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Assessment of Perceived Economic Impact of Flood among the Livestock-Rearers of Odisha

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Abstract

The impact of the flood on the farming community has recently an important subject to be assessed to improve the economic condition of the farmers. The present study was conceptualized to identify and assess the economic impact of the flood as perceived by the livestock-rearers on their livestock rearing and livelihood security. Ex-Post Facto Research Design has been used for the present study. A total of 120 livestock-rearers, selected by using a simple random sampling method from two districts namely, Dhenkanal and Balasore of Odisha were interviewed and perceived economic impact to flood index was followed for the quantification of the economic impact of the flood. Decrease in crop production due to flood was the most severe impact due to flood as perceived by the livestock-rearers of the overall study area. Majority of the respondents (53.33%) of the study area perceived that crop production was fully affected. The study also established that the severity of impact increased with the increase in the degree of flood-proneness.

Keywords: Economic Impact, Flood, Livestock-rearers, Odisha

Introduction

Flood is now the most widely spread kind of disasters around the world. Several impacts of climate change are directly or indirectly inducing the incidence of flooding that happens to be the most frequent type of major disaster nowadays (Tropeano and Turconi, 2004; Chiwaka and Yates, 2005). The world has had already witnessed devastating effects on properties and livelihoods as well as economic losses due to floods than any other hazard. (Armah *et al*., 2010). Flood, discharge of excess water which exceeds the channel capacity can pose enormous social and welfare troubles that may additionally proceed over prolonged intervals of time that better their lives, property, and relationships. (Fiasorgbor *et al.*, 2018). Among disasters, floods have escalated intensive harm to agricultural production, loss of human life, property, and livestock, which encompass monetary stress related to re-building their economic situation (Sen and Chander, 2003). The lives lost by these floods have gone from an average of 1000 per year in the decade of 1965-75 to 1700 per year in the decade of 2005-15 and the total economic loss within the last decade i.e. from 2005 to 2015 was around 2 per cent of the current GDP of India (Tripathy, 2015). Crops, local livelihoods, and infrastructure are negatively affected by Flooding (Lebel *et al.,* 2009; Kranz *et al*., 2010; Bastakoti *et al*., 2014). It was also found that monetary losses as a result of extreme climate events like floods have also gone up over the years (Botzen and van den Bergh, 2009). Floods have had been regular phenomena in India; as India is the worst flood-affected country in the world, after Bangladesh, and accounts for twenty per cent of the global death count occurring on account of floods (Padli *et al.,* 2013). The ultimate effects of floods include the agony of survivors, the spread of an epidemic, non-accessibility of essential commodities, medicines, and loss of the dwellings compel the affected people to perceive such floods as the most feared among the natural disasters being faced by mankind (Nandy, 2005). The livestock-rearing is an integral part of the rural livelihood systems in Odisha. Livestock-holding in Orissa is owned mostly by the marginal/smallholders and the landless farmers (Swain *et al.*, 2018). The various roles that livestock contributes in developing countries mean that they have value beyond the direct value of their food or earning potential (Randolph *et al.,* 2007). Contribution of the livestock sector to the country's development through nutrition, improved agricultural output, financial and social functions is huge. (Thornton, 2010). Generally, when attempts are made to understand the impact of disasters, these indirect values generated are frequently under-recognized and underestimated. (Campbell and Knowles, 2011). However, floods are a regular annual feature in Odisha. From the year 2006 to 2016, Odisha was affected by the flood every year; while, in the years 2006 and 2011, the floods happened to be severe ones… as 27 districts out of 30 districts were affected by floods in 2011, while causing havoc in the entire state. Further, around 4.6 lakh hectares of land under crop got affected by floods in the year 2015 (Anonymous, 2017). Each time, devastating floods cause huge loss of human as well as animal life, which leads to the poor economy of the state, especially among the livestock-rearers, who depend, solely, on animals for their livelihood. (Mishra, 2017). Loss of livelihoods results in a reduction in the purchasing power and loss of land value in the flood-prone area, which leaves the communities residing in these areas economically vulnerable. Therefore, it was thought essential to document the impact of the flood on the economic condition of livestock-rearers of a state like Odisha. Keeping in view all these, a comprehensive study was conceptualized to assess the economic impact of the flood as perceived by the livestock-rearers of flood-prone districts of Odisha, to formulate location-specific plans to prosper their economic conditions and overall livelihood.

