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Climate Change and Tamang Livelihoods in Tarebhir Kathmandu Nepal

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Abstract

Background: Climate change impacts livelihoods worldwide, with agricultural communities being particularly vulnerable. The Tamang community in Tarebhir, Kathmandu Valley, provides a case study of how socio-economic and environmental factors interact with climate change to shape local livelihoods. **Objective:** This study investigates the perceptions of climate change and its effects on the livelihoods of the Tamang people. It explores how climatic and non-climatic factors influence agricultural practices, resource management, and socio-economic conditions. **Methods:** A mixed-methods approach is adopted by combining qualitative and quantitative data collection. In-depth interviews, focus groups, and field observations were conducted for 94 randomly selected household heads. The semi-structured questionnaire included both open and closed-ended questions. Primary data was supplemented with secondary data on the availability of rainfall and temperature records of the last 30 years drawn from the Department of Hydrology and Meteorology. Key themes were related to climate factors, cropping patterns, and socio-economic impacts. **Results:** The findings showed changes in sowing and harvesting dates, where the delay in maize and rice sowing was up to a month due to changed rainfall. A rise in temperature and deterioration in soil quality caused changes in crop maturation dates. The water resource at the local level had also deteriorated; the stream flow was reduced and the groundwater points had disappeared. The traditional resource use practices are supplemented by modern adaptations such as drought-resistant crops and the use of chemical pesticides, but with limited awareness of their implications on the environment. Modernization, population growth, and urbanization-which are socio-economic factors-cumulatively had a higher impact on livelihoods than climate change; however, this indirectly influenced economic activities through costlier agriculture, poor quality of

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agricultural produce, and health-related effects. **Conclusion:** Although relevantly indirect, the influence of climate change has been less imposing compared to socio-economic factors that have attacked the livelihood of the Tamang community. Some adaptations in agriculture, resource use, and economic strategies show resilience among the people. The findings bring forth the complex interrelationship of climate change with socio-economic dynamics in shaping rural livelihoods. **Novelty:** This study underlines the indirect influence of climate change on poor communities and integrates indigenous knowledge into current practices for sustainable adaptation. It also points out the compound effects of socio-economic changes, therefore providing insight into holistic challenges facing rural communities in rapidly urbanizing regions.

Keywords: Adaptive strategies, Climate Change, Livelihood, Perception, Tamang caste

Introduction

Livelihood encompasses the resources and activities individuals or communities utilize to satisfy their fundamental needs. It involves the skills, assets, and strategies required for a sustainable lifestyle capable of adapting to challenges and fostering future opportunities (Chambers & Conway, 1992). Various natural and anthropogenic factors, including cultural and environmental conditions, significantly influence livelihoods (Herbiniak & Joyce, 1985). While local economies and agricultural systems are sculpted by climatic variables, human-environment interactions are often of paramount interest in explaining settlement and subsistence strategies; Milton, 1997; Laland et al., 2010. Human life in its interaction with the natural environment is critically affected by the correlation that affects resilience to impacts. Climate change adversely affects livelihoods across the world.

Tamangs are one of the largest mountainous dwelling ecologically sensitive ethnic group whose culture and tradition are highly vulnerable due to several negative impacts of climate change (Macchi, 2010; Roncoli et al., 2009). Global climate change is identified as one of the major contemporary issues, which is caused by both natural and anthropogenic factors (Khatri, 2012; Ahmad, 2009). It enhances the vulnerability of diseases, malnutrition, and food insecurity, which always bears a higher burden on poor communities (Shrestha et al., 2012; Rai & Gurung, 2005). In regard to these, Nepal has been introducing a number of climate change adaptation policies, including the National Adaptation Programme of Actions and Local Adaptation Plans of Action, to respond to the needs of the most vulnerable communities (Government of Nepal, 2011).

Anthropological research has emphasized the significance of local perspectives and traditional knowledge in understanding community responses to climate change (Crate, 2011). This study seeks to document the perceptions of the indigenous Tamang people regarding the impacts of climate change on their livelihoods and way of life. Indigenous knowledge, rooted in a deep historical connection with the environment, plays a crucial role in formulating effective coping strategies (Crate, 2008; Poudel, 2011). Accurate documentation of this knowledge is essential

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for addressing future climate-related challenges and understanding their broader implications (Crate & Nuttall, 2009; Carey, 2010; Poudel, 2016).

