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Impact of Climate Change on the Farming Community of Bhaktapur District of Nepal

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Abstract

This study was carried out to evaluate the impact of climate change on the farming community in Bhaktapur, Nepal. The study considered rainfall, temperature, flood/drought, harvest and sowing time, and pest and disease incidence over 20 years as primary factors to be considered. A household survey of 120 houses was conducted following the set of questionnaires prepared. As a result, significant changes were observed in climatic aspects as well as biological aspects. The obtained result demonstrated that the precipitation observed drastic change as there was an incidence of erratic and heavy rainfall on summer days while the intensity and frequency of rainfall decreased during winter. These abnormalities certainly do not favor agriculture and farming. Similarly, the temperature of the study area has increased annually over the last two decades. The data suggests that the average annual temperature is increasing at the rate of 0.038^0C per year. Moreover, the survey showed that the time of harvest and time of sowing seeds have been delayed respectively to the time a few decades back while the climatic aberrations have increased the incidence of pests and diseases. In a nutshell, the changes in climatic conditions have a drastic change in the farming system and thus the agricultural produce and productivity. The study highlights the significant impact of climate change on traditional farming practices in Bhaktapur, Nepal. It underscores how changes in rainfall patterns, temperature, and the incidence of extreme weather events like floods and droughts have disrupted agricultural activities such as planting and harvesting cycles. The research not only identifies challenges but also emphasizes the need for adaptation strategies to mitigate the impacts of climate change on farming communities. By linking research findings to policy recommendations and practical interventions, the study offers actionable insights for policymakers, practitioners, and local stakeholders striving to build resilience in agricultural systems.

Keywords: agriculture, climate change, farming system, rainfall, temperature

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Introduction

Climate change is expected to adversely impact the agriculture sector of developing countries due to the associated damage and huge adaptation costs. The Intergovernmental Panel on Climate Change (IPCC) announced in the Sixth Assessment Report that the global average temperature has risen by 1.10 ^{0}C in the recent decade (2011–2020) while it is projected to increase by about 1.30 ^{0}C– 5.70 ^{0}C by the end of the century corresponding to the low-emissions and very high-emissions scenarios (IPCC, 2021). These warming scenarios impose a greater risk on South Asia, especially in the sectors of agriculture, land use, energy, biodiversity, health, and water resources (Food and Agriculture Organization of the United Nations, 2019).

United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as: "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable periods." Construing this definition, Climate change refers to long-term fluctuations in temperature and weather patterns. Variations in the solar cycle are generally responsible for such fluctuations. But, since the 1800s human activities such as the burning of fossil fuels and coal have been the drivers for such changes.

There is no doubt the world is heating up. The United Nations General Assembly (UNGA) mandated an International Panel on Climate Change (IPCC) for gathering and disseminating scientific knowledge on climate change in 1988 (UNGA Resolution A/RES/43/53). It has so far produced four assessment reports. In the beginning, no one really knew whether climate change was anthropogenic, but as time went by it became more and more obvious. The language of the IPCC also kept changing from weak to more authoritative. In 1995, IPCC reported that the balance of evidence suggested a discernible human influence on global climate (Assessment Report 2); in 2001, it reported that there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities (Assessment Report 3), and IPCC's report of 2007 authoritatively stated that most of the observed increase in globally-averaged temperatures since the mid-twentieth century is very likely (more than 90 percent certain) due to the observed increase in anthropogenic (caused by humans) greenhouse gas concentrations (Assessment Report 4). Greenhouse gas concentrations are at their highest levels in 2 million years. Emissions are continuing to rise. As a result, the Earth is presently around 1.1 degrees Celsius warmer than it was in the late 1800s. *The most recent decade (2011-2020) has been the warmest on record.* Greenhouse gas concentrations are at their highest levels in 2 million years. Emissions are continuing to rise. As a result, the Earth is presently around 1.1 degrees Celsius warmer than it was in the late 1800s. *The most recent decade (2011-2020) has been the warmest on record.*

