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Flood Impact on the Households and their Socioeconomic Condition: A Study of the Koshi Basin, Bihar, India

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Abstract
The objective of this study is to examine the economic losses of the households in flood-affected areas of the Koshi Basin. Hence, it plays an important role in the Bihar economy. While this study is based on primary data. Which is collected by schedule and interviews. Moreover, the observation method has played a crucial role in this study. The sample size of this work is two hundred twenty-three. This study was done in districts named Supaul, Purnia, Bhagalpur, Saharsa, and Katihar under different blocks and villages. The Hypothesis of the study is "Does disaster affect different population groups differently?" which further differentiates between the null and alternate one. To analyse the data, we have tested it using the chi-squared test method. This gave an impactful result. The study finds that poor households faced a greater impact of the flood than some other households. Especially those who belonged to the marginalised group.

Keywords: Floods, Households, Socio-Economic Status, Koshi Basin, Disaster Impact.

Introduction

Socioeconomic status refers to the combination of economic and social factors that can greatly impact an individual's well-being. This includes education, occupation, and income, all of which are influenced by one's health. For instance, a child who maintains good health throughout their adolescence is more likely to receive a high-quality education, secure a better job, and earn a higher income. Conversely, poor health and negative behaviour during childhood can lead to long-lasting effects that impact education, occupation, and income, ultimately making life more challenging. Therefore, when evaluating health parameters within schools, it is crucial to consider these interconnected factors. College attendance will also give you healthy social behaviour examples. Some selected colleges and elite college environments reinforce healthy behaviour like a healthy diet and physical activity, changing their adolescence to adulthood and lifelong. But there is also such a kind of college environment that influences adolescents to consume alcohol, smoke, etc., which is directly associated with socio-economic status and poor health conditions. These are narrow facts, but if we are looking forward to the broader facts that impact an individual's health, like adequate land possession for housing and exercise, availability of nutritious food, a healthy neighbourhood, and healthcare facilities available near the house, all these factors impact the individual's health. Socio-economic status includes income as an important factor. In Economics, income is defined as disposable income, which is calculated by subtracting the total amount of direct taxes paid (including income tax and social security contributions) from the sum of the previous "primary" transfer incomes. While there isn't a single universally accepted definition of income, it is generally understood to refer to the compensation individuals or entities receive over time as payment for services rendered, products sold, and returns on investments, pension distributions, gifts, and other forms of value transfer. Income is directly related to the individual's purchasing power, which coincides with better health because greater income resources allow a person to spend more on healthcare facilities, and they can easily avail of it. Moreover, higher income can also purchase better–quality housing with lovelier neighbourhoods and healthier food, which will reduce

psychological hazards and stress ultimately. Determining one's socio-economic status involves taking into account their occupation, which is closely linked to their income. Additionally, a person's occupation can provide insight into their social standing and help them establish stronger social connections. However, evaluating socio-economic status based on occupation can be difficult, as individuals may switch jobs early on or retire before their occupation can be fully assessed. Typically, the occupation with the longest tenure is used to gauge socio-economic status, but this method may not apply to younger or retired individuals. To gain a better understanding of the underlying factors contributing to the socio-economic pattern, it is important to assess the pattern itself. As such, attention turns to measuring this pattern.

Density and Distribution of Population

Population density is often used in science to know about the relative abundance of species and how they will respond to local conditions. Two types of situations lie on it:-

i) If conditions are good/suitable for the species, the density will be high
ii) If conditions are not suitable for those species, the density will be low.

Moreover, density can be used as an explicit proxy for the population size. Where the population density is the ratio between the size of the population and the area. Perhaps density simply gives the number of organisms present in some defined study area.4 Moreover, the population density of our research is mentioned in the following table:-

Table 1: Population Density

Population Details	Bihar (Overall)	Purnia	Supaul	Saharsa	Madhepura	Bhagalpur
Area, Sq. Km	94,163	3229	2420	1696	1788	1182
Total population	103,80	3.26	2.22	1.89	1.99	3,037,766
Decadal growth rate (%)	25.10	25.10	28.33	25.79	30.65	25.36%
Literacy rate (%)	63.82	30.65	-	25.79	28.62	63.14%
Female sex ratio	916	914	929	906	925	880
Infant mortality rate	52	71	64	62	64	
Natural growth rate	19.50	20.40	22.00	24.2	22.70	
Crude birth rate	28.90	27.60	28.50	32.1	30.10	
Crude death rate	7.30	7.20	6.50	7.80	7.50	
Population of SC	16567325	390991	354249	317249	346275	
Population of ST	1336573	139490	10168	6009	12532	

Source: Census 2011, AHS (2010-11)