Materials and Methods

Sampling Plan

Ex-post Research Design was followed for the present study. The study was conducted in the state of Odisha, purposively, since it is one of the most affected states on account of the flood (Samal and Patra, 2012). In Odisha, out of 30 districts in the state, 17 districts are major flood-prone districts and 13 are minor-flood prone districts (Anonymous, ARD, 2013). From each category, one district was selected, randomly. Thus, Dhenkanal and Balasore district was selected, purposively. From each selected district, two blocks (Odapada and Gondia from Dhenkanal; Bhograi and Jaleswar from Balasore district) were selected, randomly. From each block, two villages were selected, randomly (Table 1). A livestock-rearing farmer, having more than 10 years of experience in livestock-rearing of at least one species among cattle, buffalo, sheep, and goat was considered as the respondent for the present study. All the household-heads were considered as respondents for the present study. Subsequently, 15 respondents from each village were selected, randomly. Thus, the total sample size for the present study was One Hundred Twenty (120) (Table 1). Data were collected by personal interview method while visiting at the doorstep of the farmers and/or grazing ground and/or their field of crop production with the help of a pre-tested structured interview-schedule.

Table 1: Block-wise selected villages

Category	Districts	Blocks	Villages	
Minor	Dhenkanal	Odapada	1. Kharagprasad	2. Bido
Flood-Prone Distrct		Gondia	1. Kasipur	2. Deulasahi
Major	Balasore	Bhograi	1. Manunagar	2. Aruhabati No-1
Flood-Prone District		Jaleswar	1. Debkumar	2. Namkana

Operationalization and Measurement of Economic Impact

The word "*Perceive*" means: "to become aware or conscious of (something) by using one of the senses, especially that of sight". Whereas, the word "*Impact"* means: "the measure of the tangible and intangible effects (consequences) of one things or entity's action or influence upon another". In the present study; economic impact was referred to as the negative effect of the flood on the economic condition of the livestock-rearers, as perceived by them. A set of probable economic impacts was prepared by the personal interview method and through focused group discussion with the respondents during the pilot study. Livestock-rearers were requested to put their response on a four-point continuum, viz. fully affected, moderately affected, affected, and not affected with a score of 3, 2, 1, and 0, respectively on a pre-listed economic impact of flood for both the districts. The severity of each impact was assessed by using a "*Perceived Economic Impact to Flood Index*", underlying the principle of Goswami (2017) with modification by using the following formula:

$$\text{Perceived Economic Impact to Flood Index(PEIFI)} = \frac{\text{Obtained score}}{\text{Maximum obtainable score}}$$

Perceived economic impact with higher index value indicated that this perceived economic impact was comparatively more severe than the perceived economic impact with the lower index value. The ranking of each perceived impact was done based on their index value. All the respondents of the study area were categorized into three differential levels of economic impact of flood i.e. low, medium, and high based on obtained index scores by the respective farmers by using Cumulative Square Root Frequency Method.

Results and Discussion

Economic Impact of the Flood as Perceived by the Livestock-Rearers (District-wise)

Results portrayed in Table 2 indicated that livestock-rearers perceived in terms of ten (10) probable economic impact of the flood on their livestock-rearing as well as livelihood security. It was found that 41.67 per cent of the respondents of major flood-prone districts perceived that loss of livestock due to the flood was moderately affected; while the majority of respondents (58.33%) from minor flood-prone district perceived the same, as only affected. Majority of the livestock-rearers (71.67%) from major flood-prone district perceived that increase in expenditure for treating animal affected due to disease and/or injury due to the flood was fully affected to them, but the majority of respondents (81.67%) from minor flood-prone district perceived the same as moderately affected to them. Livestock-rearers of the major flood-prone district (88.33%) perceived that crop production was fully affected due to flood, while livestock-rearers of the minor flood-prone district (61.67%) perceived that crop production was moderately affected. Therefore, it may be concluded that the intensity of flood on livestock and crop was higher in the major flood-prone district (Balasore) than the minor flood-prone district (Dhenkanal). The majority of respondents from the major flood-prone district (70%) perceived that productive and reproductive performance of livestock were fully affected during the flood period, whereas the reproductive performance of livestock was moderately affected, as perceived by the majority of respondents (68.33%) from the minor flood-prone district. It can be concluded that the productive performance of livestock was affected by the unavailability of food and occurrences of disease, which was caused due to flood water. Livestock-rearers (60.00% and 56.67% of the major flood-prone district and minor flood-prone district, respectively) perceived that household income from livestock was moderately affected due to flood. The scope of employment/unemployment was moderately affected, as perceived by the majority of livestock-rearers (61.67% and 53.33% of the major flood-prone district and minor flood-prone district, respectively). Investment pattern of the livestock-rearers on various festivals and food was affected moderately, as perceived by the majority of livestock-rearers (61.67% and 55% of the major flood-prone district and minor flood-prone district, respectively.

