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Article

Tharu community's perception on climate changes and their adaptive initiations to withstand its impacts in Western Terai of Nepal

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This paper brings out perceptions and observations of Tharu communities (Rana and Chaudhary), inhabitants of Shakarpur VDC of Kanchanpur and Gadariya VDCs of Kailali on climate change and its impacts on their livelihood strategies over the years. In addition, the paper explores some initiatives taken by the local communities to minimize its effects and impacts. Focus Group Discussions (FGD) were organized to collect and analyze vulnerability contexts on climate change and its impact on various sectors like, agriculture, forest, livestock, biodiversity, infrastructure, human casualties and water sources. Similarly, information on available service providers and their contribution was garnered through secondary sources. Local communities are facing these changes over the time and adapting strategies as per their own traditional knowledge, skills and information. Most of these strategies are biodiversity friendly, economically viable and socially acceptable. However, these innovative steps should be shared for larger scale dissemination after validating with scientific review and justifications.

Key words: Tharu community, climate change, adaptation, perception, innovation.

INTRODUCTION

Nepal is one of the least developing countries (LDCs) based on defined criteria for LDCs that is, low income, human resource weakness and economic vulnerability with only US$ 210 GNP/capita (Huq et al., 2003). Also, it is amongst the most vulnerable to the adverse impacts of human induced climate change in future, as poor people are highly vulnerable to climate change impact and they have lowest capacity to deal with it (LI-BIRD, 2009). It is therefore, essential to develop coping and/or adaptation strategies to deal with such adverse impacts and also to ensure that such adaptation measures are suitable to wider dissemination and important for climate change policies in line with existing national and sectoral development activities. In this background, Nepal ratified United Nations Framework Convention on Climate Change (UNFCCC) in 1994 in order to take actions against climate change and its impacts in country.

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Nepal's temperature is increasing at a high rate 0.06 degree Celsius per year compared to the world scenario (GON/MOE, 2066 B.S.). Grass root communities are also experiencing this increment and also facing extreme weather events such as erratic rainfall, longer droughts, landslides, floods both in terms of magnitude and frequency that ultimately leads to climate change impacts in their daily life mostly in the field of agriculture, forestry and natural resource management. At this juncture, they are coping and adapting these impacts based on their prevailed traditional knowledge, skills and experiences. Such farmers' adaptive innovations, techniques, methods and processes based on their own knowledge, skills to lower down or to prevent from devastating climate change impacts are location specific and community specific. These innovations should be documented and disseminated so that other communities from distant locations should get benefits from these adaptive initiations.

Tharu community, an indigenous community living in Terai Landscapes, is well known for their traditional skills

