Humanities and Social Sciences Journal
2023; Volume 15, Numbers 1-2 : 53-63
https://rrlc.tu.edu.np

doi: https://doi.org/10.3126/hssj.v15i1-2.63774
ISSN: 2594-3065 (Print); ISSN: 3021-9744 (Online)

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Impact of Climate Change on Livelihood of Poor and Marginalized Communities in Sudur Pashchim Nepal

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Received: September 11, 2023; **Accepted**: November 24, 2023; **Published**: November 30, 2023

Abstract

The present world has brought out considerable attention on the issues of climate change and more so in the regions like Nepal where impacts are being directly and indirectly faced by people living below the poverty line. This study has been carried in Kailali and Doti districts of Sudur Pashchim Province of Nepal to explore the impact of climate change on livelihood of poor and marginalized communities using mixed-method approach which combined quantitative and qualitative methods of research. Based on household survey, focus group discussion, interaction with the key informants and local authorities, poor and marginalized communities in both Doti and Kailali districts noticed that climate is changing, although slowly, and that people have been experiencing several impacts of climate change. The result indicated that out of total respondents 45.1 percent has been reported declining yields of major crops, 25.3 percent has been shared in changes in cropping pattern, 58.5 percent has been informed the increased in pest and disease infestation, 69.8 percent has been reported decreased in availability of water in nearby streams and rivers in recent years in all study sites compared to the past situation. Similarly, 53.1 percent has been shared the deceasing on movement of wild habitats, 73.5 percent has been informed in loss of dependent wild species and 46.4 percent of respondents has been expressed the decreasing of crown density in forests and grasslands coverage. This study helps policymakers and other stack holders to develop suitable policies and effective adaptation strategies to enhance the livelihoods within this context of local marginalized communities' context.

Keywords: climate change, cropping pattern, poor people, sustainable development

Introduction

An understanding of the emerging trends of climate change and its effects in local communities particularly the poor and marginalized people is an important starting point in addressing the negative effects of climate change (Dube and Phiri, 2013). Climate change is common and challenging problem in the world. The changing nature of climate and its variability has impacted many aspects of the livelihood of the people as well as sustainable development (Wang et al., 2013). Climate change and variability affect virtually everyone and every region of the world (Dhimal et al., 2021). Its inconsistency risk effects are nowhere more prominent than among rural poor and marginalized communities that depend on agriculture and forest product for a living and they face numerous livelihood challenges (Roy et al., 2024). Climate change has altered the physical geography of the area leading to a disappearance of plants and animals and other natural habitat that represent the livelihoods of the local people (Dube and Phiri, 2013).Climate change will exacerbate existing rural development challenges including income generation, food and water security, and health (USAID, 2008).Changes in climate regimes, ranging from severe droughts to flash flooding, have presented additional challenges to food security, particularly among poor households, who often have limited capacity for adaptation(Simatele et al. 2012). Local ethnic minorities are identified as among the most vulnerable communities to climate change and natural hazard disasters because they are identified the poorest, natural resources-dependent livelihoods, and lack opportunities for capital access which leads to insufficient adaptive capacity (Sen et al., 2020).

Nepal is one of the most vulnerable countries affected from climate change (UNFCCC, 2007). Adaptation to climate change in the agricultural sector and related sectors is a major current and future challenge for Nepal (UNDP, 2019). Nepal has occurrence almost all types of climates, from subtropical to alpine as having diverse topography (Karki et al. 2016). The rainfall pattern is subjugated by the existence of the monsoon distribution and its interface with the high mountains to low plains (Kansakar et al. 2004).Climate change possesses a great threat to Nepal in terms of both the natural environment and the livelihoods of the people, especially the poor and deprived communities (ADB, 2021). Erratic rainfall, unpredictable flooding, droughts, unusual health hazards, changing livelihoods activities etc are some of the immediate impacts faced by the poor and marginalized communities. Multidimensional poverty differs significantly based on ethnic background and gender, rural or urban areas, ecological region and province (UNDP/GoN, 2020). The pattern of monsoon rainfall both is changing in-terms of degree and season; the number of heavy rainfall events