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Nepal is a land-locked country located in South Asia between India and China, at 28° North latitude and 84° east longitude. It has an extremely varied and complex climate, driven by the uneven terrain and regional weather systems. Within a few hundred kilometers, the country's elevation changes from the lowland of 70m in the Terai to the top of the world, Mount Everest (8,848m). Nepal is considered one of the top ten countries most likely to be impacted by global climate change (WFP, 2009) but is one of the least contributors to the emissions of greenhouse gases (GHGs), emitting only 0.027% of global share (INDC, 2016). Moreover, low-income people from rural areas of Nepal are more vulnerable because of their high dependence on the agricultural sector (Department of Hydrology and Meteorology, Government of Nepal, 2017). The challenges of climate change on Himalayan regions, which includes Nepal, are well-noted in the IPCC's fourth assessment report (IPCC 2007). In 2004, the Initial National Communication of Nepal (INCN) to the United Nations Framework Convention on Climate Change (UNFCCC) and a range of recent studies show that Nepal is highly vulnerable to the potential negative impacts of climate change (Regmi and Poudyal, 2009).Climate change scenarios estimate that the temperature of this region is highly likely to accelerate. This will result in a considerable retreat of the glaciers, the over-flowing of rivers for a certain period of time, and consequently a gradual shortage of clean water supplies. Floods and landslides, from erratic precipitation, have been significant causes of loss of life and fertile land has been lost due to changes in geographical structures. The delay in the monsoon season due to changes in global weather patterns has also made thousands of hectares of farm land fallow and has reduced agricultural production due to a lack of adequate water supply (Regmi and Adhikari 2007).

Our knowledge of climate change has increased and improved significantly in these last decades. Yet there are many uncertainties about to what extent a warmer world might affect our ecosystem. A global survey in 2019 showed that there are rising public concerns about recent climate change, and most people believe that this is a major global threat (Fagan and Huang, 2019). Studies in Nepal show results similar to the global scale with observed rising cases of drought events, landslides, and soil erosion in the mountainous areas, and flooding and inundation in Terai (Nepal Disaster Report, 2015; Sapkota and Rijal, 2016; Devkota et al., 2020). Research has shown that grass growth, medicinal plants, and other local agricultural products have declined due to the low amount of snowfall in the Himalayan region (Tiwari et al., 2010).

Statement of Problem

Impact of climate change on agricultural production

The landscape of Nepal is divided into three parts: Mountainous, Hilly and Terai. The total land area of Nepal is 147,181 km2. Agriculture is the dominant profession and the major economy in Nepal. The World Bank (2011) cites agriculture as the principal source of food, income, and employment for the majority of the population.

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Particularly for the poorest in Nepal the World Bank (2011) notes, the growth in agriculture is crucial for reducing poverty, and preliminary findings from the National Living Standards Survey indicate that despite the Maoist insurgency, the sector has made a significant contribution to poverty reduction. Agriculture has been a major contributor of Nepalese gross domestic product (GDP) and has contributed 35 per cent of the total GDP although only 21 per cent of the total land area is properly cultivated (Central Intelligence Agency 2010).
Climate change is threatening the traditional way of agriculture, and so the creation of a sustainable agricultural approach to counter the impact of climate change has been a main priority for the country (Malla 2008). The main challenge for cultivating sustainable agricultural development in Nepal is to turn subsistence farming into commercial farming as well as adapting to the new patterns of farming as a result of increasing temperatures. The average size of individual land holdings is very small in Nepal. The visible pattern of land ownership in Nepal is uneven, and its distribution is highly lopsided. Forty-five per cent of farmers have less than 0.5 hectares and share only 13% of the total land (Central Bureau of Statistics 2004).

Agriculture is largely based on low-value cereals and subsistence production, with a mere 13 per cent of output traded in markets and the absence of economic opportunities outside subsistence agriculture keeps most Nepalese poor (World Bank 2011). The population growth rate of the country is one of the most troubling obstacles in developing agriculture in a sustainable way to cope with climate change. The census data released by the Central Bureau of Statistics (2012) shows that the population growth rate was 2.25 per cent per annum. A recent preliminary assessment however, shows that it has decreased to 1.4 per cent. The increased population needs more houses to live in, more trees to build houses, and more arable land for farming, all of which cause huge areas of forest to disappear every year.

