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STATUS OF CLIMATE CHANGE AND FOOD SECURITY IN KATHMANDU DISTRICT

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ABSTRACT

Climate change and its impact on agriculture and food security are serious global challenges we are facing today. This study investigates the specific impacts of climate change on agriculture and food security among farmers in Kathmandu district, Nepal. With farmers forming a significant portion of the agricultural workforce, understanding their unique challenges and adaptive strategies is crucial for developing effective interventions. Conducted over three months from April 22, 2024, to July 22, 2024, the research sampled 50 households using simple random sampling techniques. Data collection comprised both primary and secondary sources. Primary data were obtained through semi-structured interviews with respondents, field observations, and discussions with local facilitators, extension workers, and community leaders. Secondary data were gathered from published documents. The study's findings provided a detailed socio-economic profile of the respondents. Agriculture was the primary occupation for 67% of respondents, highlighting their dependence on this sector for livelihood. Land ownership patterns varied, with 34 respondents owning their land, 6 practicing sharecropping, and a few relying on leased land. Irrigation was primarily sourced from boreholes (58%), supplemented by drip irrigation, rainwater harvesting, and natural rainfall. Despite their efforts, 62% of respondents reported insufficient food production, leading to prevalent food shortages. Food insecurity was a significant issue, with 74% of respondents experiencing annual food shortages and only 24% having food security throughout the year. Many respondents resorted to purchasing food or working as laborers to meet their daily needs.

Keywords: Adaptive strategies, agriculture, climate change, food security, irrigation methods

INTRODUCTION

Climate change poses a formidable threat to agriculture and food security worldwide, and Nepal, with its diverse topography and agrarian economy, is particularly vulnerable to its impacts. Among the most affected are farmers in Kathmandu district, whose pivotal roles in agriculture are increasingly jeopardized by shifting weather patterns and environmental degradation (Gautam, 2021).

Nepal's agricultural sector is a cornerstone of its economy, contributing significantly to GDP and employing a large portion of the population. However, the sector faces mounting challenges exacerbated by climate change, including rising temperatures, erratic precipitation, and more frequent extreme weather events (Gautam, 2021). Climate change has worsened the living conditions of especially resource-poor households dependent on subsistence farming, fisheries and forest resources (Rajbhandari, 2024).

Kathmandu District, while mostly urban, still has rural areas where farming is important. Many farmers here are struggling to deal with changes in weather patterns, such as less predictable rain and warmer temperatures. These shifts not only reduce crop yields but also make farming more difficult by increasing problems like soil degradation and pest infestations. Studies show that the production of important crops like rice and maize in Nepal has dropped by 10-20% in recent years due to these climate-related challenges.

Food security, which means having reliable access to enough nutritious food, is at risk in places like Kathmandu. As climate change disrupts farming, many farmers in the region face uncertain futures. This thesis aims to understand how farmers in Kathmandu District perceive climate change and how these changes are affecting their ability to produce food. By learning about their experiences and challenges, we can better understand the current status of food security in the region and identify possible solutions to help farmers adapt to the changing climate.

MATERIALS AND METHODS

The study was conducted in Kathmandu district, located in the Central Bagmati Province of Nepal. This district lies within the subtropical highland climate zone and experiences four distinct seasons: spring, summer, monsoon, and winter. The elevation ranges between approximately 1,300 and 1,400 meters above sea level, with the Kathmandu Valley covering around 50 square kilometers. The selected study areas included Gokarneshwor, Budanilakantha, Shankharapur, Kageshwori,

Tarkeshwor, and Nagarjuna, representing urban and peri-urban areas. The region, serving as the headquarters of the Bagmati Zone, has a dense population of about 1.5 million people, with a population density of approximately 30,000 per square kilometer. Nepali is the primary language spoken in the area, which operates on Nepal Standard Time (UTC+5:45).

The study was conducted over three months, from April 22, 2024, to July 22, 2024. A total of 50 households were selected using a simple random sampling technique to represent the urban population of Kathmandu district. With an estimated urban population of 1.5 million, a sample size formula for proportion-based studies was applied, considering a 95% confidence level, a 10% margin of error, and a proportion of 0.5 to account for maximum variability. This calculation indicated that 50 households would provide a representative sample. The sampling ensured that the selected households reflected the diverse socio-economic characteristics of the district.

Data collection involved a combination of primary and secondary sources. Primary data were gathered through semi-structured interviews with respondents, field observations, and discussions with facilitators, extension workers, and community leaders. These methods provided detailed insights into the experiences and challenges faced by the study population. Secondary data were collected from books, journals, research papers, and annual publications of various institutions. Additional resources such as internet materials and publications from relevant organizations further supported the comprehensive analysis of the research topic.

