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RESEARCH ARTICLE

VULNERABILITY OF FARMERS AS PERCEIVED IN REGULARLY FLOOD AGROECOLOGY

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Abstract

The natural disaster in the form of flash flood in the monsoon season, damage crops in the farmers' field, destroy properties, means of communication as well as hundreds of lives in the state of Bihar. The vulnerability of People in general and farmers in particular in the flood affected state of Bihar need to be mitigated for creating resilience and sustainability of farming. This study is the estimation on the social vulnerability as perceived of area adversely affected by the flash flood of the state Bihar in the year of 2021. The interview was conducted personally with 40 people engaged in farming occupation using of pre-structured interview schedule in the flood prone area of the state Bihar. The data were analysed statistically applying tools viz descriptive statistics, correlation, regression using statistical software SPSS-23. It was found that family size (x_6), vulnerable members (x_9), age (x_1) and perception on occupation (x_4) of the flood affected farmers were negatively and significantly correlated with perception on social vulnerability of the farmers. It was also found that credit load (x_{16}), education (x_2) and social participation (x_{11}) were positively and significantly correlated with the perception on social vulnerability of the flood affected farmers in the increasing strength of association. The independent variables such as. age (x_1), education (x_2), perception on occupation (x_4), family size (x_6), vulnerable members (x_9), social participation (x_{11}) and credit load (x_{16}) have all together explained 82.4 per cent of the variance embedded in the social vulnerability as perceived by flood affected farmers.The study concluded that all the estimated significant socio-economic agro-economic and socio-psychological characteristics of flood affected farmers determines the perception on social vulnerability of farmers which in turn will help policy makers to undertake suitable remedial measures to improve the precarious situation in a better way not only by developing infrastructures but also with appropriate improved agricultural technologies in the form of flood tolerant varieties, crop protection measures and farm mechanization so that the farming occupation can become resilient and sustainable.

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Introduction:-

Bihar is an agricultural state in India having gross sown area 79.46 lakh hectares out of total geographical area 93.60 lakh hectares. Bihar is one of the most flood affected state in India, where 68.80 lakh hectare area are flood prone area comprising of 73.06 per cent of the total Geographical area. Flood condition is more serious in Northern plains of Bihar. Every year during monsoon, there is heavy damage of household properties, loss of human lives and makes the people structurally and functionally vulnerable. Flood Exposure increases for socially vulnerable population especially for inland floods. Eric tate (2021) argued that social vulnerability is the result of the combined process of social, political and economic producing heightened sustainability to hazards for some population. Dwyer et. al. (2004) studied social vulnerability to natural hazards used quantitative method using 13 indicators viz. age, house-hold income, type of resident, tenure, occupation, language skills, house hold types, lack of ability, insurance of house, insurance of health, loan,savings, car and gender to model risk.Only 4 factors out of 13 was perceived as important enough to score more than 1 per cent of the relative importance compared with injuries, Insurance of house (13.36 per cent), Income (11.59 per cent), Type of tenure (9.61 Per cent), Age (2.1 Per cent). Kuhlicke et. al. (2011) while studying the factors for vulnerability to flood disasters with the use of three case studies from Germany, Italy and United Kingdom separately found that none of the common set of factors explained vulnerability in all three case studies that is valid for comparison across countries and that can explain vulnerability in all three phases of a disaster. Fussel (2007) differentiating internal and external socio-economic drivers concluded that policies of the nation, global aids or globalized economies are the external whereas, internal factors are income of household, social networks or information access. Mathilda Englund et. al. (2003) concluded while mapping Social Vulnerability Index that injustices arising from the unequal distribution of social vulnerability indices can help in decisions and investments in disaster risk reduction by identification and locating vulnerable people.Disaggregating exposed population is vital as socially vulnerable population disproportionately dwell flood affected areas (Platt, 1998; Lee and Jung, 2014). The present study was carried out with the objective of to explore socio-economic status of farmers in regularly flood prone area, to, identify factors responsible for perception on social vulnerability and to assess the interrelation and interaction of farmers perception on social vulnerability with the identified socio-economic factors.