One of the main environmental problems that affect people, animals, and plants in different ways is climate change. Early climate and culture studies were primarily based on environmental anthropology and archaeology, according to Crate (2011a), and anthropology's roles in climate change ethnography need to be expanded. Additionally, social scientists ought to use methodologies and theoretical frameworks to document how place-based communities view and react to the direct consequences of climate change (Crate, 2011b). The topic of climate change has been the subject of study, research, and debate because Nepal is a mountainous nation with diversity in geography, hydrology, plants, animals, and ethnic groups. Nepal's changing rainfall patterns, temperature, and other climatic conditions have a direct or indirect impact on people's livelihoods in addition to plants and animals. Social and cultural systems are not directly impacted by natural scientists. As a result, social scientists and the general public are finding the topic of climate change to be both fascinating and useful (Khatri, 2012). Since ancient times, indigenous people have had a close relationship with natural resources, which has led to the development of their own traditions, religions, and cultures. The indigenous Tamang people of Nepal, who have their own culture, customs, and way of life, are also dependent on and closely related to one another. Additionally, it is customary for Nepal's indigenous people, including the Tamang, to preserve their own forests, manage their own land, and provide equal access to the country's natural resources (Government of Nepal, 2002).

The Tarebhir Village is one example of how the Tamang people in the Kathmandu Valley still use these systems. Anthropological evaluations of how environmental changes affect the Tamang community's way of life, how cultures and traditions change over time, and how the Tamang people adapt to their changing environment are still lacking, with a particular focus on the Tamang community in Nepal. Therefore, the purpose of this study is to record the Tamang indigenous people who live close to urban areas' knowledge of climate change and how they have observed changes in their local environment over time. Furthermore, the study's key components include their cultural relationship, how climate change affects their means of subsistence, and coping mechanisms for unfavorable environmental conditions. According to this presumption, the Tamang people of Tarebhir village, which is close to the Kathmandu Valley, were regarded as a crucial source of information regarding climate change.

Literature Review

The pressing effects of climate change on many facets of Nepali life, especially in relation to the Himalayan glaciers, have been brought to light by recent studies. According to Rai and Gurung (2005), these glaciers are melting at startling rates, increasing the risk of glacial lake outburst floods, which can cause serious harm to people's lives, property, and ability to relocate their communities. They contend that one of the biggest obstacles to Nepal's sustainable development and efforts to reduce poverty is climate change. In their edited volume, "Climate Change and Water Resources in South Asia," Mirza and Ahmad (2005) stress how important

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it is to include adaptation plans in national development plans and encourage stakeholder involvement in order to successfully lessen the negative effects of climate change on Nepal's water resources. Further examining how climate variability affects livelihoods, Lohani (2007) points out that extreme weather events like floods, droughts, and glacier melt pose a serious threat to food security and agricultural productivity. Using interviews conducted in a variety of socio-ecological contexts throughout Nepal, Chapagain et al. (2009) delve into the attitudes and experiences of rural communities with regard to climate change.

According to Eriksson et al. (2009), there are important knowledge gaps regarding how climate change is affecting water resources and hazards in the Himalayan region. They recommend that monitoring systems be established that take socioeconomic development into account. In order to improve the resilience of food production, Aase et al. (2010) examine the effects of climate change in the Manang Valley and suggest four adaptation strategies: reclaiming abandoned land, replacing barley with wheat, cutting back on conspicuous consumption, and moving agricultural practices. Rai (2010) highlights the significance of acknowledging local knowledge as a crucial resource in comprehending climate change issues by examining the interaction between local socio-cultural narratives and global climate discourses. As an example of how environmental changes disproportionately impact different groups, Massey et al. (2010) point out that women have more difficulty gathering fodder while men have more difficulty gathering firewood. According to Onta and Resurreccion (2011), changes in snowfall and monsoon patterns have a negative impact on the Lama and Dalit communities' means of subsistence. According to research by Manandhar et al. (2011), a large number of Nepali farmers interpret climate change using traditional knowledge, indicating the need for more extensive support networks to enable productive coping mechanisms.

Maharjan et al. (2011) concentrate on neighborhood projects meant to reduce the effects of climate change in areas like infrastructure, forestry, and agriculture. In a similar vein, Poudel (2011) highlights the indigenous knowledge and adaptive techniques used by Kathmandu farmers, especially in reaction to the decrease in rainfall. The effects of climate change on millet production among the Magar community in Baglung district are examined culturally by Khatri (2012), who connects climatic changes to changes in ritual practices and livelihoods. Maraseni (2012) describes how changing weather patterns have made resource degradation and social inequality worse. Local people in the Annapurna Region have a sophisticated understanding of their environmental conditions, even if it isn't always scientifically accurate, according to a 2013 study by Becken et al. In the Khumbu region, McDowell et al. (2013) identify climate change vulnerabilities that impact crop yields, water access, and the production of hydroelectric power. According to Maharjan and Joshi (2013), who examine how climate factors affect Nepal's main food crops, temperatures rose by 0.7 degrees Celsius between 1978 and 2008, which had a negative effect on yields, especially of maize and millet.