The overexploitation of natural resources has created a significant problem in sustainable agriculture and helped to increase the negative effect of climate change on agriculture and life. Most of the agricultural land, in both Terai and Hilly regions, depend on seasonal rain for the proper crop growth in Nepal. At one time the monsoon rains originating in the Bay of Bengal would support the crops and the farmers who planted them according to their expertise and experience of the seasonal cycles over the years. However, as weather patterns have been changing, farmers have had a dilemma. Over-exploitation of natural resources has resulted in an environmental degradation which is deeply connected with permanent loss, depletion or pollution of natural resources, adverse weather conditions, changing microclimates and unbalanced situations which affect the inherent chain within the ecosystem. Excluding adverse physiographical, ecological, geological and meteorological factors resulting in common natural hazards such as floods, earthquakes, droughts, cold and hot waves, hailstones, windstorms and cyclones, landslides, disease epidemics, GLOF, avalanches, lightning and fires, the

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environmental degradations are basically caused by human intervention in the form of modern technological adaptations (Ghimire 2008).

Data on trends of Nepal from 1975 to 2005 showed that temperature rise by 0.06°C annually whereas mean rainfall has significantly decreased on an average of 3.7 mm (-3.2%) per month per decade. Under various climate change scenarios, mean annual temperatures are projected to increase between 1.3-3.8°C by the 2060s and 1.8-5.8°C by the 2090s. Whereas, annual precipitation is projected to reduce in a range of 10% to 20% across the country (INDC, 2016). The temperature in the Himalayas, however, is increasing at a faster rate, and this has serious impacts on the country's glacial lakes (Raut, 2004). According to Nepal's second communication report, 2014; the overall seasonal maximum temperature in the country is found to have the largest increase of 4.5˚C in spring and the smallest increase of 3.3˚C in summer, whereas the minimum temperature in the country is found to have the largest increase of 5.4˚C in winter and smallest increase of 3.4˚C in summer by the end of the 21st century. PRECIS projection found that annual precipitation will decrease by 2% of the baseline amount by the 2020s. However, it will increase by 6% and 12% of the baseline by 2050s and 2080s (MoSTE, 2014). The IPCC and some other scientific bodies have projected a sea level rise of between 18 and 59 centimeters because of the melting of glaciers and snow (Fourth Assessment Report 2007). Moreover, The Mool et al. (2001) study recorded that there are 2323 glacial lakes in Nepal covering 75 square kilometers. Geoscientists have recorded that the number and volume of Glacier Lake Outburst Flooding (GLOF) hazards are increasing in Nepal (Richardson and Reynolds 2000).

An average temperature rise of 0.06 percent has been recorded in the country. This rise has shown the multidimensional impact of climate change on agriculture. Frequent drought and prolonged rains as well as many fatal floods and landslides are some of the major obstacles being experienced in Nepal in agricultural as well as other sectors of social life. A study conducted by the Nepal Agricultural Research Council (NARC) showed that the change in temperature has had a positive effect on the yield of rice and wheat in all regions but also showed a negative impact on the yield of maize, particularly in the plains land of Nepal, otherwise known as Nepal's bread basket (Malla 2008). Changes in weather patterns, such as unseasonal heavy rains, hailstones, floods etc. have frequently caused serious damage to crops. Rising annual temperatures, a delayed monsoon season, prolonged or increased annual rainfall as the result of glacial melting, and intense rainfall have all affected many rain-fed communities in Nepal. Extreme climatic conditions increase vulnerability to erosion, landslides, avalanches, flooding, loss of flora and fauna and decreased agricultural production (Nepal and Chipeniuk 2005).

About 68.00% of Nepal's workforce is involved in agriculture, accounting for one-fourth (25.00%) of the gross domestic product (GDP) (Economic Forum, 2023). Over the past decade,

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demand for the summer crop "corn" and winter crop "wheat" has increased by more than 5.00% (Sapkota and Pokhrel, 2010). Due to the existing tedious and labor-intensive agronomic practices, people are losing interest in millet cultivation though its demand is high (Devkota et al., 2016). Agriculture products have been both negatively and positively impacted by climate change. However, the rising problems perceived by a majority of people in previous studies are the increase in pests and diseases, insects, and invasive species in their farms with increasing climatic variability (Tiwari et al., 2010; Joshi and Joshi, 2016; Food and Agriculture Organization of the United Nations, 2019; Neupane et al., 2019).

