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FARMERS' PERCEPTION AND ADAPTATION TOWARDS CLIMATE CHANGE ON VEGETABLE FARMING IN KATHMANDU DISTRICT

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ABSTRACT

Climate change is a global phenomenon and Nepal being an agricultural country is more affected by it. Vegetables are more sensitive to climate change and sudden rise in temperature as well as irregular rainfall at any crop growth stage can affect its yield. So, this study "Farmers' perception and adaptation towards climate change on vegetable farming in Kathmandu district" was performed from May to June, 2023 with an objective to know about adaptation strategies undertaken by the farmers to mitigate the impact of climate change and their perception towards climate change. A sample size of 100 respondent farmers was taken by using simple random sampling. The study revealed that 96% of total respondents were being affected by ongoing climate change and facing different natural hazards. So, to tackle such scenario, 86% of farmers were trying different adaptation strategy including mulching, drip irrigation, cultivation of vegetables in plastic tunnels, etc. to mitigate negative impacts of climate change. Climate change also influence the pest and disease occurrences, migration to new places, time of appearances. . The number of weeding for a crop in a season is increased from last few years. Farmers are using heavy chemicals as alternative to reduce the incidence of diseases and pests. Farmers are adjusting planting and harvesting times in response to climate change, affecting crop cycles. Disease and pest resistant and drought and adverse climatic condition tolerant varieties should be introduced to farmers by showing them its benefits. Farmers should be supported with the technical assistance related to disease, pests, and new practices like IPM and drip irrigation.

Key Words: Climate change, cultivation, mitigation strategy, vegetables

INTRODUCTION

Climate change refers to changes in meteorological conditions over decade and long-term periods (IPCC, 2014; Kaufman *et al.*, 2009; Travis *et al.*, 2018) and can have a negative impact on agricultural systems (Tesfahunegn *et al.*, 2016).

Agriculture is one of the important sectors of Nepal. It covers majority of the occupation that people are involved in. It is the basis of living for many people.

Climate change is one of the most challenging problems for agricultural country like Nepal. Changing temperatures and erratic rainfall pattern are affecting crop production in Nepal (Malla, 2008). Other changes in agriculture, such as loss of local land races of both crops and domestic animals, changes in cropping sequences, scarcity of water due to drying up of wells, and increasing incidences of disease and pest have also been noticed (Regmi and Bhandari, 2013). Climate change is expected to increasingly affect the livelihoods of farmers, especially those who are economically more vulnerable (Manandhar *et al.*, 2011). The problem of drought in the months of Kartik to Baisakh affects the planting time and growth of major crops of the country. All these factors lead to low production from agriculture sector and contributing to the vicious cycle of poverty among Nepali farmers.

The farmer's perception of climate change plays a vital role in developing mitigation and adaptation strategies for land use and farming activities (Mertz *et al.*, 2009) . In fact, some farmers in the Himalayan region successfully mitigate the impact of climate change by diversifying and rotating crops, adjusting planting times (early and late), and selecting crops suitable for the landscape and the time of year (Aase and Chapagain, 2017). Farmers' perception on climate changes and its impacts on the agricultural production have resulted in the adjustment of agricultural calendar and adoption of different adaptation strategies (Wl *et al.*, 2013).

Vegetable production is an important sector of Nepalese economy contributing around 9.71% to total Agricultural GDP (Paudel *et al.*, 2021). Climate change is adding problems in vegetable farming as farmers are unaware about adaptation of climate change mitigating factors. Therefore, a study was undertaken to figure out perception, impacts and determinants of climate change adaptation among vegetable growers of Kathmandu district.