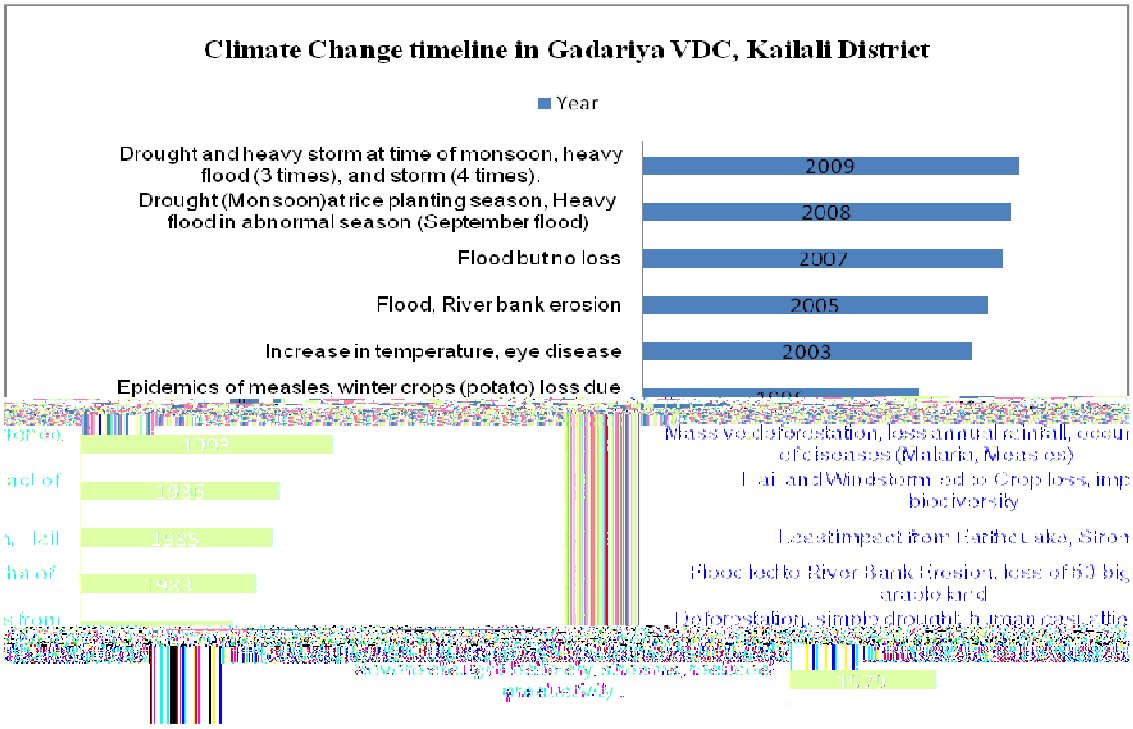

Figure 1. Climate change trend for Gadariya VDC of Kailali district.

and knowledge. Tharus are the people adapted in this region even at the time of severe Malaria outbreak throughout the region in 1950s. With this historical evidence, a study was carried out to gather the perceptions of this community on climate change and also to understand their traditional innovations in order to adapt climate change impacts in two locations of Western Terai Landscapes viz. Gadariya VDC of Kailali district, as dominated by Chaudhary tharu and Shankarpur VDC of Kanchanpur district, as dominated by Rana tharu.

METHODOLOGY

This study used the participatory tools and methods in order to generate qualitative and quantitative information about climate change impacts and community based adaptation strategies to climate change. Primary information was acquired using focus group discussions (FGDs) with farmers, members of Biodiversity Conservation and Development Committee (BCDC) and CFUGs. One day focus group discussion was carried out in each village. Each meeting was attended by over 50 participants and share their views and experiences in an informal environment. During FGD, participatory tools like matrix ranking (impact of risks and disasters vs. livelihood assets), timeline (for identifying major events and frequency of occurrence) and local knowledge documentation (documenting local knowledge, technology and practices related to coping and adaptation strategies) were applied. In addition, quantitative data related to crop losses, climate change impacts on different sectors were collected through key informant interviews and weather data were collected from district weather station. Gender, age, social position and income of respondents were considered during the process. Information gathered were analyzed and tried to validate with scientific reviews and justifications.

RESULTS AND DISCUSSION

Climate risk and hazards

Past and current climatic stresses and frequencies of such stresses were analyzed using timeline over the 30 years. These subjective perceptions of farmers revealed that how the communities are affected by climate stresses over the years. According to respondents, climate risks and hazards are increasing in terms of magnitude; frequency and severity of impacts are high as compared to past events.

While discussing and drawing timeline with community in both localities, almost 90% of the respondents perceived that risks and uncertainty of the climate has increased. The timeline showed that occurrence of climatic stresses like flood, drought, river bank erosion, windstorm and hail increased in recent years as compared 25 - 30 years back, even drought and 2 - 3 times flooding in a single season.

