

**Climate Change Impacts on Bats, Chiuri and Chepang of
Nepal: Indigenous Knowledge Assessment and Sustainable
Intervention for Livelihood**

Final Project Report

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1. Introduction

In a recent study on climate change and its impacts (Bathiany et al., 2018), it has been stated that poor countries are not only predicted to experience an increase in temperature but also to suffer from higher variations. Present temperature fluctuations have already shown negative impacts in the agricultural economy in various parts of the world and wildlife in particular has been driven to extinction due to the consequences impelled by climate change. Such scenarios could be hard-hitting for developing countries that rely heavily on natural resources for daily livelihoods. Nepal is one among such countries where agriculture has been the main occupation for a long time, and this makes the country's economy extremely sensitive to climate variability. To make it further complex, the country also has the Himalayas that isn't suffering any less from climate change due to deglaciation, causing growth of glacial lakes and annual flooding catastrophes (Shrestha & Aryal, 2011).

Climate variability becomes a challenge to human livelihoods and evidence suggests that the rural communities in developing countries are expected to affect more (UNFCCC, 2009). Communities in these areas depend heavily on climate sensitive livelihood options around their natural resources and this highly affects the communities' livelihoods. Indigenous communities in the fragile geography of rural Nepal are even more vulnerable not only for livelihood, but also threatened with natural disasters. The Chepang are one of the indigenous, semi-nomadic communities, inhabiting the south-central part of Nepal that covers parts of Makwanpur, Dhading, Chitwan and Gorkha districts of Nepal (Sapkota & Uranw, 2013). They practice animism and shamanism, crediting shamans for any important cultural practices in their community (Manandhar, 2004). The community has been listed as a highly marginalized ethnic group by Nepal Federation of Indigenous Nationalities (NEFIN), based on their literacy rate, land holdings, education and population size (CBS, 2001). In recent years, the community has shifted from a semi-nomadic lifestyle to permanent settlement. Traditionally, the community practiced 'hunter-gatherer' culture and have only recently started practicing agriculture (Sapkota & Uranw, 2013). Archery was known to be their major weaponry, while clearing and burning was their primitive method of agriculture along with hunting of bats and fishes were their major practices (Sapkota & Uranw, 2013).

The Chepang community share a very sensitive bond between the Chiuri plant (*Diplokenema butyracea*) and the fruit-eating bats that work as its main pollinator. Chiuri is an important plant used by this community for health benefits, food resources, fertilizers and fodder. Honey from its flowers is a popular source of sugar and regarded as beneficial for health. Oil extracted from its seed is also used to cure different kinds of skin diseases and cooking purposes as well. Moreover, the plant holds

traditional cultural significance in the community since daughters are given this plant as dowry. The Chepang people use traditional methods to hunt bats on occasion for food. However, the recent shift in the trend of serving bat meat as a delicacy in nearby markets has pressured the bat population in the community. The decrease in fruit-eating bats leads to decrease in pollination of Chiuri flowers and low production every year. Climate change has been speculated to be one contributing factor to this decline and has affected the community's socio-economic and socio-ecological elements.