Methodology:-

Determination of flood social vulnerability is very necessary for the food securities as well as to recuperate their losses during floods. The face to face surveyof 40 farmers carried out using of pre-structured interview schedule in the flood affected cow town of the state of Bihar which is situated in the vicinity of a Parvan river a subsidiary of Mahananda river. Scale of Perception on Social Vulnerability (Y) was developed with the judgement score of selected farmers who were not incorporated in the final survey. The independent variables used were age (x_1), education (x_2), habitation (x_3), perception on occupation (x_4), agricultural experience (x_5), family size (x_6), gender ratio (x_7), divyang (x_8), vulnerable members (x_9), transportability (x_{10}), social participation (x_{11}), information source (x_{12}), cropping intensity (x_{13}), agricultural income (x_{14}), irrigation index (x_{15}), credit load (x_{16}) and holding size (x_{17}). The dependent variable was perception on social vulnerability (Y). The collected data were analysed for descriptive, correlation of coefficient and linear regression with the help of statistical software SPSS-23.

Results and Discussion:-

Table 1:- Descriptive Statistics of farmers of the flood affected village in Bihar.

						n=40
Sl No.	**Independent variables**	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**	**(C.V) %**
1	Age(x_1)	32	76	54.325	11.15712	20.53
2	Education(x_2)	1.00	3.00	1.9000	0.74421	39.16
3	Habitation(x_3)	2.00	4.00	3.7250	0.55412	14.87
4	Perception on occupation(x_4)	.30	4.00	1.1485	0.74830	65.15
5	Agricultural experience(x_5)	3.00	4.00	3.9500	0.22072	5.58
6	Family size(x_6)	.50	12.00	6.5250	2.79869	42.89
7	Gender ratio(x_7)	.25	3.00	.91750	0.72182	78.67
8	Divyang(x_8)	.20	1.00	.27000	0.21507	79.65
9	Vulnerable members(x_9)	.00	7.00	1.2900	1.87121	145.05

10	Transportability(x_{10})	.20	2.20	1.1900	0.54903	46.13
11	Social participation(x_{11})	.20	1.60	.60000	0.43442	72.40
12	Information source(x_{12})	.60	2.80	1.3600	0.52271	38.43
13	Cropping intensity(x_{13})	50.00	300	174.325	51.45244	29.51
14	Agricultural income(x_{14})	25000	120000	167567.5	301146.3035	179.71
15	Irrigation index(x_{15})	50	200	106.9000	43.32749	40.53
16	Credit load(x_{16})	5000	400000	55525.00	101393.1135	182.60
17	Holding size(x_{17})	1.50	50	8.137500	12.79623	157.25
18	Perception on social vulnerability(Y)	99.00	132.00	117.7750	9.15532	7.77

The table 1 shows descriptive statistics of the farmers of flood affected village in Bihar

Minimum Age(x_1) of the respondent is 32 years, whereas maximum Age(x_1) is 76 years. Mean value of the Age(x_1) of the respondents is 54.3250 with standard deviation 11.15712. Coefficient of variation of Age(x_1) is 20.53 per cent indicates high level of consistency.

Minimum value of Education(x_2) of the respondents is 1, which indicates that respondents are formally educated up to 0-5 years. Maximum Education(x_2) of the respondent is 3, which indicates that respondents have attained maximum formal Education up to 10-15 years. Mean value of Education(x_2) is 1.9 with standard deviation 0.74421. Coefficient of Education(x_2) variation is 39.16 per cent indicating that medium level of consistency.

Minimum value of Habitation(x_3) of the respondents is 2 indicating 5-10 years of living in village, Harerampur, whereas maximum is 4 means respondents have been living in the village for more than 15 years. Mean value of the Habitation(x_3) is 3.7250 and standard deviation is 0.55412. Coefficient of variation of Habitation(x_3) is 14.87 per cent, which shows high level of consistency in data collected so far.

Minimum value of Perception on occupation(x_4) is 0.30, whereas maximum is 4.00, which indicates that respondents are mainly associated with agricultural occupation, services along with self- employment, business, and labor. Mean value of Perception on occupation(x_4) is 1.1485 with standard deviation 0.74830. Coefficient of variation of Perception on occupation(x_4) is 65.15 per cent showing medium level of consistency.