The decadal growth of the population of Bihar has increased by 25.42% as per the census 2011 data, as compared to the period 2001-2011, to the period 1991-2001. The density of the population of Bihar state for the current decade is 2863 per square mile. If we compare some facts related to Bihar as per the census 2011, it is quite striking that Bihar possesses the highest population density, 1102/sq.km. The second fact in literacy Bihar possesses the lowest rate, which is 63.82%, whereas India's overall literacy rate is 74%. Moreover, the density of the population helps to identify the population variation, which is shown in the 2011 census. So, in the following table, we will describe the total eleven districts of the Koshi basin, whose names are 1. Madhubani, 2. Supaul, 3. Araria, 4. Purnia, 5. Katihar, 6. Madhepura, 7. Saharsa, 8. Darbhanga, 9. Samastipur, 10. Khagaria, and 11. Bhagalpur.

Table 2: District-wise CD Blocks–Cum–Anchals, No. of Villages, Area, and Population

S. No.	District	Total Rural Area in sq.km.	Total no. of villages	Total population	No. of Block cum Anchals	Average area in sq. km. per unit Block	Average Population per unit Block
1.	Madhubani	3475.76	1257	4487379	21	166.71	213684.71
2.	Supaul	2388.66	612	2229076	11	220.45	202643.27
3.	Araria	2778.93	782	2811569	9	314.44	312396.56
4.	Purnia	3148.59	1235	3264619	14	230.64	233187.07
5.	Katihar	3015.80	1413	3071029	16	191.06	191939.31
6.	Madhepura	1748.09	461	2001762	13	137.53	153981.69
7.	Saharsha	1665.87	514	1900661	10	168.7	190066.10
8.	Darbhanga	2259.82	1203	3937385	18	126.6	218743.61
9.	Samastipur	2888.50	1179	4261566	20	145	213078.30
10	Khagaria	1473.54	311	1666886	7	212.28	238126.57
11.	Bhagalpur	2514.00	1143	3037766	16	160.56	189860.38
Total		27,357.56	10,110	32,669,698	155	2,073.97	23,57,707.57

Source: Census 2011

The above table has been taken from the 2011 census, which is the latest census report available on the government census site as of 2022. Yet we have to emphasise this for further inquiry or research purposes. Moreover, we are looking at the density of the population of the Koshi basin area. So, we can observe the differences within the district in these. If we are differentiating these districts, then, area-wise, 1. Madhubani, 2. Purnia, and 3. Katihar has the highest rural area. And in terms of total villages, the district was 1. Katihar, 2. Madhubani, and 3. Purnia. Which is slightly different from the area. If we are looking at the population of this area, then 1. Madhubani, 2. Samastipur, and 3. Darbhanga. And in terms of the highest no. of blocks of these areas, which is the same as the population, like – 1. Madhubani (21), 2. Samastipur (20), 3. Darbhanga (18).

Socio-Economic Status (SES)

Socio-economic status (SES) refers to the social and

economic position of an individual or a household within a society. It is a measure that takes into account various factors such as income, education level, occupation, and social standing.

The Socio-economic Status of a Household is Typically Determined by Considering the Following Indicators:

1. **Source of Income/Occupation:** The household's total earnings from various sources such as employment, investments, and government assistance programs. The type of work and the level of skill required in the jobs done by the household members. This can include factors such as job stability, career advancement opportunities, and job benefits.
2. **Education:** The level of education attained by the household's members, including the highest level of schooling completed and any advanced degrees.
3. **Occupation:** Wealth and assets: The total value of assets owned by the household, including property, savings, investments, and other valuable possessions.
4. **Housing and Neighbourhood:** The quality of housing, including ownership or rental status, living conditions, and the socio-economic characteristics of the neighbourhood in which the household resides.
5. **Access to Resources:** The availability of resources such as healthcare, transportation, and social services can impact the overall well-being of the household.