Based on timeline; flood, drought, river bank erosion, hailstorm, windstorm and hail were seen as most prominent climatic stresses in the studied sites (Figures 1 and 2). Among them flood, drought and river bank erosion were common in both sites, but differences in their intensity. In Gadariya, drought is more prominent as it comes in first places while ranking among farmers and

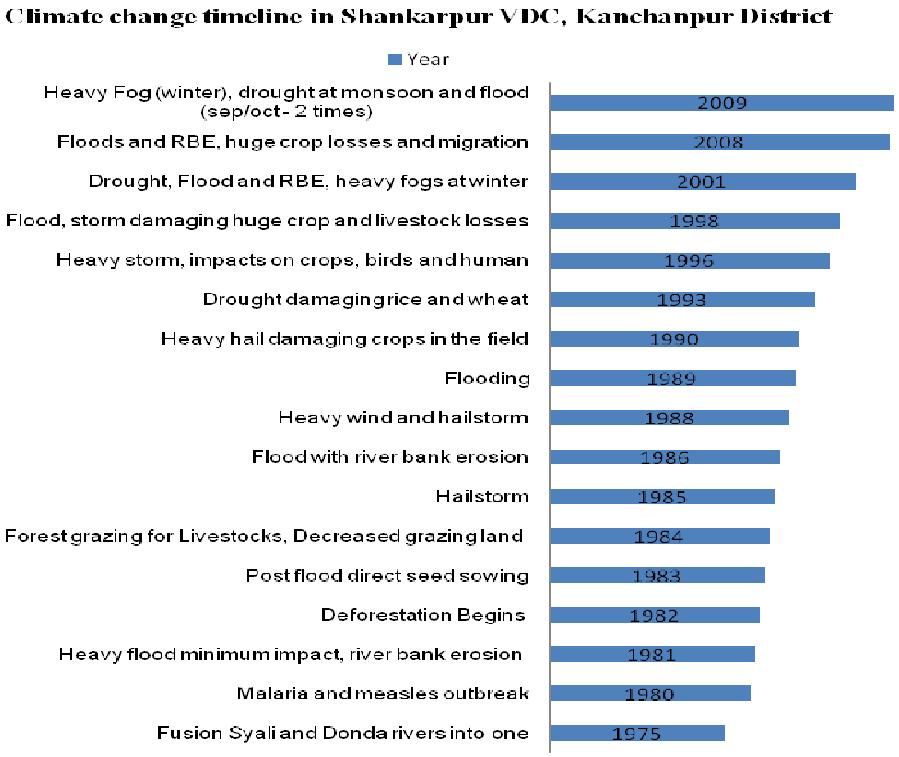

Figure 2. climate change trend of Shankarpur VDC of Kanchanpur district.

Table 1. Climatic risks and hazards seen in Gadariya, Kailali and its impacts on different vulnerability sectors.

Threats /Sectors	Agriculture	Livestock	Forest	Human Casualties	Infrastructures	Water sources	Total	Rank
Flood	4	2	3	1	2	4	16	3rd
River bank erosion	4	1	3	-	2	-	10	5th
Drought	4	4	4	4	3	3	22	1st
Frost	4	3	1	3	1	2	14	4th
Storm	4	2	4	2	4	2	18	2nd
Earthquakes	1	1	1	-	3	-	6	6th
Epidemics	2	4	1	4	-	3	14	4th
Total	23	17	17	14	15	14		
Rank	1st	2nd	2nd	4th	3rd	4th		

1-low/no impact, 2-medium impact, 3-high impact, 4-severe impact.

community (Table 1). But in case of Shankarpur, flood is more severe than drought (Table 2). Farmers observed long term drought at time of monsoon which affect on late transplanting of rice in year 2008 and also 2 - 3 times flooding at September and October due to abnormal heavy rainfall for 4 - 5 days, which impacted huge losses in agriculture, livestock, forest, water resources, infrastructures and even lead to human casualties. Agriculture is the mostly impacted sector in both sites, as more than 95% of the people engaged in this sector for their subsistence in the studied sites, which is followed by livestock, forestry, infrastructure, human casualties and water sources.

Observed climate change impacts

Impacts on biodiversity and livelihoods

Impact on agriculture: Agriculture is central to human

Table 2. Climatic risks and hazards seen in Shankarpur, Kanchanpur and its impacts on different vulnerability sectors.