Climate change consequences are much more than periodic droughts and bad harvests. "Entire belts of arable land are likely to shift as climate patterns change permanently. Water resources, already strained, could dry up as the mountain glaciers that feed them vanish. In human terms, this could mean famine, competition over remaining resources, and migration, either within countries or across national borders" (O'Neill 2009, 45).Cline's estimations predict that as a result of global warming and climate change, global agricultural productivity will decline between 3 to 16 percent by 2080 (Cline 2008). These estimations and predictions vary as geographical regions differ.Estimates of agricultural output have not been made for the Himalaya region, where the primary concern of researchers and politicians is with retreating glaciers, since the mountains constitute the 'water tower' for 1.3 billion people living in Asia (Aase et al. 2010). There is general agreement that for low-income countries, climate change will lead to significant reductions in agricultural productivity (Gitay et al. 2001). Climate change-related drought in recent years has emerged as a source of household-level vulnerability in the hill agriculture of Nepal (Ghimire et al. 2010). The farmers cannot grow crops when there is no rainfall during the cropping season. They have a weak adaptive capacity against drought due to the poor asset base and low access to services and facilities (Ghimire et al. 2010). The estimations of climate change do not provide clear data on the magnitude of the temperature change and there are uncertainties as to the extent of change in precipitation and the monsoon system.

The Consequences of Climate Change on Food and Nutrition Security:

On one hand increases in CO2 concentrations are good for crop growth but on the contrary CO2 emissions are resulting in frequent climatic fluctuations like intense heat, severe weather, and droughts which are huge threats to In-demand crops like wheat and maize. "Although some crops may benefit from the extra CO2 in the atmosphere, research suggests this may be offset by damage from higher temperatures, water stress, more virulent disease, and pest attacks" (Yamin and Depledge 2004, 22). This also emphasizes climate change is also a threat to food security because at some point the spread of genetically modified seed and other proprietary biotechnologies will be a threat to farmers' livelihoods, and the food security of the population is dependent upon this group (Shiva 1993). The link between climate change and environmental change on agriculture and food security has been becoming more and more

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serious in terms of the local scope of Nepal. Concerns for food and drinking water along with water for irrigation tighten the knot of the relationship between climate change and the population that lives around mountains and other places, and who depend on mountain-source water resources and rainwater for their agricultural production. The warnings of climate change are so serious that Nepal and Nepalese farmers must act to adapt to, or at the very least, mitigate the speedy rate of widespread flooding from snowmelt or changes in weather patterns. Agriculture is the mainstay of the Nepalese economy, which continues to be dependent upon monsoon rainfall due to the lack of sufficient irrigation facilities, and changing weather patterns will further damage the agricultural capacity (Bhujel and Ghimire 2006). It is perceived that climate change mainly entails higher temperatures. However, the temperature rise is merely the beginning of the narrative. As everything is interconnected in the ecosystem. Thus, shifts in one aspect will equally impact others. Research has shown that, If the global average surface temperatures rise between 1.5-2 degrees, then the world's wealthiest countries will experience fewer changes in their local climate as well as crop yields due to well-built information systems in place whereas low-income or less developed countries will suffer more in terms of food security and food safety due to climate change and lesser resilient crop infrastructure.