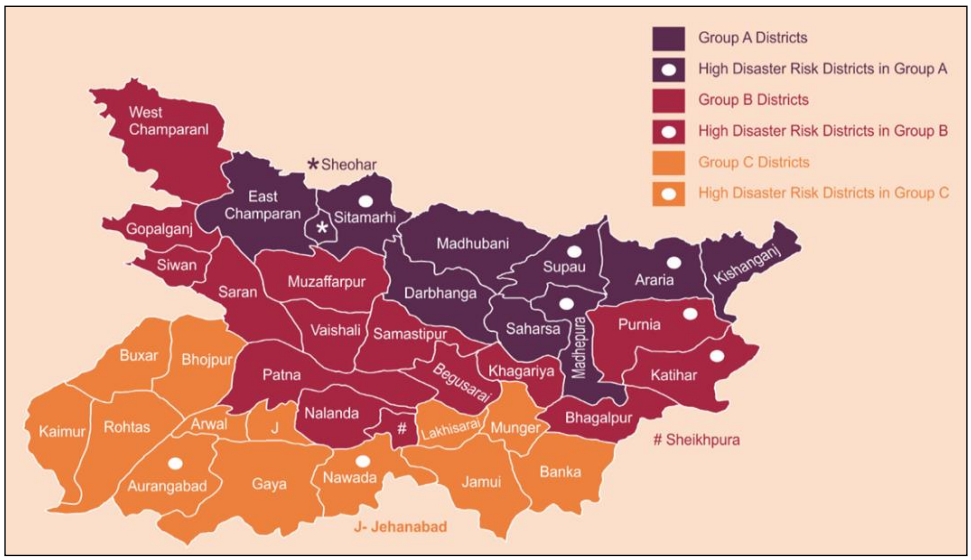
These factors are used to assess a household's socioeconomic status and determine its relative position within the broader society. Socioeconomic status can have significant implications for individuals and households, influencing their access to opportunities, resources, and social mobility.

Through the Literature

This chapter aims to investigate the socio-economic status of the selected households in flood-prone areas of the Koshi basin. Socio-economic status means combining Social and Economic, under which social includes indicators like unemployment rates, estimates of life expectancy, crime rates, health status indexes such as the average number of "healthy" days, school enrolment rates, etc. (Ritzer, George (2007). Firstly, we will discuss the social indicators in detail, and after that, we will discuss the economic indicators. Let us know about the social indicator, why we need it, and what its importance is. Well, answering all of these questions one by one. We have already mentioned in the above paragraph the brief definition of the social indicators and economic indicators. Moreover, the importance of social indicators is very relevant for society's well-being, because it follows the principle of observing the changes over the period. In other words, we will investigate our first research objective, "to analyse the economic losses of the households in flood-affected areas," under the null hypothesis, which is "Does the disaster affect different population groups differently through this chapter. Further, socio-economic status has too many different definitions that we have selected one, which indicates education is associated with socio-economic status and its association with higher income and good health. Which is related to the human as a capital with the cognitive skills. So, we can say that it is the first indicator of social status, which leads to upward mobility, along with other variables like livelihood, income, and capital. Moreover, the quantitative methods use education as a measure of how many years they have spent in school to complete the degree. Because this number of years of schooling is significantly associated with better cognitive development, and in the job market, they could find a better job, which will further increase their incomes. (Cited in B. H. Elizabeth, 2014) However, this research work has taken one variable in its schedule: family education, in which there are several options, like a. literate, b. illiterate, c. children who didn't go to school, in which number of Boy/ Girl, and we have added further questions like – what is the reason behind that, and the options given were (i) because there is no school available near the house, (ii) lack of income and the last one is (iii) others.

Research Findings

1. **Study Area:** This study has collected two hundred twenty-three samples from the fieldwork. This study was done in districts named Supaul, Purina, Bhagalpur, Saharsa, and Katihar under different blocks and villages. We selected these districts because, according to the Bihar state disaster management, ten districts are under Group A, and 18 districts in Group B are considered as high disaster risk districts in Bihar, which is clearly shown in the Bihar district map-1. So, we have taken these districts that are close to the Koshi River.



Source: Bihar State Disaster Management

2. **Objective of the Study:** The objective of this chapter is to analyse the economic losses of the households in the flood-affected area. Moreover, this objective will also highlight the household's socio-economic status, which will help us further understand the social and economic perspectives of those houses.
3. **Hypothesis of the Study:** The study has one hypothesis, which is the following:-
   Does the disaster affect different population groups differently?
4. **Data and Methodology:** This study has included primary and secondary data. However, the analysis of the objective is done by the primary data. Total sample size 223. The schedule we have prepared for the 250, but 27 schedules were not up to the mark, that's why we did not include them. Our sampling technique is a random sample size method for the study areas. The size is small due to the time & cost of the study; because this study is not sponsored or financed by any institutional body, the whole study cost is borne by the researcher themselves.

Secondly, one particular reason has the same level of difficulties faced by the people, which is why if we have taken, for example, 100 samples or 20 samples, the problem would be the same. So, there is a method that says if you don't find the heterogeneity in the data, then there is no meaning in the sample; you would take 1000 or 100, the result would be the same.

For the data analysis, we have used SPSS version 20. For the data analysis, we have used the Chi-Square test. For the data collection, we have prepared a schedule with open and closed-ended questions.