Threats/Sectors	Agriculture	Livestock	Forest	Human casualties	Infrastructures	Waters sources	Total	Rank
Flood	4	4	2	1	1	1	13	1st
Riverbank erosion	4	1	4	1	1	1	12	2nd
Hailstorm	4	1	1	-	1	-	7	5th
Drought	3	1	1	1	-	1	7	5th
Wind Storm/d	1	1	4	2	2	-	10	4th
Epidemics	1	3	1	4	-	1	10	4th
Heavy fog	4	4	1	2	-	-	11	3rd
Total	21	15	12	11	5	4		
Rank	1st	2nd	3rd	4th	5th	6th		

1-low/no impact, 2-medium impact, 3-high impact, 4-severe impact.

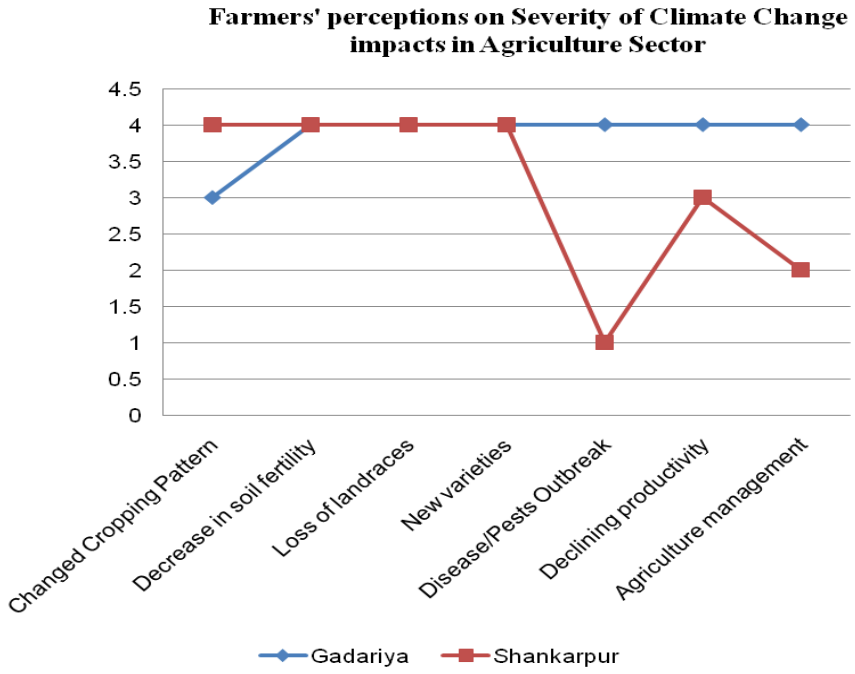

Figure 3. Farmers' perceptions on severity of impacts in agriculture sector 1-low/no impact, 2-medium impact, 3-high impact, 4-severe impact.

survival as it is main source for sustenance, livelihood and economy and is probably the human enterprise most vulnerable to changes in climate. The communities living in western terai are also facing the problems due to changes in climatic patterns. Impacts induced by such climatic stresses can be seen in their households, farms and their surroundings. Uncertainty and uneven occurrence of rainfall that is, drought impacting untimely plantation and harvesting the seasonal crops led to decrease in production per unit land. In addition, flooding at the time of harvesting swept out the consumable agriculture produces impacting huge agricultural lost even agricultural land based on farmers' perception, changed cropping patterns, decreased soil fertility, loss of some local landraces, introduced new crop varieties, observed new diseases and pests declined productivity and changed management practices were some of the observed changes due to climate change (Figure 3). Flood induced huge loss of arable land up to 20 - 30 bighas *(1 Bigha equivalent to 0.6 Hectare)* and also lost of landraces like *Gaguwa, Raimanuwa, Jhinawa*, *Sauthyari, Satha Dulhaniya, Suhawat*, some of mango landraces. Declining productivity mostly seen in rice, wheat, maize due to changes in rainfall patterns, but in case of lentil, production was increased in the season after occurrence of flood (up to 60 - 70 quintal/bigha) in