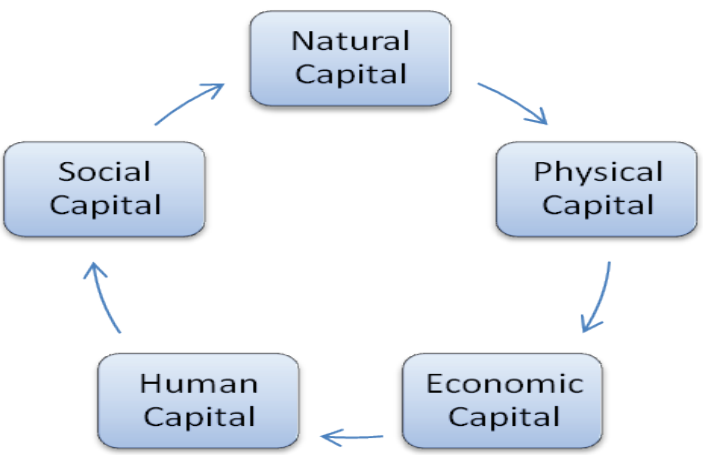
in western Nepal has increased while rainfall in eastern Nepal has become more unpredictable (ADB, 2021). The overall objective of this study was to find out the climate change scenario and its effect on livelihoods, particularly to the poor and marginalized people.

Conceptual Framework

For assessing the impact of the Climate Change on livelihoods, the sustainable livelihoods framework has been used as an analytical framework. The sustainable livelihood combines all human activities including five core properties: natural, social, physical, human and economic capital upon which the livelihoods are built. This study has been analyzed climate change and their effect on key sectors namely, agriculture as social and economic capitals, and health as a human capital, natural resources (forest and water) as a natural capital and about the climate change scenario for physical capital in the study area.

Figure 1

Five Capitals under Sustainable Livelihood Framework



Methods

The survey has been carried out using a mixed-method approach which combines both quantitative and qualitative methods of data collection and analysis. Since the purpose of the study has to trace out the climate change scenario and impact on livelihoods of poor and marginalized communities, firstly consultation with local bodies and Key Informant has been carried out to identify the localities and representation of target group. HHs has been selected with key consideration given to the poor and marginalized households only. Therefore, a rigorous statistical

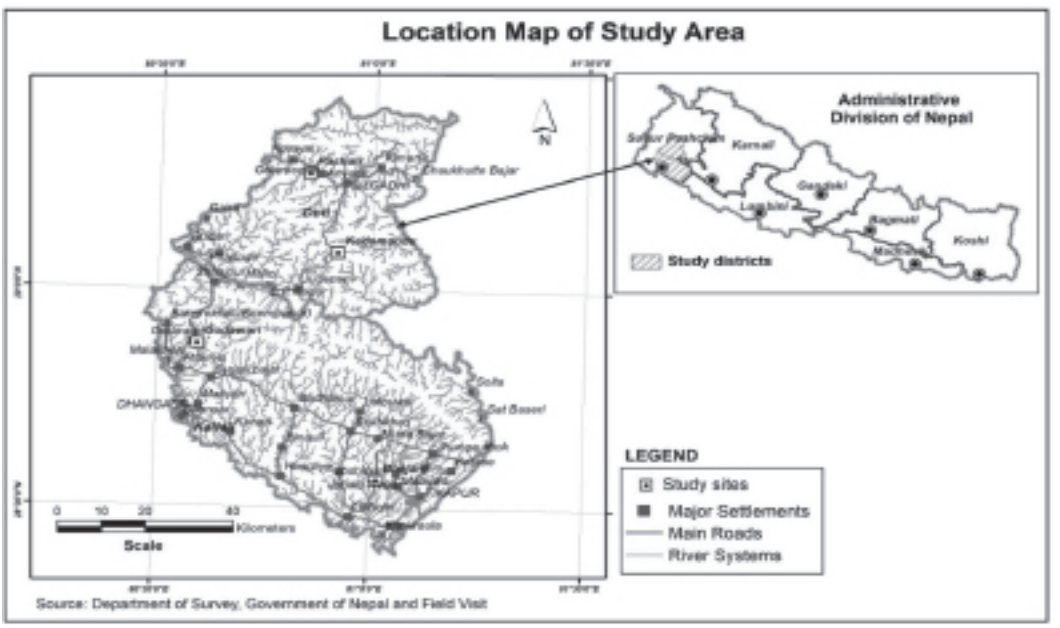
method has not applied in the selection of the households. Two types of data; namely quantitative data has been derived from HH survey (162 HHs) and qualitative data has been collected through focus group discussion (8 groups represented gender and equity in social inclusion), PRA tools and consultations. HH survey data along with PRA data has been triangulated with the information obtained from literature review to validate the findings. Data obtained through field survey has been analyzed and presented.