For the Answer to the Objectives, We have Asked Many Questions, Such As:

1. Household size of the family members
2. Education of the family
3. Occupation of the households
4. List of animal husbandry if they do
5. Religion and caste of the households
6. The total land they possess
7. What kind of farming do they engage in
8. Women are working or housewives
9. What kind of houses do they possess
10. Do they have some vehicles?

5. Results of the Data Analysis

The following results have been found through the primary data analysis on SPSS-20, with the use of the Chi-square test:-

Table 3: Family Source of Income

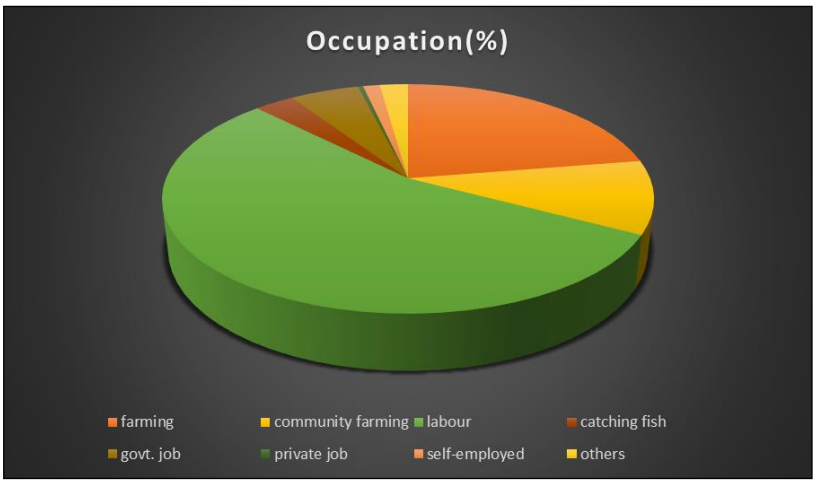
Occupations	Self-farming	Community farming	Labour	Catching fish	Govt. jobs	Private jobs	Self-employed	Others	Total
Frequency	50	23	122	7	12	1	3	5	223
Percent	22.4	10.3	54.7	3.1	5.4	0.4	1.3	2.2	100

Source: Author's calculation

The very first indicator of the socio-economic status of households is income'; that is come from the occupations. The above-mentioned table-3 shows the total distribution of income sources. We have found eight categories of occupations in the study areas; that is, 1. Self-farming (those who own the land and farm it themselves), 2. Community farming (those who farm as tenants or two people share the work and earn the profit together), 3. Labour [In this category, we have found two types of labour: (i) labour in the agriculture field, and (ii) labour in some other work], 4. Catching fish (those whose basic lives depend on catching fish and selling them in the market), 5. Government job (those who work for the government, either state or central), 6. Private Job (those who work for a non-government company, institution or firm), 7. Self-employed (those who work for themselves or contract directly with their clients), 8. Others (in this category, we have put those who do not fall in the above-mentioned seven categories).

Secondly, we have calculated all of these categories into the percentage. Through the percentage, we can figure out the total share of each category in total.

Which is mentioned in the Pie Chart:



Source: Author's own calculation.

Graph 1: Occupation of the Households.

The pie chart is prepared for the household's percentage share in the occupations. This graph will give us clear dimensions of the house's participation in the different types of work. As we can see in Graph 1, people in the study area do labour work 54.7% (about 55%), which the highest work is done by those people. The second highest work done by them is self–farming at 22.4% (about 22%). The third highest work done by them is community farming at 10.3% (about 10%). So, we can say that agriculture and the allied sector work is massively done by about 85% of them, and the rest 15% work share is being done by them. In which catching fish, government jobs, private jobs, self-employed, and others are included. Moreover, we can say that households in the study area depend on agricultural and allied sector activities.

Our second socio-economic status indicator is 'education', which we will see through the table and graph in the study area.

Table 4: Left side: Education of the family, Right side: whether a child goes to school

Education of the family		
	Frequency	Percent
illiterate	71	31.8
Literate	152	68.2
Total	223	100.0
Whether a child goes to school		
	Frequency	Percent
Yes	18	10.5
No	154	89.5
Total	172	100.0

Source: Author's calculation

Our second indicator is the education of the households; the above table has two variables: the first one is the overall education of the family, and the second one is whether a child goes to school or not (in percentage form). The first table represents the education of the family, which said 31.8% of people are illiterate and 68.2% people are literate. This figure gives us a clear picture of the education level of the study area. When it comes to the children of the households, whether they go to school or not. The answer is 10.5% of people say yes, they send their children to school, and the rest 89.5% of the people say no; they don't want to send them to school, because of the distance to the school. Some of the people say we are not sending our girl child due to security reasons, and the distance is far from the house, which is not suitable for them. (The literacy rate is a common metric used to assess the level of literacy within a population. It measures the percentage of people within a specific age group or population who can read and write with comprehension. Literacy rates are often used as indicators of educational attainment, development, and the overall well-being of society.6

The third socioeconomic status indicator is 'wealth and assets'; in our study finding mass population is farming and labour in the agricultural field. Hence, for them, their assets are land, and their wealth is the crops they are yielding and animal husbandry. So, we will see through the tables and graphs.