Table 2: Distribution of respondents (reflected in percentage) on the basis of economic impact, as perceived by them (n=120)

S. No.	Perceived economic impact of flood	Minor Flood-prone District (Dhenkanal; n_1=60)				Major Flood-prone District (Balasore; n_2=60)				Overall (Odisha; n=120)			
		FA	MA	A	NA	FA	MA	A	NA	FA			
1	Loss of livestock	8.33	23.33	58.33	10.00	35.00	41.67	23.33	0.00	21.67	32.5	40.83	5
2	Increase in expenditure for treating sick and injured animals	0.00	81.67	18.33	0.00	71.67	28.33	0.00	0.00	35.84	55.00	9.16	0.00
3	Decrease in crop production due to flood	18.33	61.67	20.00	0.00	88.33	11.67	0.00	0.00	53.33	36.67	10.00	0.00
4	Decline in productive and reproductive performances of the livestock	5.00	68.33	26.67	0.00	70.00	26.67	3.33	0.00	37.5	47.50	15.00	0.00
5	Decrease in household income from livestock	3.33	56.67	40.00	0.00	28.33	60.00	11.67	0.00	15.83	58.34	25.83	0.00
6	Unemployment among respondents	3.34	53.33	43.33	0.00	25.00	61.67	10.00	3.33	14.17	57.50	26.67	1.66
7	Reduced Expenditure pattern on festivals, Clothes and Food during/after flood.	0.00	55	40.00	5.00	20.00	61.67	18.33	0.00	10.00	58.33	29.17	2.50
8	Reduced capacity of repayment towards loan due to less income	0.00	38.33	50.00	11.67	13.33	75.00	11.67	0.00	6.66	56.66	30.84	5.84
9	Loss of grains and feeds stored in preservation/ during post-harvest	0.00	45	46.67	8.33	38.34	48.33	13.33	0.00	19.10	46.66	30.10	4.14
10	Damage of fodder stored for the livestock	0.00	41.67	51.67	6.66	36.67	53.33	10.00	0.00	18.33	47.50	30.83	3.34

FA: Fully Affected; MA: Moderately Affected; A: Affected; NA: Not Affected

Few livestock-rearers of the major flood-prone district (13.33%) perceived that repayment capacity towards loan was fully affected due to flood, whereas (38.33% and 75.00% of respondents of the minor flood-prone district and major flood-prone district, respectively) perceived that repayment capacity was moderately affected. So, from these results, it can be concluded that the effect of the flood on household income, spending capacity, and repayment capacity towards indebtedness was more in the case of respondents of the major flood-prone district (Balasore) than minor-flood prone district (Dhenkanal). Loss of stored grain was affected fully, as perceived by the respondents of the major flood-prone district (38.34%), whereas 48.33 per cent of respondents from the major flood-prone district, perceived that loss of stored grain was moderately affected to them. Result also illustrates that 46.67 per cent of respondents from minor flood-prone district perceived the same was only affected. Damage of fodder due to the flood was fully affected, as perceived by the respondents of the major flood-prone district (36.67%), whereas respondents of the minor flood-prone district (41.67%) and major flood-prone district (53.33%) perceived that damage of fodder due to the flood was moderately affected. From these results, it may be concluded that most of the respondents of the major flood-prone district were residing in the low-lying region, which is more vulnerable to the flood water to be entered into the house and their locality than respondents from the minor flood-prone district. Naveen (2014) found that crop loss was the major problem among the farm problems due to flood which accounted for about 92.22 per cent of the responses, followed by loss of farm soils (85.89%), non-availability of labour (83.16%), non-availability of inputs (71.21%), field inundation (68.12%) and increase in incidence of pest attack (52.17%). Shortage of dry fodder was the major problem among the livestock problems due to flood which accounted for about 85.01 percent of the responses followed by a shortage of green fodder (80.58%), loss of livestock (lost/death) (78.33%) and non-availability of concentrate (74.78%).

Results portrayed in Table 3 indicated that the degree of severity of the identified ten (10) economic impacts of the flood, as perceived by livestock-rearers of the study area. Index values were range between “0 to 1”. The most severe impact was indicated by the highest value i.e. 1 and least severe was indicated by ‘0’. It was found that the impact of the flood on the production of the crop, as the most severe impact among the respondents of both minor flood-prone district and major flood-prone district. ‘Expenditure for treating injured and sick animals’ was the

second severe impact, as perceived by livestock-rearers of both the district. 'Decline in productive and reproductive performances of livestock' was perceived as the third severe impact by the livestock-rearers of both the districts. It can be concluded that the productive performance of livestock was affected by the unavailability of food and occurrences of disease, which was caused due to flood water. 'Damage of fodder due to flood' was perceived as the fourth severe impact by respondents of the major flood-prone district, while the same impact was perceived as the eighth-most severe impact by respondents of the minor flood-prone organizations.