According to the State of Food Security and Nutrition in the World report, approximately 750 million people experienced extreme food insecurity in 2019. The number of undernourished people or food insecurity is increasing, with climate shocks playing a significant role. Climate change will raise food prices, reduce food supply, and promote instability and conflict due to competition for water and arable land unless immediate action is taken. Food security worldwide is at risk under climate change, due to reduction of yield of key crops (Olesen and Bindi, 2002; Parry et al., 2004). Himalayas is especially at risk, given the complex topography, and social conditions therein (Malla, 2008; Ortiz et al., 2008; Bhatt et al., 2014). Also the present population growth in the area rise food demand (Strzepek and Boehlert, 2010). The most relevant crops here are cereals, especially wheat, *Triticum* L., rice *Oryza* L, and maize *Zea Mais* L (Supit et al., 2010). All these crops need rainfall, and possibly irrigation during growth season (Bocchiola et al., 2013; Nana et al., 2014; Bocchiola, 2015; Palazzoli et al., 2015). The impact of climate change on agriculture may include the effects of (i) rising CO2 on respiration, mostly for *C3* plants (Morison, 1999; Leuning, 1995; Jarvis et al., 1999), (ii) changing temperature and rainfall, possibly leading to altered crop production along the XXI century (Brouwer, 1988; Rosenzweig and Hillel, 1998; FAO, 2009). The assessment report AR5 of the Intergovernmental Panel on Climate Change IPCC stated that negative impacts are more common than positive ones (IPCC, 2013), and that 5–200 M more people may be exposed to starvation until 2100 (Olesen and Bindi, 2002; Olesen et al., 2007; Schmidhuber and Tubiello, 2007). This study focuses on the Dudh Koshi river basin of Nepal. Nepal is very vulnerable to climate change (Awasthi et al., 2002; Matthews and Pilbeam, 2005; Rai, 2007; Eriksson et al., 2009a; Nyaupanea and Chhetrib, 2009; Maskey et al., 2011; Shrestha and Aryal, 2011; Karki and Gurung, 2012; Agarwal et al., 2014; Devkota and Gyawali, 2015; Palazzoli et

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al., 2015), and it has low adaptive capacity (Dulal et al., 2010). Small scale (~0.7 ha) subsistence agriculture is a backbone of Nepal's economy, with 78% work force, and contributes ~36% of Nepal's GDP (World Bank, 2012). With cropland only irrigated for 27%, above all in Terai (along Nepal-India border), arable land is largely rain-fed. Effects of global warming in Nepal include temperature increase (Rupa Kumar et al., 2006; Malla, 2008; Eriksson et al., 2009b), erratic rainfall, shorter winter, more frequent and longer droughts (Sharma and Dahal, 2010), and the question arises whether climate change will (negatively) impact cropping, and food security (Bocchiola, 2017).

Objectives of the Study

The general objective of the survey is to find out the incidence of evidence of climate change and its impact on the agricultural aspect of Bhaktapur district of Nepal.

The specific objectives are:

1. To highlight evidence of climate change in Nepal.
2. To analyze the impact of climate change on the farming community of Bhaktapur District in Nepal.

Limitations of the Study

This paper is limited to its area of study done primarily on the agricultural-based community in a single district of mid-hill Nepal-Bhaktapur. The sample size taken considers a small area of farmers and people involved in agriculture and therefore it is just a part of the entire nation. Henceforth the secondary data are obtained through interaction with other stakeholders.

Methods and Materials

Instrument and design

Questionnaire design

Simple model questionnaire was used for the sampling. The questionnaire included the information about the evidence of climate change, impacts on agriculture and impact on farming system as well as livelihood.

Interview

A face to face interview was done with the farmers at their home. In addition to that, phone survey was taken as a means of primary data collection.

Data and Data types

Primary data

Primary data was obtained through face-to-face interview and questionnaire surveys with the farmers of the study area.

Secondary data

The secondary information was obtained through reviewing the IPCC website and publications, climate change journals and other related articles.

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Methods and techniques of data analysis

The research survey is primarily based on primary data collected through field research conducted in Bhaktapur district of Nepal. The collection technique for the study has been based on primary and secondary sources i.e. field survey, the library method and websites.

The collected data from various sources were analyzed elaborately.

Research Design

This research is based on descriptive and analytical methods. During this research, researcher tried to study the impacts of climate change on the livelihood of the community based on agriculture production.

Study Area

The study intends to focus on farming system in Bhaktapur district of Nepal. Bhaktapur, locally called Khowpa, is a city in the East corner of the Kathmandu valley in Nepal, located about 13 km from the capital city, Kathmandu (Figure 1). In terms of area, Bhaktapur is the smallest district in Nepal. Geographically, it is located on a small hill in the Eastern part of the Kathmandu valley. The total area of Bhaktapur district is 6.889 km^2. The population density of Bhaktapur district is 11,000/km^2. As part of the Kathmandu valley, it shares its history, culture, and language with the other cities of the valley. Bhaktapur is one of the most visited tourist destinations in Nepal. In addition to that, it consists in itself the generational-long tradition of growing crops and farming in a conventional way.

