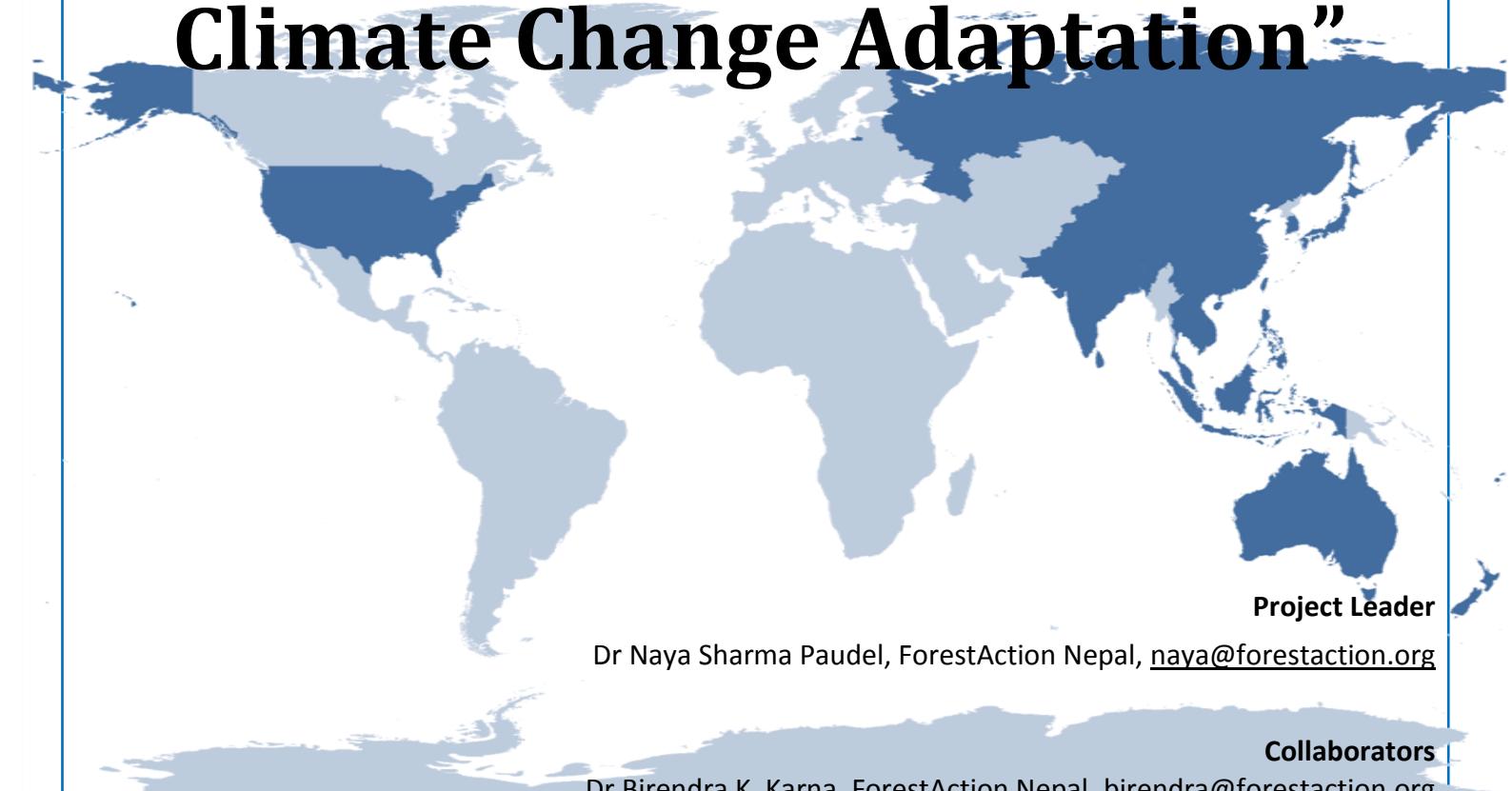


# “Community-based Forestry and Livelihoods in the Context of Climate Change Adaptation”



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**"Community-based Forestry and Livelihoods in the Context of  
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## OVERVIEW OF PROJECT WORK AND OUTCOMES

### Non-technical summary

Climate change and its impacts are visible in most of the countries including South and East Asia. In Bangladesh, Nepal, Thailand and Vietnam like many other developing countries, the issue of climate variability and extremes has been given little attention with a more reactive approach rather proactive one. This study was undertaken in the rural agrarian villages depending on the forest resources of Bangladesh, Nepal, Thailand and Vietnam with a view to understand and document the trend of climate change as well as the adaptation measures to cope up the adverse situations that might arise in the near future. The study was accomplished through intensive survey of households in each countries and analysis of long term meteorological database (nearly 30 years). The results exhibited that resources, particularly natural resources and agriculture has been either reduced or there has been change in the patterns. Increasing trend of climate change along with anthropogenic activities are the main reasons for decreasing the natural resources and livelihood options of the community. The results of the analysis of long term climatic data base particularly the changing trend of temperature and rainfall has strongly been supported by perceptions/opinions of the community people. The community people based on their experiences have already been adopting adaptation measures (anticipated) like changing planting time, using new technologies etc. Similarly the government and different agencies has undertaken several adaptation measures and framed policies to protect the forest and environment though the efforts that have been inadequate to support the community to better adapt with climate change impacts. In the face of challenges of climate change and livelihoods, communities have strongly suggested to undertake some new adaptation measures like construction of water reservoirs, strengthening aforestation program through community approach, develop strong institutional mechanism, introduction of pest and disease resistant variety, supply of high quality planting materials etc. for conservation of resources and their better livelihoods which need strong support from the public and private levels.



## **Project objectives**

The research, within the broad framework of APN's Second Strategic Plan, aimed to investigate how climate change was affecting forest-dependent communities in one of the world's most vulnerable regions and the actual and potential adaptation measures that enable households, communities and networks to remain resilient in the changing contexts.

The specific objectives of the projects were to:

- Explore, document, analyze and synthesize lessons on community based adaptation by the grassroots institutions,
- Establish and strengthen climate change researcher's network in participating countries (Bangladesh, Vietnam, Nepal and Thailand),
- Disseminate research findings through diverse publications and engage with policymakers at national and international level, and
- Train young researchers in the field of climate change adaptation.

## **Amount received and number years supported**

The Grant awarded to this project was:

- Project Duration: 2 years
- Funding received from APN in Year1: US\$40,000.00
- Funding received from APN in Year 2: US\$40,000.00

## **Activity undertaken**

Major project activities undertaken were:

The project was implemented in six phases: 1) Planning and developing research tools, 2) Review of literature, 3) Collection of the data and information 4) Analysis of relevant information, 5) Organize a training program on climate change and adaptation, 6) Final project report, knowledge sharing workshop and capacity building.

The major activities undertaken in these phases were:

- Planning and brainstorming workshop, 25-27 July 2011, Bangkok, Thailand
- Development of research methodology
- Data collection and interviews in selected forest dependent villages in each four countries



- Conduct a two days training program for rural village leaders, students and teachers on various aspects of climate change, mitigation and adaptation, Payment for Ecosystem Services, REDD+,
- Regional seminar on Community-based Forestry and Livelihood in the context of Climate Change Adaptation in South Asia
- Provide guidance to master's students for their research dissertation related to climate change adaptation
- Organize meetings and publish documents related to climate change adaptation
- Publish climate change adaptation articles from four regions including others in a peer reviewed journal of Forestry and Livelihood published by ForestAction Nepal.

## **Results**

The major outputs from the project were:

- Documented traditional knowledge of rural people in relation to climate change adaptation, which will contribute to policy development based on the context of individual project partner countries.
- A training manual on climate change and adaptation (in Nepali) has been published for the climate change trainer to help them train rural villagers, community forest users, farmers, teachers and students (see appendix 1 for summary of the training program and visit [www.forestaction.org](http://www.forestaction.org) for complete manual download).
- A special edition of peer reviewed Journal of Forestry and Livelihood on climate change adaption has been published including four papers from current APN research and other four papers from different scientists (see appendix 2, visit [www.forestaction.org](http://www.forestaction.org) for download, and hard copy publication is in press).
- Four Master's students have completed and published their research dissertations.
- Presentations in international conferences/symposia.
- Summary of regional Seminar on Community-based Forestry and Livelihood in the context of Climate Change Adaptation in South Asia , 9-10 December, 2012, Kathmandu, Nepal (Appendix 3).
- Final project report.



### **Relevance to the APN Goals, Science Agenda and to Policy Processes**

The project was relevant within the scope of both APN's science and policy agenda which encompasses issues like (i) climate change, (ii) ecosystem, biodiversity, and land use, and (iii) pathways of sustainable development. The project has addressed these agendas within the scope of research and development of policy documents to address the policy agenda. The research document, empirical lessons on community based adaptation strategies has been presented in an international seminar and published in a peer reviewed journal along with policy document and policy recommendations to national and regional policy makers. Both these activities has contributed to the scientific body of knowledge and informing policy makers on the best practices based on empirical research findings. It has also been able to established international-level climate change consortium network with researchers in Asia, particularly Bangladesh, Nepal, Thailand, Vietnam, Bhutan, India, USA and scope to expansion beyond. The consortium network has been enabled researchers to share their experiences and identify adaptation strategies appropriate to each country's situation.

### **Self evaluation**

The project was successful in generating local information on consequences of climate extremes and anthropogenic changes in their resources and livelihoods and documents the indigenous knowledge to cope with the changes occurring in environment in four countries in the South and East Asia. The outcome has been acknowledged by the policy makers and agencies working together in the climate change issues. A successful international seminar was held in Kathmandu, Nepal to present the outcomes of the project and other similar researches with the participants representing research institutions, PhD student, policy makers and university faculties. The workshop created a platform to share on the potential impact climate change on rural communities who are dependent on natural resources for their livelihoods, and considered how individuals, communities, institutions and governments needed to respond. The publication of training manual in Nepal on climate change adaptation has been highly recognized as a valuable resource for the trainers and local resource person working in the climate change sector. However the training and publication of manual was carried out in Nepal and should have done in other remaining countries so people could also get benefitted from our learning. Supporting student's



dissertation in partial fulfillment of the requirement for the degree of Master of Science in Natural Resources Management /Agriculture/Climate Change has been extremely valuable in terms of capacity building.

### **Potential for further work**

This study has opened avenues to expand strong and unique regional consortium where policy makers, practitioners, researchers, university faculties and local people could conduct research, analysis, policy discussion and publish on issues around social-environmental nexus.

Besides the study found some of additional scope for further exploration

- Approach of mainstreaming community based adaptation with development agenda should be designed and developed. Conventional development approach and linear climate change research should be replaced with integrated approach of research which covers social, ecological, technical aspects as well as development dimension.
- Institutional preparedness and capacity enhancement of stakeholder: Institutional preparedness and capacity of the stakeholder seems deficit in most of the project site. In some cases, INGOs and NGOs were more engaging rather than government agency. In case of Nepal, even though community have papered community adaptation plan of action (CAPA), the implementation status is so weak. On the other side, the capacity of the institutions working in climate change sector should be strengthen. So there is a need to build capacity of the meso and local level government line agencies and local communities who have been involved in preparing these CAPAs.
- There exist diverse practices of adaptation to changing environment at the local level. However, besides few empirical researches, these indigenous practices have not been adequately acknowledged and documented. Therefore, there is a need to document and upscale the practices adopted by local communities to climate change adaptation and inform the policy makers in order to keep these issues in mind while framing policies.



## **Publications**

A few publications are in progress.

## **Acknowledgments**

The project team is grateful to ForestAction Nepal especially Rahul Karki and Rajesh Bista for their significant contribution towards the successful completion of the project. We likewise express our gratitude to the local villagers of Bangladesh, Nepal, Thailand and Vietnam for their support and active involvement during the field study. Finally, we would also like to extend our gratitude to National Science Foundation (NSF) for financial support through the Asia Pacific Network for Global change Research.



## TECHNICAL REPORT

### Preface

This technical report entitled “Community-based Forestry and Livelihoods in the Context of Climate Change Adaptation” provides an overview of a research project executed by ForestAction Nepal in collaboration with the Asian Institute of Technology, Thailand; Bangabandhu Sheikh Mujibur Rahman Agriculture University, Bangladesh; and Hue University of Agriculture and forestry, Vietnam. A series of case studies were conducted in selected areas in the four participating countries of South and East Asia. The research methodology, results of the case study are presented in this report. The report also includes feedback from the workshops and training.



## **Table of Contents**

1. Introduction
2. Methodology
  - 2.1 Research Design
  - 2.2 Selection Criteria for the Study Site
  - 2.3 Sampling Unit
  - 2.4 Data Type
  - 2.5 Data Collection
  - 2.6 Description of Study Area
3. Results & Discussion
4. Conclusions
5. Future Directions

### **References**

- Appendix 1: Synthesis report on Facilitating Skill Development on Climate Change Adaptation and Mitigation: Training to Local Community Leaders
- Appendix 2: Cover page of Journal of Forestry and livelihoods
- Appendix 3: Synthesis report Seminar on “Community-based Forestry and Livelihood in the context of Climate Change Adaptation in South Asia”, Kathmandu, Nepal
- Appendix 4: Household survey form



### **List of table**

- Table 2.1 Total household in relation with forest use in each village in Tambon Sra Charokea as of 2011
- Table 2.2 Geographical Location and climatic condition of study site:
- Table 3.1 Respondent's perception on change in climatic parameters.
- Table 3.2 Local institutions
- Table 3.3 Expectation from local government for resilience of climate change impacts
- Table 3.4 Changes in distribution of tree species in the study area
- Table 3.5 Types of forest products available/collected as opined by the respondents
- Table 3.6 Change of cropping intensity over time in the study area
- Table 3.7 Respondents' perception on climate change over time in the study area
- Table 3.8 Adaptive measures in agriculture in Huong Son commune
- Table 3.9 Reason for changes in livestock grazing
- Table 3.10 Income from forest and household economic in Huong Son commune
- Table 3.11 Perception of local people about extreme weather conditions

### **List of Maps and Figures**

- Map 1 Geographic locations of study sites.
- Map 2 Study site map of Thailand.
- Map 3 Study site map of Nepal.
- Map 4 Study site map of Vietnam
- Map 5 Study site map of Bangladesh

### **List of Figures**

- Figure 3.1 Types of benefit from engaging in institutions
- Figure 3.2 Kind of services provided by VDC



## **1. Introduction**

Climate change is being increasingly reported to have significant adverse impacts on almost all sectors, in varying degrees across the world. But the scales of severity of impacts are predicted unprecedentedly high in resource poor countries especially in South and East Asian countries including Bangladesh, Nepal, Vietnam and Thailand. These four countries are frequently cited as one of the most vulnerable countries to climate change because of its disadvantageous geographic location; flat and low-lying to steep mountainous topography; high population density; high levels of poverty; reliance of many livelihoods on climate sensitive sectors, particularly agriculture, forest and fisheries; and inefficient institutional aspects (MoEF, 2008). Many of the anticipated effects of climate change, such as sea level rise, higher temperatures, short monsoon with high precipitation, and an increase in cyclone intensity, are being adversely placing pressure on the existing resources like agricultural land, forest land and so forth. Moreover, it has, reduced livelihood opportunities of the population. To cope with the climate change extremes, many adaptation measures have been suggested. Community based adaptation (CBA) is a “community led process, based on communities priorities, needs, knowledge and capacities, which should empower people to plan for and cope with the impacts of climate change” (Reid 2009 et al.).

Local communities possess relevant knowledge and experience coping with climate change (IUFRO, 2005, FAO 2008). This knowledge needs to be documented and disseminated in order to be used in effectively (Tiempo 2008). Communities in the developing countries are heavily dependent on climate sensitive resources like forest, agriculture and fisheries and lesser capacity to adapt and are more vulnerable to effect of climate change (Stern, 2006; Saleemul, H. et al, 2006; Stern, 2006; Mirza, 2003; Mirza, 2003; IPCC, 2001).

Adaptation measures to climate change have been undertaken in developed countries as well as in developing countries (IPCC, 2007). However, adaptation measure suitable in one particular country may not be suitable in other, as impact of climate change is location specific, also depends on socio-economic characteristic of communities. Yohe and Tol (2002) state that spatial and temporal scale, nature of sector, climatic zone, socio-economic base of



actors or combination of these factors play vital role in designing any adaptation measures. Therefore, there is need to develop policies at sub-national level rather than at central level alone for effectively improving adaptive capacity of vulnerable communities (Puppim de Oliveira, 2008). However, very little study has been documented about climate change and community based adaptation strategies in the participating research countries. There is growing recognition that individuals and communities in the developing world can be highly resourceful in responding and adapting to external disturbances and change. However, there is lack of researches for understanding impacts of climate change on people's livelihood and designing measures to improve their adaptive capacity to cope with climate change (Hedger et al., 2008).

## **2. Methodology**

### **2.1 Research Design**

The research is conducted in four different countries of South and South East Asian region namely, Bangladesh, Nepal, Thailand and Vietnam. The study was conducted in at least one community that has witnessed some climate change effects in recent years in each country. This study was aimed at understanding the trend of climatic parameters such as temperature and precipitation, and examining vulnerability of household to prevalent trend of climate. The households were assumed to adopt some adaptation measures in response to recent climatic events. So, adaptation measures adopted by households in response to climatic hazards were documented. The field study was conducted in 2011-12. For the purpose of the research, data were collected from primary sources and supplemented from secondary sources. Data analysis involves both qualitative and quantitative methods.

### **2.2 Selection Criteria for the Study Site**

The study sites in each country were selected based on the following criteria:

- Area close to meteorological station
- Area that has experienced climate effect in recent years
- Households dependent on forestry resources
- Majority of the population is dependent on agriculture as major occupation



### **2.3 Sampling Unit**

Simple random sampling was carried out for selection of households for questionnaire survey. For the purpose of conducting household survey and collecting primary data, following formula is used:

$$n = \frac{N}{1 + Ne^2} \quad (1)$$

where, n= Sample size

N= Population size

e= error limit

### **2.4 Data Type**

Both primary and secondary data were used for the purpose of this research. Primary data was collected for information on livelihood of local people and their sensitivity, exposure and adaptation measures that they had adopted to cope with climatic events. Similarly, daily rainfall data, daily minimum and maximum temperature and national policy related information, communication between national and global agenda on climate change and adaptation issues were the secondary data collected for the research.

### **2.5 Data Collection**

The methodology adopted for data collection is similar in all four sites. However, some terminologies may vary depending on the local dialect and context. Following are the methods applied for the data collection.

#### **2.5.1 Primary Data Collection**

For collection of primary data, household questionnaire survey, key informant interview, field visits and observations and group discussions were carried out. Both close and open ended questions were used to collect information. The questionnaires were tested for 10 percent of sampling numbers of households. The purposive random sampling of suitable sampling intensity was carried out.



**Participatory Resource Mapping:** Participatory resource mapping was conducted in order to understand the resources distribution, community locations and other bio-physical and socio-economical aspects within the study site.