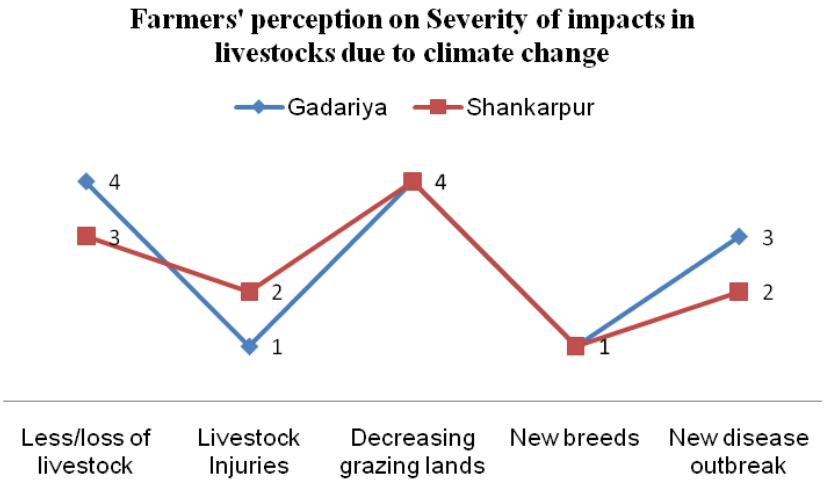

Figure 4. Farmers' perceptions on severity of impacts on livestock 1-low/no impact, 2-medium impact, 3-high impact, 4-severe impact.

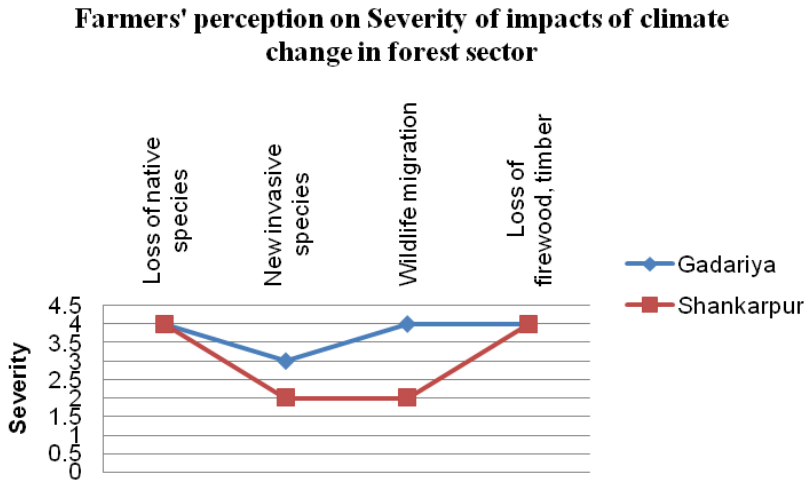

Figure 5. Farmers' perceptions on severity of impacts on forest sector 1-low/no impact, 2-medium impact, 3-high impact, 4-severe impact.

Shankarpur, Kanchanpur.

Impact on livestock

In livestock sector, direct and indirect impacts were observed, while lost/decrease in livestock number either due to flood or injuries/outbreak of new disease as direct and decrease in grazing land, loss of fodder and forages as indirect impacts induced by climate change (Figure 4). While seeing severity of impacts based on farmers' perception in studied sites, there were minimum impacts on livestock injuries and new breeds but high severity in decreasing grazing land and loss of livestock life in both sites.

Impact on forest and biodiversity

Forest is also an important sector of Tharu communities as they are still depending on it for various livelihood options. It is also in critical condition due to climate induced changes as some of native species (*Sal - Shora robusta, Sissoo – Dalbergia sissoo, Khayer – Acacia catechu, Simal – Bombax ceiba, Bijaysal - , Padan, Tun, Siris – Albezia lebbek, Asna, Amala – Emblica officinale*) were lost and also loss of timber, firewood species (Figure 5). Introduction of some invasive species such as *Besaram*, *Lantana camara* and these species are replacing native species in agriculture land, river basin areas and also in forest that impacts biodiversity in long run. Some forest species like Eucalyptus, *Melia azedirch*,