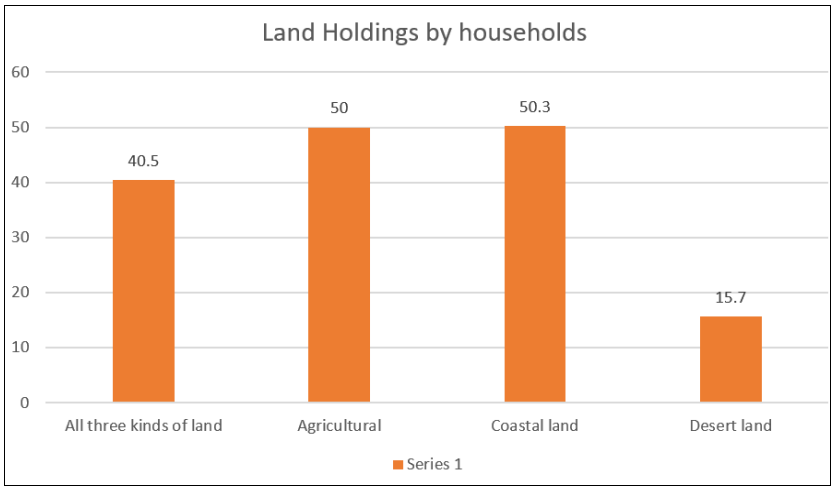
Table 5: Types of Land Holdings

	Total land	Agriculture land	Coastal land	Desert land
Frequency	79	93	84	25
Percent	40.5	50.0	50.3	15.7
Total	195	186	169	159

Source: Author's calculation

The above-mentioned table shows the household's land holdings and the nature of the land they possessed. Out of the 223 households, only 195 households have their land; the remaining households do not have land. We have differentiated these lands into different categories, such as how much land they have. We have categorised them into three categories- 1. Agricultural land, 2. Coastal land, 3. Desert land. We have given these categories because their extended land was near the Koshi Basin Rivers, so; every year more or less they face a flood, and because of that generally; more than half of their land is covered by the river or sands.

That is another kind of problem they are facing related to agricultural production. This is the main reason for their low earnings. And reaming agriculture productions were washed off into the floods.



Source: Author's calculation

Graph 2: Land Holdings by Households

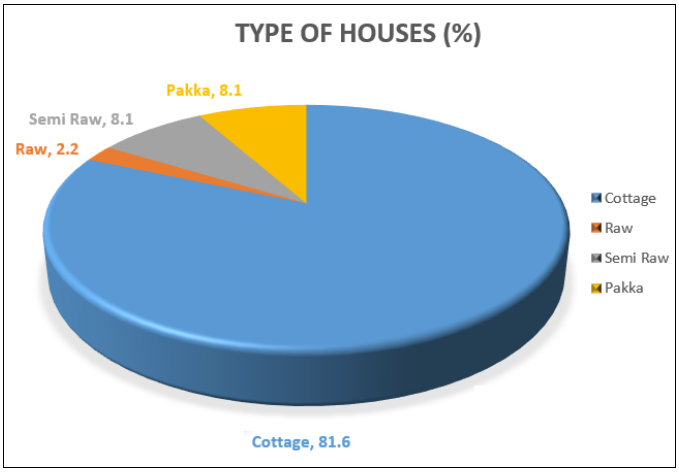
The above bar diagram shows the household land holdings in percentage form. We have calculated these percentages by using a frequency table in SPSS-20. This means around 40.5% of households have all three kinds of land, i.e., agricultural land, Coastal land, and Desert land. Whereas the share of agricultural land is 50% only.