### **Questionnaire Survey**

The households were randomly selected for the purpose of questionnaire survey. The close and open ended questions were used for this purpose. Household survey was conducted so as to collect the information on the households, environmental changes they have witnessed and adaptation measures they had adopted in response to those changes.

### **Key Informant Interviews**

Key informant interviews were conducted with the village leaders, individuals who have stayed in the area for long time and individuals affiliated to the government and non government organizations. They were interviewed about change in rainfall and temperature pattern and changes in resource availability, presence of external support etc. Open ended questionnaires were used for this purpose.

### **Group Discussions**

Group discussions were conducted to gather information on past natural disaster events in the area, observed environment changes in recent years, adaptation measures adopted by local people, including various other socio-economic details of the area. PRA tools like seasonal calendar were used to have a better understanding on the cropping calendar of agricultural crops during the group discussions.

### **Field Observation**

The field observation was done to observe and gather information on local social and physical features like the village settings, topography and so forth, in order to get an insight on the aftermath of disasters and local practices on measures adopted by people to cope with floods, drought and cyclone.

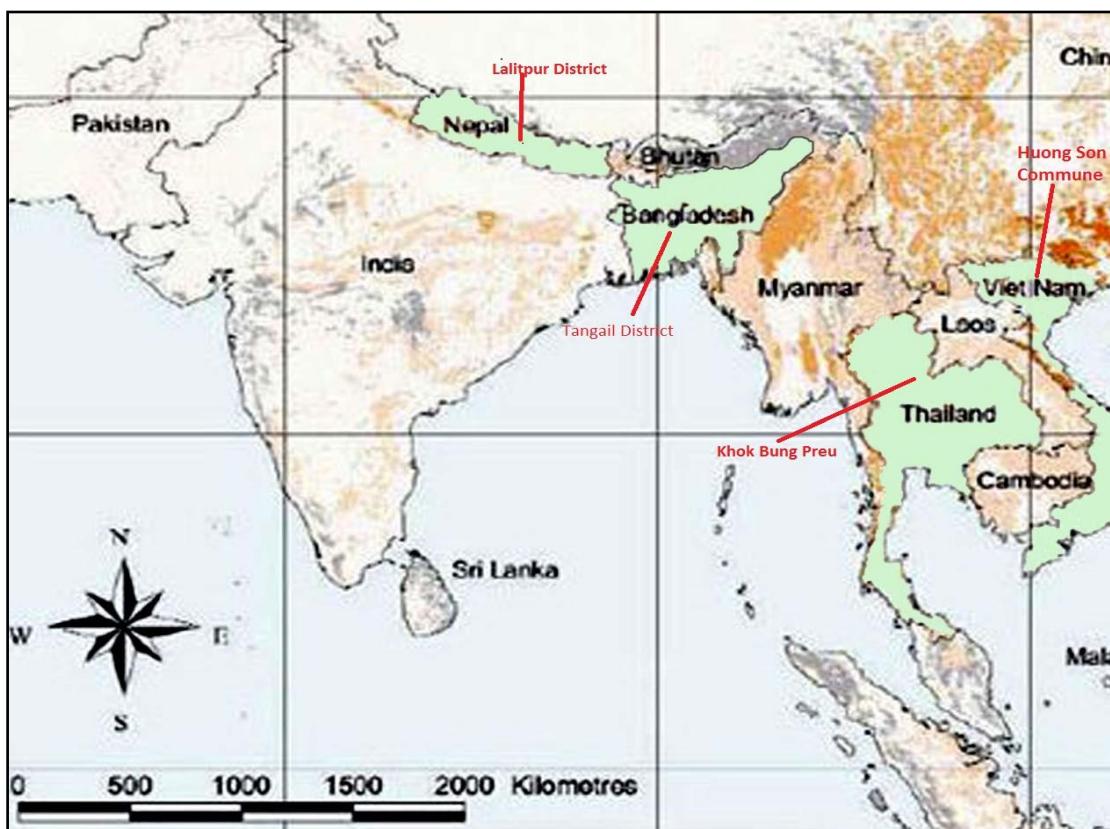


## 2.5.2 Secondary Data Collection

The daily minimum temperature, maximum temperature and precipitation data of the research sites for 30 years were collected from the Department of Hydrology and Meteorology. Other sources for secondary data collection include journals, websites and various published reports of government offices and various other concerned agencies were also analyzed.

## 2.6 Description of Study Area:

A total of four sites in each participating country were considered for the research purpose. The following research sites were selected from the four participating countries in the South and East Asia region. The geographic locations of these study sites are shown in Map 1.



**Map 1:** Geographic locations of study sites.



### **1) Description of study site in Thailand**

Located in a central agricultural production area of North Eastern Thailand, three villages in **Nakhon Ratchasima** province of Thailand, Kog Bung Preu forest covers an area of 560 ha which is under community forest management. The main occupation of the community is subsistence agriculture with paddy being the main crop. Cassava is also cultivated as a cash crop in the fields located along the boundary of Kok-Bung-Preu and sloppy areas. The number of landless farmers in three villages ranges from 3-15%. The community is dependent on forests mainly for its subsistence, collecting various kinds of seasonally available Non Timber Forest Products (NTFPs) like mushroom, pakhwan, ant egg, toad and frog, wild fruits and bamboo shoot throughout the year. Moreover, timber and firewood has been an important sources them as well. Some products like fresh mushrooms and ant eggs are also sold in the local market, when in surplus.

**Table 2.1: Total household in relation with forest use in each village in Tambon Sra Charokea as of 2011**

Village No.	Name	HH	Population		Total
			M	F	
1	Ban lung	171	456	475	931
7	Ban Non Boad	95	185	206	391
12	Ban Sai-toon	78	160	157	317
		344			1639





**Map 2: Study site map of Thailand.**

## **2) Description of study site in Nepal**

The research was conducted in Lamatar village development committee (VDC) of Lalitpur District which is located at around ten kilometers east of Kathmandu. The study site covers 11 community forest user groups (CFUG) with more than 560 ha. of forest land with 894 households (HH) that lies under Lamatar Range Post<sup>1</sup>.

Lamatar has more or less similar environment and climatic condition that of Kathmandu. The average temperature of the area during the winter ranges from 10 to 14 degrees centigrade and 15 to 30 degrees centigrade during the summer. In winter snow falls cover the upper parts of the hill region of Lamatar. Three dominant natural species in the high

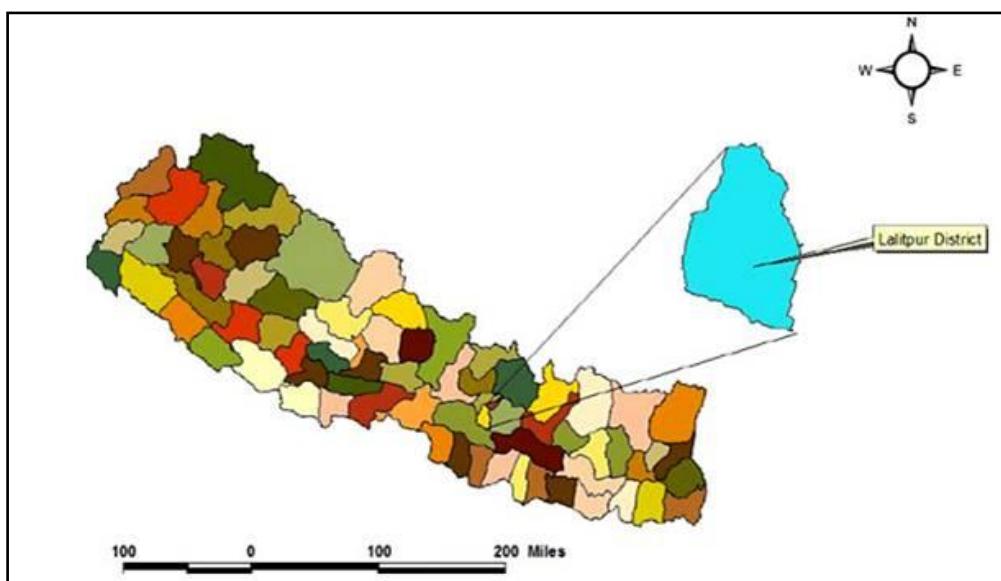
<sup>1</sup> Range Post (RP) is a lowest office of government forest service in Nepal under District Forest Office. Generally, there are more than eight RPs in a district encompassing more than one VDC within its jurisdiction.



land are Uttis (*Alnus nepalensis*), Chilaune (*Schima wallichii*) and Katus (*Castanetopsis indica*) whereas Uttis (*Alnus nepalensis*), Paiyu (*Prunus ceracoides*) and Lapsi (*Choerospondios auxillaris*) are found in low land of Lamatar. The present forests that falls within the Lamatar range post has a short history because the area was totally degraded in the past due to free access and harvesting of timber and firewood which was sold to the near market area of Lalitpur and Kathmandu districts. In the initiation of government forest office, VDC and District Development Committee (DDC), the area is now re-gaining its greenery and forest cover since last one and half decade.

**Table 2.2: Geographical Location and climatic condition of study site:**

Latitude	27.38. N
Longitude	85. 17.E
Elevation from MSL	1212 m
Climate	Subtropical- Temperate
Annual Rainfall(mm)	1236 mm
Area(ha)	385 km <sup>2</sup>
Population	419004(2009)
Cultivated hand(ha)	27, 376
Farm Size(ha/HH)	0.29
Population Density	1059 Sq Km



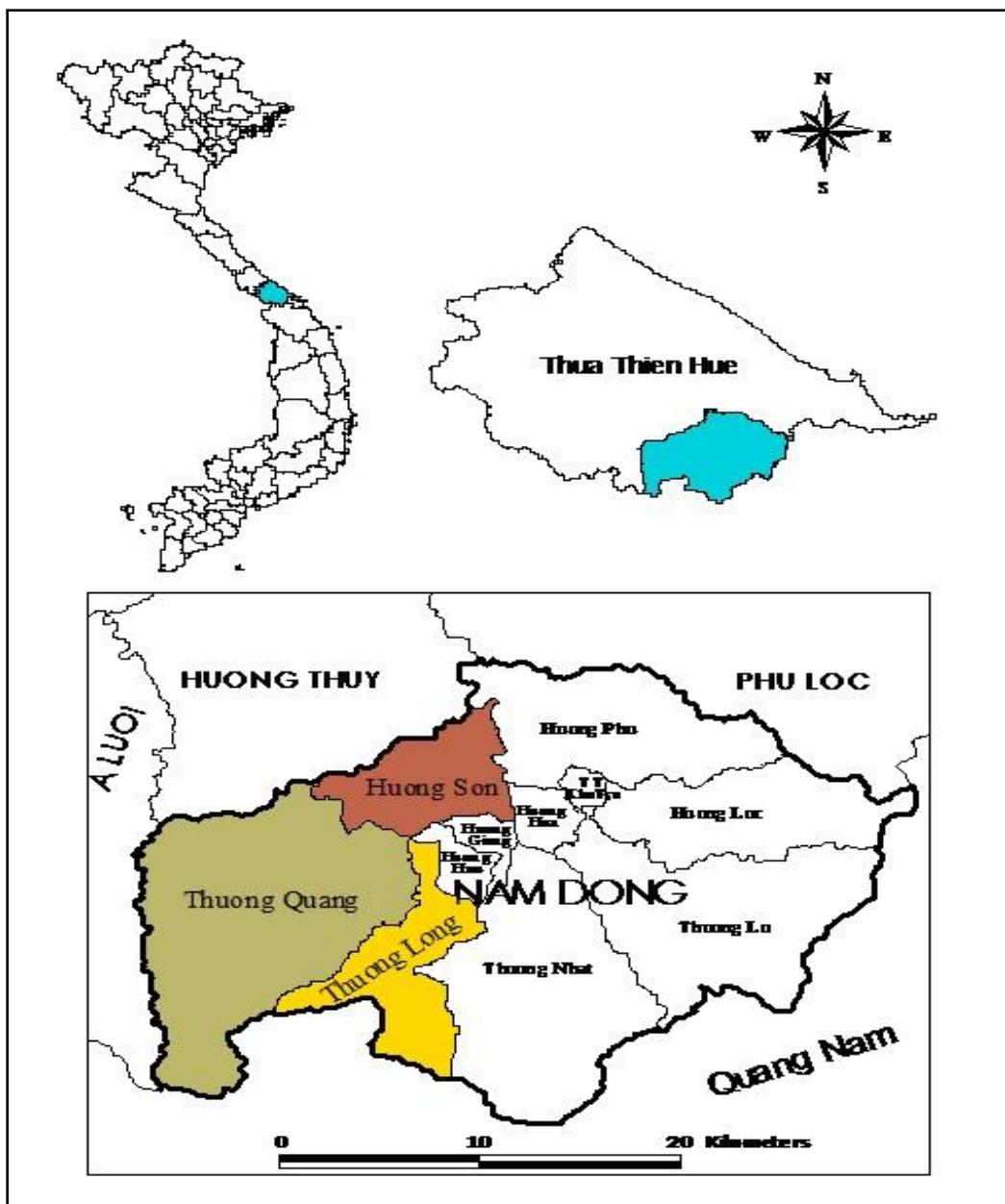
**Map 3: Study site map of Nepal.**



### **3) Description of study site in Vietnam**

The study site, Huong Son is a western mountainous community of Thua Thien Hue province with Katu ethnic group dominating the area. About 86.5% of the community participated in agriculture production which is highly depended on the climate condition. According to the report on Implementing the National Strategies in preventing and reducing impacts of climate change in Thua Thien Hue to the year 2020, the estimated changes in the climate conditions would be increase in number and degree of typhoons, higher number of warmer days which magnify droughts in the region, longer cold periods (such as in 2009, there were highest cold period: 28 days), the increase in the flood level (50 – 60 cm compared to the period of 1977 – 1986), higher number of flood (increase 0.6 time/year), stronger and abnormal typhoons (Suu et al., 2010). The low rainfall season coincides with the dry, hot, with high evaporation creating difficulties for live and agri-production. In the rainy season, there are frequent flood, typhoons observed. All these create damages for economic activities and people lives (Son et al 2009). Climate change threatens the lives of local people, reducing the area and quality of soil, creating difficulties for agriculture and forestry production, reducing the yield and quality of products.



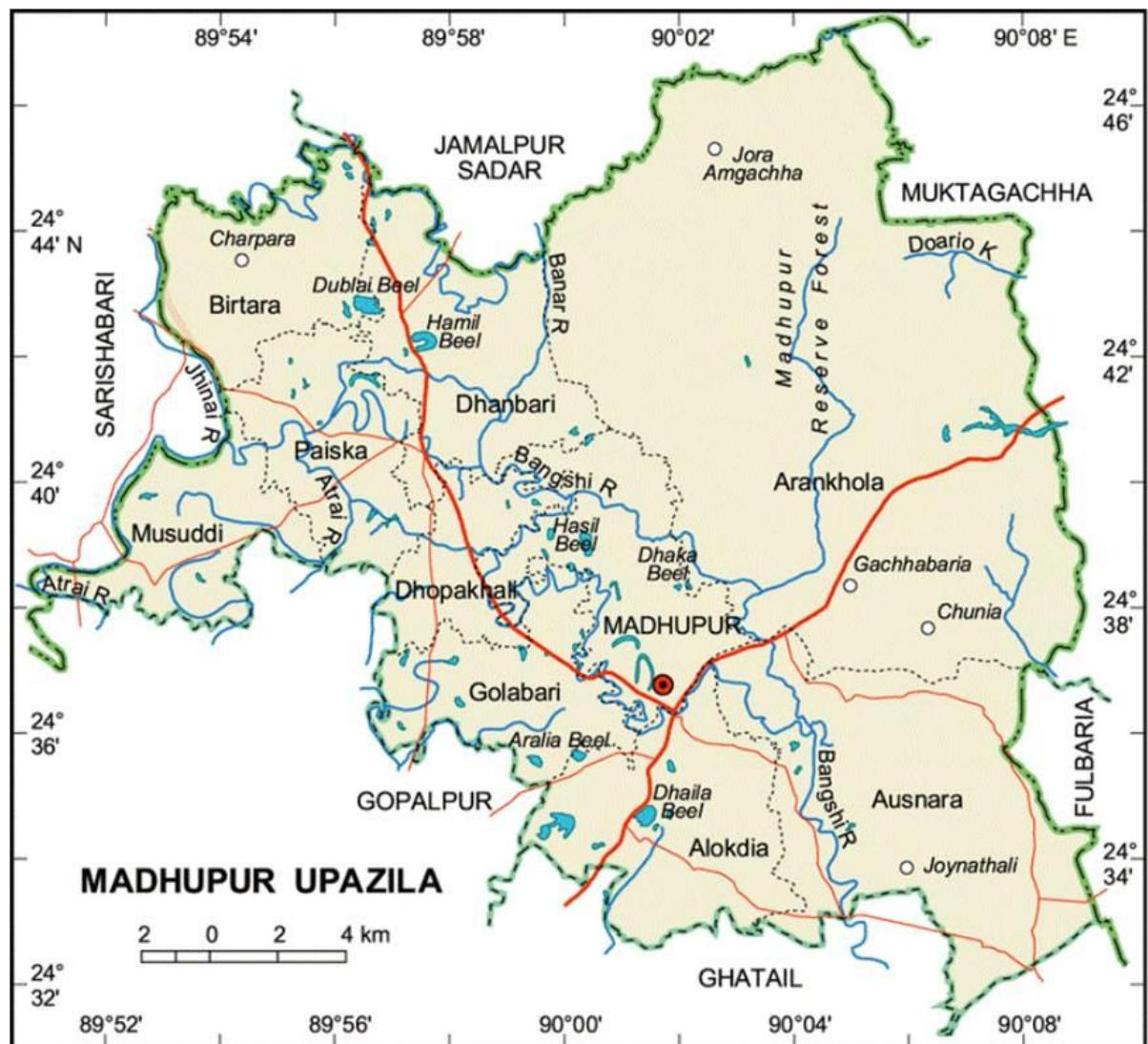


**Map 4: Study site map of Vietnam**

#### **4) Description of study site in Bangladesh**

The study was conducted in two villages namely Matonginagar and Joloy under Madhupur Upazila of Tangail District at the vicinity of Sal Forest. Fifty respondents out of the total 202 households from two villages were extensively studied through pre-tested interview schedules during September 2011.





Map 5: Study site map of Bangladesh



### **3. Results & Discussion**

This section provides a brief overview of the results from four project sites in four different countries. The detailed results, the key findings and analysis of the four country cases have been published in the Journal of Forest and Livelihoods as a part of this project activity (JFL volume No 10(1) 2013.

#### **1) Climate change and adaptation: lessons from community based forest management in Nepal**

##### **Change in climatic parameters:**

Perception of the respondents was analyzed in order to understand the change in climatic parameters. Impacts of climate over 30 years of time revealed so many changes in climatic parameters. Regarding the summer temperature, 93% respondent opined the increasing trend of temperature whereas 76% respondents revealed that the winter temperature has been decreased over the time. Similarly, 76% of the respondents believed that there has been a decrease in the intensity and frequency of rainfall. Landslides/flood impact is not much severe in the study site as majority of the respondent state no changes in landslide/flood severity and frequency. Due to increasing temperature, respondents opined increasing drought length and severity. 87% respondent think that the drought length has been increased over the time and 93% respondents opined the increasing frequency of the drought. Regarding the hailstorm and frost, majority of the respondents felt the decreasing trend over the time.