Study Area

Two study sites from each district (Godawari and Bhajani from Kailali and Kadamandu and Pachnali from Doti district) have been selected for this study which is located in Sudur Pashchim province. Ecologically, one district has been taken from hilly region and another from Tarai region. Kailali district is extended from 28^0 22' to 29^0 05' north latitude and 80^0 30' to $81^0$18' east longitude from Chure to Tarai region with the elevation from 109 meters to 1950 meters and the surface area of 3235 sq km. Similarly, Doti district is extended from 28^0 52' to 29^0 28' north latitude and 80^0 30' to $81^0$14' east longitude in hilly region with the elevation from 600 meters to 3430 meters and the surface area of 2025 sq km.

Figure 2

Location Map of Study Area



Findings and Discussion

Climate Change Scenario

Analysis of climate change scenario in Doti and Kailali revealed that temperature in both the study districts has been increasing slowly at the rate of 0.01 degree Celsius per year between 1978 to 2016 with relatively sharper increase observed in case of spring season in Doti at the rate of 0.05 degree Celsius per year between 1987 to 2016 (DHM, 2016). Likewise, in Kailali district, winter is getting warmer with an average annual temperature increase of 0.03 degree Celsius per year. Rainfall has been decreasing at the rate of 1.1 mm per year in case of Doti district and 6.2 mm per year in Kailali between 1978 and 2016 with more erratic rainfall observed after 1998 in both the districts. Relative humidity has been gradually decreasing in both the districts with larger fluctuations observed in 1998 in case of Doti and in 1984 in case of Kailali. According to the local communities, foggy conditions have increased in Bhajani and Pachnali sites in recent years. Winter fog in Bhajani site has been very persistent in the past 10 years; most of the areas in Pachnali site (lying along the banks of Seti River) that never saw fog five years ago have been covered by fog till noon in recent years. No significant changes where observed in case of frost formation. Heat and cold waves in Bhajani site has reported to be increased in recent years.

Impact of Climate Change

The study has found so many changes due to climate change in the study areas. Declining yields of major crops (rice, maize and wheat), changes in cropping pattern, increased in pest and disease infestation, decreased availability of water in nearby streams and rivers, loss of wild habitats (chituwa, syal, dumsi, kharayo, bundel, lokharke, suga etc.), loss of dependent species (amala, bamboo and tama, niguro, dry grass, tree leaf, bel, mauwa and many other forest fruits etc.) and changed in crown cover density and species (sal, sati sal, bijaya sal, jamun, harro, barro, rhododendron etc) in forests and grasslands are the major changed reported by respondents (Table 1).