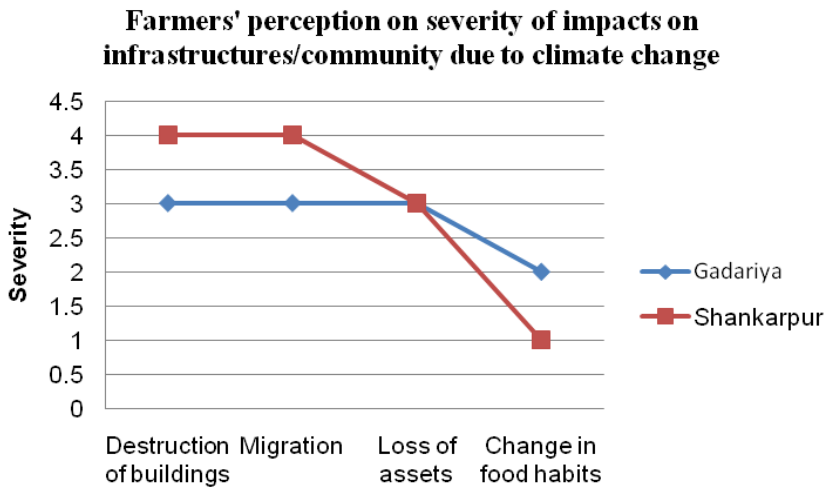

Figure 6. Farmers' perception on severity of impacts on infrastructure 1-low/no impact, 2-medium impact, 3-high impact, 4-severe impact.

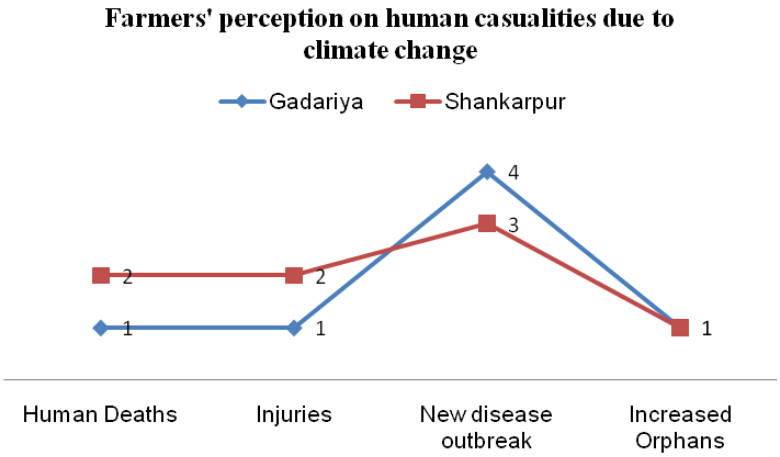

Figure 7. Farmers' perception on human casualties 1-low/no impact, 2-medium impact, 3-high impact, 4-severe impact.

Lahare pat, *Teak* are newly introduced in the forest trees around Gadariya VDC. The climate change induced human activities such as capturing forest land in avoidance of floods and other climate change stresses has impacted on migration of wildlife.

Physical and social impacts

Impact on physical infrastructures

Climatic risk and hazards especially flood, river bank erosion and windstorm has severe impacts on infrastructures like buildings, bridge, roads, foot trails etc (Figure 6). As Shankarpur is prone to flood, there was severe impact on suspension bridge in Donda River, which directly obstructed farmers movement especially for agricultural purposes. In case of Gadariya, windstorm damaged individual buildings and community building as well.

Human casualties

Tharus of the studied sites indicated that climate risk and hazards had also impacted on human casualties and injuries in some cases (Figure 7). Mostly flood followed by heavy intense rainfall and intense windstorm greatly impact on human casualties. One of the farmers in Shankarpur informed that they have to stay alert whole night at the time of monsoon and/or intense rainfall as they do not have any early warning system in their village.