MATERIALS AND METHODS

The study was conducted in Tarakeshowr Mucipality and Kageshowri manohara Municipality of Kathmandu District. Kathmandu lies between latitudes 27°32'13'' and 27°48'10'' north and longitudes 85°11'31'' and 85°31'38'' east. This area was purposely selected as this is the area with more vegetable farms in the district. Simple random sampling technique was used to select and collect the

information of the household. A well-structured questionnaire was developed to cover the study objectives. A sample of 100 households was collected from different areas of the Kathmandu district. Sampling was made as inclusive as possible to include households from different ethnic groups, different farm size, different economic status, and different vegetable production systems. Primary data were collected by directly visiting the respondents in each household of the study area.

The data collected from both primary and secondary source were analyzed quantitatively and qualitatively. The collected information from the household survey were analyzed using the Microsoft Excel.

RESULTS AND DISCUSSION

Source of livelihood of respondents

Among 100 respondents 62% were doing commercial farming, 35% were doing semi-commercial and the rest 3% were doing subsistence farming. Agriculture was found to be the source of livelihoods of majority of the respondents. It was

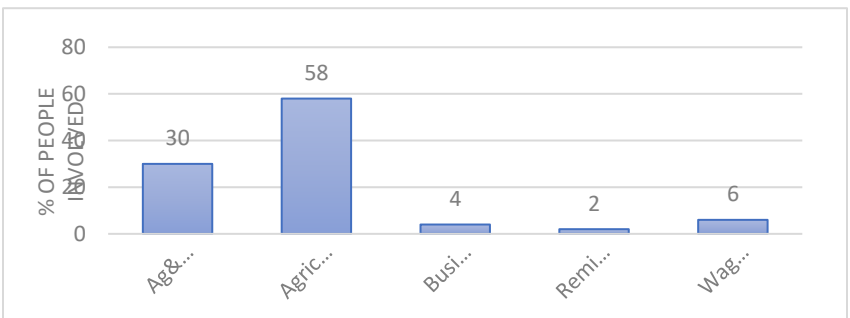

Figure 1. Source of livelihoods of the farmers at Kathmandu district

observed that 58% were dependent on agriculture, 30% in both agriculture and job, 6% in wages and agriculture, other 4% in business and agriculture both and last 2% in remittance and agriculture both (Figure 1).

Experience of living with Natural Disasters

Most of the respondents (96%) experienced natural disasters since they started to do agriculture. During this period, they encountered natural disasters like long season drought, extreme rainfall, hailstones, destructive winds, etc.

Farmers' access to training

According to the survey, it was discovered that just 11% of farmers have received training, while the remaining 89% had not undergone any training (Figure 2).

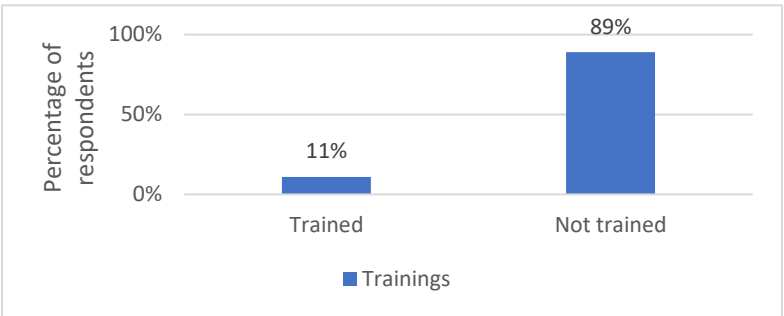

Figure2. Farmers' access to trainings in study area

Farmers' knowledge on climate change

Acquaintance with climate change

Almost all of the surveyed population had heard about the term 'climate change' but when asked about whether they understood what it meant, 82% stated 'yes'. Among them 51% knew about it from media, very few conscious farmers (30%) got knowledge of climate change through self-study and 1% respondent knew about climate change from organization. Similarly, 18% of the respondent didn't have any idea about climate change (Figure 3). Likewise, out of 38% male respondents 35 % have knowledge about climate change and out of 62% female respondents 47% have knowledge about climate change. Also, overall male (92%) respondents knew climate change to some extent then female (75%).

