RECURRING ANNUAL FLOOD IN BHAGALPUR DISTRICT OF BIHAR: A CASE STUDY OF AGRICULTURAL, LIVESTOCK, SOCIO-ECONOMIC AND PUBLIC HEALTH IMPACT

Bihar is one of the worst-affected flood-prone states of India due to recurring floods along the Ganga River during the monsoon season. Impacts of flood depend on maximum depth and duration of flooding, the extent of inundation in the floodplains, velocity of flow and rate of rise of flood levels. As per one estimate, in the Bhagalpur region flood affects about 85.86% of agricultural land as well as the large scale of livestock and livelihood. It not only affects the infrastructure but also the socio-economic life in the state. Frequent riverine floods caused 60% of economic loss; 84% of people suffered from health issues, and damage to 80% of agriculture and 40% of infrastructure. A detailed study is presented on the issue of a lack of clean drinking water during disasters, evacuation of people, loss of livestock and crops, and research being done to provide medicines, food materials, clean water, toilets, and relief camps. The purpose of this research paper is to present a comprehensive analysis of the situation of frequent and rising flood levels in the Bhagalpur district of Bihar.

Key words:-
Floodwater in Bhagalpur, Inundated Area,Impacts on Livestock and Livelihood, Sanitation, Human health, Sources of drinking water, Agricultural loss.

Introduction:-

Bihar is a pre dominantly agrarian state of India, where a large population depends directly or indirectly on Agriculture and livestock for their livelihood. The area of Bihar spread in 1.01x1012 sq ft with 140 million of population. There is total twelve District in Bihar through Which the river Ganga passes which are Buxar (Entry point), Bhojpur, Saran, Patna (Longest stretch), Vaishali, Samastipur, Begusarai, Lakhisarai, Khagariya, Munger, Bhagalpur, Katihar (Exit point) due to which a large population located near this River. Bhagalpur ranks as the third largest city in state in Bihar by population which is located on the southern alluvial plains of the River Ganga. Bhagalpur city is divided into 16 Blocks. Most parts of the Bhagalpur area, like Nathnagar, Sultangang, Naugachia, Sabour etc are flat, with slopes near the banks of the River Ganga. Every year, these regions of Bhagalpur are heavily affected by floods because of their geographical structure which is located nearby both River Ganga and River Koshi.“Kosi River is also known as sorrow of Bihar due to their shifting course. The overflow and shifting course of River Ganga and Kosi play major role in causing flood in Bhagalpur district. Other reasons of causing heavy flood in these areas are - Rivers carry large quantities of sediment from the Himalayas, when this sediment settles in the plains, the riverbed can become shallower, reducing its water-carrying capacity.

Strong River currents can erode riverbanks and contribute to changes in river channels and result into flooding. Some low-lying areas of Bihar like Bhagalpur have difficulty draining excess water, resulting in prolonged waterlogging and flooding.

Due to the annual flood problems many families are force to live their villages and towards the safer areas like relief camp, high altitude roads etc. The population who faces the flood, they even do not know how many days, weeks, Months they have to live with disturb situation. With the people, a large population of domestic cattle faces different kinds of issues like field scurrying, loss of habitat, fighting with multiple viruses and bacteria etc. Flood disturbs the people, by emotionally, socially, economically etc. The damages occur during the flood like, damages of road, building, bridges, houses, or any other infrastructure etc. It weakens the economic status of the people by restoring

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farmland, rebuilding their livelihoods, repairing houses etc. Flood brings contaminated water with dead animals, plants, and other decomposed materials, which generate a bad smell from the floodwater. This bad smell can result in respiratory problems in humans as well as in domestic animals. Floodwaters generally submerge agricultural fields during the peak monsoon window (July to October), lingering for 6–15 days and sometimes for up to 50–65 days in perennially waterlogged basins. This prolonged stagnation suffocates and completely ruins major food-security crops such as paddy (rice), maize, sugarcane, and seasonal vegetables. When early- or late-season flash floods destroy early Kharif saplings, farmers are forced to absorb heavy financial losses on seeds and fertilizers. This delays the sowing timelines for subsequent Rabi (winter wheat and lentils) cycles, trapping marginal communities in cycles of debt and seasonal migration. Children face problems while travelling to and from school and returning home. The schools, colleges, and administrative offices located in low-lying areas or near rivers are often filled with floodwater.

We visited 12 villages which are Mathrapur, Haridaspur, Choti Haridaspur, Rasadpur Diyara, Rasalour, RattipurBariya, Gosaidaspur, Serampur, Raghopur, Sahpur, Madhopur, Chandani Chock. All these villages come under Nathnagar Block of Bhagalpur. The main reason to visit these areas to know about the problems faced by the people, how they survive without basic need like clean water, toilet, proper food, medicine etc. during the flood time.

