West Bengal (2011–2012) Economic review. Government of West Bengal, 2011–2012
- Jain SP, Polman W (2003) A handbook for trainers on participatory local development. RAP Publication, Bangkok, p 07
- Madhava Rao V, Hermon RR (2003) Application of Geoinformatics in Natural Resource Management at Micro Level, Map Asia 2003, GIS Development
- Mondal D, Chowdhury S, Basu D (2014) The role of gram panchayats in disaster management: a study in Aila affected areas in West Bengal. *Indian Res J Ext Educ* 14(3):51–54
- Mondal D, Chowdhury S, Basu D (2016) The role of local institutions in reducing vulnerability to natural disasters in coastal areas of West Bengal. In: Acharya, Basu, Das, Adhikary, Mishra. *Krishi Sanskriti Publications*, New Delhi
- Taori K (2005) Disaster management through Panchayati Raj. Concept Publishing Company, New Delhi

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