2. Objectives

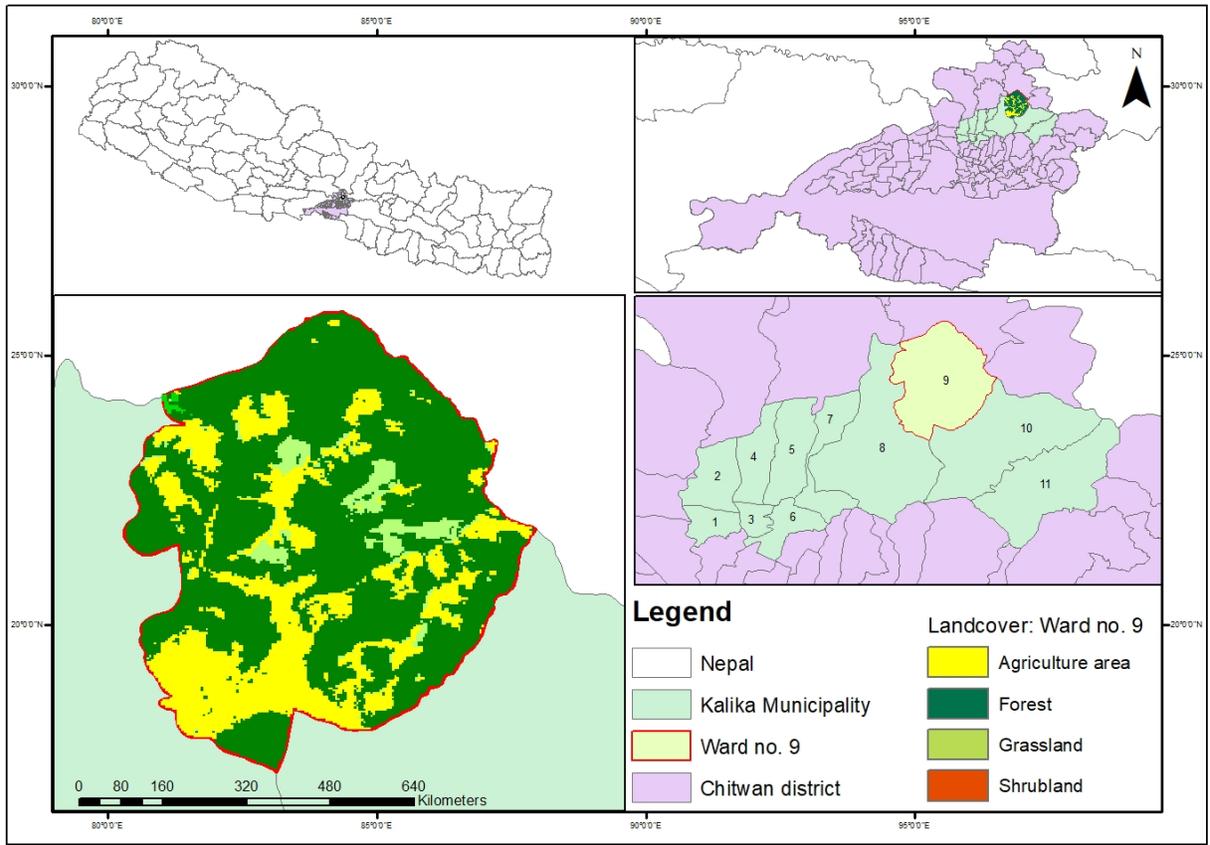
The inter-relationship between the plant, mammal and the community are in a delicate balance that is increasingly threatened by climate and environmental changes. The aim of the project hence is to assess the knowledge of climate change on Chepang people, and the impact change has brought to the communities' relationship with bats and chiuri plants.

The objectives are:

- Assess the Chepang community's knowledge on climate change, status of bat population and chiuri production in Shaktikhor, Chitwan.
- Spread awareness of climate change impacts in the natural environment due to climate change in the Chepang community of Shaktikhor, Chitwan.
- Propose a sustainable intervention for livelihood for the Chepang community in Shaktikhor, Chitwan

3. Study Area

The study was conducted in Shaktikhor Village Development Community (VDC) in Chitwan District in Province number 3 of Nepal. Province 3 is one of the 7 provinces of Nepal established by the country's new constitution declared as of 2015. The province is mostly hilly and mountainous and covers about 14% of the country's total area and has forest patches of deciduous, coniferous, alpine and woodland forests. Chitwan District is known to be particularly rich in flora and fauna, housing Nepal's first national park: Chitwan National Park and supports species diversity of rare mammals like Bengal Tiger, Gharial, Asian Rhinoceros and more. The people inhabiting the district are predominantly farmers focused on cultivating mainly cash crops.



Around 26km north of the National Park is situated the project site: Shaktikhor VDC. The area extends from 300 to 2500 meters in altitude and experiences a tropical to subtropical climate (Rijal, 2010). Three overall forest types are present in the area, namely: Sal (*Shorea robusta*), mixed broadleaved and pine forests. The area has a small population of wildlife, including barking deer (*Muntiacus muntjak*), jackals (*Canis aureus*), rhesus monkey (*Macaca mulatta*) and common langur (*Semnopithecus schistaceus*) (Rijal, 2010). Bats are prominent in the community as they not only act as food source for the indigenous community but play a vital role in pollination of the Butter Trees.