So, we did survey in these villages to know their problems which affect their lifestyle and health for long time of period.













Objective

The primary goal of this study is to conduct a comprehensive analysis of the situation of frequent and rising flood levels in the plains of Northern Bihar, as well as to address a few key issues and seek long-term solutions. It also investigates the underlying causes and the subsequent search for amicable solutions to mitigate and lessen the disaster's impact. A thorough investigation of the issue of drinking water scarcity in such flood-affected areas, current available measures, and research being conducted to develop sustainable water filtration methods is required. Two critical issues are the importance of wetlands in flood mitigation and the medical issues caused by disasters such as water born disease, mosquito infections, respiratory and skin infections in survivors. The visit also aims to

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assess their damage caused by flooding, identify the challenges faced by affected families, and understand their needs for relief, recovery, and rehabilitation.

Materials and Method

The entire study focuses on Bhagalpur region of Bihar, allowing for a thorough examination of a few key issues and the pursuit of amicable solutions. The study begins with a detailed analysis of the underlying causes of such devastating flooding in Bhagalpur.By observing inundated communities, multiple questionnaires were asked by the flood survivor according to their current situation and problem facing by them.



Fig – Survey report of flood questionnaire

The highlights of the questionnaire were about how the flood effects their daily life such as impact of floodwater on their house, where did they stay, what was the biggest challenge during evacuation, what are the main source of drinking water, what type of toilets they have been using, what is the biggest sanitation problem, hygiene problems, did any one seek medical treatment, what has been your family's biggest concern since the flood, how they manage daily food materials, has anyone in your household developed any illness since the flood began, what symptoms have occurred, where was treatment obtained, is stagnant water present near your house, do you own livestock, did you lose any animals because of the flood, have your animals developed illness after the flood, what is the main occupation of the household, what was damaged, approximate economic loss, has access to menstrual-hygiene products been affected, are adequate toilets/privacy available for women, what has been your family's biggest concern since the flood, do you feel that the flood has caused significant stress or anxiety in your family, have you received any relief, what assistance did you receive, what is still urgently needed etc.



Fig 1: Children face difficulties in attending school due to rising flood water.



Fig 2: People face scarcity of clean water due to flooding.



Fig 3: Hygiene and health challenges faced by new born Babies and lactating Mothers during flood.



Fig 4: Pregnant women and their child facesunavailability of food and medicines in relief camp.

We observed that about every family around 90% of the people facing multiple difficulties with their daily chores as well as they were facing difficulties in maintaining their health and hygiene. Houses were completely trapped in flood. The family members had to displace to the relief camp from their original houses. The domestic animals/cattle were also shifted to the relief camp. Children were facing problems while going to school and returning home.After doing field work, we collect numerical data on the basis of different type of questionnaire, which was asked from the flood survivors. First of all, we converted the data into percentage form by using mathematical calculation.

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I) Percentage of people affected by flood = $\frac{\text{Number of people suffered}}{\text{Total number of peopl}}$ X 100

II) Percentage of houses trapped in flood = $\frac{\text{Number of houses trapped in flood}}{\text{Number of total houses in villages}}$ X100

III) Percentage of drinking water affected = $\frac{\text{number of affected source of drinking water}}{\text{Total number of source of drinking water}}$ X100

IV) Percentage of people suffering from illness = $\frac{\text{Number of people suffering from illness}}{\text{Total number of people}}$ X 100

V) Percentage of affected pregnant women = $\frac{\text{Number of affected pregnant women}}{\text{Total number of people}}$ X 100

VI) Percentage of loss of domestic animal = $\frac{\text{Number of death animal}}{\text{Number of total animal}}$ X 100

The study begins with a detailed analysis of the underlying causes of such devastating flooding, then moved on to statistical reports on the loss of lives and property. Statistical analysis was done by using mean/ average method of the collected data.

*Average of affected people in flood = $\frac{\text{Sum of all Age group people}}{\text{Number of Age group people}}$

Discussion

The study looked at 225 people of various ages, 56 of whom were adult and the rest were children and old age people, who were directly affected by the 2026 annual floods in Nathnagar block, which caused widespread devastation in Bhagalpur district. The findings show that people over the age of 60 have significantly higher rates of depression than people of other ages.