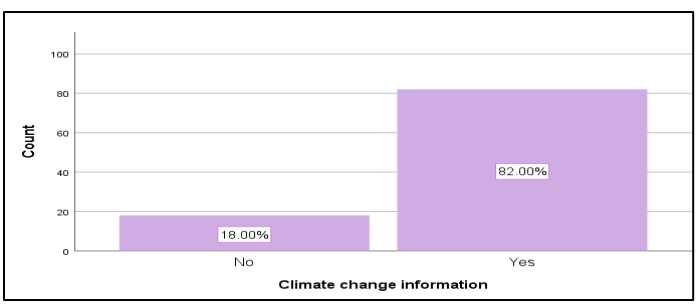

Figure 3. Respondents' understanding of climate change

Perception of farmers towards various impacts of climate change

According to survey, most of the respondents (93%), perceived that timing of rainfall is changed, which aligns with data from the DHM. Uneven rainfall caused huge loss in vegetable crops. It helped to develop many diseases.

Similarly, most of the farmers (86%) perceived that drought period is increased from last few years. Majority of respondents thought that there is decrease in frequency of hailstones, 76% perceived about decrease in frequency of hailstone

Majority of survey area was near river basin, so most (60%) of the farmers perceived that there is no change in water availability. But some conscious farmers (40%) thought there was decrease in water level in rivers. Some farmers faced problem of water scarcity due to drying wells and boring in long drought period.

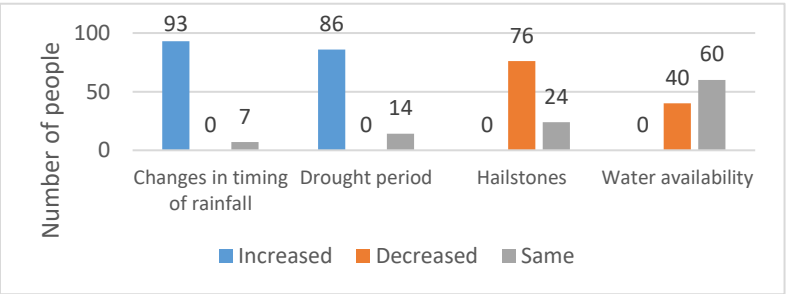

Figure 4. Perception of farmers towards various impacts of climate change

Perception of farmers towards number of hot days

The survey revealed that 82% farmers perceived increase in number of hot days. Whereas, 18% thought there was no change in number of hot days.

According to farmers, sudden increase in temperature affects vegetables adversely in the stage of fruit development. High temperature affects seed germination, plant growth, flower shedding, pollen viability, fruit setting, fruit size, fruit weight, fruit quality and color too

Impact of climate change on crop productivity

Based on field survey on impacts of climate change, 54% farmers thought that crop productivity is decreasing but 24% farmers said that yield is increasing and remaining 22% perceived that crop productivity is same.

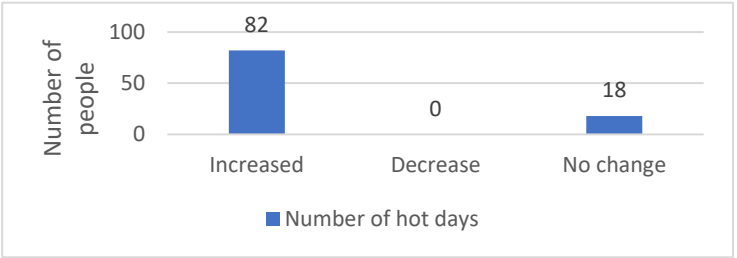

Figure *5*. Perception of farmers towards number of hot days

Impact of climate change in number of weeding

The incidence of weeds has been on the rise over the past few years, leading to an increase in the need for weeding. According to survey the number of weeding for a crop in a season is increased from last few years. 68% of farmers are now performing weeding 2-3 times more than usually they did in the past.