**Table 3.1 Respondent's perception on change in climatic parameters.**

Climatic Parameter	Respondent perception (in percent)				
	Increased	Decreased	No Change	No idea	Total
Temperature( Summer)	93	7	0	0	100
Temperature(winter)	17	76	3	4	100
Rainfall Intensity	33	57	10	0	100
Rainfall frequency	10	77	13	0	100
Landslide/flood severity	20	23	50	7	100
Landslide/flood frequency	27	23	40	10	100



Drought length and severity	87	3	7	3	100
Drought frequency	93	7	0	0	100
Hailstorm amount and severity	10	63	17	10	100
Frost amount and severity	10	73	13	4	100

### **Impact of climate change in natural resources:**

Climate change has negative impacts on natural resources and livelihoods of the community people. Variations in precipitation and temperature ultimately change the natural cycle of the water, forest and agricultural resources. In the study site the respondent also observed changes in temperature and rainfall, consequently changing the agriculture pattern as well forest product availability. However, there has been a considerable change in the agricultural technique applied by the community. Overall the agriculture yield of vegetable crops and maize has been increased due to use of chemical fertilizer and hi-tech farming practices. More than 64% respondent changed the cropping items from wheat, mustard and maize to tomato and other seasonal vegetables . Decreasing availability of water resources, and increasing opportunity cost of vegetable farming motivate the farmer to change the crop type. Likewise more than 82% of the respondents opined the decreasing water quality and quantity in their surrounding in last 10-20 years. Rapid urbanization, immigration and population growth polluted the water source and ultimately decreases the water resources. Similarly, forest vegetation composition in last 10-20 years has also been changed. *Katus, Kafal, Phalat, , Uttis, Salla* and Sour species have been increasing whereas *Bakley, Kali kath, Dhasingrey , Gofla*, and some other shrub have been decreasing naturally year to year. Increasing invasive species such as *Lanatanca camera* and fern species has been changing the species composition of the forest.

### **Institutions and adaptation**

Local institutions play a critical role in supporting adaptation of communities and individual households. Different local institutions exists in the study sites such as – CFUG, water user group, farmers group and small agriculture credit group, from where the community people have access to different resources. More than 87 % of the respondents were associated with



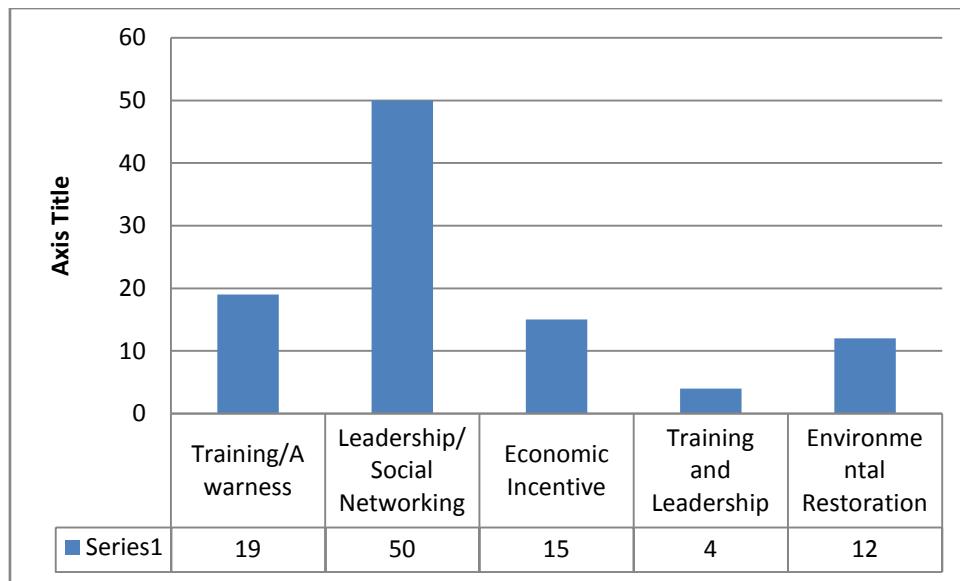
forest based institutions whereas 30% and 27% were associated with the agriculture and water based institutions respectively.

**Table 3.2 Local institutions**

Institution	Number	Jurisdiction
Water based institution	10	District water resource committee
Forest based institution	11	DFO
Agriculture based institution	20	District agriculture development office
Livestock based institutions	5	District livestock development office
Village development program group	35	District development committee
Agricultural cooperatives	3	District agriculture development office
Dairy cooperatives	2	District livestock development office
Saving and credit cooperatives	11	
Women cooperatives	1	District development committee

Out of the total respondents, 83% believed that they were benefited from different local institutions where they were engaged. 50% respondent revealed that the leadership and social networking are one of the perceived benefits whereas 15% perceived economic incentive, 19% training and awareness whereas 12% perceived environmental restoration as a benefit.

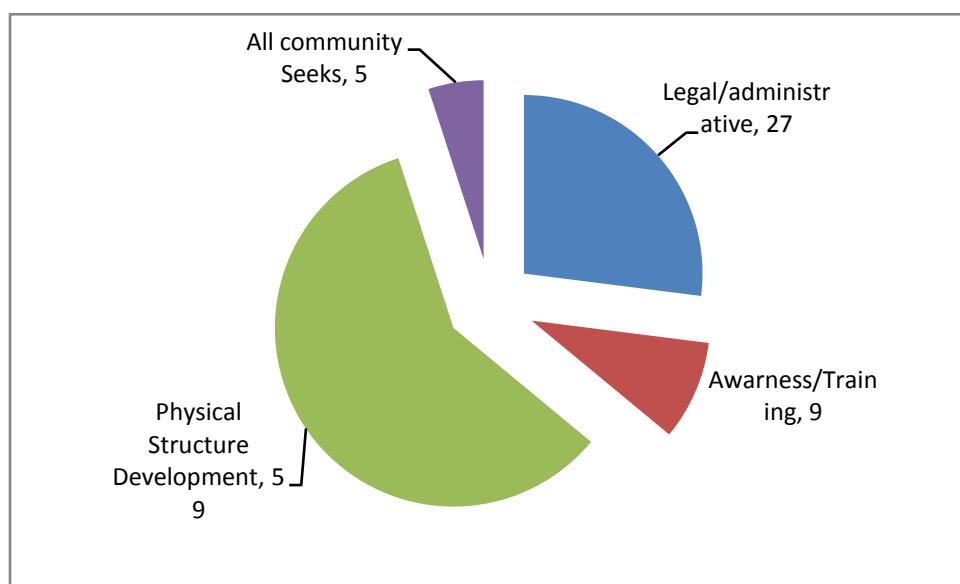




**Figure 3.1 Types of benefit from engaging in institutions**

#### **Role of local government in community adaptation**

In every planning process, the role of local government is important. In terms of the services provided by the local government, more than 59% respondent preferred physical structure development (like road, school, irrigation canal, road wall), whereas 27% said legal and administrative services provided by the local government. In relation to climate change adaptation, respondents argued that they were not satisfied by the services provided by the VDC.



**Figure 3.2 Kind of services provided by VDC**



Likewise, analyzing the expectation from local government for resilience of climate change impacts, more than 17% expect awareness and economic incentive, 14 % policy provision and inclusive program and policy and 10 % recommend holistic/ integrate development approach.

**Table 3.3 Expectation from local government for resilience of climate change impacts**

Services Expected	Frequency (%)
Holistic/Integrated Development approach	10
Inclusive Program and policy	14
Plantation	7
Awareness	17
Policy Provision	14
Economic Incentive	17
No idea	21
<b>Total</b>	<b>100</b>

#### **Community adaptation measures**

In the study site, it was observed that the communities have been adopting several adaptation measures like crop diversification, substitute of forest product, commercialization of NTFPs and management of forest. One of the well documented crop diversification practices in Lamatar was tomato farming. Less water requirement and high income potentiality of tomato farming have attracted the community in it. Likewise, due to the decline in the availability of forest product and increasing access to alternatives like LPG gas, kerosene stoves etc, community have changed their preferences. Communities have also promoted scientific forest management for healthy forest condition and initiated bio briquette production from invasive species and forest biomass, which can be regarded as one of the adaptations practices adopted by the communities. Similarly, promotion of NTFPs by the communities with external support has helped in its commercialization of which can also be considered as another forest based adaptation practice. Likewise, optimization of water resource use and infra-structural adjustment is adopted by the community to cope



with decreasing water availability. Finally, establishment of community based institutions, government and external agency also play vital role in formulating adaptation plan which is expected to create a synergy among the institutions.

## **2) Climate Change and Adaptation: Evidences from a Forest Dependent Community in Bangladesh**

### **Change in Resources over Time**

**Forest resource:** Villagers were very much dependent historically on forest resources compared to others. The dominant forest species was Sal (*Shorea robusta*) followed by Bohera (*Terminalia bellerica*), and Amloki (*Emblica officinalis*). The aforementioned forest resources were decreased severely. Over-exploitation of resources along with illegal felling and climate change were reported as the main reasons for decreasing the indigenous forest species. On the contrary, some forest species which are known as exogenous such as Akashmoni (*Acacia auriculiformis*), Mahogany (*Swietenia macrophylla*) were reported to increase (Table 3.4). The increased trend of exotic species plantation occurred because of their quick growth in nature and relatively high level of adaptability under the climate change.

**Table 3.4 Changes in distribution of tree species in the study area**

<b>Type of change forest species</b>	<b>Vegetation</b>	<b>Respondents' opinion</b>	
		<b>Frequency</b>	<b>Percent</b>
Decrease of indigenous spp.	Sal ( <i>Shorea robusta</i> )	50	100
	Bohera ( <i>Terminalia bellerica</i> )	50	100
	Horitoki ( <i>Terminalia chebula</i> )	50	100
	Amloki ( <i>Emblica officinalis</i> )	50	100
Increase of exogenous spp.	Aakashmoni ( <i>Acacia auriculiformis</i> )	38	76
	Eucalyptus ( <i>Eucalyptus camaldulensis</i> )	25	50
	Mahogany ( <i>Swietenia macrophylla</i> )	20	40
	Other species	10	20

**Changes in availability of forest products in the study area:** Different types of forest



products were collected and used by the respondents as a part of their livelihood activities but the availability of those products were decreased over time. Irrespective of forest products, availability and collection were decreased which varied from 16-60% (Table 3.5). Among the different products, the highest reduction was found in as non-timber forest product (60%) followed by fruit (58.33%), bamboo (56.25%), fodder (50%) and timber (42.50%). The decrease of those forest products had created a negative impact on the livelihood of the forest dependent community.

**Table 3.5 Types of forest products available/collected as opined by the respondents**

<b>Forest product</b>	<b>Availability of forest products as opined by respondent (%)</b>		
	<b>10 years back</b>	<b>Current year</b>	<b>Change (%)</b>
Leaf and branch	100	84	-16.00
Fuel wood	100	74	-26.00
Timber	80	46	-42.50
NTFP (Non-Timber Forest Product)	50	20	-60.00
Bamboo	32	14	-56.25
Fodder	20	10	-50.00
Fruit	25	10	-58.33

**Alternative resources for adapting to the reduced availability of forest product:** The preceding section revealed that there was less availability of forest products as time is passing. As a result, the respondents were searching for alternative resources to overcome their needs especially the energy requirement. The finding of the study showed that respondents have already been using a number of alternative resources to cope up with the unavailability of forest resources. Among the alternative resources, cow dung was found to be as the most preferred alternative resource followed by rice husk and bamboo.

**Changes of cropping intensity over time:** It was learned during the study that farming was not the dominant livelihood activity in earlier period but it became an important activity due to the unavailability of forest products. Trend in growing different crops increased remarkably and it varied from 10 to 40% except wheat cultivation (Table 3.6). Among the



increased rate of growing crops, turmeric ranked the top (40%) followed by banana (30%), aroid (25%), pineapple (22%), ginger (18%), potato (14%) and rice (10%), while the growing of wheat was almost nil. Further, the cultivation of cereal crops was very low because of upland ecosystem of the study area.

**Table 3.6 Change of cropping intensity over time in the study area**

Crop	Change of cropping intensity as opined by respondents (%)		
	10 years Back	Current year	Change
Turmeric	23	63	40
Banana	15	45	30
Aroid	12	37	25
Pineapple	10	32	22
Ginger	6	24	18
Potato	0	14	14
Rice	12	22	10
Wheat	6	0	-6

**Water availability:** Water availability was an important issue in the study site as reported by the respondents. Rain water available during the month of July to September was the main source for irrigation and drinking in the study area. Except for monsoon (July to September), the availability of water has not been adequate to fulfil the demand of the communities, and the condition gets even worse during the winter months. In the study area, roar pump has been the main source of water for domestic purpose, while shallow tube well has been used as the source for irrigation.

**Evidences from community perception:** The perceptions of the community on change of local climate and their important impacts over time revealed that respondent perceptions (Table 3.7) were almost similar to the evidences of climate change recorded from the meteorological database. Regarding the change of summer and winter temperature over time, respondents opined that they have been experiencing cooler winter temperatures while summer temperature has been rising. This information correlated with the change of maximum



temperature recorded from the meteorological data base. This statement was also found to be consistent with the change of minimum temperature of long term data base. Regarding rainfall (precipitation) intensity, majority of the respondents (64%) opined that it had increased over time, while the rainfall frequency decreased as opined by 72% of the respondents. Though there was no evidence from the database on frequency of rainfall but this was confirmed by the community during the FGDs. In terms of the impact of climate change, majority of the respondents expressed that the drought length and severity (54%) as well as drought frequency (56%) had increased over time which was consistent with the current climatic events.

**Table 3.7 Respondents' perception on climate change over time in the study area**

Climatic parameter	Respondents' perception (respondent opinion expressed as percent)				
	Increased	Decreased	No change	No idea	Total
Temperature (Summer season)	98	0	0	2	100
Temperature (Winter season)	34	44	14	8	100
Rainfall intensity	64	24	2	10	100
Rainfall frequency	18	72	2	8	100
Drought length and severity	54	8	14	24	100
Drought frequency	56	4	16	24	100
Cold spell-intensity and severity (March-April)	24	10	24	42	100
Cold spell-intensity and severity (September-October)	14	16	22	48	100

#### **Adaptation Measures Taken by the Government and Community**

The preceding sections stated that there were distinct changes on local climate especially temperature, rainfall etc., which might have affected the productivity of both crop and forest. To cope with the impacts of those changes, government as well as local community have undertaken some-sort of adaptation measures. The adaptation measures taken by the



government as well as community for both forest and agricultural production in the study area are discussed below:

**Adaption measures undertaken by government agencies:** The government of Bangladesh through the Department of Forestry and Agricultural Extension adopted a number of adaptation measures to protect and promote forest against the impacts of climate change and increasing pressure from other anthropogenic activities. Among various measures taken, plantation by exotic species had been found to be the topmost measure followed by restriction to harvest of forest products. The other important measures were social forestry activity for the management of forest, making water reservoirs inside the forest to supply water during the drought, restriction on grazing, distribution of improved seeds of grasses or fodder trees to make them available outside the forestland in order to reduce pressure from livestock grazing. The other important measures were the introduction of new fuel use technology like improved stove and biogas to reduce the dependency on forest products, and control of pests and diseases through spraying insecticides and fungicides. These findings revealed that both local community and government are concerned and proactive to protect and promote the natural forests from the impacts of climate change events and other natural and man-made activities.

**Anticipated adaptation measures undertaken by the community:** A number of anticipated adaptation measures have been undertaken by the community for sustaining their production systems owing to their livelihood. Among those, change in planting time was the most common adaptation measures followed by using new technologies. In case of using new technologies, majority of the respondents adopted new varieties, micro-irrigation and plant protection measures. The respondents opined that they have been practicing those adaptation measures because of late on-set of rain, scarcity of water for irrigation and emergence of new pests and diseases. They also urged the researcher to provide short duration, drought tolerant and pests and diseases resistant crop varieties to cope up with the changing climatic scenarios.



### **Problems and Opportunities Prevailing in the Locality/Community**

**Problems:** The local community used to struggle against a number of problems, both climatic and anthropogenic in order to maintain their livelihoods. Some problems were found as severe and some were moderate. There were several issues pointed out by the local community, first, gradual decrease of ground water level resulting in scarcity of irrigation and drinking water. Second, the cutting of forest illegally is being done by some politically powerful people. Third, restriction has been imposed on harvesting forest products from the natural forest. Fourth, the infestation of disease and insect-pest both in agricultural crops and forest has been observed. Moreover, the communities have been increasingly experiencing the changing climatic patterns. As a result, the problem of occurrence of sudden extreme climatic events like storm, excess rainfall, water logging, high temperature, cold spell, frost etc have been prevalent. Decrease in productivity of land was also found as and was also becoming dominant due to the impact of climatic events along with intensive land use having indiscriminate use of insecticides, fungicides and huge application of inorganic fertilizers. The other problems included lack of quality of planting materials/seeds, degradation (pollution) of soil/land, long dryness and drought, and change of timing of weather parameters.

**Opportunity:** A number of opportunities to have been suggested by the respondents to overcome the problems existing in the locality. The top-most priority was the construction of water reservoirs for ensuring water supply to combat the impacts of climate change and to make the forest and agriculture productive. The respondents also indicated on the enhancing the afforestation programme through community approach/partnership followed by development of pest and disease resistant varieties, increase grass land area for grazing and ensuring availability of high quality planting materials. Other opportunities were to reduce the use of chemical fertilizers and pesticides, increase homestead plantation, provide access of the community to forest land for resource collection, improve drainage system to reduce flooding/water logging conditions, and also provide loan or credit to overcome the crisis.



### **3) Community-based adaptation to climate change: The case of Nakhon Ratchasima, Thailand**

#### **Ecosystem Goods and Services**

Community managed forest ecosystem in the study site has been subjected to physical damage due to flash flood and sand deposition. The changes in the soil structure have been affecting the ecosystem which in turn is adversely affecting the agriculture production, biodiversity, and water quality. Due to these changes, reduced soil quality and less water availability combined with increased demand on cash crop like cassava, has hampered the production of paddy.

Communities, have traditional ways of life that are closely linked to the ecosystem goods and services. The access of the communities to resources has been lost due to the change in climatic pattern and increasing impact of humans over those resources. An integrated digester management strategy is needed in this line to ensure equitable resource sharing.

#### **Water availability**

The primary concern of the climate change impact in the study area was the declining water level and balance between its supply and demand. The communities in the study area rely on water supply from shallow and deep groundwater wells however, due to the decreasing level of water, many wells and other water sources has been drying up that directly affect the availability of water for drinking and irrigation.

#### **Change in land use**

Increasing incidences of floods and erratic perception patterns has induced land use changes in the study area. Moreover, due to flooding, there has been an increase in the deposition of sand over the paddy field that could lead to shift in the agriculture pattern. This in turn has promoted cassava plantation in the area which eventually leads to shortage of major food grain. The deposition of sand also has impact on the natural forest ecosystem resulting in natural habitat loss which is gradually being replaced by invasive species.

