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Climate Change and Male Migration in Ganges River Basin of Bhojpur District of Bihar: Climate Adoption and Feminization of Agriculture

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Abstract— *This paper discusses the effect of extreme weather especially rains resulting to floods on male migration. Directly and indirectly many socio-economic situations emerge in areas of Ganga basin due to this extremity of weather. People in this region face floods in monsoons and respectively droughts in the next summer which affect their livelihood and well being. Due to continuous recurrence of this situation agriculture is no more beneficial for them, not even for survival. So men are migrating towards cities for better job and livelihood. But this extreme weather situation, a by-product of climate change affects the men and women in different ways. Men migrate from villages and women remain at home. Absences of male countrrparts push women to take part in agriculture activities as cultivators or agriculture labours. In other words climate change affects the women adversely because now women work in agriculture with household activities. Due to this change women are participating more compare to male and this situation is known feminization of agriculture which is happening in Ganga basin region of Bhojpur district of Bihar. Various other socio economic changes are happening due to this climate change like changing form of agriculture land, crop pattern, and changing farmers' role. Finally this paper concludes different potential policies to minimise the affect of climate change and tackle with emerging situations.*

Keywords— ***Climate change, Floods, Migration, Feminization of agriculture, Ganga Basin***

I. INTRODUCTION

Climate change affects the whole world, and India is feeling it too. India's location and its economy, which depends a lot on farming, make it very vulnerable to climate change. This leads to more severe and unpredictable problems for its people. India faces floods, heatwaves, weak monsoons, and unexpected rain. These extreme weather events make India the fourth most affected country in the Global Climate Risk Index (Sönke et al, 2016: 7). The National Action Plan on Climate Change (NAPCC) says that women might suffer more from climate change (Ministry of Environment and Forests, 2008). This edition of the Review of Women's Studies looks at why this policy is important by studying how women deal with the challenges of climate change.

The Ganga River is very important for Bihar. It flows for approximately 445 km through the north-central part of the state. The river affects most of the area with its water supply. The Ganga enters Bihar from the west in the Buxar district. It then flows through Bhojpur, Patna, Saran, Vaishali, Munger, Bhagalpur, Katihar, and other districts of Bihar. After moving through eastern Bihar, the Ganga moves towards West Bengal.

People in Bhojpur face problems with too much or too little water because of climate change. It is important to understand these problems. They mainly deal with two weather issues: floods during the rainy season and droughts in summer. These problems affect people differently based on gender, caste, and class. The difference in access to resources between men and women affects how they handle these problems.

This study, based on comprehensive fieldwork conducted in Bhojpur, situated in north Bihar, investigates several critical issues. A notable deficiency in the current body of research is the limited examination of the micro-level effects of adaptation strategies. Typically, non-farming rural households are often neglected in broad analyses of climate change impacts. One prevalent adaptation strategy is male migration; however, it is crucial to acknowledge that not all such migration can be directly attributed to climate change.

Objective of the study

- Analyzing the impact of climate change on agriculture.
- Analyzing the impact of climate change on migration.
- Explain the changing role of female in agriculture due to climate change

II. METHODOLOGY

Methods like group talks, interviews, watching participants, and walking through areas were used to collect main data. Looking at both physical and social factors made the analysis better. The research was done in Bihar's Bhojpur district from February to July 2025 in four villages. Each village had a different situation: frequent floods, a new flood area, floods from building projects, and being far from government help. All these villages are inside the Ganga embankments. These villages, located up to 1.5 km from the left bank of the Ganga River, are low-lying and experience frequent flooding and water logging for two to three months annually.

Climate Change in Bhojpur

Bhojpur district, situated in the western region of Bihar, has Arrah as its administrative centre. Geographically, it is positioned between the Ganga River to the north and the Son River to the east, which contributes to its fertile land, ideal for farming. Spanning approximately 2,400 square kilometres, the district is part of the Gangetic plain. The climate is tropical, characterized by hot summers, moderate monsoon rains, and cool winters. The alluvial soil deposited by the rivers makes the area highly productive for crops such as paddy, wheat, pulses, maize, and sugarcane. Economically, Bhojpur is largely agricultural, with the majority of its population involved in farming and related activities. Agriculture forms the backbone of the district's economy, and irrigation from canals and rivers boosts productivity. In addition to agriculture, the district hosts small-scale industries like rice mills, oil mills, handloom weaving, and brick kilns. Bhojpur is recognized for its vegetable production and floriculture, which are gradually expanding. Although industrial growth is limited, the district holds potential due to its fertile land and proximity to key markets like Patna and Varanasi. Migration to other states for employment is also common, highlighting the need for more local industrial development.