Piya et al. (2013) discuss the few studies that link Nepal's indigenous populations to climate change, concentrating on how the Chepang community views these changes and their adaptation plans. The idea that local communities lack scientific knowledge is called into

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question by their findings, which indicate that Chepangs have a significant understanding of climate variability. Finally, Bhattarai et al. (2015) examine how gender relations and climate change responses are impacted by socioeconomic changes, pointing out that changing agricultural practices can exacerbate gender disparities already present in biodiversity management. Panthi et al. (2015) report notable shifts in Nepal's rainfall patterns, including patterns of declining pre- and post-monsoon rainfall, which have important ramifications for managing livestock and agriculture. Climate change and migration have also been studied in different ways where nations can focus on particular areas for future developments by properly researching and evaluating the push and pull factors that are significant (Pokharel et al., 2024).

Theoretical Perspective

The human-nature relationship is the subject of this study. Anthropology is the study of human beings in all their forms, from ancient societies to the present. Numerous disciplines, including biology, physics, archaeology, and linguistics, are related to anthropology. One of the main areas of anthropology that focuses on people and their surroundings is the study of bio-physical phenomena and historical and contemporary social events (Kottak, 2002). The relationship between the environment and people results in human culture, traditions, or general means of subsistence (Ingold, 2000; Leichenko & O'Brien, 2008).

Due to the fact that the global environment is changing quickly, climate change is one of the most important issues in the world and has been given priority in research, policy, and social and ecological resilience. In this study, the cultural ecology model is applied. Understanding the relationship between humans and the environment is made easier with the aid of the cultural ecology model. Ethnographic fieldwork is employed in this study to document the elusive realms of cultural practices and meanings. Anthropology places a strong emphasis on participant observation and fieldwork because it recognizes that social interactions and everyday life offer a contextual understanding of cultural realities that cannot be obtained solely through structured survey methods (De-walt & De-walt, 2002).

Methodology

A mixed-methods approach has been adopted for this research, integrating both quantitative and qualitative methods in order to comprehensively study the impacts of climate change on the livelihoods of the Tamang community in Tarebhir, Kathmandu Valley. Data collection involved in-depth interviews, focus group discussions, direct observations, and secondary data analysis.

Qualitative Methods: In-depth interviews were conducted with 94 household heads, selected randomly from a total of 161 households. The semi-structured approach included both open-ended and closed-ended questions that enabled respondents to elaborate on experiences and perceptions of climate change. Respondents contributed knowledge regarding past climate trends and how livelihoods in agriculture and resource management had been affected. These comprised of three focus group discussions with diverse demographics to gain an understanding regarding the community perception on climate change and implications on the type of agricultural practices. This was further accompanied by observations in the villages on

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the ground, agriculture actually practiced, resources available, amongst others, were all clearly recorded in the field journal that had supplement interview data.

Quantitative Methods: Quantitative data from the interviews could be extracted from the closed-ended questions, allowing statistical assessment of trends in climate perception and impacts. A structured checklist was filled out to systematically record participants' experiences on changing times of sowing and harvests, crop diseases, and water resources.

Secondary Data Collection: For the contextualization of the findings, 30 years of historical rainfall and temperature data (DHM, 2016), were collected from the Department of Hydrology and Meteorology (DHM), Kathmandu. Literature relevant to the subject of this research has also been reviewed from books and journal articles with a view to providing a theoretical framework to understand global and regional patterns in climate change.

Data Analysis: Qualitative data were thematically analyzed to identify patterns and relationships pertaining to climate change and livelihoods, while quantitative data were analyzed by using descriptive statistics to indicate key trends in the responses of participants. This multi-tiered methodology has ensured a robust and holistic examination of both direct and indirect impacts of climate change on the Tamang community and provides valuable insights into adaptive strategies and socioeconomic challenges.

Results

The majority of the informants listed below (58.52%) stated that the timing of crop sowing and harvesting has changed compared to previous years (Table No. 1). Most of the time, the sowing time is not set and is typically 15 days to 1 month later. Rainfall shifts have caused maize and rice to snow later in the past and present. These two crops were traditionally sown in *Baisakh or Jestha*, but now people must wait until *Asar*. The informants did not state whether the time for wheat sowing had changed from the past. *Kartik/Mangsir* is when wheat is sown. According to informants, there hasn't been much of a change in harvest time. According to the majority of them, crops that are sown earlier will be harvested sooner, and crops that are sown later will ripen later. However, some of the informants concurred that they have noticed a shift of roughly 15 days in the ripening time of all crops and fruits as a result of rising temperatures and shifting soil quality. Crop sowing and harvesting times are directly impacted by altered weather patterns, particularly those related to temperature and precipitation.