Table 3: Index score and ranking of the perceived economic impact of the flood on livelihood as well as livestock-rearing of respondents (n=120)

S. No.	Perceived economic impact of flood	Minor Flood-prone District (Dhenkanal; n_1=60)	Major Flood-prone District (Balasore; n_2=60)	Overall (Odisha; n=120)
1	Loss of livestock	0.43 (ix)	0.71(vii)	0.57(viii)
2	Increase in expenditure for treating sick and injured animals	0.61 (ii)	0.91(ii)	0.76(ii)
3	Decrease in crop production due to flood	0.66 (i)	0.96(i)	0.81(i)
4	Decline in productive and reproductive performances of the livestock	0.59 (iii)	0.89(iii)	0.74(iii)
5	Decrease in household income from livestock	0.54 (iv)	0.72(vi)	0.63(iv)
6	Unemployment among Respondents	0.53 (v)	0.69(viii)	0.61(v)
7	Reduced expenditure pattern on festivals, clothes and food during/after flood.	0.50 (vi)	0.67(ix)	0.59(vii)
8	Reduced capacity of repayment towards loan due to less income	0.42 (x)	0.67(ix)	0.54(ix)
9	Loss of grains stored in preservation/ during post-harvest	0.46 (vii)	0.75(v)	0.60(vi)
10	Damage of fodder stored for the livestock due to flood	0.45 (viii)	0.76(iv)	0.61(v)

NOTE: Values in parentheses indicate the order of merit of preferences by the livestock-rearers column-wise

Flood damages the stored fodder by rotting those fodder, which will be not fit for the feeding purpose for livestock. These rotten fodders will create many parasitic infections and contagious diseases in the animal. 'Loss of grain due to flood water' was perceived as the fifth most severe impact by the respondents of major flood-prone District, whereas the same impact was the seventh most severe impact, as perceived by respondents of the minor flood-prone district. 'Decrease in household income from livestock' was perceived as the sixth most severe impact by the livestock-rearers of the major flood-prone district, while it was perceived as the fourth most severe impact by livestock-rearers of the minor flood-prone district. Impact like 'loss of livestock during flood' was the seventh severe impact, as perceived by respondents of the major flood-prone district, whereas this same impact was perceived as the ninth severe impact by livestock–rearers of the minor flood-prone district. 'Increase persistence of unemployment among farmer' was the eighth severe impact, as perceived by respondents of the major flood-prone district, while the same impact was perceived as fifth severe impact by the respondents of the minor flood-prone district. Impact like both 'reduced expenditure pattern on festivals and food' and 'reduced capacity of repayment' were the ninth severe impact, as perceived by livestock-rearers of the major flood-prone district, while that same impact was perceived as sixth and tenth sever impact, respectively by livestock–rearers of the minor flood-prone district.

Economic Impact of the Flood as Perceived by the Livestock-Rearers (Overall Study Area)

Table 2 also showed the impact of the flood on livestock-rearers of the overall study area. Loss of livestock was only affected, as perceived by 40.83 per cent of the respondents of the overall study area. An increase in expenditure for treating sick and injured animals was moderately affected to them, as perceived by the majority of the respondents (55.00%) of the overall study area. Crop production was fully affected, as perceived by the majority of the respondents (53.33%) of the study area. Around 47.50 per cent of respondents of the study area perceived the impact of the flood had a moderate impact on productive and reproductive performances of the livestock. Household income from livestock was moderately affected by the flood, as perceived by the majority of the respondents (58.34%) of the study area. The unemployment problem was moderately affected (by 57.20% of the respondents) during and after the flood period, as perceived by the livestock-rearers. Expenditure patterns on festivals, clothes,

and food were affected moderately, as perceived by the majority of the respondents (58.33%). The capacity of repayment of the loan was moderately affected, as perceived by the majority of the respondents (56.66%) of the study area. Flood washes out the grain and feeds for livestock, which had a moderate effect on livestock-rearers as perceived by 46.66 per cent of respondents. Flood damages the stored fodder. So this impact was moderately affected, as perceived by 47.50 per cent of the respondents.