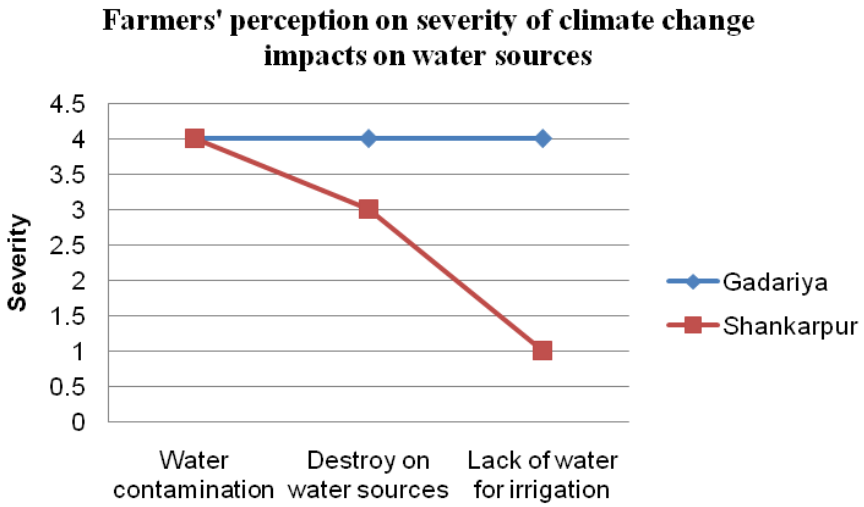

Figure 8. Farmers' perceptions on severity of climate change on water source 1-low/no impact, 2-medium impact, 3-high impact, 4-severe impact.

New disease outbreak led by climatic stress is highly severe in Gadariya and severe in Shankarpur.

Impact on water sources

Water sources are great problem for Gadariya either for drinking purpose or for irrigation purpose. According to farmers, climatic stress enhanced contamination of water (severe impacts in both cases), destruction of water sources severe impact in Gadariya and high impact in case of Shankarpur and lack of irrigation water is severe in Gadariya which is not severe in Shankarpur (Figure 8).

Adaptive initiations adopted by farming communities

Farming communities with their traditional skills and local knowledge are custodian regarding use and management of genetic resources. They are also experiencing climate change impacts at grass root level and they are more eager to deal and adapt with these changes with their own knowledge, resources and ascribed information at their own level. Tharu communities, as survivors at the time of horrible malaria epidemic in Terai region, are rich in traditional knowledge for climate change adaptations. Farmers in studied sites also adapted some initiations based on their own knowledge and skills, which can be seen in different sectors.

Agriculture and livestock

In Gadariya, where more than 95% population are Chaudhary Tharus, farmers are cultivating maize, sugarcane, til, fodders instead of rice in the fields due to uncertainty of rainfall at the time of monsoon. They are cultivating fodder crops as loss of grazing lands due to flood and that why, they keep the livestock in stall feeding. As flood induced decrease in soil fertility, farmers are utilizing dried leaves of Sal, Asna as compost after collected from forest and used as farm litter. Direct rice seed sowing (*Ghaiya dhan*) is followed by some farmers instead of planting rice due to lack of water at the time of planting. Watermelon cultivation in the field and also in river basin area is becoming popular among farmers in escape water stress condition in the field. *Thati ghar* and seed storage in raised area using wooden flakes is famous in the locality to save seed/grain at the time of flood. Maize cobs are stored and dried in *Gharanga.*

In case of Shankarpur, where more than 90% farmers were originally Rana Tharu, the communities also cultivated maize instead of rice in some farmers field while others adapted the changing climate by cultivating early maturing rice cultivars like Chaite – 4, Chaini, Hardinath, Radha – 4, Anjana, Nimoi in order to escape flood. In addition, farmers preferred flood resistant cultivars – *Tilki* and *Shyamjira* in their fields. These landraces survived in flood occurred in October 2008, which gave some relief to the farmers that were suffered from massive flood (Sagun, Care Nepal, 2009). On the other hand, Vegetable farming (cauliflower and pototo) and sugarcane are replacing rice due to untimely occurrence of rainfall in the locality, which ultimately impacted on food habits also. In some parts of the river basin area, water stress tolerant crops like groundnut, tomato, bottlegourd, cucumber, watermelon cultivation is becoming more common and satisfying farmers' needs. Seeds and grains are stored in second floor of their

houses and also in elevated places in the building to escape flood. Bimal et al. (2009) also found similar cases in their study in Kailali district.