Minimum value of Agricultural experience(x_5) of the respondents in years is 3.00, which indicates respondents have 0-5 years of experience in cultivating crops, whereas maximum is 4 indicating more than 15 years of experience of the respondents in agriculture. Mean value of the Agricultural experience(x_5) is 3.9500 with standard deviation 0.22072. Coefficient of variation of Agricultural experience(x_5) of the respondents is 5.58 per cent showing high level of consistency.

Minimum value of Family size(x_6) of the respondents is 5 and maximum is 12. Mean value of the Family size(x_6) of the respondents is 6.5250 with standard deviation 2.79869. Coefficient of variation of Family size(x_6) is 42.89 per cent showing medium level of consistency.

Minimum value of Gender ratio(x_7) of the respondent is minimum 0.25, whereas maximum is 3.0. Mean value of the Gender ratio(x_7) is 0.9175 with standard deviation 0.72182 Coefficient of variation of Gender ratio(x_7) of the respondents is 78.67 per cent showing medium level of consistency.

Minimum value of Divyang(x_8) of the respondents 0.20, whereas maximum is 1.0. Mean value of Divyang(x_8) of the respondents is 0.2700 with standard deviation 0.21507. Coefficient of variation of Divyang(x_8) is 79.65 per cent showing medium level of consistency.

Minimum value of the vulnerable member(x_9) of the respondents is 0.00 and maximum value is 7.0. Mean value of the Vulnerable members(x_9) of the respondents is 1.2900 with standard deviation 1.87121. Coefficient of variation of Vulnerable members(x_9) is 145.05 per cent showing low level of consistency.

Minimum value of Transportability(x_{10}) of the respondents is 0.20, whereas maximum value is 2.20. Mean of the Transportability(x_{10}) is 1.1900 with standard deviation 0.54903 Coefficient of variation of Transportability(x_{10}) is 46.13 per cent showing medium level of consistency.

Minimum value of Social participation(x_{11}) of the respondents is 0.20 and maximum value is 1.60. Mean value of Social participation(x_{11}) of the respondents is 0.6000 with standard deviation 0.43442. Coefficient of variation of Social participation(x_{11}) is 72.40 per cent showing medium level of consistency.

Minimum value of Information source(x_{12}) of the respondents is 0.60, whereas maximum value is 2.80. Mean value of Information source(x_{12}) of the respondents is 1.3600 with standard deviation 0.52271. Coefficient of variation of Information source(x_{12}) is 38.43 per cent indicating high level of consistency.

Minimum value of Cropping intensity(x_{13}) of the respondents is 50, whereas maximum value is 300. Mean value of Cropping intensity(x_{13}) is 174.3250 with standard deviation 51.45244. Coefficient of Cropping intensity(x_{13}) of the respondents is 29.31 showing high level of consistency.

Minimum value of Agricultural income(x_{14}) of the respondents is 25000, whereas maximum value is 120000. Mean value of Agricultural income(x_{14}) of respondents is 167567.500 with standard deviation is 301146.3035. Coefficient of variation of Agricultural income(x_{14}) is 179.71 per cent showing low level of consistency.

Minimum value of Irrigation index(x_{15}) is 50, whereas maximum value is 200. Mean value of Irrigation index(x_{15}) of the respondents is 106.9000 with standard deviation 43.32749. Coefficient of variation of Irrigation index(x_{15}) is 40.53 per cent showing medium level of consistency.

Minimum value of Credit load(x_{16}) of the respondent is 5000, whereas maximum value is 400000. Mean value of the Credit load(x_{16}) of the respondents is 55525.0000 with standard deviation 101392.1135. Coefficient of variation of Credit load(x_{16}) is 182.60 showing low level of consistency.

Minimum value of Holding size(x_{17}) of the respondents is 1.50 whereas, maximum value is 50.0. Mean value of Holding size(x_{17}) of the respondents is 8.1375 with standard deviation 12.79623. Coefficient of variation of Holding size(x_{17}) of the respondents is 157.25 per cent showing low level of consistency.