#### **Impacts on Local Society**

Growing climate related hazards have impacts on the local social systems in numerous ways.



People who preferred living in a nucleus society now have dispersed and some of them migrated to urban city. This has affected the local culture and traditions in some extent. In addition, increasing demand for workers in the labour-intensive industries has led to changes in the traditional agriculture system.

### **Perceptions of Stakeholders**

Some of the household respondents in the study site have heard about climate change, especially change in weather patterns. Some of them claimed that some changes have already been observed such as increase in the frequency of flooding every year. However most of them do not realize that changes in the local ecological and physical settings will also reduce the capacity of the society and ecosystem to cope with climate change and extreme climatic events in the future. The respondents were very keen to identify local development issues and have their own perception about causes of current impact.

### **4) Adaptability in agriculture and forestry activities in Huong Song community, Nam Dong district, Vietnam**

#### **Impacts of climate change on agriculture and forestry production**

Huong Song Community is situated in the Nam Dong district, Vietnam. The total average annual temperature of the area is around: 8.0 °C whereas the average total annual rainfall is recorded to be around 3300 mm. The dry season prolongs creating shortage of water for agriculture production in some areas. Similarly, shift in rainy season and prolonged dry season has resulted in changes in the seasonal calendar of agriculture pattern, techniques and decline in the agricultural production. Some of the households have been clearing up natural forest for swidden fields and use it for plantation (*Acacia sp.*) are some of the reasons behind the reduction of natural forest and increase in plantation forest. The statistical data shows that in 2003, there were 649.3ha of plantation forest in Nam Dong, while in 2010, this area expanded to 1,423.24 ha, with an increase of 773.94 ha within a period of 7 years.

#### **Adaptation measures in agriculture pproduction**

A lot of households have changed the swidden field into ladder fields and shifted to fish



farming as their major agriculture activity.

**Table 3.8 Adaptive measures in agriculture in Huong Son commune**

Measurements of local people	Yes	No
Apply soil conservation measure	10.8	89.2
Change the seasonal calendar	86.5	13.5
Apply pest and disease removal measure	59.5	40.5
Apply soil conservation measure	10.8	89.2
Change the seasonal calander	86.5	13.5
Apply pest and disease removal measure	59.5	40.5
Apply pest and disease prevention measure	10.8	89.2

Being a mountainous community, common swidden cultivation system has been practiced but soil conservation measure has been seldom applied. The degraded soil needs time and scientific procedures to restore its quality. Local people mentioned that agriculture production and swidden cultivation have been changed and the “slash and burn” technique is not followed anymore. Instead, people tend to change into intensive swidden cultivation. In recent times, Rubber and *Acacia sp* are getting the status of major crops and has been valuable in terms of poverty alleviation. Intercropping between Rubber and *Acacia sp* has also been widely applied to create good ground cover to reduce soil erosion and increase income for local people as adaptation measures. Decreasing number of livestock rearing has been of a great concern for the local communities which directly affect the livelihood. The reasons that have lead to the change in grazing structure of local people are: increased diseases, lack of folder, reduced quality of the forage area (table 3.9).



**Table 3.9 Reason for changes in livestock grazing**

	Percentage		
	Increase	Reduce	Stable
Disease	100.0	.0	.0
Folder availability	4.8	90.5	4.8
Quality of foraging area	5.0	95.0	.0
Impact of temperature change	20.0	13.3	66.7

**Adaptive measures based on available resources**

The study site has forest allocation program in the two villages and the forest has very important role in household income as both timber and non timber forest has been harvested. However reducing forest cover due to poor governance people particularly the poor households have been losing benefits from this forest resource.

**Table 3.10 Income from forest and household economic in Huong Son commune**

		Household economic status			
		Wealthy	Medium	Poor	Very poor
Contribution of plantation forest	Very important	42.9	57.1	.0	.0
	Important	31.8	59.1	9.1	.0
	Not important	.0	.0	.0	.0
Contribution of NTFPs products	Very important	.0	.0	.0	.0
	Important	25.0	62.5	12.5	.0
	Not important	25.0	50.0	25.0	.0

**Personnel and knowledge in preventing natural disasters**

Most of residents agreed that before the typhoon or flood they get the announcement from local authorities through local media. Presently, there are very few people who are experienced in predicting natural disaster. Local people mention that natural disasters seem to increase in recent years. Temperature and rainfall are more frequent and much stronger.



**Table 3.11 Perception of local people about extreme weather conditions**

Extreme weather conditions	Percentage		
	Earlier	Later	Stable
Time of appearing cold period	8	92	0
Time of appearing flood period	46	22	32
Time of appearing hot period	95	5	0
Time of appearing droughts	89	8	3
Time of appearing typhoons	46	38	16

#### **Factors affecting the adaptability of local people**

Doing the Multi-regression analysis, we found that the adaptability of local people depended on the economical condition of the household (The better off household has higher adaptability compared with the poor ones); the role of natural forest with household livelihoods (higher the role, lower the adaptability of local people). This proves that the poor household group suffer most from the impact of climate change.

In comparison with other regions within the Tam Giang Lagoon in Thua Thien Hue province (CSRD, 2010), we found that the adaptability of local people in Huong Son commune is far less in their traditional knowledge in agriculture production, climate change adaptation and coping with natural disasters.

#### **4. Conclusions**

The consequences of climate change have caused increase in extreme climatic events such as floods drought, erratic rainfall and cyclone among others. These have further negative implications on water availability, agricultural production, food security in context of project research sites. The agrarian households depended on agriculture sector for their livelihoods are vulnerable to the impact of climate change. To adapt with the extreme events, communities adopted measures to manage resources, harness opportunity from technology and practices traditional and indigenous knowledge. The role of government and external agencies has been found to be vital for empowering local people and strengthening local institutions in process of adapting to climate change.



Few key findings and outcomes from some of the individual case studies are highlighted below:

1. In Bangladesh the study revealed that increasing trend of climate change particularly temperature and erratic rainfall pattern and anthropogenic activities (like deforestation) could be the reasons for decreasing the natural resources particularly forest. The community people have taken some adaption measures like change in planting time, using new technologies etc. However, community strongly opined that the concerned authorities should take appropriate measures like construction of water reservoirs, afforestation through community approach/partnership, development of pest and disease resistant variety etc. These might have positive benefits to combat with the impacts of climate change to a considerable extent and creating their better livelihood opportunities.
2. In Nepal rural communities are highly dependent on the forest product for their livelihood. The effect of climate change can be seen in the form of less forest product availability for harvesting. Institutions play vital role in climate change adaptation and enhance capacity of local people to cope with the extremes. Success of all the adaptation practices depends on the arrangement of institutions and the performance. Even government also recognized the role of local communities in designing, implementing of based adaptation approach.
3. In Thailand it has been realized that the climate is changing and this has had an impact on the cropping system, water availability and traditional harvesting pattern from the forest. Direct impacts from changing climate on crop yield and natural resources are still not noticed well but reported that such impacts are difficult to distinguish from effects due to deforestation and land use change. Local wisdom and traditional knowledge could be useful to help to respond to environmental changes. However, this has been lost by introduction of modern technology in some cases. Local research to compile and conserve traditional wisdom is critical for the community and province to strengthen their capacity to adapt and respond to future environmental impacts, including climate change.



4. In Vietnam, in order to adapt to climate change, local people have been changing their agriculture activities, number of livestock rearing, cultivation techniques, crop composition, vaccination, pest and disease prevention measurement and apply new techniques. Most of the adaptation activities of local people toward climate change are from their own experiences or learning from their individual practices. There were no any programmes from the government/local authorities to help local people to adapt to climate change. The focus of the government in the coastal area where the impacts of the climate changes are much more serious.

## 5. Future Directions

- There is scope to strengthening the regional network for research, analysis, policy discussion and publish on issues around social-environment.
- Institutional preparedness and capacity of the stakeholder seems deficit in most of the project site. So there is a need to build capacity of the meso and local level government line agencies and local communities who have been involved in preparing these CAPAs.
- Besides few empirical researches, these indigenous practices have not been adequately acknowledged and documented. Therefore, there is a need to document and upscale the practices adopted by local communities to climate change adaptation and inform the policy makers in order to keep these issues in mind while framing policies.



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## **Funding sources outside the APN**

Apart from APN funding each participating countries were also provided in-kind support for the project activates.

### **List of Young Scientists**

Following students were supported for their masters' degree in various institutions:

1. Student name: Name: **Ms Tahmina Afroz**

Degree: MS (Master of Science) in Agroforestry and Environment

Thesis title is: Community based forestry and livelihood in the context of climate change in Madhupur Region of Bangladesh

2. Student name: Name: **Rajesh Bista**

Degree: Master in Development Studies

Thesis title is: Ecosystem services and poverty alleviation: case of community based forest management in Nepal

3. Student name: Name: **Nguyen Van Hoang**

Degree: Master of Science

Thesis title is: Comparison the adaptive capability of local people in agriculture and forestry production in Huong Tra and Nam Dong District, Thua Thien province, Vietnam

4. Student name: Name: **Ms Suparat Phranoret**

Degree: Master of Science in Climate Change and Sustainable Development

Thesis title is: Climate change adaptation to rice production by small farmers in Yasothon provience, Thailand



## **Appendix 1**

Synthesis report on  
**Facilitating Skill Development on Climate Change Adaptation and Mitigation: Training to  
Local Community Leaders**



ForestAction Nepal



**Asia Pacific Network for Global Change Research**  
**February, 2012**



#### **A. Background:**

The ongoing research on “**Community Based Forestry and Livelihoods in the Context of Climate Change Adaptation**”, within the broad framework of APN’s Second Strategic Plan, aims to investigate how climate change is affecting forest-dependent communities in one of the world’s most vulnerable regions and the actual and potential adaptation measures that enable households, communities and networks to remain resilient in the changing contexts. In this context, the project aims to explore, document, analyze and synthesize lessons on community based adaptation by the grassroots institutions.

With the aim of exploring the community based climate change adaptation, the field level activates were accomplished in Lamatar VDC of Lalitpur district in 8 different CFUGs. The respondents during the field visit demanded on the basic knowledge on climate change. . They further stressed on the need of the basic orientation ‘in order to increase the resilience capacity of community.

Moreover, there has been a realization on the need of training in this regard. In this line, two days training targeted to the local communities of Lamatar VDC was organized on January 2012. The aim of the training program is to make aware on the climate change issues and enhance the level of understanding and inquisitiveness on issues related to environment and climate change. Based on the information and content of training conducted, a training manual has been prepared in native language (Nepali), which will serve as a reference tool for the field practitioners and local resource person working on climate change. Realizing the need of extension, different issues and aspects like Climate change adaptation, mitigation, national and international climate change policy, Reducing Emission from Deforestation and Forest Degradation (REDD+) and Payment for Ecosystem Services (PES) were the border themes of the training.

#### **B. Objective of training: (For detail schedule refer Annex 2)**

1. To familiarize the local communities on the basic concepts of climate change, weather, green house gases (GHGs), and REDD+ and PES among others..
2. To make the communities aware on climate change impacts and its adaption and



mitigation measures.

3. To sensitize the local communities on the local climate change adaptation framework.

#### **C. Trainer and trainee:**

Two project team members and one training specialist from Forest Action Nepal and two experts were involved during the training. Moreover, CFUG leaders and few influential people of the community were actively involved in the training. The selection of the CFUG and community leaders for the training was based on the assumption that they will communicate and dispatch the knowledge among their respective CFUGs. (List of participant is in Annex 1)

#### **D. Tools and Approach:**

Different tools and approaches were used during the training period. In order to deliver the training content following tools were applied:

- Hand outs
- Poster /Diagram
- Group work
- Documentary show
- Brainstorming sessions
- Games
- Experience Sharing

#### **E. Content of Training:**

##### **Day 1:**

###### **Session one:**

Session one was more focused on introduction of participants and to familiarize the trainees over objectives of the training. Besides, expectations of the participants from the training were listed in Meta cards. Before the real execution of the training, pre-evaluation test was carried out (refer Annex 3) in order to judge the level of knowledge/understanding of the trainees on the agenda which was supposed to be discussed during the training period.



Some of the questions put forth by the participants are as follows:

- What is climate change?
- What is the difference between adaptation and mitigation?
- What is the role of forest in climate change?
- What would be the role of communities towards addressing climate change?
- What can we compel the externalities for the payment of environmental services?
- What is Nepal's position in climate change policy development process?
- What is carbon trade?
- Can we really benefit from carbon trade?
- What is the relation between water sources and forest?

### **Session two:**

Session two was more focused on the issues of climate and weather and their relation. Moreover, climate change related terminologies were also discussed during this session. More emphasis was put on climate change and its impacts. Besides, the concept of greenhouse gas (GHG) effect and its sources was discussed where the relation of GHG, global warming and Climate Change was discussed.

### **Session three:**

Third sessions was focused on the national and international initiatives carried out in relation to climate change adaptation and mitigation. National initiatives like the National Adaptation Programme of Action (NAPA), Local Adaptation Plan of Action (LAPA), Community Adaptation Plan of Action, Climate change policy, REDD+ strategy and other initiatives in this line were discussed. Likewise, international initiatives like COP, UNFCCC and Kyoto protocol was brought to the discussion. With relation to these national initiatives, Nepal's commitment and position was discussed where the participants put forth some issues on possible trade offs.

### **Day 2:**

Day two of the training kicked off with review and reflection of the contents from day one and further discussion was carried out on the unclear issues. Sessions in day two was more



engaging where participants were encouraged to share and engage in group work and discussion.

**Session one:**

The major objective of this session was to understand the awareness level of the participants on different environmental services. The concept of Payment for Ecosystem services (PES) and its process was discussed during this session. The participants were interested in knowing more on payment mechanism of Environmental Services (ES), and few good examples and policy update with regards to ES and PES was discussed.

**Session two:**

Intensive group work was carried out during this session. Participants were divided in four groups and were assigned to map the impacts of climate change in different sectors - water, forest and biodiversity, agriculture and natural environmental and based on the impact observed, participants were asked to draw the adaptation measures that community have been adopting.

**Session three:**

Session 3 was focused more on the presentation based on the group work from the previous session. During the presentation, each group presented the impact of climate change in different sector and its adaptation measures.

**Session four:**

The Last or the fourth session was allocated to address the queries from the participants Subsequently, post evaluation form was filled up and overall training evaluation was carried out by the participant themselves(refer Annex 3 an 4) . And finally team leader of the APN project wrapped up the training with his closing remarks and thanked all the participants for their active participation during the training and cooperation during the field survey.

**F. Conclusion:**

Two days training seemed fruitful in terms of enhancing the level of understanding of the participants on climate change adaptation of the participant. Besides the participants



stressed on the need for regular updates and training on relevant issues in the future. The participants expressed their concern on the need for these type of trainings for the secondary school level students so that they can share it with their family and friends.



**Annex 1: Participant Details:**

S.N	Name	Institution	Phone
1	Dhurba Prasad Ghimeri	Chisapani CFUG	9841383742
2	Shivaram Paudel	FECOFUN, Lalitpur	9849837842
3	Parbati Tamang	Mathilo Patley CFUG	9849406974
4	Sunita Tamang	Mathilo Patley CFUG	
5	Nani Ram Ghimeri	Kafley CFUG	9841214231
6	Shikhar Pd Ghimeri	Gomati CFUG	
7	Bishnu Pd Ghimeri	Gomati CFUG	9818083875
8	Pursotam Paudel	Padali CFUG	
9	Bijaya Lama	Mathilo Patley	9808575272
10	Krishna Gopal Shrestha	Shree Ganesh CFUG	
11	Raja Ram Paudel	Padali CFUG	9841132170
12	Raj Kumar Bhudhathoki	Chisapani CFUG	5582361
13	Shree ram Paudel	Patley CFUG	9808734148
14	Susmita Gautam	Patley CFUG	9849837867
15	Komal Bd Chand Thakuri	Patley CFUG	
16	Surendra Bd Tamang	Goldadakakri Dada CFUG	9803533252
17	Santa Aadhakari	Patley CFUG	
18	Ambika Sharma	Gomati CFUG	
19	Pitambar Ghimeri	Chisapani CFUG	
20	Kamal Bhandari	ForestAction	9841395850
21	Rajesh Bista	ForestAction	9851139450`
22	Samjana Lama	Sisneru School	
23	Birendra Karna	ForestAction	
24	Yasoda Bista	FECOFUN	
25	Aatma Ram Chaulgain	Dhikaspakha CFUG	9841380642
26	Pravu Ram Khadka	Dhikaspaha CFUG	9841651495
27	Bal Ram Lama	Manedada CFUG	
28	Prgaya ghimeri	Kafley CFUG	
30	Krishna Khadka	Dhikaspakha CFUG	9851095206
31	Damodar Acharya	Chisapanai CFUG	9841453785



### Annex 2: Program Schedule

दिन	सेसन	विषयवस्तु	समय	विधि	सहजकर्ता
पहिलो दिन	पहिलो	<ul style="list-style-type: none"> <li>● स्वागत र परिचय</li> <li>● अपेक्षा संकलन र तालिमको उद्देश्य</li> <li>● तालिमको व्यवस्थापन</li> <li>● मूल्यांकन सर्वेक्षण फारम</li> </ul>	९:३० - १०:४५	प्रवचन समुहकार्य	कमल भण्डारी विरेन्द्र कर्ण राजेश विष्ट
	दोस्रो	<ul style="list-style-type: none"> <li>● मौसम र जलबायु परिवर्तन भनेको के हो, यसका फरकहरु र यो कसरी हुन्छ ?</li> <li>● यसका असर र प्रभाव</li> <li>● हरित गृह र्याँस र जलबायु परिवर्तनको सम्बन्ध</li> </ul>	१०:४५ - १२:१५	प्रस्तुतीकरण र छलफल	कमल भण्डारी राजेश विष्ट
खाना ब्रेक १२:१५ - १:००					
तेस्रो		<ul style="list-style-type: none"> <li>● अन्तराष्ट्रिय महासंघिहरु तथा नेपालमा जलबायु परिवर्तन सम्बन्ध गरीएका प्रयासहरु न्यूनीकरण र यसका उपायहरु ( रेडको अवधारणा, प्रकृया संभावना)</li> <li>● अनुकूलन र यसका उपायहरु</li> </ul>	१:०० - ३:४५	प्रस्तुतीकरण र छलफल	कमल भण्डारी शान्त राम वराल
		चिया खाजा तथा पहिलो दिनको समापन			
दोस्रो दिन	पहिलो	<ul style="list-style-type: none"> <li>● बातावरणीय सेवा भुक्तानीको अवधारणा र विकास</li> <li>● बातावरणीय सेवा भुक्तानी प्रकृया र यसका फाइदा र वेफाइदाहरु</li> </ul>	९:३० - १०: ३०		कमल भण्डारी राजेश विष्ट <sup>1</sup> डा. धर्म उप्रेती