Map of Study Area

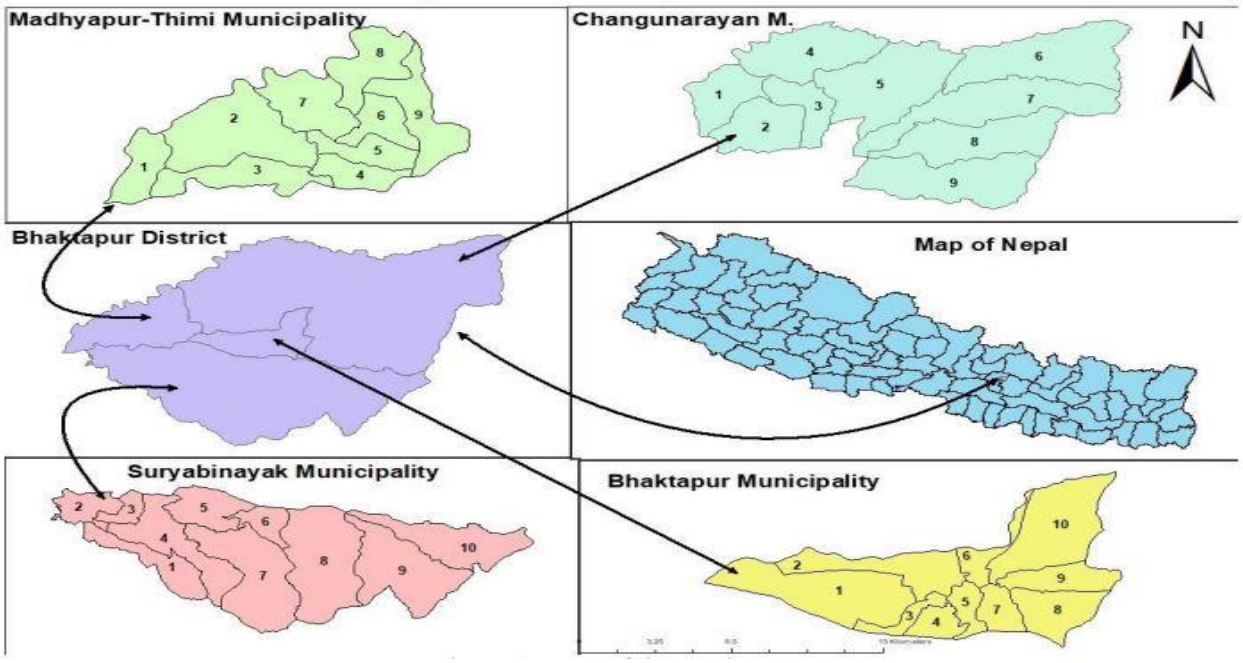

Figure 1: Map of the study area

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Source of Data

The primary sources of data will be collected through field surveys from the farmers of the Bhaktapur district of Nepal and secondary ones obtained through various sources available in published media, journals, and articles.

Sample Size:

Considering the total population size and for the data to be rational, the random sampling technique was done with a sample size a total of 120. A sample size of 30 samples from each municipality was taken to make the survey as rational as possible.

Data Processing, Analysis and Presentation:

The data will be processed, analyzed and presented in suitable headings in tabulated and descriptive form to analyze the variables in order to justify the purpose of the study.

Results and Discussion

Socio-Economic and Demographic Characteristics:

A sample of 120 respondents was taken from the total population of Bhaktapur district, i.e., 5, 9 wards in Changunarayan municipality, 1, 2 wards in Bhaktapur municipality; 2, 3 wards in Madhyapur Thimi municipality; and 1, 4, 7, 10 wards in Suryabinayak municipality. The study site were taken into consideration since there is greater agricultural land and more farmers stay in these wards, they were selected and interviewed for the purpose of the survey.

Age group of respondents:

Fifty-four percent of the respondents were males, and the remaining 46 percent were females. Respondents were categorized by their age groups. 60% of the respondents belonged to the age group 40-60, 26% of the respondents belonged to the age group below 60 and 14% belonged to the age group above 60.