Followed by coastal land is 50.3%, and desert land is 15.7%. Our fourth indicator is 'housing and neighbourhood'; this will give us a broader sense of their living, and the basic and essential need of any household is a safe and better house.
The following table – 6

Table 6: Nature of houses

Types of houses	Frequency	Percentage
Cottage	182	81.6
kachcha	5	2.2
Semi Raw	18	8.1
Pakka	18	8.1
Total	223	100.0

Source: Field data Calculation

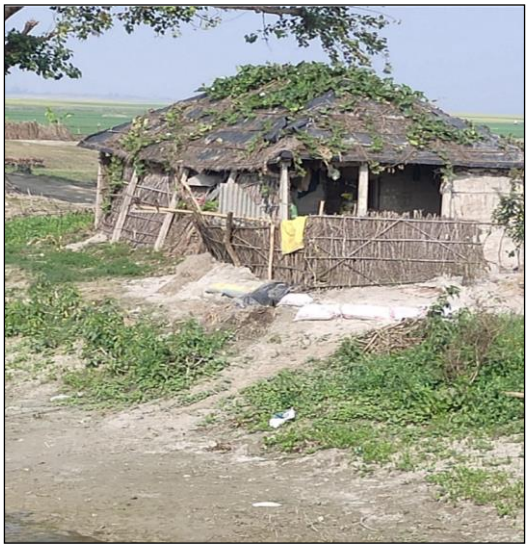


Source: Author's Calculation

Graph 3: Types of Houses (%)

We have depicted this pie chart from the above table-6, which also shows the percentage distribution of the type of houses in the study area.
Now, we will show some pictures of the house from the study area, which were collected during the field survey.

Picture 1: House where they live



Source: Field survey's collection

If we talk about the neighbourhood, they were also the same.

Picture 2
The picture shows their living standards. It blows our minds to think about the other basic amenities.

This is made of bamboo and straw; this house cannot withstand or defend against any kind of disaster. This cottage only has space to sleep overnight, and other work like cooking and cleaning has to be done in open spaces. These houses were situated below 50 to 150 meters from the Koshi basin.

Source: Author's collection

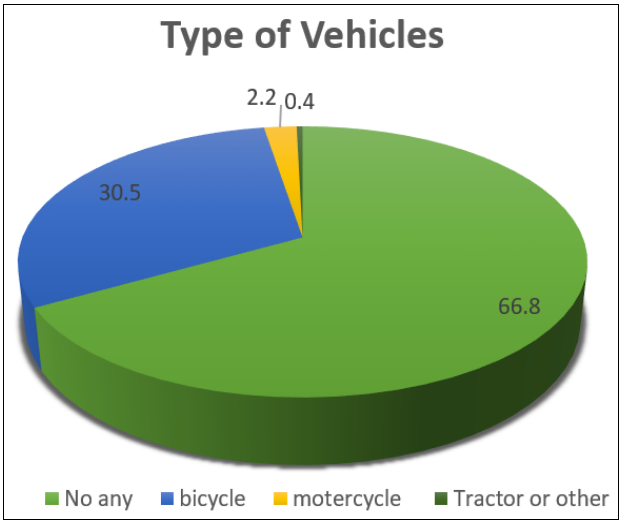
Our fifth indicator, the socio-economic indicator, is 'access to resources'; in which we have to take the different types of variables, like the type of vehicles, and some government social programs like the PDS system, MNREGA, SHGs, etc.

Table 7: Possession of a Vehicle

	Frequency	Valid Percent
No	148	66.4
Yes	75	33.6
Total	223	100.0

Source: Author's calculation

From the above table, we can see that out of the 223 households, only 75 have some kind of vehicle, and the remaining 148 don't. In terms of percentage, that is 66.4% have no access to any kind of vehicle, whereas; 33.6% have some kind of vehicle. More specifically, we can tabulate the types of vehicles they have in the following graph 4.



Source: Author's calculation

Graph 4: Types of Vehicles

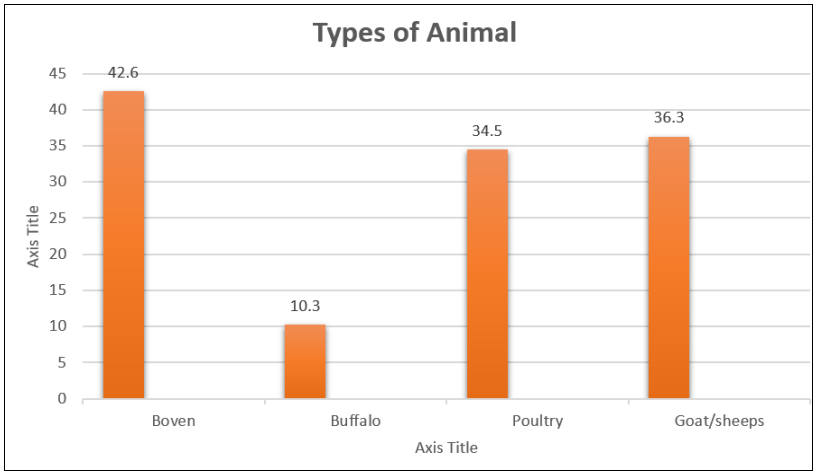
Graph 4 shows the distribution of the vehicles they have. This figure is quite striking because; 66.8% of people don't have any kind of vehicle. And; 30.5% of people have only a bicycle, whereas; 2.2% people possess a motorcycle, and the remaining 0.4% people have a tractor or other type of vehicle. This figure clearly shows the disparity among the people.