दोस्रो	स्थानीय स्तरमा देखिएको वातावणीय प्रवाभबारे सहभागीहरुको बुझाई	१०: ३०- १२:१५	समुह कार्य	
दिउँसोको खाना		१२:१५ देखि १:००		
तेस्रो	समुह कार्यको प्रस्तुती र छलफल	१:०० - ३:००	प्रस्तुतीकरण र छलफल	कमल भण्डारी विरेन्द्र कर्ण राजेश विष्ट
खाजा, चिया ब्रेक		३: - ३:१५		
चैथो	तालिमको सिकाई, मूल्यांकन र समापन	३:०० - ४:१५		कमल भण्डारी विरेन्द्र कर्ण राजेश विष्ट



### **Annex 3: Pre and Post Evaluation Form**

#### **१ जलवायु परिवर्तन भन्नाले:**

- क. तापक्रम, वर्षा र हावाको वहावको अवस्थालाई जनाउँछ,
- ख. लामो समयको औषत अवस्थालाई जनाउँछ
- ग. कुनै निश्चित ठाउँको लामो समय आवधिमा तापक्रम, वर्षा र हावाको अवस्थामा भएको परिवर्तन लाई जनाउँछ ।
- घ. माथिका सबै

#### **२. नेपालको बार्षिक तापक्रम बृदि दर निम्न डिग्री सेल्सयसमा भईरहेको छः**

- क. ०.०४
- ख. ०.०७
- ग. ०.०६
- घ. ०.०५

#### **३. सबै भन्दा बढी कार्बन उत्सर्जन गर्ने देश कुन हो ?**

- क. जापान
- ख. अमेरीका
- ग. जर्मन
- घ. चीन

#### **४. हाल सम्म सुचि कृत गरेका हरित गुह ग्यासँहरु कति बटा छन ?**

- क. ५
- ख. ४
- ग. ७
- घ. ६

#### **५ हरित गृह ग्यासँहरु मध्ये कार्बनडाइअक्साइडले कति प्रतिशत भाग ओगटेको छ ?**

- क. ६०
- ख. ७५
- ग. ८०
- घ. ८५



**६. तलकामध्ये जलबायु परिवर्तनले कुन क्षेत्रमा बढि प्रभाव पार्छ ?**

क. जलस्रोत

ख. कृषि

ग. वन्यजन्तु

घ. वन

**७. वायूमण्डलमा बढेको हरितगृह ग्याँसको प्रभावले पृथ्वीको तापक्रम बढिरहेको छ ।**

क. थाहा छ र व्याख्या गर्न सक्छु

ख. थाहा छ र वुझेको छु तर व्याख्या गर्न सकिदैन

ग. सुनेको मात्र छु

घ. केही थाहा छैन

**८. संयुक्त राष्ट्र संघको जलबायु परिवर्तन महासन्धि कहिले भएको थियो ?**

क. १९९१

ख. १९९५

ग. १९९०

घ. १९९२

**९. हरित गृह ग्याँसहरु के के हुन् ?**

क. थाहा छ र व्याख्या गर्न सक्छु

ख. थाहा छ तर नाम मात्र भन्न सक्छु

ग. सुनेको छु तर याद भएन

घ. केही थाहा छैन

**१०. जलबायु परिवर्तन बाट हुने जोखिमका क्षेत्रहरुको बारेमा**

क. वुझेको छु र व्याख्या गर्न सक्छु

ख. अलि अलिमात्र थाहा छ

ग. सुनेको मात्र छु भन्न सकिदैन ।

घ. केही पनि थाहा छैन



**११. वनविनास तथा वनको क्षयीकरण कम गरेर यसवाट उत्सर्जन हुने कार्बनको मात्रा घटाएँ वापत विकासोन्मुख देशहरूले भुक्तानी प्राप्त गर्नुपर्द्ध भन्ने अवधारणा नै रेड हो ।**

- क. वुभेको छु र व्याख्या गर्न सक्छु ।
- ख. अलि अलि मात्र वुभेको छु, व्याख्या गर्न सकिदन ।
- ग. सुनेको मात्र छु ।
- घ. अहिले सम्म सुनेको छैन ।

**१२. हाम्रो समाज आर्थिक, सामाजिक, राजनैतिक हिसावले विभिन्न वर्गमा विभाजित छ र यसको असर हाम्रो वन श्रोत माथिको पहुँच र व्यवस्थापन प्रकृयामा परेको छ भन्ने कुरा ।**

- क. वुभेको छु र व्याख्या गर्न सक्छु ।
- ख. अलि अलि मात्र वुभेको छु, व्याख्या गर्न सकिदन ।
- ग. सुनेको मात्र छु ।
- घ. केही थाहा छैन ।

**१३. जटिल सामाजिक संरचना र त्यसका कारणबाट हुने श्रोतमाथिको फरक पहुँचले यसवाट प्राप्त हुनुपर्ने लाभको वाँटफाँटमा कस्तो प्रभाव पार्द्ध भन्ने लाग्छ ?**

- क. फरक फरक अवसर प्रदान गर्द्ध
- ख. समाजमा सिमित वोलवालाहरूको मनोमानी वढाउँछ
- ग. पछाडी पारिएका समुदायहरूलाई अभ पछी पार्द्ध
- घ. माथिका सबै

**१४. जलवायु परिवर्तन अनुकूलनमा वनको योगदान के हो ?**

**१५. कार्बन उत्सर्जनको न्युनिकरणमा वनको भुमिका कस्तो छ ?**



**Annex 4: Training Evaluation form**

मूल्यांकनका विषयहरु	अति राम्रो	राम्रो	कमसल	कारण
तालिममा समावेश गरिएका विषयवस्तुहरु कतिको उपयोगी थिए ?				
प्रस्तुतीकरण				
प्रशिक्षण विधि				
व्यवस्थापकिय पक्ष				
प्रशिक्षकको दक्षता तथा शैली				
यो तालिमले तपाईं जिवनमा कस्तो परिवर्तन ल्याउला ?				
तालिमको समयावधि				
तालिम संचालन प्रकृया कस्तो लाग्यो ?				
खाजा तथा खानाको प्रवन्ध कस्तो थियो ?				
सहभागिहरुको सहभागिता कस्तो थियो ?				

- यो तालिमबाट विस्तृत नसक्ने कुरा के सिक्नु भयो ?

.....

- तपाईंले अपेक्षा गरेका कुराहरु कति परा भए कति भएनन ?

.....

- केही सल्लाह सुझाव भए लेख्नु होला ?

.....



#### Annex 5: Photo Plates:



Group photo of the participants



Participant in group Exercise





**Participant during Discussion**

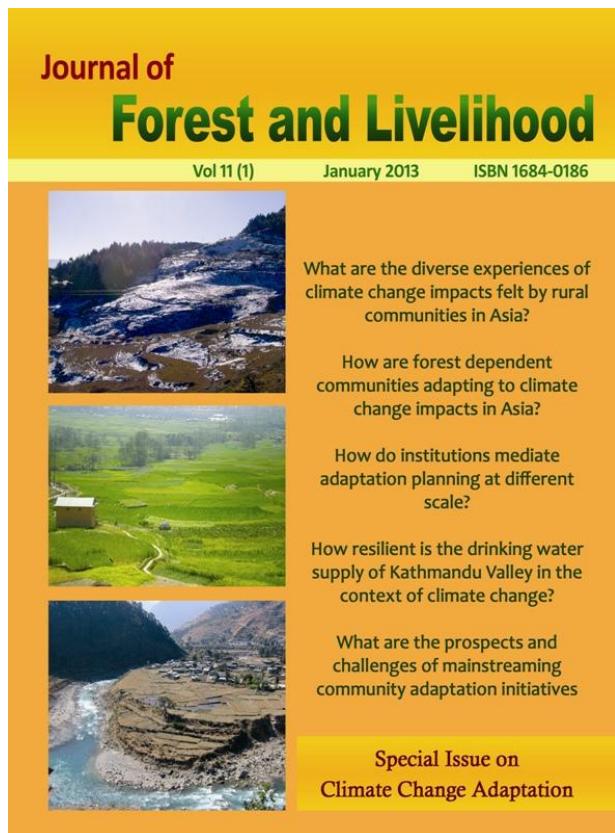


**Participant sharing the result form group exercise.**



## Appendix 2

Cover and back page of Journal of Forest and livelihoods .Volume 11(1) 2013



Established in 2000, ForestAction (Forest Resource Studies and Action Team) is a Kathmandu based non-governmental organization working in the field of Forestry, Agriculture and Climate Change. ForestAction is established and nurtured by a multidisciplinary team of professionals combining natural and social science. It follows deliberative governance, transformative learning and collaborative partnership as its guiding principles. It has made significant contribution in transforming Nepal's forest governance and policy making environment from a traditional, top-down, state-centric approach towards a deliberative, collaborative and community based approach. During its decade-long institutional life, it expanded considerably in the scale and diversity to become a national centre of excellence and a regionally well-recognized actor in social science research and policy processes, along with a strong international knowledge network.

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**APN**

## **Appendix 3**

### **Synthesis report**

**Seminar on “Community-based Forestry and Livelihood in the context of Climate Change  
Adaptation in South Asia”, Kathmandu, Nepal**



ForestAction Nepal



**Asia Pacific Network for Global Change Research**

December 09-10, 2012

## **Executive Summary**

### **A. Background:**

Adjustment in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts is understood as Climate Change Adaptation (IPCC 2001). Adapting to the changes has consequently emerged as a solution to address the impacts of Climate Change that are already evident in some regions. It involves adjustments to reduce the vulnerability of communities, regions, or activities to climatic change and variability. The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report states that "adaptation will be necessary to address impacts resulting from the warming which is already unavoidable due to past emissions" (IPCC, 2007: 18). Adaptation to climate change is considered especially relevant for developing countries where societies are already struggling to meet the challenges posed by existing climate variability (Yamin *et al.* 2005; Adger *et al.* 2003; Handmer 2003), and are therefore expected to be the most adversely affected by climate change (McCarthy *et al.* 2001). Climate change is a global problem and has multiple direct and indirect consequences (Almendares and Epstein 2009) in regional and sectoral level. Increasing temperature, erratic rainfall patterns, and rising sea level threats to sustainable livelihoods which are posed by climate change (WB, 2008). Different studies show that climate change has severe impacts on livelihoods of poorest country of the world including south and south East Asia. The effects of climate change are expected to deepen poverty and adversely affect livelihoods (Gaire *et al.*, 2008). With the increasing climate change impacts, the developing country is still being unable to adapt on the changing context of Climate Change. Even local communities posses wider knowledge of adaptation since so long, the lack of documentation and dissemination of that knowledge and resource constraints challenging to meet the overall adaptation agenda.

With all this backdrops Community-based Forestry and Livelihoods in the Context of Climate Change Adaptation project was designed and implemented in four Asian countries-Bangladesh, Nepal, Thailand, and Vietnam, which was hosted by Forest Action Nepal. It is critical to explore adaptation practices that can help rural communities respond effectively to these threats. The present research aims to investigate how climate change is affecting forest-dependent communities in one of the world's most vulnerable regions and the actual

and potential adaptation measures that enable communities and networks to remain resilient. The project was executed for two years from 2011-2013. During the first year, all the partner countries executed different research activities and conducted site based exploration to understand the community based climate change adaptation with relation to livelihood. While during the second year of the project, the research findings were shared and discussed through workshop seminar held in Kathmandu on December 9-10, 2012.

#### **B. Objectives of the seminar**

The major objective of the seminar was to disseminate the research findings conducted in four Asian countries- Nepal, Bangladesh, Thailand and Vietnam and strengthen the network among the researchers and partner countries. Besides, the seminar aimed to discuss the further steps in order to strengthen climate change research in partner countries and upscale the findings among wider audiences.

#### **C. Program and Participants**

The participants during the seminar represented different research and academic institutions and few from INGOs/NGOs. Welcome speech and objectives of the workshop was delivered by the former project proponent - Dr Dharam Raj Uprety and overall seminar was facilitated by Dr. Naya Sharma Paudel from ForestAction Nepal. A total of eight papers were presented in the seminar and out of those presented, four papers were an outcome of the APN research conducted in the four Asian countries. While the remaining four papers came from different academic and research institutions. Name of the participants is attached in annex B.

The program was scheduled for two days (annex A). Day one was observed by introduction to the program, paper presentations and discussion over them. On the following day a field visit to Sano Gaun Community Forest in Kavrepalanchok District was organized to understand the forest management practices by the community.

### **1. Day One:**

Day one of the seminar was dedicated towards paper presentations on climate change adaptation. A total of eight papers were presented and most of them dealt with the issue of climate change adaptation, livelihoods, community based adaptation. List of the papers with their respective presenter are as follows:

<b>Presenter</b>	<b>Organization</b>	<b>Topics</b>
Md. Giashuddin Miah	Bangabandhu Sheikh Mujibur Rahman Agricultural University , Bangladesh	Climate Change and Adaptation: Evidences from a Forest Dependent Community of Bangladesh
Tran Nam Thang	Consultative and Research Center on Natural Resource Management (CORENARM) Vietnam	Adaptability in agriculture and forestry activities in Huong Son Commune, Nam District, Thua Thien Hue, Vietnam
Rajesh Bista	ForestAction Nepal	Understanding Community Based Climate Change Adaptation through Local Perspective
Birendra Karna	Asian Institute of Technology, Thailand	Community-based adaptation to Climate Change: the case of Thailand
Dharma Raj Uprety	Multi Stakeholder Forestry program(MSFP) Nepal	Building climate resilient communities through community based adaptation planning and action: some empirical evidences from Nepal
Rahul Karki	ForestAction Nepal	Community Level Climate Adaptation Planning in Nepal: Insights from Terai and Hill
Khem Raj Dahal	Institute of Agriculture and Animal Science (IAAS), TU, Rampur, Nepal	Climate Change and Livelihood: Nepalese Perspective

Primarily, all presentation centered on the issue of climate change impact and community based adaptation in different temporal and spatial basis. Detail content of the presentation is discussed below (also refer annex D):

### **Presentation 1 - Climate Change and Adaptation: Evidences from Forest Dependent Community of Bangladesh**

Prof. Dr Md. Giashuddin Miah of Bangabandhu Sheikh Mujibur Rahman Agricultural University, Bangladesh shared on the climate change adaptation evidences in Tangail District of Bangladesh. The paper tries to understand and document the trend of climate change as well as the adaptation measures to cope up the adverse situations that might arise in near future. He shared that increasing trend of climate change along with anthropogenic activities are the main reasons for decreasing the natural resources and livelihood options of the community. A steady increasing trend of both maximum and minimum temperatures over time was noted where increment rate per year of maximum and minimum temperatures was 0.017 and 0.011°C, respectively. The paper further analyzes long term climatic data base particularly the changing trend of temperature and rainfalls have strongly been supported by perceptions/opinions of the community people. The community people have taken several adaptation measures like changing plantation time, using new technologies etc. as well as actively participating in the social forestry programme of the government. In the face of challenges of climate change and livelihoods, community have strongly suggested a number of adaptation measures like construction of water reservoirs, afforestation through community approach, development of pest and disease resistant variety, supply of high quality planting materials etc. for conservation of resources and their better livelihoods which need strong support from the public and private levels.

### **Presentation 2: Understanding Community Based Climate Change Adaptation through Local Perspective**

Mr Rajesh Bista, from Forest Action shared about the impacts of climate change and adaptation measures adopted by the Forest User Groups in Nepal. His study sites cover 8 CFUGs of Lamatar VDC of Laitpur District. Similarly, his paper also assessed the role and responsibilities performed by the local institutions in relation to climate change adaptation

and livelihood support. The result exhibited that the dependency on forest product is declining due to availability of alternative sources and changing preferences on different environmental services. Likewise, community also perceived that there has been a change in climatic parameters like rainfall and temperature . And finally, the paper measures the performance of different local institutions and recommends the need of institutional preparedness in order to mainstream climate change adaptation and increase the climate resilience of local community.

### **Presentation 3 - Adaptability in agriculture and forestry activities in Huong Son Commune of Nam District, Vietnam.**

Dr Tran Nam Thang of Consultative and Research Center on Natural Resource Management (CORENARM) presented about the climate change adaptability of local people in Huong Son commune, Nam Dong District, Thua Thien Hue Province of Vietnam. Major arguments in his paper were 1) Climate change have negative impact to the human lives and agriculture and forestry production; 2) Local people have clearly observed climate change fluctuations but they have not got effective adaptation measurements; 3) Primary and unconnected measurements in climate change adaptation are present within the community; 4) The degradation of natural resources threaten livelihoods of those with low income depending on forest and shifting cultivation; 5) Local people, especially the low income groups, have highest vulnerability towards unfavorable climatic conditions; 6) Diversification of livelihood options help local people better adapt to climate change impacts; 7) There haven't been any programmes/projects supporting local people to better adapt to climate changes; 8) There should be policies/projects to help local people in adapting with climate changes.

### **Presentation 4- Community-based adaptation to Climate Change: the case of Thailand**

Dr Birendra Karna of Asian Institute of Technology, Thailand / Forest Action Nepal shared about the community initiatives with regards to climate change impacts in agriculture and biodiversity from Nakhn Ratchesima Province of Thailand. Like other developing countries, the issue of climate variability and extremes has been given little attention with a more reactive approach rather than a proactive one, compared to more pressing development concerns such as economic growth, poverty alleviation and environmental degradation in Thailand. He shared that current responses to extreme climatic events are viewed more as

disaster preparedness and mitigation opportunities rather than as warning signals of much needed long-term adaptation and the institutional preparedness is comparatively low in Thailand. He stressed on the need to focus on bottom-up approach to address the level of vulnerability to the existing and future impacts that could lead to effective enhancement of local adaptive capacity and adaptation in the long run.

#### **Presentation 6 – Climate Change and Livelihoods: Nepalese Perspectives**

Mr Khem Raj Dhahal, from the Institute of Agriculture and Animal Science (IAAS), Tribhuvan University, Rampur, Nepal shared about the overall climate change discourses with relation to agriculture and livelihoods. The presentation focused on the impact of climate change in agriculture where he showcased various examples to illustrate his arguments. He shared different adaptation practices based on his field experiences and his engagement in different research works in the past. He concluded that agriculture sector should be more prioritized and make suitable implementation plan of action to niche specific adaptation plan to climate change.

#### **Presentation 7- Community Level Climate Adaptation Planning in Nepal: Insights from Terai and Hill**

Mr Rahul Karki, from ForestAction Nepal shared on the community based adaptation plan initiatives in Nepal. He stressed that various agencies have been involved in preparing the community adaptation plans (CAPs) aiming to help the local communities cope to the changing environment. Attempt has been made to involve diverse institutions (in the form of unit of CAP preparation) like community forest user groups (CFUGs), the poor, vulnerable and socially excluded groups and conservation CFUGs (mainly in the case of conservation areas).