Climate change has become a significant concern in Bhojpur. Historically, the district experienced minimal annual flooding during the summer monsoon season, which was beneficial for enhancing soil fertility. However, with the expansion of the city to encompass parts of the Ganga and Sone rivers, the depth and duration of flooding in certain areas have increased. Previously, the region was characterized by consistent, low-intensity rainfall, with the Ganga swelling to double or triple its size due to heavy rains in Nepal. This pattern has shifted to persistent rains during the monsoons, resulting in sudden floods followed by prolonged dry periods. The monsoon season, which traditionally commenced in June and concluded in September, now often begins in the last week of May, with floods occurring as early as June. In rural areas, floodwaters previously receded within a week, but now the land remains waterlogged for a month, adversely affecting the kharif (monsoon) crops. In some parts of Bhojpur, waterlogging persists for three months or more

Agriculture and climate change

Historically, annual flooding was an important feature of the region. Farmers waited for it and used the fertile silt to cultivate crops. Water logging was not a part of this process. In the late 19th and early 20th centuries, the colonial administration built numerous embankments in the area ostensibly to protect the city and its surrounding areas from floods, but, in the process, destroyed the natural drainage (Nevill 1909; Gupta et al 2013). Such measures coupled with the usurpation of numerous water bodies in the region led to perpetual water logging, destruction of livelihoods, and uprooting of households. A typical example is the displacement of fishers (Nishads and Kewats), especially of Ramgarh Tal in the city, whose livelihoods were destroyed due to rampant encroachment of lakes in the city, including by the state. In 2010, only 40% of the fishers depended on the lakes for a livelihood. The rest had been forced to leave their traditional occupation and work as casual wage labour (Mitra 2010).

These communities seek to diversify their livelihoods as casual daily wage labour, painters, and carpenters in urban areas.

Those that stay back need cash for food security. The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and distribution of food through the public distribution system helps those who cannot migrate,

such as women, the elderly and children who cannot work. For many of the small and marginal farmers, one option in the face of failing crops and lack of remunerative prices is to sell their land and migrate to the city. Such land transfers are boosted by the in-creased demand for land for housing societies in peri-urban are-as. Sometimes, especially in the short run, the women and those who cannot work stay behind in the homestead. The scenario is rather complex and needs to be analyzed in its nuances. In the next section, the phenomenon of migration spurred by climate change, especially of the men, is discussed.

Most literature on the impacts of climate change fails to make the fundamental distinction between the landed and the landless. In this region, there is tremendous heterogeneity in the social and occupational structures. The artisanal class (potters, ironsmiths, washers, fishers, and boatmen) has almost disappeared, having migrated to towns, sometimes leaving behind their family in the short run. However, while not all of the migration of the artisanal class is because of climate change, it has to be noted that a general agricultural crisis has an impact on the agrarian economy as a whole, lowering the wages and demand for casual labour (Himanshu 2006). Indeed, Indian agriculture has seen a general decline in agriculture and a gradual withdrawal of the state from the sector, especially since 1990. In "economically backward districts, agricultural policy supports from the state are defined more by their absence than presence" (Mitra 2015: 288).3 In real terms, this has meant massive shifts in the structure of the agricultural workforce.

Thus, between the 2001 and 2011 Census, rural cultivators in Bhojpur declined by 35.96% and rural agriculture labourers increased by 55.95%. This in itself is an indicator of the decline of agriculture due to state policies and subsequent pauperization accentuated by climate change.

The overall decline of agriculture affects the non-landed classes who survived by servicing agriculture and agriculturists, like potters, ironsmiths and flayers. Many of them have joined a the agricultural labour force while others have migrated to cities and towns.

Migration and Climate Adaptation

Migration, particularly among men, as a response to adverse local conditions, is a prevalent characteristic of small peasant economies. During the colonial period, Bhojpur and the broader region of southern Bihar served as significant sources of indentured labor for British colonies in Southeast Asia, Africa, and the West Indies, recruited by agents known as arkatis (Mitra and Singh 2011: 2). These laborers were enlisted through the infamous indenture system initiated by colonial authorities in 1834 and were referred to as girmityas due to the agreements they signed for an initial five-year term. This system was abolished in 1920 (Mitra and Singh 2011: 1). It is noteworthy that while some individuals from upper castes became girmityas due to unforeseen circumstances, the majority were from lower castes, compelled to migrate to escape "the clutches

Essential municipal services critical to the city's functioning, such as sewer maintenance, are predominantly performed by individuals from lower caste groups, including primarily marginal farmers and landless laborers. A significant number of these individuals do not possess adequate housing in their rural communities (Mitra and Singh 2011: 12-20).

At the local level, the concept of climate change is not widely recognized. Consequently, when discussing the reasons for migration, no one attributed it to climate change. Instead, a significant majority (81.3%) pointed to garibi (poverty) as the primary cause. The respondents linked poverty with food insecurity, which they believed stemmed from a lack of job opportunities. Notably, food insecurity and unemployment were identified as the second and third most significant factors driving migration (Mitra and Singh 2011: 24).

Migration is driven by multiple factors, with climate change intensifying the phenomenon. The geographical features of eastern UP render it particularly vulnerable to flooding. Over recent decades, both the frequency and intensity of floods have markedly increased, now occurring every three to four years. In certain regions, flooding has become an annual event, adversely affecting livelihoods. To evaluate the influence of climate change on migration, respondents were queried about flooding, riverbank erosion, land infertility, and the region's susceptibility to drought (Mitra and Singh 2011).