Table 1

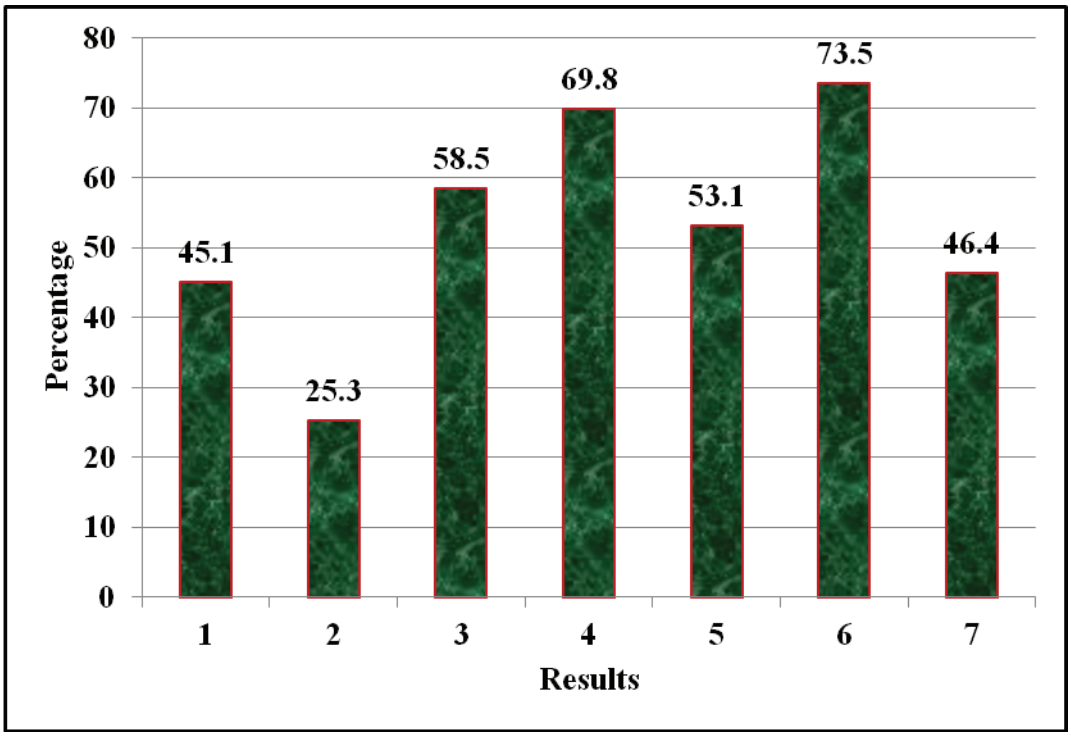
Results of Climate Change

Results	Respondents	Percent
Declining yields of major crops	73	45.1
Changes in cropping pattern	41	25.3
Increased in pest and disease infestation,	95	58.5
Decreased availability of water in nearby streams and rivers	113	69.8
Loss of wild habitats	86	53.1
Loss of dependent species	119	73.5
Changed in crown cover density in forests and grasslands	75	46.4

Source: Field survey

Figure 3

Impact of Climate Change by Sectors



Impact on Agriculture

In the study sites, 45.1 percent farmers reported decrease in crop yield due to inadequate rainfall. Climate change have also found impact on the cropping patterns in some isolated pockets of Bhajani site where during monsoon season paddy could not be grown due to flooding. Likewise, due to delay in the arrival of monsoon, delay in

the transplanting time has observed in case of rice by nearly a month and local people reported early flowering of peach in Godawari site. In addition to this farmers have informed the significant changes in crop productivity (loss compared to past 10 years) as a result of some changes in sowing and harvesting time which could be attributed to the impacts of climate change. Nevertheless, maturity period of some crops and increased pest infestation have been reported by 58.5 percent respondents mainly due to increase in temperature and changes in rainfall patterns (receiving when not required and not arriving when required, amount of rainfall erratic, heavy rainfall within a short period of time etc.) Incidence of pests such as cabbage butterfly (*Pierisrapae*) and fruit borer *(Helicoverpaarmiegra)* have been reported to be increased in recent years. People have been reported that changes in the agro-biodiversity (changed in rice varieties and crop diversification) related to climate changes in Bhajani site. Due to increased heat stress and elevated incidence of foot and mouth disease (Khoret) and Cheraute diseases in livestock caused by increased temperature.

Impact on Human Health

Some of the major human health problems like malaria, diarrhea and dysentery have clear links with climate change (WHO, 2018). Based on the consultation with health workers, local authorities and senior citizens regarding the past and present experiences on health condition, it has been concluded that over the past five years 0.1 in Doti and 1.5 percent in Kailali have been affected by Malaria, while every year 250 cases in Doti and 90 cases in Kailali aged below 5 are affected by diarrhea cases. In the study sites, incidence of water borne disease have been reported to be increased in downstream areas such as Bhajani and Pachnali sites mainly due to water contamination during flood events. Likewise, flooding incidents in Godawari sites have been continuously transmitting water borne diseases like diarrhea and dysentery. Combination of flood, increased temperature and humidity create favorable condition for the proliferation of these diseases. In terms of vector borne diseases, dispersal and reproduction of mosquitoes have increased in recent years increasing number of Malaria patients. In addition, a number of deaths due to malaria have been reported in Pachnali and Godawari sites. Appearances of mosquitoes have also been reported in hilly areas like Kadmandu site where previously it was not reported. Incidences of Conjunctivitis which occurs during summer seasons have increased by almost 3 times in recent years compared to the situation about 10 years ago. Cases of allergies, rash and other form of skin disease have increased in Godawari site mainly due to the use of polluted water aggravated by increase in temperature in recent years. Likewise, some people reported about the lives of the very poor people taken away by extreme of events of temperature increase and flood events in Pachnali and Bhajani sites.