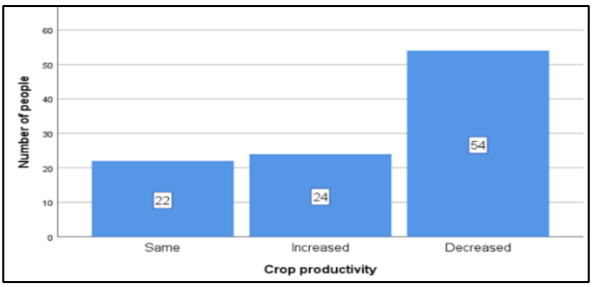

Figure 6. Crop productivity of respondents

Impact of climate change in planting time of vegetables

According to the survey, climate change had forced majority of farmers to shift (15-20 days) planting and harvesting times. Among all farmers, 63% and 26% cultivate vegetables early and late than usual practice, respectively.

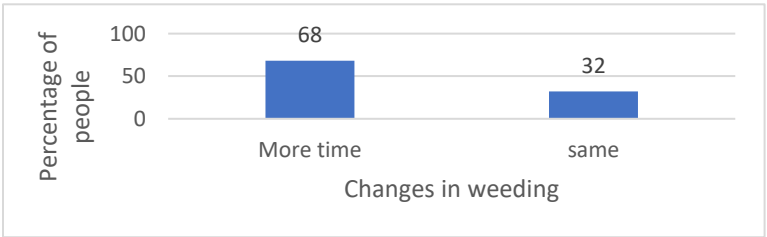

Figure 7. Changes in number of weeding

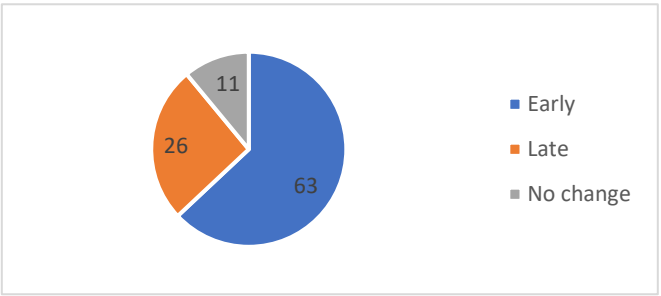

Figure 8. Impact of climate change in planting time of vegetables

Impact of climate change in harvesting time

Unusual weather pattern due to climate change had forced farmers to alter harvesting time, 42% of farmers made delayed harvest whereas 37% harvested earlier than usual practice. Very few respondents (21%) harvested vegetables at usual time.

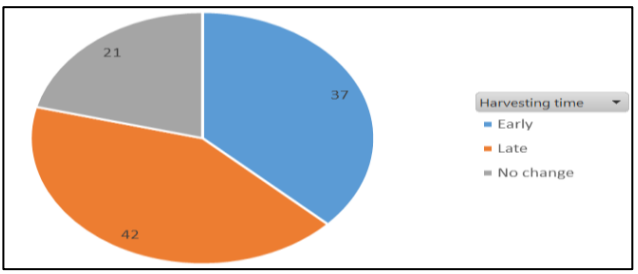

Figure 9. Impact of climate change in harvesting time of vegetables

Impact of climate change on cucurbits and solanaceous vegetables

Climate change has affected all types of vegetable farming. Cucurbits and solanaceous vegetables were most commonly grown at the time of survey. So, farmers were asked about impact of climate change on cucurbits in comparison

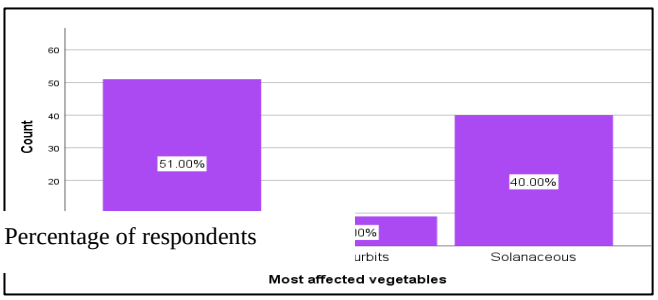

Figure 10. Farmers' perception on impact of climate change on cucurbits and solanaceous vegetables

with solanaceous vegetables. According to survey, majority of farmers (51%) perceived that both type of vegetable farming are affected equally due to climate change. 40% respondents thought that solanaceous vegetables are more affected due to climate change. Very few (9%) farmers thought that cucurbits are more affected due to climate change.