Table 1

People's perception on changing crop sowing and harvesting time

Change in Crop Sowing and Harvesting Time	No. of Respondents	Percent (%)
Yes	55	58.51
No	39	41.48
Total	94	100

Source: Field Survey

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Furthermore, the village was not close to any springs or other water sources. Naturally, they clarified, there was an adequate supply of water in the nearby well and stream during the rainy season. Due to the current lack of rain, the stream's water level has drastically decreased. The stream was severely flooded during the 7 and 11 days of rainfall, making it challenging to cross. Less rainfall has had a more significant impact on the stream. Furthermore, Mr. Ajay Tamang, 75, stated that during the rainy season, ground water used to sprout (*Mul Phutne*) everywhere in the village and occasionally inside homes. In the village, the situation no longer exists. According to the respondent, Saru Kumari Tamang is employing her indigenous knowledge of mixed farming as an adaptive strategy. Crop rotation is used to maintain irrigation and soil fertility. Her diverse approaches, which emphasize sustainable practices, have been handed down through the generations. However, Saru has since begun implementing new adaptive strategies, such as using drought-resistant crop varieties and joining local farmer groups to exchange resources and new knowledge. Saru is currently looking into excellent revenue streams, like selling organic produce at neighborhood markets.

Findings and Discussion

In this respect, the findings point out the fact that the contribution of climate change is very minor in relation to other socio-economic changes for the loss of livelihood of the Tamang community. It is on record that though observable adverse effects are visible on agricultural land, crops, and vegetables due to climate change, its impact on agriculture has remained relatively lower because the Tamang community now largely depends on purchased food. Elderly respondents also stressed that this decline is more due to modernization, change in livelihood strategy, or preferences of a changing society and is not entirely attributed to negative climate change impacts on forest resources and fodder. Meanwhile, the temperature-related changes reportedly by the respondent, such as dew, frost, snowfall, rainfall, and temperature themselves have caused diseases on crops to be more recurrent, reduced soil fertility and the frequency of droughts.

Thereby, the impacts are indirect, with the effect becoming visibly economic while locals face an extra burden for crop-disease management and food security because they need chemical fertilizers and pesticides to cope. All traditional ways of organic ways of pest management using cow urine, ash, and lime-treated water have widely been replaced by chemical pesticides which, though reachable, are at a cost that is less ecological. The adverse effects of these chemicals are not well recognized. Livestock farming has declined, which is good for forest conservation, but this decline has been blamed on urbanization, land fragmentation, and a shift to commercial agriculture.

The study also reported significant changes in climatic patterns: increased temperature and alteration of rainfall distribution, with a distinct decline in the frequency of snowfall, frost, dew, fog, and hail. These weather changes have resulted in perceptible changes in agricultural practices, from changes in the cropping season to changes in the life cycle of crops (sowing, flowering, fruiting, and harvesting) to increased reliance on hybrid seeds and chemical inputs.

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While production levels remain stable, the quality of the crops has declined, which further aggravates the economic problems of the community.

In addition, climate change reduces the soil quality, availability of water resources, and public health. According to the socio-economic survey, population increase, urbanization, educational awareness, and cultural transformation provide more direct and pronounced impacts on the livelihoods than that of climate change. It contributed to poverty, job insecurity, land sales, reduced sizes of landholdings, and separation of families. This has led to a situation where most Tamang households have limited land resources, low educational attainment, and economic difficulties that force family members to seek work abroad or in urban areas. Modernization has brought certain benefits but has also disrupted traditional cultural practices and reduced the availability of land for economic pursuits. These findings highlight the complex interplay between socio-economic factors and climate change in shaping the livelihoods of the Tamang community.

Conclusion

Although the research indicated that socio-economic factors, such as modernization, population growth and urbanization, or cultural changes, shape people's livelihood strategies in Tarebhir, Tamang of the Kathmandu Valley predominantly influences indirect impacts of climate change in slowly visible manners over agricultural and bio-resource bases. These are changes in rainfall patterns and increased temperatures that have altered the times of sowing and harvesting, reduced soil fertility, and enhanced crop diseases, thus compelling farmers to introduce modern adaptations such as chemical pesticides and drought-resistant crop varieties. These changes, together with declining water resources and a shift away from traditional livestock farming, reflect the responses of this community to environmental and socio-economic pressures. While the direct effects of climate change on livelihoods are far less apparent compared to other influences, the cascading effects through agricultural costs, food security, and health underline it as a big underlying challenge. Traditional knowledge and practices, such as mixed farming and indigenous pest control methods, remain integral to resilience but are increasingly complemented by modern strategies. It advocates for policies that integrate indigenous knowledge with sustainable modern practices to help vulnerable communities adapt to climate change while responding to broader socio-economic challenges.

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