4. Methods and Materials

The study was based on primary data collected by questionnaire surveys conducted within the Chepang community of Shaktikhor, Chitwan.

4.1 Sampling

Using cluster random sampling method, random selection was done to select local people of the Chepang indigenous group from the project area. 200 adults between age 18 to 70 of male and female groups were selected for the questionnaire survey. 10-12 participants were selected for focused group discussion (FGD).

4.2 Data Collection

Questionnaires and FGD were conducted with people from Chepang communities from Shaktikhor community. Closed, semi-structural questions were contextualized for questionnaires that related to the local social, cultural and physical environment. Draft of the questionnaire survey was tested prior to field visit. Issues regarding climate change, knowledge about the changing climate and their impacts on the dynamic of bat population and butter tree production was included too.

For FGD, participants from previous questionnaire surveys were selected through stratified random sampling methodology. The participants were from the male, female groups of the local population. The discussion focused on the use of chiuri plant in Chepang community, causes of loss in chiuri production in recent years, causes of loss in bat abundance in the forest, changes in weather and climate experienced in the community and alternative livelihood options that can benefit both chiuri and economy of the community.

4.3 Awareness Programs

Awareness program about local climate change issues, inter-relationship between chiuri, bats and the community through talks, discussion and posters were conducted within the participants involved in both questionnaire survey and FGD. The information discussed also focused on the gap of knowledge found through data collection conducted earlier in the project.

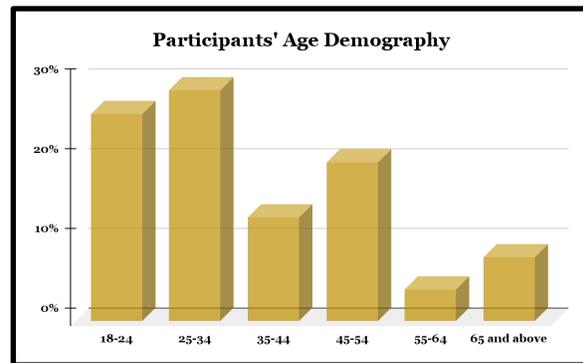
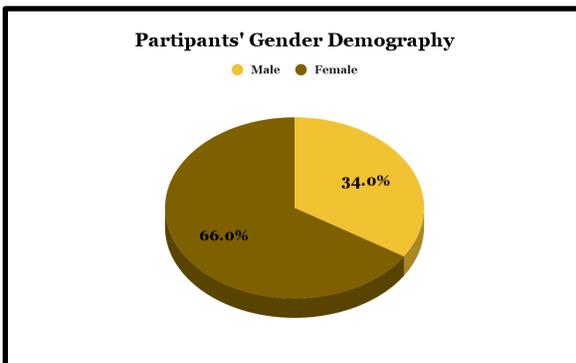
4.4 Capacity Development Program

From the discussion conducted with Chepang people and local authorities, beekeeping was selected as the most suitable program to enhance Chepang community's capacity. 10 participants were involved in the program.