Minimum value of perception on Social vulnerability(Y) of the respondents in selected village Harerampur is 99, whereas maximum value is 132. Mean value of Perception on social vulnerability of the respondents is 117.7750 with standard deviation 9.15532. Coefficient of variation of Perception on social vulnerability of the respondents is 7.77 showing very high level of consistency.

Table 2:- Correlation coefficient of Perception on Social vulnerability with independent variables of village, Harerampur.

		n=40
Sl. No.	**Independent Variables**	**Correlation coefficient (r)**
1	Age(x_1)	-.440**
2	Education(x_2)	.439**
3	Habitation(x_3)	-.162
4	Perception on occupation(x_4)	-.369*
5	Agricultural experience(x_5)	.280
6	Family size(x_6)	-.621**
7	Gender ratio(x_7)	.165
8	Divyang(x_8)	.131
9	Vulnerable members(x_9)	-.558**
10	Transportability(x_{10})	-.185
11	Social participation(x_{11})	.321*
12	Information source(x_{12})	-.013
13	Cropping intensity(x_{13})	-.078
14	Agricultural income(x_{14})	-.141
15	Irrigation index(x_{15})	.097

16	Credit load(x_{16})	.478**
17	Holding size(x_{17})	-.159
****Significant at 0.01**		
***Significant at 0.05**		

The table 2 shows that Spearman's correlation of dependent variable Perception on social vulnerability with seventeen independent variables in the locale of study, Harerampur. The perusal of table shows that independent variables viz. Credit load(x_{16}), Education(x_2) and Social participation(x_{11}) have been found to be positively and significantly correlated with Perception on social vulnerability(Y) with increasing strength of association. The table also shows that independent variables viz. Family size, Vulnerable members, Age(x_1) and Perception on occupation(x_4) have been found to be negatively but significantly correlated with increasing strength of association with Perception on social vulnerability(Y) of the respondents.

Table 3:- Linear regression of Perception on Social vulnerability versus independent variables of village, Harerampur.

n = 40

Sl No.	Independent variables	Unstandardized Coefficient		Standardized Coefficient Beta	t	Sig.	
		B	Std. Error				
	Constant	135.190	5.026		26.897	.000	
1	Age(x_1)	-.091	.077	-.110	-1.182	.246	
2	Education(x_2)	5.379	1.445	.437	3.772	.001	
3	Perception on occupation(x_4)	-5.702	1.069	-.466	-5.332	.000	R^2=.824
4	Family size(x_6)	-1.833	.320	-.560	-5.730	.000	
5	Vulnerable member(x_9)	-1.700	.530	-.347	-3.207	.003	
6	Social participation(x_{11})	-2.240	2.590	-.106	-.865	.393	
7	Credit load(x_{16})	-1.209E-5	.000	-.134	-1.531	.136	

Table 3 shows that linear regression of the effect variable, Perception on social Vulnerability versus independent variables of flood affected village of Bihar. The perusal of table shows that Age(x_1), Education(x_2), Perception on occupation(x_4), Family size(x_6), Vulnerable members(x_9), Social participation(x_{11}), Credit load(x_{16}) have contributed in causing Perception on social vulnerability. It has been found that value of $R^2$is 0.824, implying that 82.4 per cent of the variance embedded in effect variable, Perception on social vulnerability has been explained cumulatively by the causal variables viz Age(x_1), Education(x_2), Perception on occupation(x_4), Family size(x_6), Vulnerable members(x_9), Social participation(x_{11}), Credit load(x_{16}).

Conclusions:-

Determination of perception on social vulnerability identifies the socio-economic and socio-psychological and agro-economic factors responsible for the farmers vulnerability in regularly flooded agroecology where flash flood occurs during the monsoon season which last for two to three months every year. Based on the findings of the study suitable mitigation strategy can be prioritized according to the vulnerability index of the locale and its neighbouring villages. Major enterprise followed during the flash flood period is paddy which are washed away and decreasing the profitability of the farmer which makes them utterly vulnerable. Food susceptible varieties of paddy can be replaced with flood resistant varieties which not only would increase cropping intensity but also minimize the loss from the farmers enterprise. Education of the school as well as college going students of the region during the flash flood discontinue and a special camp for their proper education can be planned for preventing from the discontinuation of their school and college studies.

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