Education level of respondents:

Respondents' education status was identified as illiterate and literate which were further classified into secondary, higher secondary, and graduate. Most of the respondents (72%) were literate in the study area while 12% of them were graduates and 32% received higher secondary education.

Main income sources:

Agriculture was the main occupation for the majority of the households surveyed. Most of the households are dependent on agriculture in the study area. Besides, agriculture, services, and foreign employment as the primary sources of family income to 45% and 25% and 5%, respectively. Thus a minor inconvenience in the income generated by agriculture poses a major threat to the livelihood.

Climate change and its impact:

Ninety-two percent of the respondents agreed with the observation of evidence of climate change. As per the findings, these changes were observed for a long duration of time. The temperature change result suggests that summer as well as winter temperatures have increased

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as a result of which a colossal effect is observed in the farming system. Similarly, rainfall changes have been observed in the Bhaktapur district where 76% of the respondents suggest these changes are extreme. A majority of these respondents agreed on the changed time of rainfall which has impacted a large scale of farming practice. Similarly, a result was noted on the impact of the possible changes caused by climate change. The findings observed is presented below.

Table 1: Possible changes of climate changes and the frequency of its impact on agriculture

S.N	Changes	No. of respondents who agreed on the agricultural impact caused by these changes
1.	Changed timing of rain	92
2.	changed intensity of rain	86
3.	reduced growing season	66
4.	change in harvest time	96
5.	change in the time of onset of flowers	92
6.	abrupt change in the growing season	84
7.	increased floods	68
8.	increased duration of drought	77
9.	incidence of fire	48
10.	high pest and disease incidence	102
11.	food shortages	42
12.	changes in livestock breeding season and timing	9
13.	destruction/obstruction in water bodies	69
14.	disappearance of vegetation	63
15.	change in intensity of heat waves	46
16.	change in intensity of cold waves	59
17.	erosions	26
18.	post-harvest losses	30
19.	crop and its variety extinction	31
20.	livestock and its variety extinction	6

Moreover, the majority of the respondents hinted that there were no positive changes in agriculture due to climate change. Similarly, the density of vegetation has been impacted and unwanted weeds have taken up space while the clearing that once used to be filled with greeneries has been emptied. In addition to that, water bodies have dried up and shreds of evidence of the drying up of underwater resources have also been noted.

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Conclusion

Climate change and agriculture are closely related. With the trend of the farming system moving from subsistence to commercial agriculture, production, and productivity are most affected by these climatic aberrations. It was found that the majority of agricultural production was dependent upon rain-fed irrigation and physiologically the crops are dependent upon temperature. Therefore, precipitation and temperature of terrain are very crucial for the study of farming systems. The primary impact of climate change comes to food and nutrition security and is much in the hands of developing and underdeveloped countries. Nepal's economy like the world's is getting fragile with each passing day and with agronomy being the backbone of the domestic economy, Nepal is at high risk for the impact of climate change to be felt. With 50.4 percent of the national population engaged in agriculture, this sector contributes 24% of the national GDP. Bhaktapur maintains a high potential to benefit from agriculture as the cultivable land in the district particularly Suryabinayak municipality and Changunarayan municipality is still arable and thus the production if given priority can provide for the entire district. Moreover, the dependency of farming in this system is similar to the entire nation and hence the impact of climate change can be observed and studied thoroughly. With the given references, this paper tries to evaluate the impact of climatic abnormalities concerning the agriculture and farming system of the aforementioned district of the nation.

The annual maximum temperature showed an increasing trend which was in line with the findings of Dawadi et al. Similarly, the annual minimum temperature showed an increasing trend. This finding was against the reports from Kattel and Yoa. The rainfall extremities in the summer days were in line with Fagan and Huang. The drought intensity and frequency also appears to be increasing which was in line with the findings of Karki et al. Similarly, the majority of changes due to climatic abnormalities mentioned in the questionnaire was found to have impacted the farming system in the study area. Thus it is very important to think about the adaptation measures and thus mitigation methods so as to minimize the effects in the field of agriculture.

Recommendation

Further studies can be made on the strategies and methods for mitigation of the impacts and threats presented by the changes that appeared throughout the years due to climatic aberrations. Similarly, studies can be further made to quantify the effects made by these changes on the production as well as productivity of the agricultural commodity of the Bhaktapur district.

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