He further argued that with all these achievements in the local climate adaptation process, there are drawbacks both at the policy as well as the implementation level. First, though there are progressive policies at the central level, none of them have considered the CAPs in their framework. The national adaptation framework has only considered the LAPA as the adaptation framework at the local level with CAPs nowhere in the scene. Second, the Ministry of Science, Technology and Environment (MoSTE), responsible for undertaking all

climate change related activities in the country do not have their implementing bodies at the meso and local level. With lack of the institutional framework at the meso level, the MoSTE has to rely on other ministries with their district chapters for implementation. Third, with the most vulnerable and poor sections of the community as the central focus of CAPs, there might be chances of their concerns overlooked by the government agencies due to weak influence at the local governance level. Fourth, CAPs in most of the cases have solely considered disaster risk reduction as the adaptation strategy and have overlooked the issues of governance, local and policy advocacy among others. And he finally concluded that there are ample avenues of effective implementation of the CAPs in Nepal. The translation of the national adaptation framework to integrate CAPs, mainstream the CAPs with the local development planning process of Nepal and strong collaboration between the local government bodies and agencies preparing CAPs needed to have its ownership are some of the pertinent issues that needs to be addressed in order to ensure the proper implementation of those CAPs.

### **Issues raised and discussion**

The discussion was focused on the issues of climate change impacts and adaptation strategies in different sectors like forest, agriculture, water with social, institutional and ecological dimensions in the background. The key issues of the discussed are summarized below:

#### **Strengthen Networking and Disseminating knowledge:**

At the end of the presentation session, most of the participants stressed on the need to strengthen network between the institutions working in climate change. Even though the impacts of climate change is differs in places, cross country sharing and cross boundary learning is imperative. The mechanism of value add in climate change knowledge should be developed in order to obtain sufficient information and build on the existing one.

**Knowledge inadequacy on climate science:**

In south and south East Asia, most of the research has been focused on social dimension. But climate change is also about scientific and technical aspects which is lacking in the research component, mainly in developing countries. Most of the paper was based on social dimensions rather than technical and statistical. Thus in order to make the research findings more robust, technical component should be inbuilt in climate change research. The paper presented from Bangladesh has very well analyzed the climatic data, and there was some concern over the need for analyzing climate change date in order to triangulate the impacts of climate change which was collected from social research.

**Scope of strengthening climate change adaptation:**

Agenda on climate change adaptation is in a juvenile stage and the institutions are still evolving. At the national and international level, governments of their respective countries have been formulating policy in building different agenda on climate change. Thus from the initial phase of policy formulation, the mechanism and process should be clearly defined and guided by those plans and policy.

**Promotion of community based adaptation:**

Adaptation strategies has been founded/formulated through practices at the grassroots level, thus promotion of community based adaptation will definitely support to address the agenda of climate change rather than adopting conventional and imposed adaptation measures. Culture and tradition of the local communities define the adaptation mechanism, thus context specific adaptation mechanism should be acknowledged and documented.

**Engagement of wider stakeholder in climate change policy:**

Until and unless the engagement of wider stakeholder is ensured, the agenda of climate change cannot be addressed. In case of Nepal, different communities has started preparing community based adaptation plan of action, but there is lack coordination between agencies working in this field. Institutions for mainstreaming local level adaptation should be timely considered, but equally important are the coordination and cooperation between the institutions that exist.

The vertical integration of institution with close coordination and cooperation among them is crucial to promote synergy.

#### **D. Final remarks**

At the end of the Day one, Dr Naya Sharma Paudel summarized the overall discussion and formally concluded the presentation session and expressed his gratitude towards all the presenters and participants of the programme.

#### **2 Day two**

The second day of the seminar was allotted for field visit to Sano Gaun Community Forest of Kavre district. This community forest is one of the first of its kind in the country. The field visit was primarily aimed to understand the forest management practices by the communities in Nepal and targeted to the international participants of the seminar. During the field visit discussion between participants and forest user group was organized. Participants shared about the history of CF management and its evolution, the management modalities and governance system of the community.

## Photo Plates



## **Annex A: Programme Schedule**

<b>Time</b>	<b>Agenda</b>
Date: Sunday, December 09, 2012	
08:30-09:30	Arrival and Breakfast /Registration
09:45-10:15	Welcome by Dr. Naya Sharma Paudel
10:15-10:30	Objective of the Seminar by Dr. Dharma R. Uprety
10:15-10:30	Introduction of the Participants
10:30-11:00	Paper presentation by Prof. Md. Giashuddin Miah Bangladesh
11:00-11:30	Paper presentation by Mr. Rajesh Bista, Nepal
11:30-12:00	Tea
12:00-12:30	Paper presentation by Dr. Birendra Karna, Thailand
12:30-01:00	Paper presentation by Dr. Tran Nam Thang, Vietnam
01:00-02:00	Lunch
02:00-02:30	Paper presentation by Mr. Khem Raj Dahal
02:30-03:00	Paper presentation by Mr. Rahul Karki
03:00-03:30	Closing of the Workshop
03:30-04:00	Tea break
04:00-04:30	APN stakeholders meeting (Project action plan and implementation modality)
Date: Monday, December 10, 2012	
08:30 onwards	Field visit to Pandey Gaun Community Forest, Kavreplanchowk

## Community-based Forestry and Livelihoods in the Context of Climate Change Adaptation



Dharam Raj Upadhyay, Ph.D.  
Proponent of this project

## Objective of the project

- Establish an international-level climate change network among researchers in Asia, particularly Nepal, Bangladesh, Thailand and Vietnam.
- Document, analyse, synthesise and publicise empirical lessons on community based adaptation strategies to national and regional policy makers.
- Organize policy seminars and disseminate research findings through diverse publications and engage with policy makers at national and international level.

## Time line of the project

### Detailed Timeline:

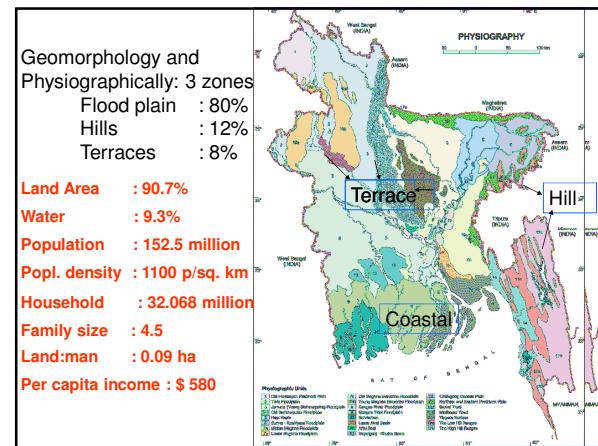
- Month 1 Selection of research team members, and research students, orientation and planning meeting, develop guidelines and norms, identification of research sites
- Month 2 Desk review, research design, prepare checklist and questionnaire development,
- Months 3 Planning meeting of country research teams, Preliminary visits to selected sites, consultations with stakeholders both at national and sub-national level and collection of secondary information, and gap analysis of each country
- Months 4 Develop country specific research method and tools; sharing these method and tools to each collaborator, organise first sharing workshop about research theme inviting concerned stakeholders from both government and non-government sector possibly in each country
- Months 5 Conduct key-informants interview with diverse range of stakeholders at different level, and documentation of these responses.
- Months 6-7 Inception workshop at site level inviting target community in the discussion, interaction with local stakeholders, site specific research; interviewing with local communities, site specific observation
- Months 8-9 Data coding, data refining, develop code book, and data entry into related computer software (e.g. SPSS) and collection of missing data (if any);Country specific analysis of data, exchange code book, prepare and exchange country case studies draft and research manuscripts to the collaborators.
- Months 10-11 National level sharing workshops aimed at policy makers, managers and decision makers; and national level studies, research papers, writing, editing, writing, feedback to students
- Months 12-14 Brainstorming workshop among researchers, local person of APN, SPG member of APN, and experts in the CC adaptation involved in the project, plan of drafting a special issues of climate change adaptation covering research outputs from collaborating countries, planning and drafting of policy briefs in each countries, discussion on research findings with Government and Non-governmental stakeholders in the Asia-Pacific region.
- 15-17 Organise international policy workshop in one of the project countries, writing of special issues of Journal of Forest and Livelihoods on CC adaptation
- 18-20 Writing policy briefs in each country, engage in policy debate with government and non-governmental organisations, editing of journal (special issue) continue
- 21-24 Publications of policy briefs, journal, writing research article, meeting of researchers

## Thank you for your hard work



**Climate Change and Adaptation: Evidences from a Forest Dependent Community of Bangladesh**

Prof. Dr. Md. Giashuddin Miah  
Dept. of Agroforestry and Environment  
Bangabandhu Sheikh Mujibur Rahman  
Agricultural University  
E-mail: giash1960@gmail.com



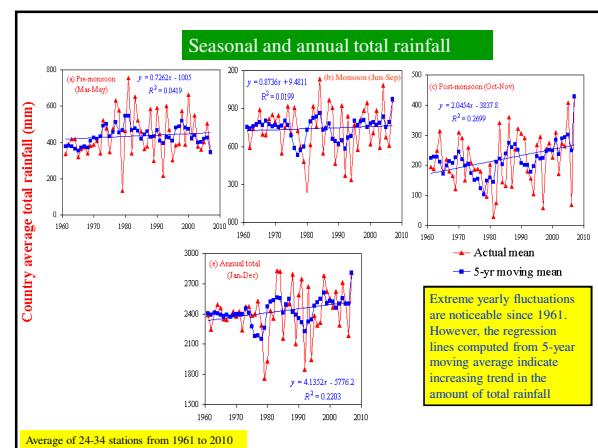
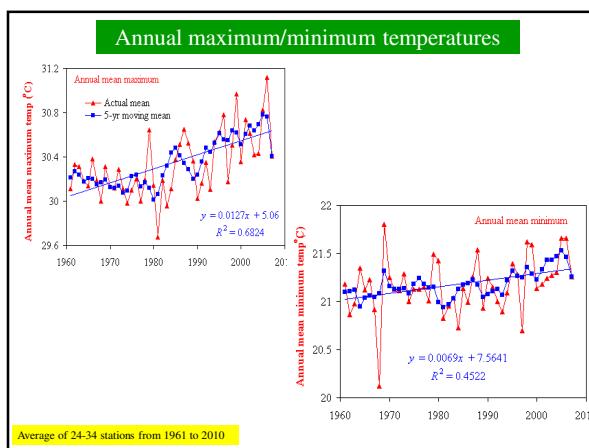
**Climate of Bangladesh: Humid Subtropical**

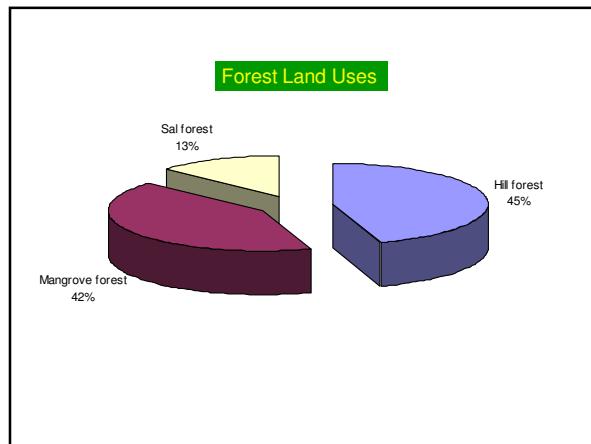
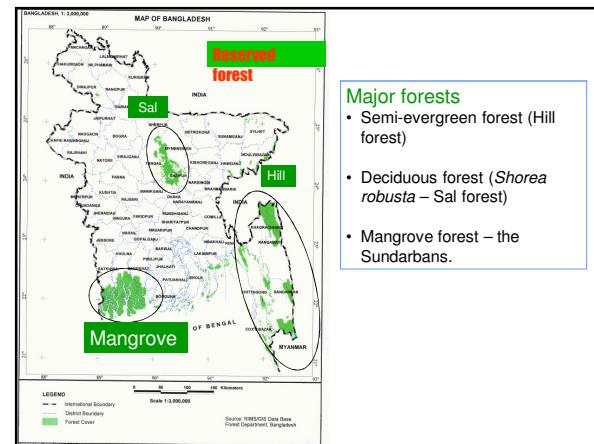
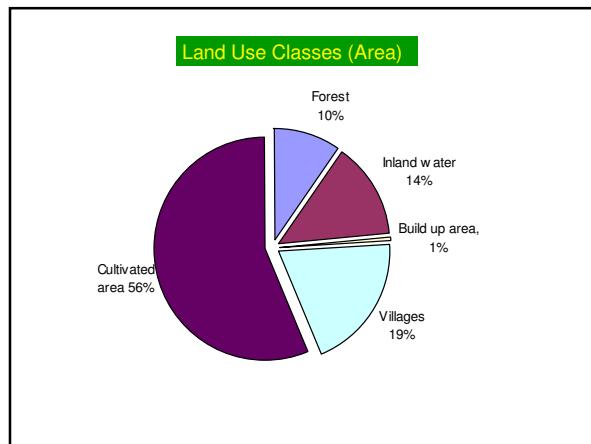
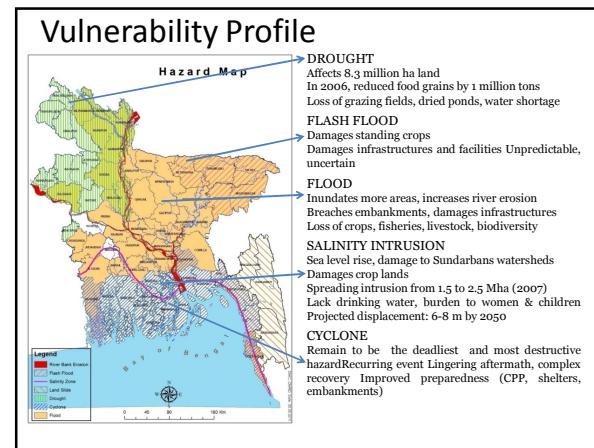
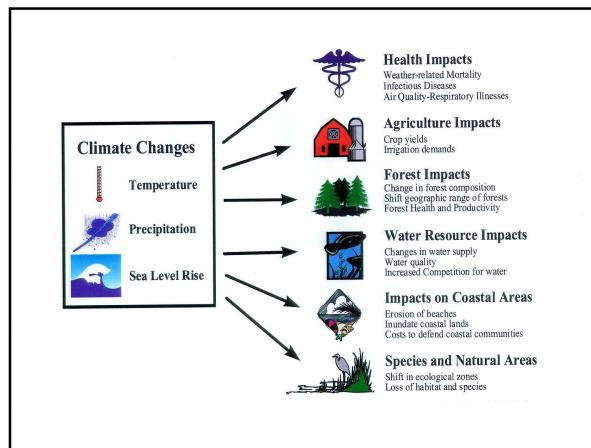
Major season:

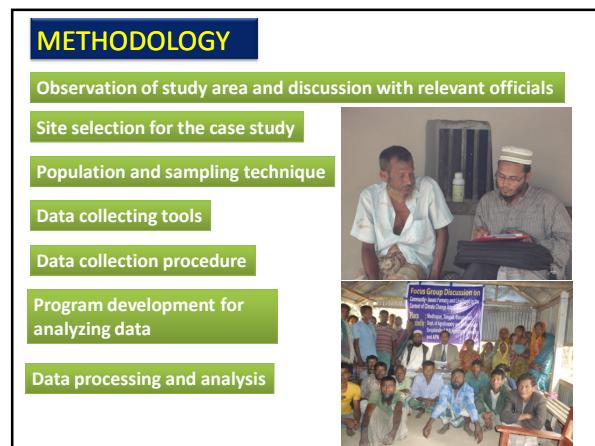
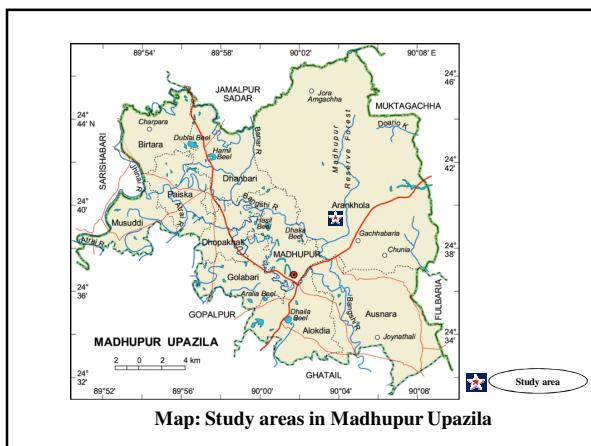
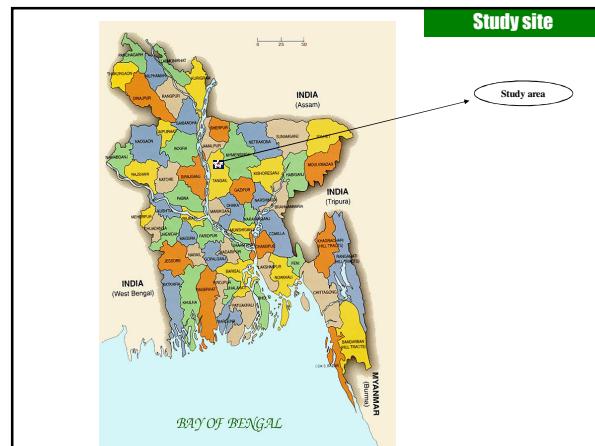
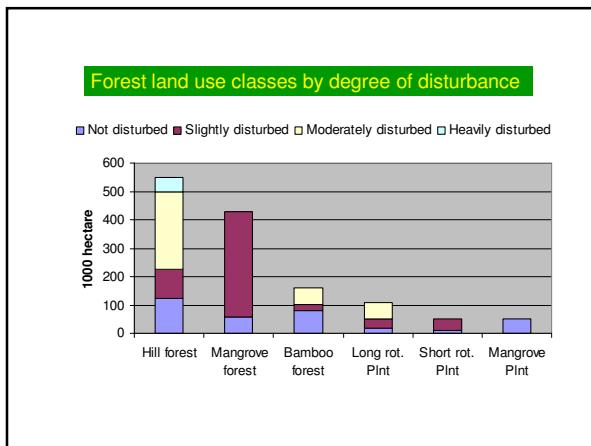
- Summer - March to October
- Pre-monsoon: March to May
- Monsoon: June to October
- Post-monsoon: October to November
- Winter: November to February

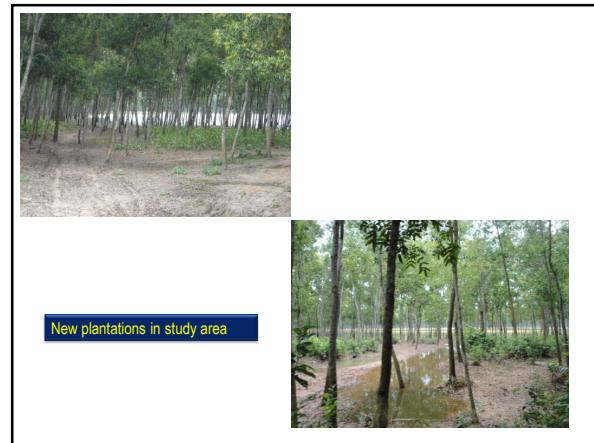
**IPPC prediction on changes in sea level, temperature and precipitation**

Year	Sea level rise (cm)	Temperature rise (°C)	% change in precipitation (base 1990)
2030	30	+ 0.8 in Monsoon + 1.1 in Winter	- 1.2 in Winter + 4.7 in Monsoon
2050	50	+ 1.1 in Monsoon + 1.6 in Winter	- 1.7 in Winter + 11.8 in Monsoon
2100	100	+ 1 in Monsoon + 2.7 in Winter	- 3 in Winter + 11.8 in Monsoon











### MAJOR FINDINGS

Table 1. Socio-economic and demographic profile of the respondents

Character with unit	Category	Respondents' Opinion			
		Frequency	Percent	Mean	Standard Deviation
Age (Actual year)	Young aged (up to 35)	11	22	46.76	0.76
	Middle aged (35-50)	19	38		
	Old (>50)	20	40		
Education (Year of schooling)	Illiterate (No schooling)	13	26	-	1.71
	Primary (1-5)	28	56		
	Secondary (6-10)	7	14		
	Higher (>10)	2	4		
Family size (Number)	Small family (<5)	17	34	5.86	2.18
	Medium family (5-8)	27	54		
	Large family (>8)	6	12		
Farm size (ha)	Landless (<0.02 ha)	3	6	0.56	0.22
	Marginal (0.02-0.2 ha)	4	8		
	Small (0.2-1.0 ha)	23	46		
	Medium (1.0-3.0 ha)	15	30		
	Large (>3.0 ha)	5	10		

Table 2. Monthly income of the respondents in the study area

Income level (BDT Tk)	Income group	Respondents' opinion (%)
≤1,999	Extreme poor	10.75
2,000-4,999	Poor	79.10
5,000-7,999	Medium	5.65
≥8,000	Rich	4.50

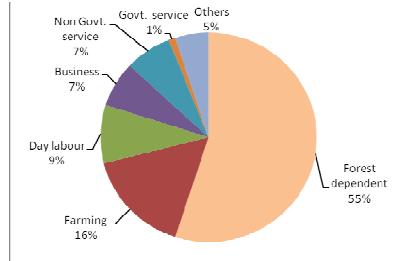


Fig. 1. Primary occupations among the households in the study area.