Table 8: Number of Animals by Type

	Cow	Buffalo	Poultry	Sheep
Numbers	95	23	77	81
Percent	42.6	10.3	34.5	36.3

Source: Author's Calculation

Table 8 shows the types of animal husbandry they are doing in the study areas. This is also shown in graph-4, which is Cow 42.6%, Buffalo 10.3%, poultry or some kind of birds 34.5%, and goat or seeps 36.3% in total.



Source: Author's calculation

Graph 5: Holdings of Livestock

Note-in the above graph, boven is used for the cow.

Discussion

We are using the chi-square test to test the hypothesis. Moreover, our data set fulfils the assumptions for the chi-square test. That is, "the chi-squared test assumes that the data is drawn from a random sample", and "the expected frequency count in each cell is greater than 5 for the test to be valid".

According to the definition, the chi-squared test (χ^2 test) is a statistical test used to determine whether there is a significant association or independence between two categorical variables. It is a non-parametric test. This means it doesn't make any assumptions about the distribution of the data or the nature of the relationship between the variables being studied. Instead, it assesses whether there is a statistically significant difference between the observed and expected frequencies of the categories within the variables.

There are two Types of Chi-squared Tests:

1. **Chi-Squared Test for Independence (or Chi-Squared Test of Association):** This test is used when we want to determine if there is a significant association between two categorical variables. It helps answer questions like, "Is there a relationship between gender and smoking habits?"
2. **Chi-Squared Goodness-of-Fit Test:** This test is used when we want to assess whether observed data fit a theoretical or expected distribution. It answers questions like, "Do observed election results match the expected distribution of votes according to a particular demographic?"

Here's a Brief Overview of Each Type:

1. **Chi-Squared Test for Independence**
   - **Null Hypothesis (H_0):** There is no significant association between the two categorical variables; they are independent.
   - **Alternative Hypothesis (H_1):** There is a significant association between the two categorical variables; they are not independent.

To do this test, we have to create a contingency table (also known as a cross-tabulation or a two-way table) that summarises the relationship between the two categorical variables. Then compare the observed frequencies in this table to the expected frequencies if the two variables were independent.

The Formula for the Chi-squared test Statistic in This Case is:

$$\chi^2 = \sum \frac{\left(O_{ij} - E_{ij}\right)^2}{E_{ij}}$$

Where:

- χ^2 =the chi-squared test statistic.
- O_{ij}=the observed frequency in the i-th row and j-th column of the contingency table.
- E_{ij}=the expected frequency in the i-th row and j-th column of the contingency table.

2. **Chi-Squared Goodness-of-Fit Test:**
   - **Null Hypothesis (H_0):** The observed data fit the expected (theoretical) distribution.
   - **Alternative Hypothesis (H_1):** The observed data do not fit the expected distribution.

In this test, we can compare the observed frequencies of categories to the expected frequencies we could anticipate based on a specific theoretical distribution or model.

The Formula for the Chi-squared test Statistic in This Case is:

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Where:
- χ^2 = the chi-squared test statistic.
- O_i = the observed frequency in the i-th category.
- E_i = the expected frequency in the i-th category based on the theoretical distribution.

The chi-squared test calculates a chi-squared statistic; which quantifies the difference between the observed and expected frequencies. Depending on the type of test and the specific research question, we can either use critical values from a chi-squared distribution table or calculate a p-value to determine the statistical significance of the results.
If the chi-squared statistic is greater than the critical value (or the p-value is less than the chosen significance level, often 0.05). We can reject the null hypothesis, indicating a significant association or a lack of fit to the expected distribution.
Chi-squared tests are widely used in various fields, including biology, social sciences, epidemiology, and market research, to analyse categorical data and explore relationships between variables. They provide valuable insights into whether observed differences are statistically significant or simply due to chance.

Hypothesis Testing
Our hypothesis is "Does disaster affect different population groups differently?"
In search of testing the hypothesis we have taken:–
H_0: Disaster does not affect different population groups differently.
H_1: Disasters affect different population groups differently.
To test the hypothesis, we have taken more than two variables across the table for the chi-square statistical test.

Chi-Square test for Independence of Attributes
The first one is the effect of disaster within a religion with respect to the amount of losses. In other words, we can say that we want to know whether disaster affects different religious groups differently or effect is the same for all households. That's why we have taken both households (Hindu and Muslim). In the loss section, we have taken the loss of home, loss of animals, and loss of crops in terms of amount. We can see the result of the chi-square test in Table-9. In this table, we have taken the amount of loss across the religions (Hindu & Muslim). And the range of amounts is 0 to 150000.