RESULTS AND DISCUSSION

Primary occupation of the respondents

The involvement of people in any activity which plays a primary role to generate income and fulfill their need to sustain their livelihood of own self and their family is referred as primary occupation. In the study site, the major occupation of the respondents was found to be agriculture with the highest frequency and percentage of 67 (Figure 1). The frequency and percentage of respondents having secondary occupation as service, business and others were percentage of 20, 5 and 8. In addition, the above figure also shows that only 16 Respondents had a primary occupation other than agriculture with the percentage of 8. This concludes that the majority of the respondents in the study site were dependent upon agriculture for their livelihood.

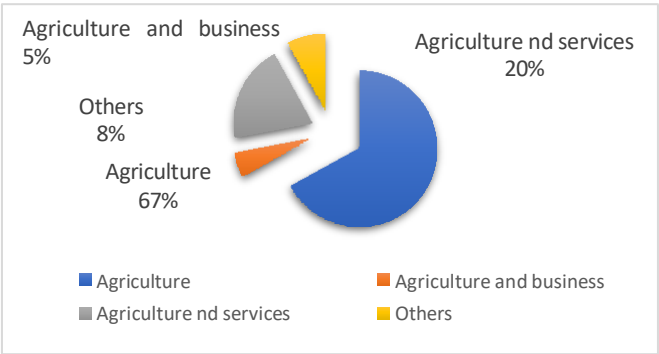


Figure 1. Primary occupations of respondents in the study site

Types of land

The type of land indicates what sort of land the respondents own. For example: Own land, lease land, share cropping. Out of the total interviewed respondents, only 34 had their land, 6 respondents employed shared cropping system, 8 respondents owned land as well as others' land and 2 respondents had their own as well as leased land (Figure 2).

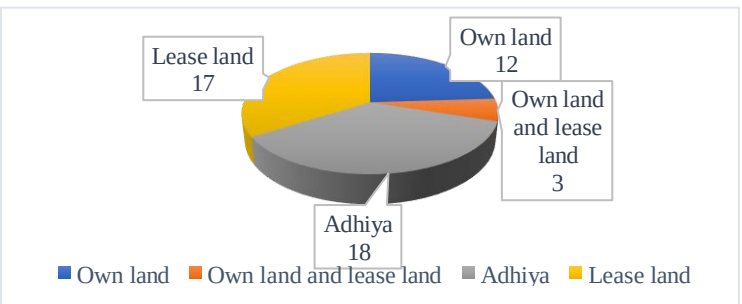


Figure 2. Types of land cultivated by the respondents

Thus, the above figure 2 clearly showed that the 24% of respondents that have their own land whereas the percentage of others land i.e. Adhya was 36. People with lease land was 34% whereas, own land and lease land was 6%.

Perception of farmers on climate change

Over 86% of respondents participating in the questionnaire surveys and focus group discussions (FGDs) indicated that they had observed significant changes in weather patterns, including rising temperatures, erratic rainfall, an increase in the number of hot days, and a decrease in cold days. Furthermore, 32% of the

participants in the household surveys and FGDs reported that the growing frequency and severity of floods and flash floods have adversely impacted food availability. These extreme weather events have caused extensive damage to agricultural land, resulting in the loss of productivity across several hectares and leaving large areas of farmland barren. This alarming trend highlights the critical challenges faced by farmers and communities as they struggle to adapt to changing climatic conditions and the consequent effects on their livelihoods and food security. Bhatta, Nepal and Rajbhandari (2024) have reported similar findings. Rajbhandari (2024) has reported that frequently more intense and extreme weather conditions have had adverse impacts on food production, availability, accessibility and supply in rural areas; and that ultimately had magnified food insecurity.

Types of irrigation method and sources

Irrigation is the artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and vegetation of disturbed soils in dry areas and during periods of inadequate rainfall. In this survey site, almost all of the respondents had irrigation facilities.

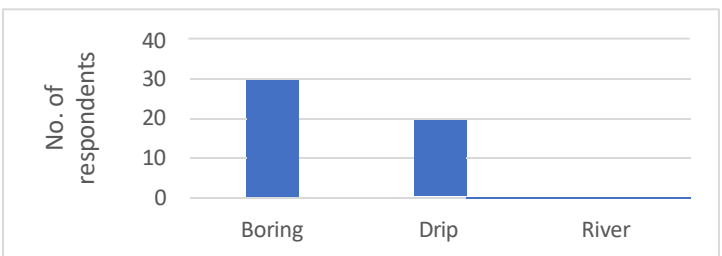


Figure 3. Types of irrigation methods and sources used by respondents

The main source of irrigation in the study area was boring which was used by 58% of respondents. Similarly, drip, rainwater and rainfall was also used as a source of irrigation by 38% and 4%, respectively.