Table 3. Changes in distribution of tree species in the study area

Type of change forest species	Vegetation	Respondents' opinion	
		Frequency	Percent
Decrease of indigenous spp.	Sal ( <i>Shorea robusta</i> )	50	100
	Bohera ( <i>Terminalia bellerica</i> )	50	100
	Horitoki ( <i>Terminalia chebula</i> )	50	100
	Amloki ( <i>Embllica officinalis</i> )	50	100
Increase of exogenous spp.	Akashmoni ( <i>Acacia auriculiformis</i> )	38	76
	Eucalyptus ( <i>Eucalyptus camaldulensis</i> )	25	50
	Mahogany ( <i>Swietenia macrophylla</i> )	20	40
	Other species	10	20

Table 4. Types of forest products available/collected as opined by the respondents

Forest product	Availability of forest products as opined by respondent (%)		
	10 years back	Current year	Change (%)
Leaf and branch	100	84	-16.00
Fuel wood	100	74	-26.00
Timber	80	46	-42.50
NTFP (Non-Timber Forest Product)	50	20	-60.00
Bamboo	32	14	-56.25
Fodder	20	10	-50.00
Fruit	25	10	-58.33

**Table 5. Alternative resources against less availability of forest products in the study area**

Alternative resource	Respondents' opinion	
	Frequency	Percent
Cow dung stick	35	70
Rice husk and bamboo	26	52
Plant part/material of homestead plantation	20	40
Crop stubble	7	14
Kerosene	4	8
Stove/ bio-gas	2	4

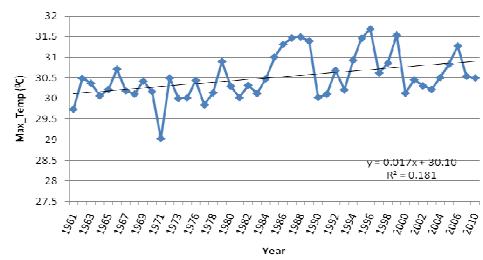
**Table 6. Change of crop coverages over time in the study area**

Crop	Change of crop coverages (respondent (%)) grows crops over time)		
	10 years Back	Current year	Change
Turmeric	23	63	+ 40
Banana	15	45	+ 30
Aroid	12	37	+ 25
Pineapple	10	32	+ 22
Ginger	6	24	+ 18
Potato	0	14	+ 14
Rice	12	22	+ 10
Wheat	6	0	- 6

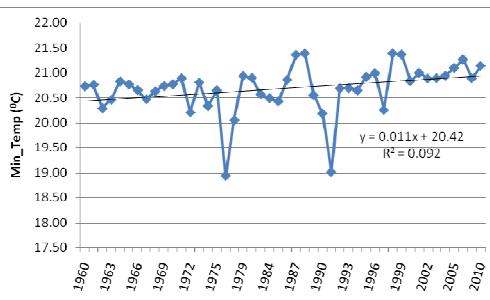
**Table 7. Water availability and its source in the study area**

Water source	Respondents' opinion	
	Frequency	Percent
<b>Availability of water over time</b>		
Increase	-	-
Decrease	50	100
<b>Purpose: Domestic</b>		
Roar pump	50	100c
<b>Purpose: Irrigation</b>		
Shallow tube well	22	44
Water from others machine	6	12
Total	50	100

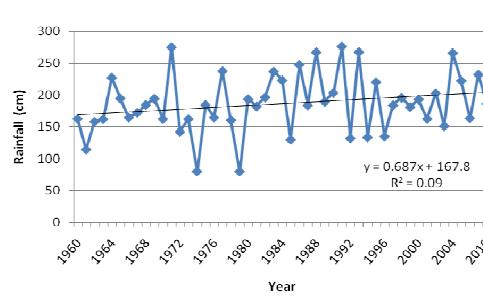
**Climate variability over time**



**Fig. 2. Long-term (1961-2010) trend of maximum temperature in the study area.**



**Fig. 3. Long-term (1961-2010) trend of minimum temperature in the study area.**



**Fig 4. Long-term (1961-2010) trend of rainfall in the study area.**

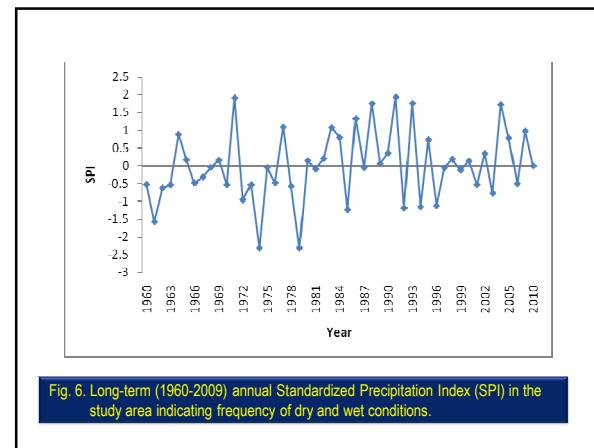
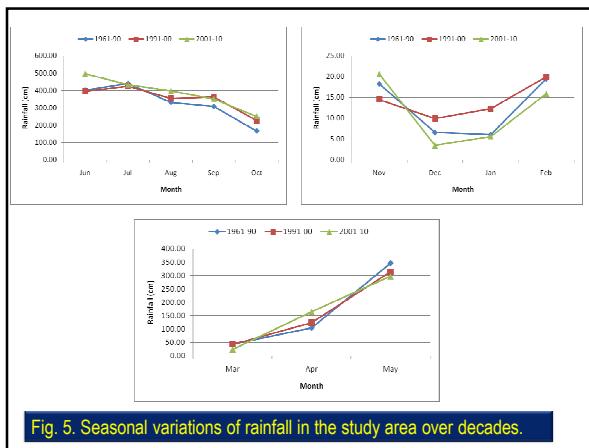


Table 8. Respondents' perception on climate change over time in the study area					
Climatic parameter	Respondents' perception (respondent opinion expressed as percent)				
	Increased	Decreased	No change	No idea	Total
Temperature (Summer season)	98	0	0	2	100
Temperature (Winter season)	34	44	14	8	100
Rainfall intensity	64	24	2	10	100
Rainfall frequency	18	72	2	8	100
Drought length and severity	54	8	14	24	100
Drought frequency	56	4	16	24	100
Hailstorm amount and severity	0	28	18	54	100
Frost/ dew intensity and severity	14	26	26	34	100
Cold spell-intensity and severity (March-April)	24	10	24	42	100
Cold spell-intensity and severity (September-October)	14	16	22	48	100
Cloudy weather	44	26	12	18	100

Table 9. Adaptation measures in relation to forest management in the study area	
Adaptation measure	Respondents' opinion (%)
New plantation with participatory approach	80
Restriction on harvesting of forest products (Restricted by the Department of Forestry)	54
Promote social forestry activity	42
Making small water reservoir inside the forestland	32
Control of grazing (Restricted by the Department of Forestry)	24
Distribution of improved seed of grass or fodder tree	22
Introduction of new fuel use technology (i.e. Improved stove, biogas)	20
Control of pest and disease	16

Table 10. Type of adaptation measures in relation of agricultural/crop production in the study area		
Adaptation measure	Respondents' opinion (%)	
Changing planting date/time	100.00	
Using new technologies	Variety	12.87
	Micro-irrigation	19.25
	Plant protection measure	11.95
	Variety, micro irrigation & plant protection measure	55.93
	Total	100.00

Table 11. Major problems faced by the community to maintain their livelihood in the study area		
Major problem	Respondents' opinion	
	Percent	Rank
Decrease of ground water level	90	1
Cutting of trees illegally	86	2
Decrease of grazing land	76	3
Restriction by the Government in harvesting of forest products	70	4
Infestation of disease and insect-pest both in forest and agricultural crop	66	5
Sudden extreme climatic events like storm, excess rainfall, water logging, high temperature, cold spell, frost etc.	62	6
Decrease of land productivity	60	7
Lack of quality planting material/seed	52	8
Degradation of soil/land	40	9
Long dryness and drought	38	10
Change of timing of weather parameters	28	11

**Table 12. Opportunities to solve the problems as suggested by the community for their better livelihood in the study area**

Opportunity suggested by the respondent	Respondents' opinion	
	Percent	Rank
Construction of water reservoirs (small pond, ditches, dam) to preserve water	88	1
Afforestation through community approach/partnership	80	2
Development of pest and disease resistant variety	78	3
Provision of grass land for grazing livestock	64	4
Availability of high quality planting material/seed	56	5
Reduction of use of chemical-fertilizer and pesticide	50	6
Increase homestead plantation with diverse species	46	7
Provide access of resource collection from forest area	44	8
Improvement of drainage system to reduce flooding/water logging condition	30	9
Provide loan or credit to overcome the crisis period	26	10

## CONCLUSION

- Socio-economic status of local community was poor resource base and once they were heavily dependent on the forest ecosystem for their livelihoods.
- Currently the trend of dependency on forest and forest products along with other resources (crops, water etc.) has been drastically reduced.
- Increasing trend of climate change particularly temperature and rainfall along with anthropogenic activities are the reasons for decreasing the natural resources particularly forest.
- Among the anthropogenic activities, illegal harvesting and over-exploitation of the forest and forest products are the main driving forces.

## CONCLUSION

- For conserving of forest resources and maintaining friendly environment, the government has restricted the access of the people to the forestland for harvesting any forest products and promoted social forestry activity.
- Community people have well accepted the social forestry program and they are also co-operating for its well execution.
- Community people have taken some adaptation measures like changing planting time, using new technologies etc.
- However, community strongly opined that the concerned authorities should take appropriate measures like construction of water reservoirs, afforestation through community approach/partnership, development of pest and disease resistant variety etc. for sustaining and improving their livelihoods.



**Thank you**

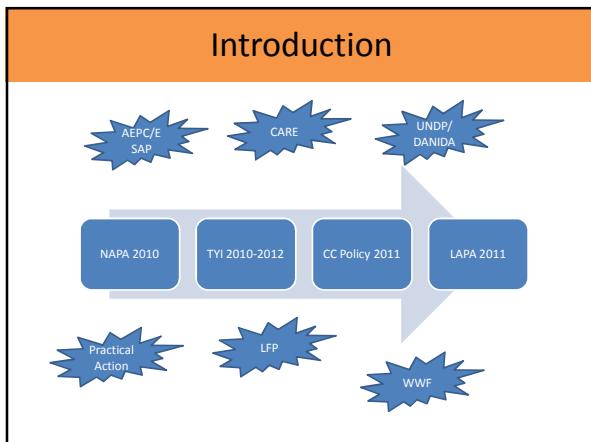
# Community Level Climate Adaptation Planning in Nepal: Insights from Terai and Hill



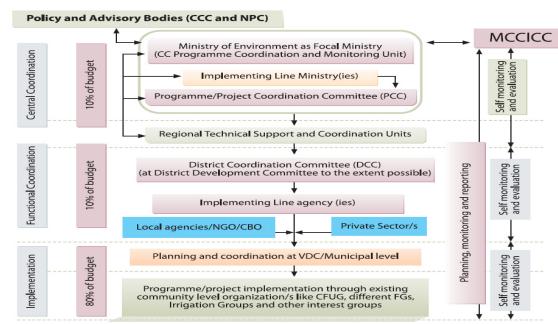
Rahul Karki  
Dil Bahadur Khatri  
Niru Gurung  
Naya Sharma Paudel

## Outline of the presentation

- Introduction
- Community Adaptation Plan of Action
- Issues/problems and process of development
- Comparative case of CAPs in Terai and Hill
- Findings and discussion
- Way forward



### Climate adaptation framework in Nepal



Source: NAPA 2010

### Study area (Intro cont..)

**Terai**

- Mahottari and Dhanusha districts
- Supporting agency: CARE Nepal
- Implementation – CARE Nepal and 9 partner organizations (5 local and 4 issue based strategic partners )

**Hill**

- Lamjung and Gorkha districts
- Supporting agency: CARE Nepal
- Implementation – FECOFUN, CARE Nepal, NTNC and WWF Nepal

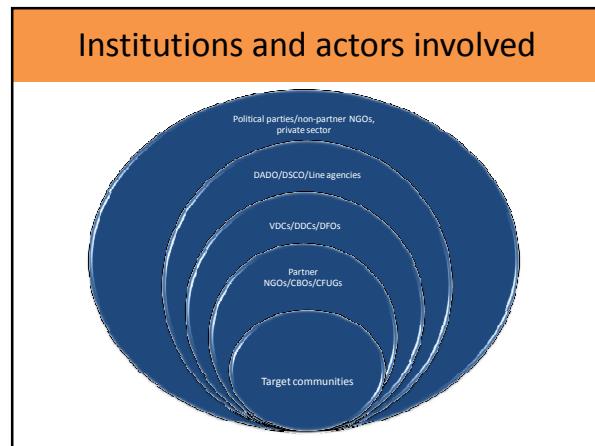
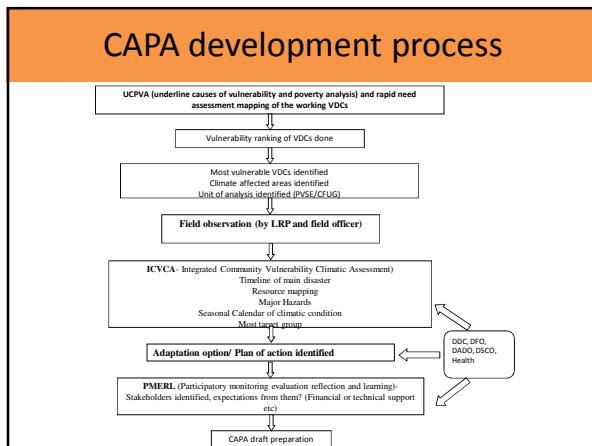



### Study approach (Intro cont..)

 <p>Interview with VDC/DDC/line agencies</p>	 <p>Interaction with CARE/partners</p>
 <p>Review of policies and literatures</p>	 <p>Focus group discussions</p>
 <p>Field observation</p>	

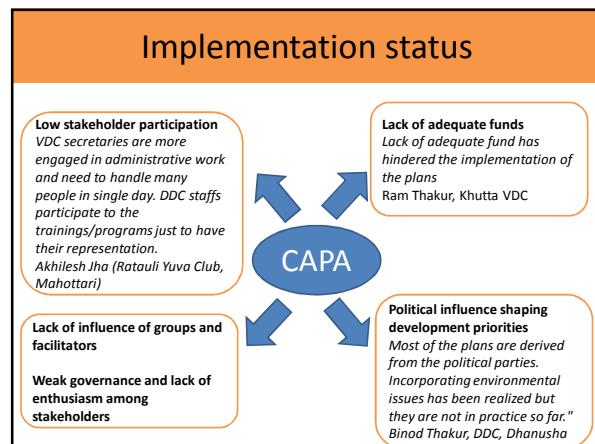
## Community Adaptation Plan of Action (CAPA)

General description	
Tera	Hill
<b>Unit of CAP preparation</b>	Poor, Vulnerable and Socially Excluded (PVSE) groups
<b>Number of CAPs prepared</b>	35
<b>Implementation status</b>	Not yet implemented
<b>Key priority projects</b>	<ul style="list-style-type: none"> <li>Natural disasters (Drought, landslide, flood, water resource drying)</li> <li>Disease (human, agriculture and livestock)</li> <li>Resistance to wind</li> <li>Fire</li> </ul>
<b>Institution and Funding</b>	<ul style="list-style-type: none"> <li>No clear costs identified</li> <li>Institutions identified (fund sharing not clear)</li> <li>VDC level fund</li> </ul>
<b>Linkage</b>	VDC planning
	Ops of CFUG



### Resources

A case of Hariyo Ban	
<b>Key activities</b>	To adapt with drought and climatic change
<b>Planned budget</b>	Tentative Total budget: 620000 External source: 348000 Community source: 272000
<b>Expected source/support</b>	Hariyo Ban, DSCO, VDC, district water division, irrigation, DADO
<b>Actual investment</b>	Not started yet



Institutional choice		
	Terai (PVSE)	Hills (CFUG)
Nature of the project	More focused on livelihood of poor and vulnerable	More focused on biodiversity, climate change and REDD+
Vulnerability	Vulnerable in terms of disaster	Vulnerable in terms of disaster
Geographical location	Less forest area; dominance of poor groups	Presence of CFUGs

Integration and Coordination	
Vertical Integration	Horizontal Coordination
<ul style="list-style-type: none"> <li>CAPA not reflected in local development plans</li> <li>Lack of local representative of line agencies (e.g. MoE)</li> <li>Poor implementation status of CAPAs</li> <li>Lack of mandates to line agencies</li> <li>Increasing political influence in development priorities</li> </ul> 	<ul style="list-style-type: none"> <li>Climate adaptation least prioritized among government line agencies</li> <li>Risk of fund sharing among institutions</li> <li>Poor implementation status of CAPAs</li> <li>Differentiated responsibilities and lack of coordination</li> </ul> 

Development Vs adaptation plan	Issues/problems pertaining to CAPAs
<ul style="list-style-type: none"> <li>Too development focus of local government <i>"The roles and responsibilities of VDCs are clear however, issues of climate change are not clear so far."</i> <b>Laxmeshwor Thakur</b>, VDC Secretary, Basbitti VDC</li> <li>No mandate for supporting adaptation activities</li> <li>Climate change friendly development?</li> </ul>	<ul style="list-style-type: none"> <li>CAPAs not recognized in the adaptation framework (NAPA/LAPA)</li> <li>No ownership from the DDCs/VDCs/line government agencies</li> <li>Uncertainty over ownership by target groups</li> <li>Obscure sustainable financing</li> <li>Confusion over geographical scale and institution</li> </ul>

Way forward	Acknowledgement
<ul style="list-style-type: none"> <li>Mainstream climate change agenda in DDC/VDC level planning</li> <li>Secure additional funds for adaptation from local government channel</li> <li>Integration of CAPAs with the national framework (NAPA/LAPA)</li> <li>Better coordination among target communities, local government and line agencies</li> <li>Increased ownership of CAPAs among concerned stakeholders</li> </ul>	<p>CARE Nepal Partner organizations and local communities The Asia Pacific Network</p>



THANK YOU

## Community-based adaptation to climate change: the case of Thailand

By  
 Birendra Karna  
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### Introduction

- In Thailand, like many other developing countries, the issue of climate extremes has been given little attention
- Current responses to extreme climatic events are viewed more as disaster preparedness and mitigation opportunities rather than as much needed long-term adaptation
- While current scientific knowledge on an increasing climate change impacts do not provide conclusive assessments of the associated impacts at local levels

### Introduction...

- Therefore a need for a bottom-up approach to address the level of vulnerability to the existing and future impacts that could lead to effective enhancement of local adaptive capacity and adaptation in the long run.