Table 9: Within religion (amount of losses %)

		0-15000	16000-24000	25000-45000	46000-90000	91000-149000	more than 150000	Total
Hindu	Count	52	20	35	40	14	34	195
	Percent	26.7%	10.3%	17.9%	20.5%	7.2%	17.4%	100.0%
Muslim	Count	14	2	1	1	4	6	28
	Percent	50.0%	7.1%	3.6%	3.6%	14.3%	21.4%	100.0%
Total	Count	66	22	36	41	18	40	223
	Percent	29.6%	9.9%	16.1%	18.4%	8.1%	17.9%	100.0%

Source: Field data analysis

Chi square statistic = 13.451* (p = 0.019)

We have chosen a significance level of 0.05. As we know, if the chi-squared statistic is greater than the critical value (or the p-value is less than the chosen significance level, often 0.05). We can reject the null hypothesis.

So, we have to calculate the degree of freedom
df =(c-1) (r-1)
Where;
c = column, and r = row
df = (2-1) (6-1)
df = 5

We have chosen the level of significance as 0.05
Hence, χ^2_{α} = 11.070 (which is less than the calculated one)
⇨ $|\chi^2| > \chi^2_{\alpha}$
⇨ 13.451* > 11.070
⇨ And the p-value is 0.019, which is also less than 0.05.

In the concluding remark, we shall reject the null hypothesis and accept the alternative hypothesis, which is that "disasters affect different population groups differently". Then, the result would state that disasters affect different population groups differently. In terms of the loss of the amount, our results state that the households of Muslims and Hindus had different impacts in terms of disaster. This means some households had more losses than others.
Moreover, our second test makes it more specific because our second test of chi-square on the amount of loss at the caste within the religion; we have categorised the caste into four categories that are (i) General, (ii) OBC, (iii) SC, (iv) ST. The caste we have categorised as per the government document record, like the Department of Social Justice, Government of India. The Bihar government social welfare department sites help us to determine the caste in categories. However, our calculation result follows in Table-9. We have taken the amount of loss into percentage form, and the range of amounts is 0 to 150000.

We have got the calculated result

Chi-square statistic = 41.099* (p = 0.004).

Now, we have to calculate the "χ^2_α" value from the chi–square table. We have taken the level of significance as 0.05%, and for the degrees of freedom, we have to calculate.
As we know degree of freedom = (c-1) (r-1)

Table 10: Amount of losses within caste

Within caste (Amount of losses)								
		0-15000	**16000-24000**	**25000-45000**	**46000-90000**	**91000-149000**	**more than 150000**	**Total**
Gen	Count	10	1	0	0	3	1	15
	Percent	66.7%	6.7%	0.0%	0.0%	20.0%	6.7%	100.0%
OBC	Count	14	6	7	18	5	13	63
	Percent	22.2%	9.5%	11.1%	28.6%	7.9%	20.6%	100.0%
SC	Count	18	6	5	8	4	10	51
	Percent	35.3%	11.8%	9.8%	15.7%	7.8%	19.6%	100.0%
ST	Count	0	0	0	1	1	3	5
	Percent	0.0%	0.0%	0.0%	20.0%	20.0%	60.0%	100.0%
BC1	Count	24	9	24	14	5	13	89
	Percent	27.0%	10.1%	27.0%	15.7%	5.6%	14.6%	100.0%
Total	Count	66	22	36	41	18	40	223
	Percent	29.6%	9.9%	16.1%	18.4%	8.1%	17.9%	100.0%

Source: Author's calculation.

So,
c = 4, r = 6
Then;
df = (4-1) (6-1)
df = 15
Hence the $\chi^2_\alpha = 24.996$
This is less than the calculated value,

- ⇨ $|\chi^2| > \chi^2_\alpha$
- ⇨ 41.099 > 24.996
- ⇨ The calculated p-value is 0.04, which is also less than 0.05.
- ⇨ Again, we have to reject the null hypothesis and accept the alternative one.
- ⇨ This is also proven by the second data set that disasters affect different population groups differently.

Conclusion

In the concluding remark, we can say that within religion, disaster impacts are different for the different castes of society. Some people possess large assets and wealth in terms of crops or animal husbandry. So, when floods come they wash off their wealth and assets with a large impact. And, some weaker sections of people might be vulnerable to disasters like floods, to cope with them. Moreover, they are facing great impact due to floods, yet they have only a hut to live in. Floods flow away all the utensils, food grain, clothes, etc., along with the huts. Hence, their impact could be greater than that of those who can cope with it.

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