Trend of livestock rearing is either decreasing or confined to stall feeding due to lack of grazing lands that led to cultivation of fodders and forages especially Berseem, *Bakaino*, Bajra in marginal land and so called low productive fields in both sites. In Shankarpur site, cattle sheds are shifted in raised area within the settlements and also cattle were brought to higher elevation to lessen effects on livestock due to flood.

Forest

Farmers are determined and initiated to minimize the impacts of climate change in forest sector both individually and collaboratively. In this case, they have planted Bamboo, *Khar*, *Munj*, *Amriso* in flood prone areas and also initiated bio-fencing with support of different stakeholders. Individually, some innovative farmers used *Besaram* plant for hedgers, walls, fencing, composts and thatches in agricultural fields which are growing massively throughout the region.

Human settlements and water sources

Due to occurrence of more frequent floods, tharu people started to construct double storey housings in both sites either to store food grains and to escape themselves from flood especially in higher elevated areas with foundation in higher places, which were not common in these localities. In addition, some farmers have captured the land in upland forest areas and huts were prepared there, which led to summer and winter housing in upland and lowland respectively, which means summer housing in upland to avoid flood and winter housing in lowland for different agricultural management and practices in Shankarpur. In Gadariya, where drought and windstorm is more severe, farmers started constructing building which faces North-South instead of traditional practice of East-West to avoid windstorms and also single door system which is more prominent than two door system in their houses.

Climate change impacts in different sectors also led to change in food habits of the communities. Tharu people in both areas ate *Dhindo* and *Chapati* instead of rice as rice growing area is decreasing and being replaced by other crops due to climatic stresses. People in Gadariya prepared *Mand,* which is liquor made from rice, soybean and chickpea in dry sunny weather to escape from thirsty.

As water excess and shortage both created climatic stresses to the farming communities, farmers in Shankarpur constructed dam (Tatbandhan) in Donda River with their own initiation and support from different district line agencies and conservation related organization to lessen its impacts in their agriculture, food security and livelihoods. On the other hand, farmers in Gadariya constructed dam in Koilahi Lake to store rainwater, which can be used in irrigation purpose to escape water stress condition at the time of rice plantation with the support of TAL and WTLCP.

CONCLUSION AND WAY FORWARD

Adaptation is the best way to deal with climate change stresses in developing countries like Nepal. Farming communities had already experienced these adaptation initiatives in their own local conditions and with knowledge and skills. Tharus being inhabitants of Terai region are facing climatic stresses each year and they are adapting these changing climates with their traditional skills and experiences. These adaptive initiations have somehow logics and ethics that should be documented, validated, shared and disseminated to other farming communities as well in wider geographical areas.

As Nepal is a geographically diverse country, the adaptation strategies that community adapted might vary based on location, specific climatic stresses and also depend on the traditional knowledge and skills community owned. Adaptation strategies for Gadariya and Shankarpur VDCs are different based on climatic risks and hazards they are facing. That's why, technologies for adaptation should be location specific, which requires investment for researches both at higher and community level.

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REFERENCES

Huq S, Rahman A, Konate M, Sokona Y, Reid H (2003). Mainstreaming Adaptation to Climate Change in Least Developed Countries, IIED/RING publications London, ISBN 1 84369 417 4, p. 40.

Sagun CN (2009). Climate Change Impacts on Livelihoods of Poor and Vulnerable Communities and Biodiversity Conservation: A Case Study in Banke, Bardia, Dhadingand Rasuwa Districts of Nepal. USAID, CARE Nepal, WWF, RIMS Nepal, FECOFUN and LI-BIRD.

Li-Bird (2009). Annual Report 2007-08. Local Initiatives for Biodiversity, Research and Development (LI-BIRD), Pokhara, Nepal. ISSN: 1561-154X, pp. 18-19.

Government of Nepal/Ministry of Environment (GON/MOE) (2066). B.S. National Policy on Climate Change, Government of Nepal, Ministryof Environment with the Support of WWF-Nepal (unpublished).