5. Results and Discussion

5.1 Demography

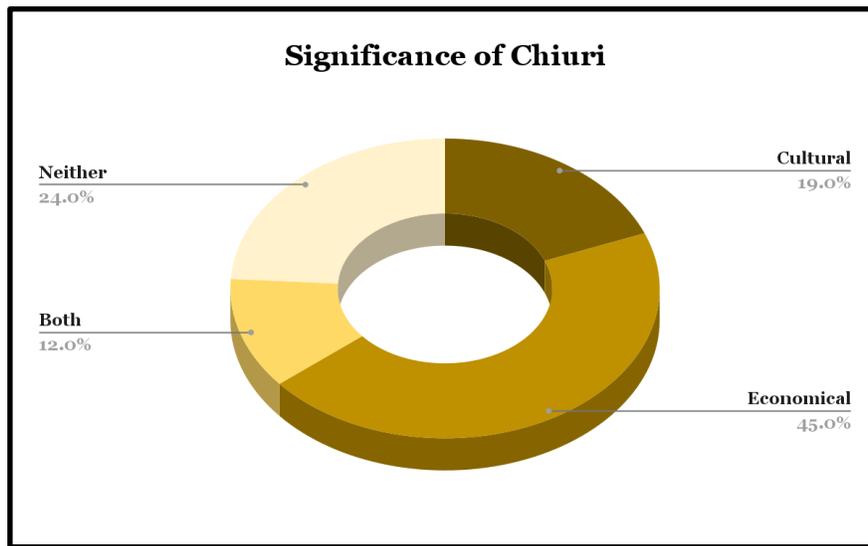
The demographic characteristics of the respondents were surveyed through participants' gender, age group, education and occupational status. Out of the total participants, 34% were male and 66% were female. The participants' age were divided into various groups: (i) 18-24, (ii) 25-34, (iii) 35-44, (iv) 45-54, (v) 55-64 and (vi) 65 and above. The diagram illustrated shows that the majority of participants belonged to the second age group i.e., 25-34.



The survey also found that the majority of people depend on farming for livelihood. However, discussion gave information that farming wasn't enough to fulfill their livelihood necessity for half of the year and many depended on labour work to meet ends in the family. The majority of the participants were also educated only till primary school and very few had gained higher secondary education. Observation showed that early marriage was a custom practiced by Chepang and this could've been one factor that affected their education.

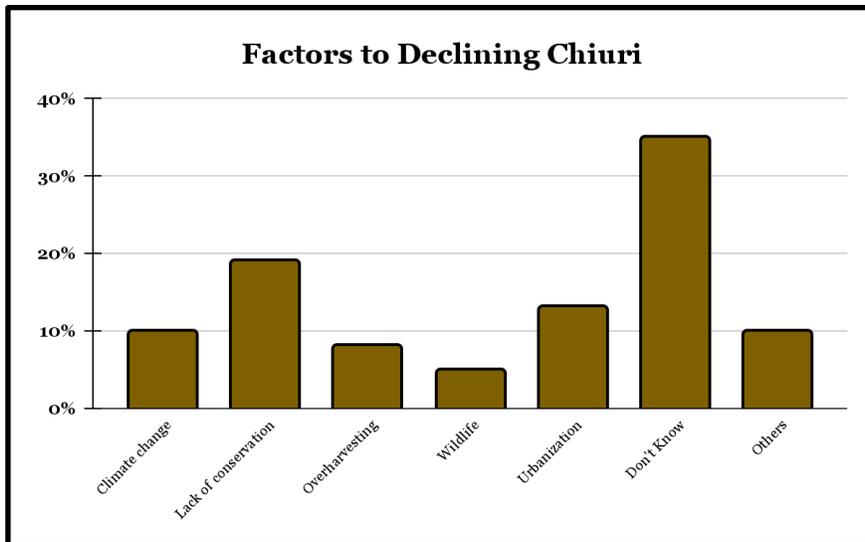
5.2 Chepang and Chiuri

Questionnaire survey and FGD showed that 45% of participants agreed that chiuri was economically significant to their livelihood. 19% of the participants responded the plant to be culturally significant in their household whilst 12% responded both. The plants flowered around November-December and fruits would ripen around May-June. Around July-August, the seeds would fall, and the fallen seeds were collected by Chepang people that would then be taken to market to be sold. The seeds were bought by traders that would be used to make different cosmetic products like soaps, shampoos and creams.