The study case shows 99% houses trapped by floodwater in almost every village. 60% of houses were filled with floodwater up to 1-2meter and 4% of houses had 0-5-meter-deep floodwater inside their houses. It has been observed that 52% (max) of the people face difficulties in transportation while 12% (minimum) of people face difficulties in shifting the livestock during evacuation. Considering the granularities of life and property loss during the occurrence of floods in the prevalence of extremely poor sanitary conditions, poor health, child mortality, poor maternal health, impoverished conditions in people, rampant food insecurity, social divide, and other factors. There was also a severe shortage of drinking water, about 84% of people use the untreated water for drinking, only 04% of people boil the water for drinking.

Most of the toilets damaged because of the flood which results into 56% of open defecation and 04% of community toilet used by the flood survivor. Next was examined that almost 100% of the people faces difficulties due to bad/poor sanitation. We observed that 76% (max) houses get affected by illness in which 60% of household suffer by fever and 04% of household suffer by diarrhoea. Over all 16.88% of people suffers through different medicinal issues. 60% of households preferred their treatment by private clinic while 04% of households were adapted the traditional treatment method at home. The unavailability of safe and clean drinking or potable water is the main reason for human mortality, malnutrition, stunted growth, and epidemics amongst other major concerns. Almost every year floods severely damages property, both movable and immovable, destroys standing crops andfood grains and badly cripples the infrastructure in Bihar. About 80% of population are involved in agriculture and its allied activities either as cultivator or agricultural labor. 40% of their livestock were died during the flood while remaining 32% became ill.

Generally, the small cultivators as being on marginal level, takes agriculture inputs on credits from the local input dealers but due crop failure they are not in a position to re-pay these amounts. Further they do not remain in the position to manage for the next year and migrates in search of livelihood. This ultimately affects the agricultural production in consequents years also. The availability of flood was also changed, 84% of flood severely reduced and 16% of food moderately reduced. Lack of balance diet or food were also observed, 24% of household depends on milk which is maximum and 04% of household depends on vegetation because most of the vegetative

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ground get inundated by flood. The flood brings untold miseries to the people as they have to leave their damaged houses and spend a long time in relief camps, raised platforms or in temporary shelters. The loss of life and limb caused due to flood events cannot be compensated.

During visiting their houses, shelter, banquets, etc., we observed that 37% of people demand plastic bags to cover their houses, 8% of people demand education for their children, and 40% of people still urgently need work for money because of their daily food provider, while 15% of people want to build their house, toilets, etc.

By observing overall current situation of flood affected area, we analysis that maximum percentage of people face difficulties in different ways to do their daily life activities. Flood impacted broadly divided into primary impact that occur due to contact with water like loss of life, livestock and property, damage caused to infrastructures like road, bridges, railways, disruption in services like electricity, availability of drinking water etc. and secondary impact that occur because of the flooding, such as disruption of services, prolonged health and malnutrition impacts. Secondary impacts cause indirect losses and its ill effect continues on long-time scales and sometimes may be more important. These include prolonged health impacts due to failure of water supply and sewage disposal system, shortage of food and other essentials due to failure in transportation network.













Conclusion

Flooding is a perennial problem in the state of Bihar with devastating impact on the livelihood of people. The effects of damages to life and property caused by flooding were severe for several years. Areas like Bhagalpur which lies on flat slop near the bank of river Ganga face every year flood issues. Flood water destroys the agriculture crops and delayed the regular vegetation which result into economic loses for farmer. Flood water and spread diseases, such as

diarrhoea, fever, infections, etc. people force to displace from home to the relief camp to proper food and medicine. The scarcity of potable water is a leading cause of human mortality, malnutrition, stunted growth, and epidemics, and is a major concern in flood-affected regions and relief camp. Furthermore, inadequate sanitation facilities, contamination of drinking water sources, and disruptions in healthcare services intensify the vulnerability of flood-affected populations. Floods also influence vegetation by damaging standing crops, submerging grasslands, disrupting plant growth, and altering the ecological composition of affected areas. Excessive inundation, soil erosion, prolonged waterlogging, and sediment deposition can alter soil structure, reduce agricultural productivity, and disrupt subsequent cropping cycles. Livestock production is similarly threatened by animal mortality, fodder shortages, contaminated drinking water, disease outbreaks, and reduced productivity, thereby undermining rural livelihoods and economic stability. “Impacts of flood depend on maximum depth and duration of flooding, the extent of inundation in the floodplains, velocity of flow and rate of rise of flood levels” Flash flood causes immediate and huge impacts, whereas gradually occurring floods allows much time for evacuation and protection of properties. The awareness of the community at risk of flooding should be raised and maintained with a clear understanding of their role in responding to emergency situations appropriately. They need to be developed so as to adaptation to the flood risk and living with them in flood plains and simultaneously permitting vacating the same for use by the river whenever the situation demands.

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