Impact on Forest Resources

Out of the total respondents, 53.1 percent has been reported the loss of habitats, 73.5 percent informed the decreasing trends in availability of dependent species, and important ecological goods and services in the study sites. In Bhajani site, local communities reported substantial decline in the different species of Sal and Amla. Likewise, Pachnali site reported species such as Harro and Bijaya Sal almost nearing to extinction. Almost disappearance of rhododendron species in Godawari site (Kailali district) has of concern to the local communities. While different anthropogenic factors might have been responsible for these changes, the role of the climatic factors such as increase in temperature and reduction in the amount of rainfall cannot be overruled. Likewise, some respondents (15.8 percent of total) and consultation with key informants have been reported the susceptibility of forest fire has increased in recent years due to increased dryness of forest brought about by deforestation and shortage in rainfall. Incident of some forest pest such as blight (Daduwa) has increased due to increase in temperature. Likewise, early flowering of rhododendron (Lali Gurans) species in Doti district is indicative of increase in the temperature in the area. Early flowering has been reported not only in rhododendron but also in other forest species like Sal. In addition to this, 46.4 percent of respondents have been reported about the change in crown density of forest and coverage of grasslands results the loss in biodiversity, forest degradation, destruction in the habitat caused by climate change.

Impact on Water Resources

The total of 68.8 percent of respondents has been reported the decrease in the availability of water in the rivers and springs in all the study sites due to instability of climatic condition. Water flow has been erratic; very high during monsoon bringing floods and very low during dry seasons. Despite decrease in water availability in rivers and streams, access to drinking water has improved, mainly due to improvements in infrastructure facilities and distribution system. Nonetheless, declining availability of water in springs and rivers is a serious concern to the drinking water and irrigation systems in all the study sites. In case of hilly areas like Kadamandu, Pachnali and Godawari sites, larger threat to drinking water and irrigation infrastructure have been facing due to landslide apparent. Increased rate of deforestation, tremendous growth in road construction projects and shifting land use practices have made not only the fragile landscape more prone to landslides but also have put large number of such

infrastructure projects at risk. In case of downstream sites like Bhajani, siltation of irrigation canals has reported and the cause of siltation was no other than flooding. In addition, aquatic habitats like wetlands have also facing several threats due to increased flooding incidents. Washing away of some small lakes like Purina and Bhakraiya in Kailali district is an indication of the similar threats that floods possess to internationally significant wetland sites like Ghodagodi Tal in the district.

Impact on Livelihoods

All of the aforementioned impacts have direct consequences on the livelihoods of people mainly the poor and marginalized groups in the study sites. Climate related shocks and stresses are being increasingly faced by these groups of people in recent years. In the study sites of Doti district, 28 percent of surveyed HHs reported that at least one person in their family has died due to either flood or landslide in the last 10 years. One key area directly hit by weather extreme is the loss of land of poor and marginalized people. Even though the value of loss was less among these groups, limited asset holdings and livelihood opportunities have made them highly vulnerable to shocks and stresses. Even though no direct relation has observed between migration and extreme weather events, higher incidence of migration has seen among those HHs affected by floods and landslides. HHs has been found to be increasingly under liability at present compared to the situation of 10-15 years ago. Despite hosts of other reasons, HHs has reported decreasing agriculture production as one of the reasons for taking loans to feed the family members. Proportion of HHs (72 percent out of total) taking loan has been highest among Dalits and ethnic groups in all the four study sites. Due to decreasing availability of forest products; women have more burdened with the responsibility of fetching such products. As selected HHs have been mostly poor and marginalized, income from agriculture, forests and wetland has very insignificant. As reported by nearly 25 percent of respondents in each of the four sites, their expenditure on food has increased due to decrease in agriculture production and reduction in land productivity. Medical expenses have also increased mainly due to leading factors including increased the incidence of water borne diseases. Majority of the HHs (67.9 percent) in all the four sites reported decrease in the number of food sufficient months from their own production. Leading reason for the decrease has attributed to increased incidences of floods and landslides, inadequate rainfall and increased incidence of pests and diseases in addition to increase in HH size.

Conclusions

The study concludes that the occurrence of climate change is noticeable itself in a very real way of life to the local communities particularly for the poor and marginalized people in the area of study area. This study has shown that increasing temperatures and decreasing precipitation has caused declining yields of major crops, changes in cropping pattern, increased in pest and disease infestation, decreased in availability of water in nearby streams and rivers in recent years in all the study sites compared to the past situation are the major implication on livelihood. In addition to these, altering the natural environment leading to the disappearance of natural habitat, flora and fauna and shifts in vegetation regimes in forests and grasslands are key impacts of inference on natural assets loss. Climate change creating a real development threat to the developing world like Nepal so urgent adaptation measures must be driven by key stakeholders including governments and other relevant sectors.

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