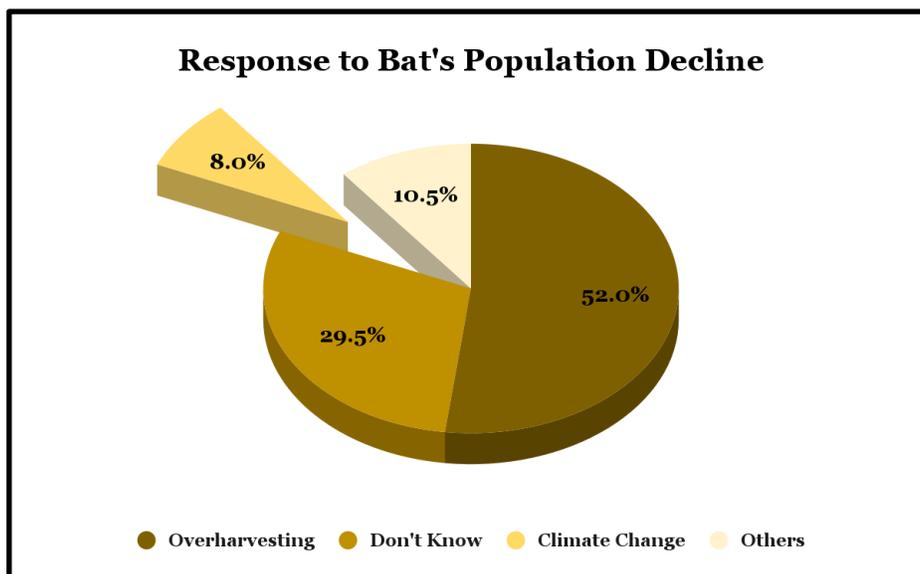
Many households depended on that income for livelihood. Some would collect the seeds and press them to make different household materials like oil and ghee. They would then be used to cook vegetables in the family. The leftovers of the seed would be used as fertilizers in their crops. Many young participants however weren't much familiar with the process of pressing chiuri seeds and although they knew the cultural significance of the plant, depended heavily on market products for cooking.

Majority of the participants responded that they had observed a decrease of chiuri production in the forest and it had affected some households' income. However, while few mentioned lacks conservation and urbanization, many didn't know what could be the factor to this decline.



5.3 Chepang and Bats

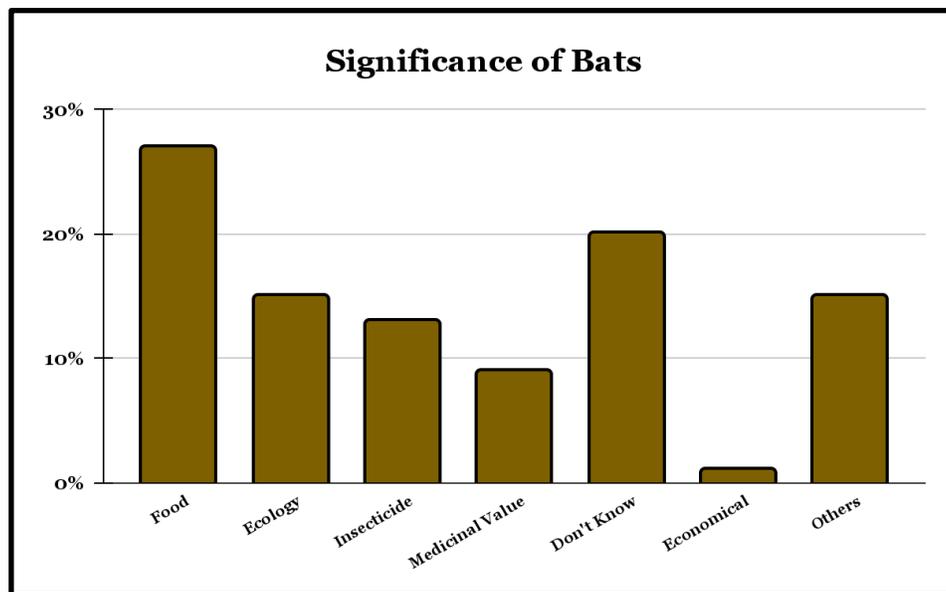
The survey study with the participants showed that there had been a decrease in bat sighting locally and many believed this to have been a pattern since the last 5 years. Only 8% of the participants believed the reason for the bat's population decline to be due to climate change whereas the larger population believed overharvesting to be the major reason for the decline of bat population in the area.