Impact of climate change on agriculture

Thirty four percent of farmers reported a decline in rice and wheat production due to the changing and unpredictable onset and withdrawal of monsoon and winter rainfall. These alterations in timing and rainfall patterns have significantly impacted farmers' decision-making regarding seedbed preparation and crop transplantation. Eighteen percent of farmers shared their challenges of having to transplant older paddy and millet seedlings as a result of delayed rainfall, illustrating the direct effects of climate variability on agricultural practices. The loss of agricultural land has exacerbated the economic burden on these farmers,

increasing their reliance on market access for food. Flooding has led to the direct loss of arable land, crops, livestock, and critical infrastructure, including road networks, foot trails, and water supply systems. Additionally, prolonged dry spells and reduced water availability for both household and agricultural use—particularly during the winter—have further diminished agricultural productivity. The winter dry spell has adversely affected winter crops and vegetables, such as wheat and potatoes, in agricultural zones that rely heavily on this produce. The perceived decrease in winter rainfall has reduced the area sown with winter crops, jeopardizing the food security of communities and smallholder farmers who depend on winter agricultural production and sales (Karki, Thapa,and Sharma, 2021).

Moreover, 73% of farmers noted that rising temperatures have led to decreased soil moisture, which in turn has contributed to lower agricultural yields. These rising temperatures have also negatively impacted livestock rearing and the production of quality livestock-derived products. Farmers have observed an increase in pests, crop diseases, and weed infestations, which they attribute to the rise in temperature and irregular rainfall patterns. They reported specific challenges, including the increased incidence of aphids and caterpillar invasions in vegetables, as well as borer, leaf blight, and seed blight issues in rice plants. Consequently, farmers have had to invest more in weeding, chemical fertilizers, insecticides, pesticides, and irrigation to combat these problems (Martin, 2011).

Additionally, the study highlights a trend of male members migrating to Gulf countries in search of alternative livelihood opportunities. This migration has resulted in an increased overall workload for those left behind, leaving farmers, children, and the elderly in vulnerable situations as they cope with climate-induced hazards such as floods and landslides. The combination of economic strain and environmental challenges underscores the urgent need for adaptive strategies to support farmers in navigating these complex issues (Buisson, Clement, and Leder, 2022).

Impact of climate change on food security

Food availability:

1. **Agricultural Productivity**: According to 56% of respondents, climate change has resulted in altered precipitation patterns, rising temperatures, and extreme weather events, all of which adversely affect crop yields. Farmers indicated that these changes could lead to a decrease in the availability of local food supplies.
2. **Pest and Disease Proliferation**: Warmer temperatures have facilitated the spread of pests and crop diseases, posing further threats to

agricultural productivity and food security, as noted by 39% of respondents. A significant percentage of farmers reported that this increase in pests and diseases has negatively impacted food availability.

3. **Crop Diversity**: Due to changing local conditions, traditional crops have become less viable, prompting some farmers to shift toward monoculture practices. Only 5% of farmers indicated that this trend has contributed to a reduction in the overall availability of diverse food options.

Food Access:

1. **Economic Strain**: Climate-induced disruptions in agriculture have resulted in rising food prices, making it increasingly challenging for low-income households to afford nutritious food. As a consequence, 28% of households are struggling to access adequate food, contributing to food insecurity.
2. **Infrastructure Challenges**: A significant 72% of farmers reported that inadequate infrastructure, including poor transportation and limited market access, has hindered their ability to bring products to market. This issue has been further exacerbated by disruptions caused by climate-induced weather events.

Status of food sufficiency from their agricultural production

The survey results revealed that only 38% of farmers reported having sufficient food production from their agricultural activities, indicating a significant level of food insecurity among the farming community (Figure 4). The findings suggested an urgent need for targeted interventions and support systems to enhance food security and improve agricultural productivity for the majority of farmers in the region. Addressing these challenges will be essential for fostering a more resilient agricultural sector and ensuring sustainable livelihoods for farming households as pointed out by Adhikari, 1999.