Incidence of disease and pest due to climate change

Climate change parameters had direct impact on the development and distribution of pests and diseases. Due to uneven rainfall and high temperature various types of diseases were increased in the study area. According to respondents, incidence of disease like powdery mildew, downy mildew, late blight, early blight, damping off, leaf curl disease and mosaic virus is increased.

Similarly, incidence of pest like white fly, aphids, fruit fly, red spider mite, red pumpkin beetle and thrips is also increased since few years due to increased temperature and uneven rainfall. Farmers used bio pesticides to reduce disease and pest infestations but they have not yielded desired results. So, they are using heavy chemicals as alternative to reduce the incidence of diseases and pests. Farmers turn to these chemicals as a means to protect their crops from devastating infestations that can result in significant yield losses. But when inquiries were made about the use of disease and pest resistant and adverse climatic condition tolerant varieties, no one reported using them.

Adaptation towards climate change

During the survey the respondents were asked about the thought of minimizing the climate change effects. 86% farmers are trying to adapt different measures. 90% of farmers are using tunnels for shading due to unusual weather pattern. Water conservation principle using drip irrigation system and mulching was adopted by more than 50% farmers.

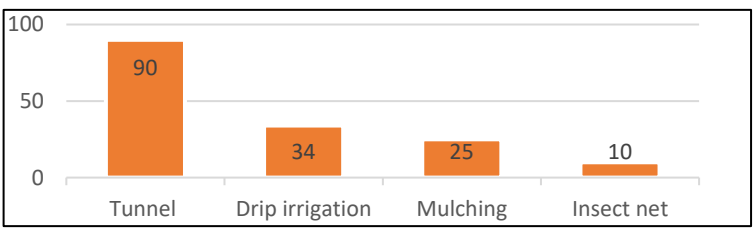

Figure 11. Farm assets of the respondents for adaptation of Climate Change

Some of the adaptation measures followed by farmers are mulching, drip irrigation, intercropping and crop rotation, changes in planting time, use of organic fertilizer, insect net, shading, shifting the time of planting. These adaptation strategies helped to increase crop yield, reduce cost of cultivation also

by having positive impact on increasing climate change. Respondents in study area were doing off-season vegetable farming

Another crucial adaptation strategy employed by farmers in response to high temperatures and erratic rainfall is the alteration of planting and showing time for vegetables. So, farmers are adjusting their vegetable planting schedules to align with shifting climatic conditions.

Vegetable growers applied animal manure to restore soil fertility. They are using chemical fertilizers by combining organic fertilizers too. They are also using micronutrients to increase productivity. They are doing crop rotation with legumes. Coriander, broad leaf mustard, were intercropped with main crop like tomato which also helps as a compensation for major crop failure and provides extra income too.

CONCLUSION

This study conducted in Kathmandu district revealed that agriculture served as the primary livelihood source for 58% of the respondents. Middle-aged farmers (36-45 years) were showing the highest level of activity. Overwhelming majority of the respondents experienced climate change impacts and natural hazards. To mitigate these impacts, 86% of farmers employed adaptation strategies such as mulching and drip irrigation, addressing issues arising from increased hot days, prolonged droughts, and shifting rainfall patterns.

Furthermore, common issues of yield decline included diseases like powdery mildew, blight, damping-off, and pests such as fruit flies, whiteflies, and aphids. Farmers were adjusting planting and harvesting times in response to climate change variability affecting crop cycles.

Climate change exerts a negative influence on vegetable production and farmers' livelihoods. Major challenges included drought, erratic rainfall, high temperatures and drought, and insect / pest infestations.

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