Discussions pointed out that Chepang still hunted for bat's meat, but mostly did it with traditional techniques that were passed down for generations. However, commercial hunting had been quite impactful in the population of the fruit-eating bats as many participants responded. Participants agreed

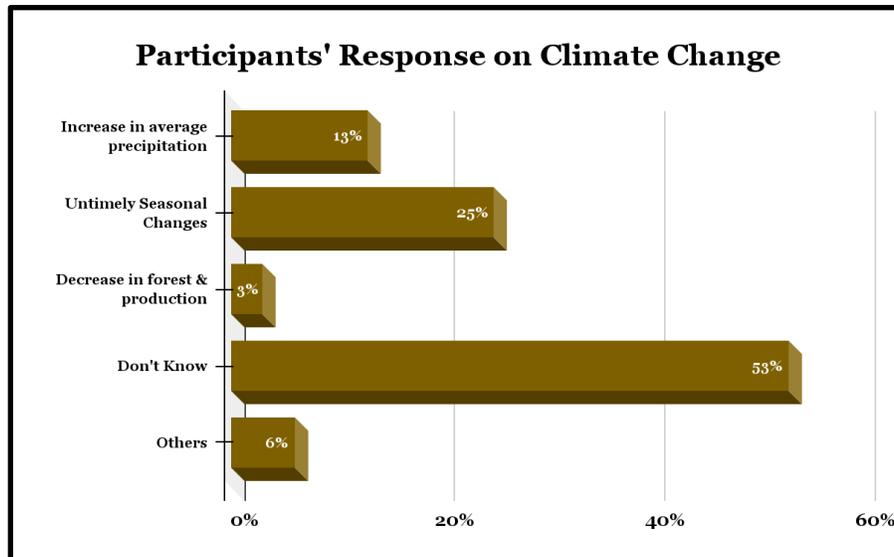
that more people were interested in tasting bat meat, and they would hunt bats to sell them in the market to people who came from different places. Most importantly, bat meat was believed to cure diseases and this information was enough to lure people.

Questions were asked regarding the significance of bats to the Chepang community, and the majority participants answered food. Few had mentioned its importance for the ecology, but almost 20% of the participants didn't know if bats had any significance at all. This was quite alarming because fruit-eating bats play an important role in chiuri production. Gap of knowledge to the main pollinator to their significant plant could lead to an even more imbalance of population in the future. The Chepang community hence need to be made aware about the importance of bats in the environment and they must understand the relationship they have with chiuri.



5.4 Chepang and Climate Change

Among the surveyed participants, more than half didn't know about climate change. Those who did know, had only briefly heard about it in workshops they had previously attended, but they didn't know how to explain the concept, or had forgotten about it. The mostly used terms to describe climate change were "increase in average precipitation" and "untimely seasonal change." Being a marginalized community, Chepang people must be made aware about the phenomena and awareness about the topic should reach them. Moreover, they must also be taught resilience against climate change and its impacts.



6. Conclusion

Most of the respondents were aware of the interrelationship their community has with chiuri, but fewer in comparison knew about the role bats play in the flowering and pollination of the plant. Similarly, the community has started to become less dependent on the traditional methods and have been more influenced by market products for cooking and household purposes. In fact, most of the younger generations weren't aware of the importance of chiuri in their community and there were mostly respondents from older generations who spoke about the role the plants had in their culture. Participants were eager to learn more about the importance of bat in the ecosystem, impacts of climate change and more awareness could enhance the community's involvement in conservation of bats.

7. Limitation

The COVID-19 pandemic hit Nepal in between the project implementation and the government announced national lockdown from March 2020 until July 2020. After almost 4 months of strict lockdown, things were just about to ease, but open borders of the country brought a rise in infected people and the virus spread like wildfire, especially in the Kathmandu Valley. The second lockdown was announced in August 2020 and lasted till the end of September 2020. At such times, it was difficult to not only travel to the field to implement remaining action plans, but also plan ahead since everything seemed extremely unpredictable. Only from November 2020 were the travel restrictions loosened. However, it was risky to engage a large group of people. Hence, with much planning, the final parts

of the project were implemented in January 2021 among a limited number of participants. This unexpected challenge became the biggest limitation for the project to run smoothly.