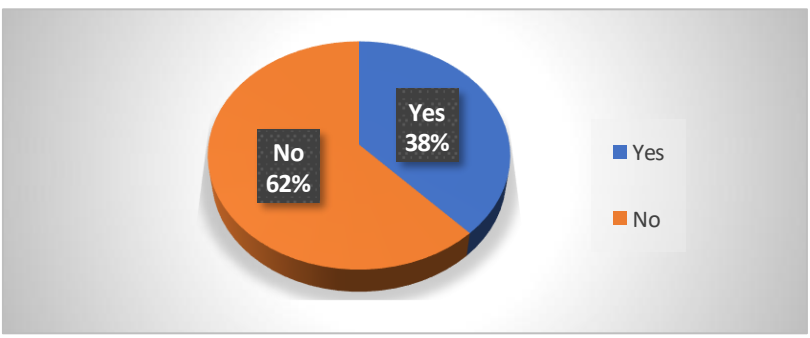
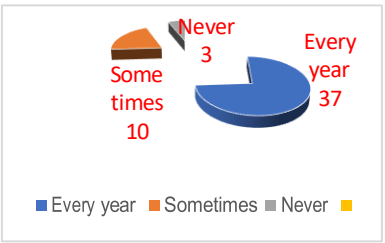


Figure 4. Status of food from their own agricultural productions

Status of problems of food shortage faced by the respondents

The majority of farmers in the study area were facing the problem of food shortage every year.



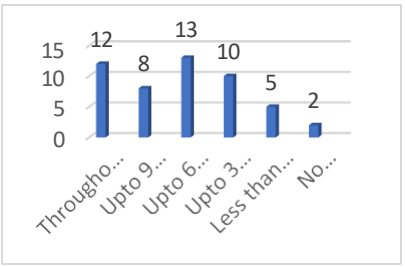


Figure 5. Problem of food shortage Figure 6. Status of food security among respondents

The survey results indicated that a significant portion of respondents experienced food shortages annually, with 74%, reporting consistent challenges in food availability. Additionally, 10 respondents (20%), indicated that they faced food shortages intermittently, while only 3 (6%), reported never experiencing food shortages (Figure 5) . These findings suggested that the majority of respondents in the study area were confronted with food insecurity on a regular basis, primarily stemming from insufficient agricultural production. To cope with these food shortages, many respondents resorted to purchasing food from the market, while some engage in labor worked to supplement their daily food needs. This reliance on external sources highlights the critical issue of food insecurity in the region, underscoring the need for targeted interventions to enhance local agricultural productivity and improve overall food access for the community (Chemjong and K.C, 2020).

Status of food security in the family of respondents

The percentage of respondents who had food security i.e food self-sufficiency throughout the year and up to 9 Months was 24% and 16%. About 26% respondents had food for six months, 20% respondents had food for 3 months, and for less than 3 months only 10% were secure. Similarly, only 4% of respondents had no agricultural production (Figure 6).

Major changes in agriculture production after the impact of climate change

There was major changes found in agriculture production after the impact of climate change in respected area. Some major changes were shift in crop patterns, water stress, vulnerability to pests' outbreak, extreme weather events and so on

(Table 1). These findings agree with those of Bhatta, Nepal and Rajbhandari(2024).

Table 1. Major changes in agriculture production

S.N.	Major Changes in agriculture production	%
1.	Shift in crop pattern	82
2.	Increased pest and disease outbreak	68
3.	Food insecurity	66
4.	Shortened growing season	23
5.	Reduced crop yield	48

Note: Total is more than 100% because of multiple choices

CONCLUSION

A study of 50 households in the Kathmandu district revealed several significant challenges related to demographics, education, agriculture, and land ownership. The average family size was 4.52, with a substantial portion of respondents aged between 38 and 48 years, reflecting a predominantly mature population. Agriculture emerged as the primary livelihood for most households, with only 8% of respondents engaged in occupations outside this sector, underscoring the critical role of agriculture in the local economy. Educational attainment among respondents was alarmingly low, with 40% classified as illiterate and only 14% having pursued higher education, indicating a significant gap in educational opportunities and access to knowledge. Land ownership was prevalent, as 68% of respondents owned land; however, the plots were generally small, which may constrain agricultural productivity and limit food security.

Furthermore, irrigation practices predominantly relied on water pumps and drainage systems, which could pose challenges for sustainable agricultural practices. The impact of climate change on food security was evident, with 56% of respondents noting that altered precipitation patterns, rising temperatures, and extreme weather events adversely affected crop yields, leading to decreased availability of local food supplies.

Additionally, 39% of respondents highlighted the proliferation of pests and crop diseases as further threats to agricultural productivity. Economic strain emerged as a critical factor, with 28% of households struggling to afford nutritious food due to rising prices driven by climate-induced disruptions in agriculture. Moreover, 72% of farmers reported inadequate infrastructure, including poor transportation and limited market access, hindering their ability to bring products to market. These findings underscore the necessity for targeted interventions to address educational deficits, enhance agricultural productivity, and improve access to resources in the community, thereby fostering sustainable development and strengthening food security.

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