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Climate change and changing role of women in agriculture

Gender affects how people adapt to changes. Men and women deal with changes in their lives, and these are shaped by gender roles, class, caste, age, education, job, and where they live. Studies show that poor people face many daily risks and stresses (Rao et al., 2017). The Intergovernmental Panel on Climate Change's fifth report noted that risks from climate change are linked to other factors like geography, farming, and economy. These factors make some people more vulnerable to climate change (Field et al., 2014).

People often confuse climate variability with climate change. Climate change means more extreme weather over a long time. Climate variability happens in the short term. Adaptation is how people and systems adjust to climate change. In nature, adaptation happens after changes occur. In human systems, it can happen before or after changes, and both private and public groups can do it (Mitra 2008a: 2). In India, adapting to change involves individuals, society, and farming. It's important to look at gender roles and how climate change affects different farming systems, social groups, and relationships.

Many small farmers are leaving farming and selling their land because of climate change. This is happening because more people want land for houses as cities grow. Land prices near Bhojpur city have gone up a lot.. Even in areas that flood, the price is ₹50,000 to ₹60,000 per decimal. Farmers have sold some of their land because they can make money and farming is hard to continue. Some people have also been cheated in land deals in this area (Mitra et al. 2015: 21).

In these areas, women have changed farming a lot. Many women grow and sell vegetables because their husbands work in cities.Women in this area earning 15000 to 20000 from farming and dairy production. They bought electronics items and turned her mud hut into a two-story brick house with marble floors. They told their husband to collect milk from neighbors and sell it in the city, making a profit of 15 per liter.

Studies have shown that men and women see land use in peri-urban areas differently (Haller 2014; Rakodi 2014). In the outskirts of Bamako, Mali, men were unhappy about farmland being turned into housing because they did not benefit from it. On the other hand, women saw more chances for business. They have had trouble getting land but are good at small trade. The demand for garden products is growing, and women are in a good spot between rural growers and city buyers (Bah et al 2003).

Most of the women rented irrigated land to grow vegetables. These deals, called hunda, are made verbally for fixed cash rent. These women got the lease because they knew the landowner, who did not want to lease it to her husband. They also rented out their own non-irrigated land to someone else in the village. The money from her vegetable farming help them support their family, which includes their children and other members Even with their new role, traditional male-dominated values are still strong.

In the area, women often rent small pieces of irrigated land to grow vegetables and use machines while the men are away. Some old methods, like mixed cropping and three-tier farming are being used again. Vegetable farming is usually done along with dairy and poultry work. However, none of the women own land in their names. As a result, only 10% of Indian women have land registered in their names (Mitra 2008b; Brule 2012), and many of them do not know they own it.

Challenges and policy implication

Women's role in farming is affected by religion, caste, and class. Climate change affects everyone in an area, but how people deal with it depends on their social and economic status. In the villages near Bhojpur, many small Muslim

farming families face problems. Changing weather, flooded fields, and crop failures make farming hard.

In the Muslim community, women usually cannot work in public places. Some women tried to work as farm laborers in a nearby village, but the community leaders did not allow it. Farming is not allowed at all. The community believes that education is very important for children because it is seen as the only way to escape poverty. They survive on their earnings and by renting out land.

Many women have started growing vegetables to deal with climate change. However, the state does not see them as farmers because they do not own land and have informal, spoken agreements. This lack of recognition affects their access to support and loans. Current support services are not enough, do not cover vegetable farming, and often leave out women. Only 5% of small farmers in India get these services, which is about half of what bigger farmers get. About 40% of support jobs are unfilled, especially in poorer areas where small or tribal farmers live. People from seed, fertilizer, and pesticide companies often act as support workers, but they usually do not focus on vegetable farming.

Women who farm do not have access to loans from banks. Small farmers, whether alone or in groups, should be able to get cheap loans from public banks using Kisan Credit Cards (KCCs). However, in villages near cities, people mostly use informal loans. The days of big, unfair moneylenders are over, but farmers, both men and women, still borrow from family, friends, and sometimes local moneylenders. Some farmers get money in advance from traders. No one mentioned using KCCs.

There is a lot of talk about MGNREGA. Many women and men say they do not get benefits even though they have job cards.

III. CONCLUSION

Ahmed and Fajber (2009) contend that incorporating gender considerations into adaptation policies and programs goes beyond merely including women's issues. It necessitates a deep understanding of gender-specific vulnerabilities and a more robust allocation of resources—financial, technical, and human—to address particular gender-related priorities. In this regard, it can be asserted that SHGS in the IBD have adopted gender mainstreaming. They have facilitated the economic independence of rural women and significantly improved their socio-economic status, leading to poverty alleviation and aiding their adaptation to evolving conditions. The WSHGs examined in the study were managed by NGOs as an alternative to conventional financial institutions to serve the marginalized sections of society. These groups play a crucial role in helping the community adapt to climate change by providing additional income for families. Therefore, in the current climate change scenario, it is increasingly vital to bolster the WSHGS to significantly reduce women's vulnerability, especially in the context of widespread male migration.

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