8. Recommendation

Despite COVID-19 and its many restrictions, the community actively participated in the project activities and women especially were interested to be a part of the capacity development workshops. However, perception of bats post-COVID must be measured as the pandemic has publicly brought negative attitudes against bats in different media. This will challenge conservation efforts on bats. Similarly, it is also important to highlight the ecological importance of these small mammals in the Chepang community along with the larger public to mitigate threats against them. Their interrelationship with chiuri plants and Chepang community for preservation of culture and biodiversity must be highlighted not only through scientific research and articles, but in general media as well. This should also reach a larger group of Chepang community as it is an important part of their culture.

8. References

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Shrestha, A.B., Aryal, R. (2011) Climate change in Nepal and its impact on Himalayan glaciers *Regional Environmental Change* 11: 65-77

CBS (2001) Population Census 2001 National Planning Commission, Kathmandu, Nepal

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9. Photo Appendix



Questionnaire survey with the community



FGD with the community on one occasion



Participants in awareness program



Participant in capacity development program

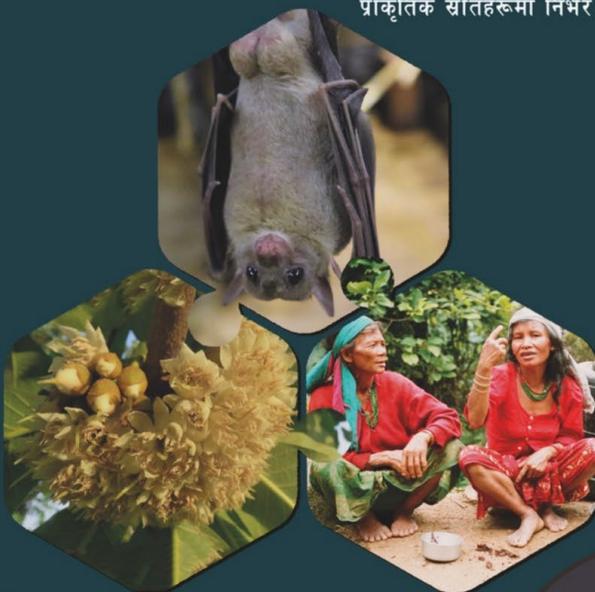


Participants in capacity building program

चमेरा, चिउरी र चेपांग

जलवायु परिवर्तन भनेको औसत मौसम ढाँचामा दीर्घकालीन परिवर्तन हुनु हो, जसले गर्दा मौसमको ढाँचा अप्रत्याशित हुन जान्छ । जसले अनपेक्षित तापमान र वर्षाको कारण बालीनाली जोगाउन र उब्जाउन गाह्रो बनाउन सक्दछ ।

जलवायु परिवर्तनको प्रत्यक्ष प्रभावको अनुभव गर्नेहरुमा जनजाति समुदाय अगाडी पर्दछन् । जलवायु परिवर्तनले उनीहरुको जीविकोपार्जन, संस्कृति, पहिचान र जीवनशैलीलाई गम्भीर खतरामा पार्छ किनभने जनजाति समुदायहरु प्रायः वातावरणसँग नजिकको सम्बन्धलाई कायम गरेर आफ्नो जीविका र परम्परागत उद्देश्यहरुको लागि प्राकृतिक स्रोतहरुमा निर्भर छन् ।



चेपांग समुदायको चिउरी र चमेरासँग अति संवेदनशील सम्बन्ध छ, जहाँ चमेराले चिउरीमा परागसेचन गर्न महत्वपूर्ण भूमिका राख्दछ ।

फलफूल खाने चमेराहरु चिउरीको मुख्य परागसेचन कर्ता हो, तर

यी स्तनधारी प्राणीहरुको झिकार गर्दा चिउरीको परागसेचनमा कमि आई उत्पादन घट्छ । जसले गर्दा चिउरीका रुखहरु कम मात्रामा उम्रन्छन् र वन क्षेत्र पहिलो, बाढी, भू-क्षय जस्ता जलवायु परिवर्तनका प्रकोपको चपेटामा पर्दछ ।

विभिन्न जलवायु परिवर्तनको प्रकोपबाट जंगललाई जोगाउन र वनमा चिउरीको उत्पादन बढाउन फलफूल खाने चमेराको संरक्षण गर्नु आवश्यक छ ।

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