Table 3 showed that the impact of the flood on the production of crop and Expenditure for treating injured and the sick animal was the first and second severe impact, respectively, as perceived by livestock-rearers of respondents of the overall study area. 'Productive and reproductive performance of livestock' was perceived as the third severe impact by the livestock-rearers of the overall study area.

Some of the livestock-rearers of each studied district perceived that at the time of high intensity of flood, it swept away their animal with the floodwater. During the flood period, some of the livestock got injured by the sharp debris of the localities and some of the livestock suffered various types of diseases like Foot and mouth (FMD), Black quarter (BQ), Haemorrhagic septicaemia (HS), etc. due to infected water. Flood damages all the crops which incurred a huge loss to the farmer, as a result of which their income reduced and they are unable to pay the loan amount. The expenditure pattern of the livestock-rearers of the study area was reduced due to less income in the flood year. When floodwater entered the house it washed away all the grains and fodder. Mubaya *et al*. (2010) found that floods resulted in very low crop yields among smallholder farmers due to waterlogging and leaching. Moreover, livestock diseases were reported with foot rot and blisters. Some of the affected farm animals died as most of the concerned farmers couldn't afford the costs of veterinary medicines to treat their farm animals. Wadhwa *et al*. (2010) reported that lack of mineral mixture and common salt in the diet leads to various reproductive problems like repeat breeding and anoestrus during the flood period.

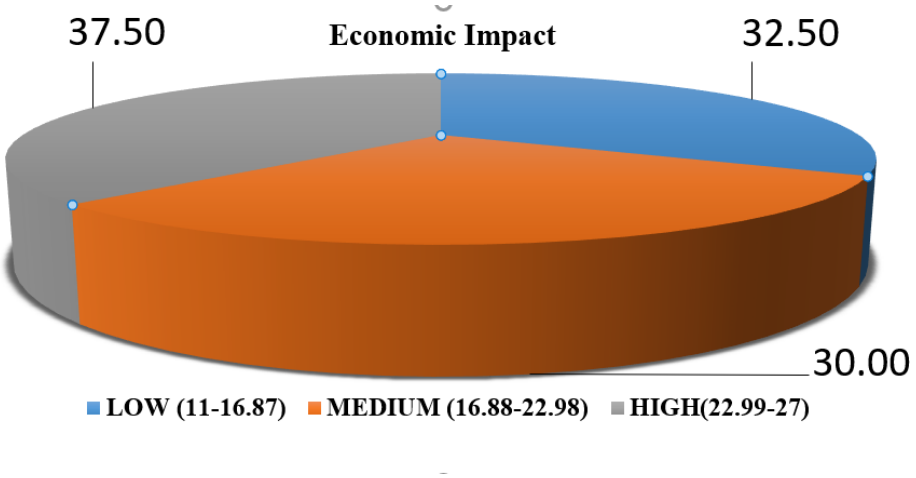

Figure 1: Distribution of the respondents (reflected in percentage) on the basis of economic impact, as perceived by them (n=120)

Categorization of Livestock-Rearers As Per Their Perception Towards Economic Impacts of Flood

Regarding economic impact, as perceived by the respondents of the overall study area, all the respondents of the study area were categorized into three differential levels of impact of flood i.e. low, medium and high based on obtained index score by the respective farmers. Cumulative Square Root Frequency Method was used to categorize the respondents into the low, medium, and high levels of perceived impact. As is evident from Fig 1, 37.50 per cent of the respondents were having a higher level of perceived economic impact followed by 32.50 percent and 30.00 percent were having a medium and low level of perception, respectively for the economic impact.

Conclusion

The study facilitated in analyzing the impacts of the flood on agriculture, livestock as well as on the livelihood issues of the farmer in the Odisha, while utilizing the available data, quantitatively and qualitatively. The majority of the livestock-rearers of flood-prone districts of Odisha perceived the economic impact of the flood on their livelihood as well as on livestock rearing. The severity of economic impact increased with the increase in the degree

of flood-proneness. Most of the livestock-rearers of the study area were having a higher level of perception regarding the impacts of the flood. It is concluded based on the findings of the study that the preparedness, response, and recovery mechanism should be given better attention both by the Government as well as NGOs to minimize the economic loss to the livestock-rearers due to flood considering the contribution of livestock to the local and national economy as well as the dependence of poor farmers on livestock for their livelihood. The present study might help different departments like agriculture, animal husbandry, and disaster management department of the State as well as Central Governments to formulate location-specific contingency plan at the time of flood to cope up with its economic impact.

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Conflict of Interests

There is no conflict of interest.

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