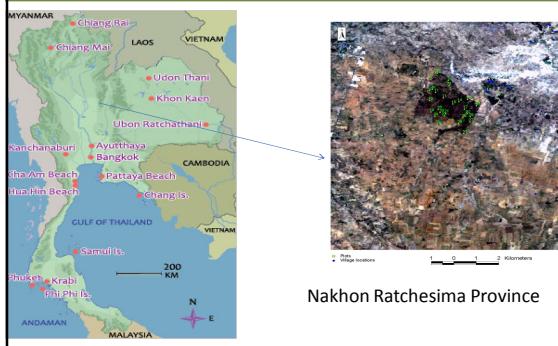
#### National Initiatives:

- Thailand has been a party of UNFCCC since March 1995

### Introduction..

- Submitted Initial National Communications to UNFCCC in 2000
- Preparing for the Second National Communication
- National Strategy on Climate Change – 2008-2012

### Study Site



### Sites description

- *Kog Bung Preu* Community Forest (KBP-CF)
- 3 villages (Moo) Ban-Lung, Non-Boad, Ban-Trai-Tong of Sra -Chorakhea Tambon of Dan-Khun-Tod District in Nakhon Ratchasima Province
- 379 HH with 1713 population
- Annual average income is 15000 baht (1 US\$: 40 baht)
- Land holding average 17 rai (1 rai = 1600 sq m)

## Sites description..

**Institutions**

- Kog-Bung-Preu Community forest headed by a **President** - a post that is held by the present Chief of the Tambon (i.e., the Khamnan)
- The forest committee receives support from the Provincial Forestry Office
- Tambon Administrative Office (TAO) at district level

## Data Collection

- Household survey (50 HH)
- Group discussion



## Climate change and Adaptation

As a tropical country, Thailand is highly Vulnerable to climate change:

- Agriculture
- Forest Biodiversity
- Coastal
- Health

## Impact on Agriculture



- Change in amount and pattern of rainfalls leading to drought, flooding
- Change of moisture level in soil
- Emergence of and increase in pests and crop diseases

## Impact on Agriculture

- Reduction of crop yields
- Introduce local drought-resistant varieties of paddy rice
- Adopt potential crop substitution like Cassava



## Impact on Agriculture



- Change in precipitation create long-term effects on surface water supply, ground water supply and fresh water ecological systems.
- Drought, especially in dry seasons, will intensify and may lead to severe conflicts in water resource allocation.

## Impact on Forest Biodiversity



- collecting mushrooms, ants, ant eggs, vegetables, frogs/ lizards, wild fruits and bamboo shoots for household use and commercial purpose
- Encourage reforestation with drought and heat tolerant species, gene bank, plant culture

## Discussion

- Capacity building at Tamboon level is urgently needed
- Need of institutions prepared for any climate related issues
- Support community-based water resource management
- Encourage water conservation and crop diversification in agriculture

## Discussion

- Sufficient need of international support to conduct research on the issues
- Need immediate attention-regionally and globally
- Thailand need to understand that domestic actions are of priority

**Thank You**

**UNDERSTANDING COMMUNITY BASED CLIMATE CHANGE ADAPTATION THROUGH LOCAL PERSPECTIVE**

Rajesh Bista  
Forest Action Nepal



**APN**  
APN  
ASIAN FOREST ACTION NETWORK

#### PRESENTATION OUTLINE

- Nepalese Context
- Study site and methodology
- Results and Findings
- Lessons learnt

**NEPALESE CONTEXT:**

- Climate change is a global agenda and Nepal is not far from this issues.
- Climate change Vulnerability Index by Mapleroft ranked Nepal in 4<sup>th</sup> position.
- Annual rate of temperature increase by 0.06 °C, predicted temperature rise significantly by 0.5°C-2°C by 2030 and 1.3°Cto 3.8°C by 2060. (NCVST )
- 1.9 million people are highly climate vulnerable and 10 million at risk.



#### CONTEXT CONTD.....

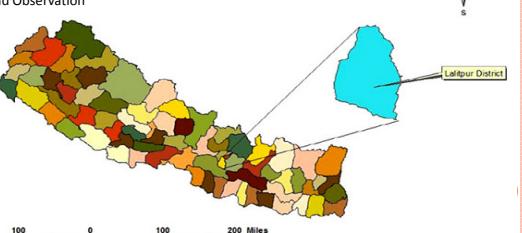
- 80% depend on agriculture
- 15<sup>th</sup> poorest country in world (30% poverty)
- 142 out of 177 in human development index



- Still Success in participatory approach of resource management.
- Thus, project aims to explore the CBA practices to address CC impacts
- .....CBA is bottom up approach whereby a communities is positioned as the main entity to implement adaptation.
- Answer why and with what knowledge of adaptation(other only answer what)

**STUDY SITE AND METHODOLOGY**

- Participatory Resource Mapping
- Pre-tested questionnaire survey(Random sampling in 50 HH)
- Focus Group Discussion(6 FGD)
- Field Observation



#### RESULTS AND FINDINGS

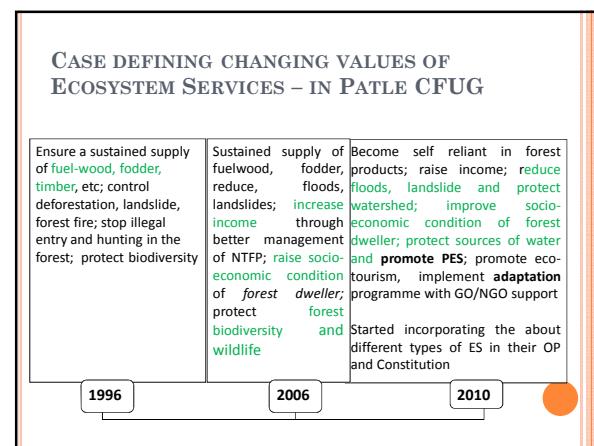
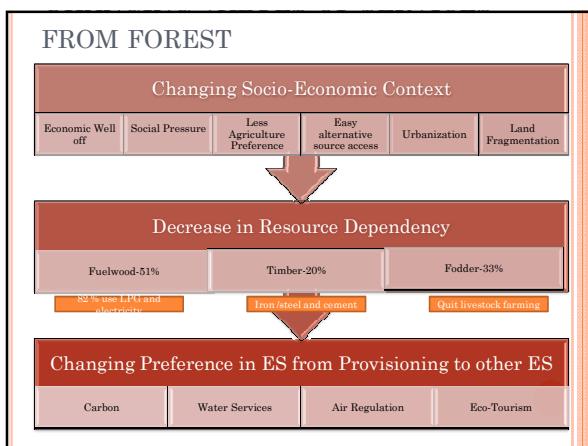
- Climate Change Impacts
- Community Based adaptation Cases
- Institutional Choice for CBA
- Changing values of services from forest
- Lessons Learnt

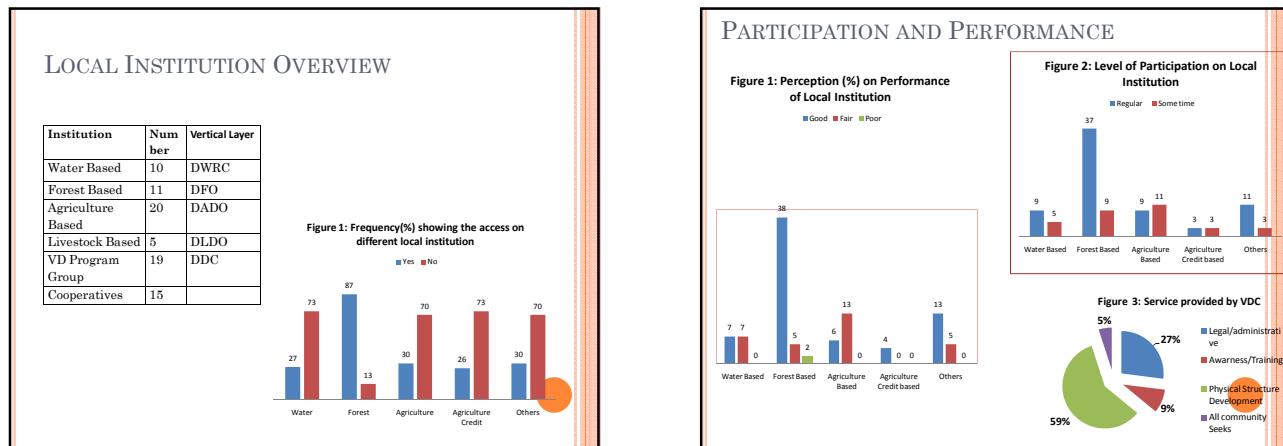
SOCIO-ECONOMIC PARAMETER OF RESPONDENT		
Character	Category	Respondents Opinion (%)
Sex	Male	73
	Female	27
Age	Below 35	23
	35-50	43
	Above 50	34
Education(year of schooling)	Illiterate	3
	Primary (1-5)	20
	Secondary(6-10)	27
	Higher (>10)	50
Occupation	Agriculture dependent	30
	Forest Dependent	13
	Private Services	20
	Government Services	10
	Business	7
	Day Labor	20
Farm Size (Ropani)	0-2 ropani	20
	2-6 Ropani	43
	6-12 Ropani	23
	Above 12	14

PEOPLES PERCEPTION IN CHANGE IN CLIMATIC PARAMETER				
	Respondent perception (in percent)			
Climatic Parameter	Increase	Decreased	No Change	No idea
Temperature( Summer)	93	7	0	0
Temperature(winter)	17	76	3	4
Rainfall Intensity	33	57	10	0
Rainfall frequency	10	77	13	0
Landslide/flood severity	20	23	50	7
Landslide/flood frequency	27	23	40	10
Drought length and severity	87	3	7	3
Drought frequency	83	7	10	0
Hailstorm amount and severity	10	63	17	10
Frost amount and severity	10	73	13	4
Cloudy weather	60	20	13	7

IMPACT OF CLIMATE CHANGE IN NATURAL RESOURCE		
Agriculture	-Decrease in Agriculture production esp- Rice, Wheat, Mustard -Increasing incidence of pest and disease in agricultural crops -Early ripen of vegetables	
Water	-82% of the respondent opined the decreasing water quality and quantity	
Forest	-Increasing invasive spps(Lantana Camera) and forest fire incidence -Early flowering of tree spps- Rhododendron, Prunus, Pears, Bayberry , Myrica Esculanta -Change in Distribution of vegetation	
	Increasing	Decreasing
	-Castanopsis Indica	-Myrsine Capitellata
	Myrica Esculanta	-Myrsine semiserrata
	-Quercus Glauca	-Winter Green
	-Alnus	-Gofla

COMMUNITY BASED ADAPTATION MEASURE		
<b>Case 1: Community initiation of Bio-Briquette Production</b>	<b>Case 2: Tomato farming for income diversification</b>	<b>Case 3: NTFP promotional activity in lamatar</b>
•Bio briquette production from 2010 from the invasive species worth Nrs 20,000.	•Water resource decline, decline in ag product •More than 585 tunnel with the size of 5*12 m •In 2011 charcoal supply for TU •Good market and higher demand – •Help to maintain healthy forest	•Two NTFP demo plot nursery with the aim to preserve and identify •More than 138 types of NTFP in one demo plan and another demo plot managed by Patley CF has more than 60 NTFP, which was supported by DFO and DDC Lalitpur
	•Drop irrigation techniques and less consumption of water. •High rate of return: three times of investment. (average expenditure per	•More than 138 types of NTFP in one demo plan and another demo plot managed by Patley CF has more than 60 NTFP, which was supported by DFO and DDC Lalitpur
<b>Case 4: Community Adopting PES mechanism</b>		
•Tri party agreement on Commercial water supply(CF, Bainsdodevi Drinking water company and land owner) •NRS 100 /tank to CF with 10% annual increase •Income Vary from NRS 6000-22000/month (base on water demand which range from 60-125 tank per month)		

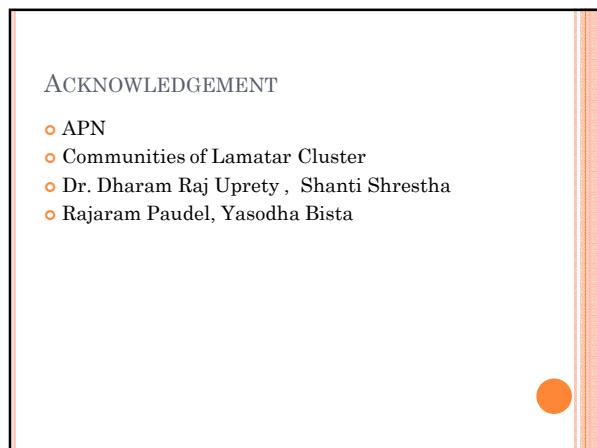


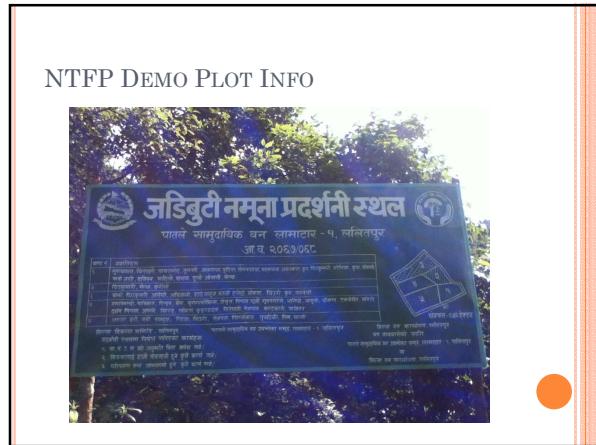


PERFORMANCE FOR ADAPTATION AND THEIR RANKING.....(AGRAWAL 2010, OSTRAM 1990, RIBOT 2002)						
	Factors	V D C	For est Base d	Agri cult ure base	Wat er Base d	Ot he rs
Characteristics	Organizational rule and understandability	@	@		@	
	Local involvement/participation	@	@	@	@	@
	Fairness in resource allocation	@	@		@	
	Clear Mechanism for enforcing rule	@	@		@	
	Accountability of Decision makers	@	@	@	@	
Context of Institution	Dissemination of new technology and training	@	@		@	
	Facilitating the functioning of local institution by Central gov	@	@			
	Network and their links with other social groups	@	@		@	
Group Served	Defined Boundaries of group	@	@		@	
	History of successful shared experience; existence of social capital	@	@			
	Appropriate leadership that change periodically (democratic)	@	@			
	Interdependence among group members	@			@	@

### LESSONS LEARNT

- Learning on CBA comes from practices rather than theory. Thus, need to draw lesson based on ground practice of adaptation.
- Community Forest user Group could be of the institutional choice for mainstreaming climate change adaptation in local level.
- LAPA envisioned VDC as a “operational unit for local level adaptation, but there needs to be more reformation in terms of their capacity, coordination , resources, priorities.
- In every catastrophic event community respond on their own way , from which lesson can be drawn for CBA.
- Chaining socio-economic context of community people change the values of Ecosystem services which also support to draw lessons for developing community based adaptation plan.



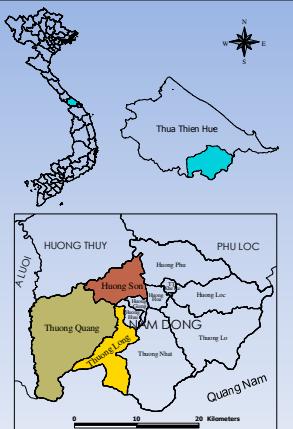


## ADAPTABILITY IN AGRICULTURE AND FORESTRY ACTIVITIES IN HUONG SON COMMUNE, NAM DONG DISTRICT, THUA THIEN HUE, VIETNAM

Tran Nam Thang  
Consultative and Research Center on Natural Resource Management (CORENARM)

**Study area: Huong Son commune  
Nam Dong district,  
Thua Thien Hue province**

- 100% Katu ethnic group
- Average forest dependency: 18% in 2004, 8% in 2009.
- Community forest allocated since 2004
- High fluctuation in rain and temperature conditions between wet and dry seasons



## Introduction

- Climate extreme (typhoon, flood) increase both in temporal and spatial scale.
- Huong Son is a Katu community with 86.5% local people are farmers.
- Variations in climate change adaptation..

## Objective

- To investigate the status of adaptability of local people in agriculture and forestry production in Huong Son commune, Nam Dong district, Thua Thien Hue province.
- To see climate change adaptation strategies in the mountainous area.
- To find the way for policies making for local context, creating incentives for local people to develop forestry and agriculture economics with sustainable manners.

## Study content

- Climate change and its impact on forestry & agriculture production.
- Climate change vulnerability of local people.
- Local personnel and experience in coping with climate change.
- Adaptive production practices.
- Adaptive measurement based on the available resources.
- Factors affecting climate change adaptive capability.

## Methodology

- **Secondary data:**
  - The social economic data from related documents of district, commune offices
- **Primary data:**
  - 60 households in the commune were randomly chosen for interview.
  - Groups discussion afterward for data validation and crosscheck
- **Data analysis:**
  - Descriptive analysis.
  - Multiregression analysis.

Results	
<b>1. Impact of climate change on agriculture and forestry production:</b>	
<ul style="list-style-type: none"> <li>- High fluctuation of rainfall</li> <li>- Change in the dry season time (prolonged)</li> </ul> <p>⇒ Changes in the seasonal calendar of local people, high density of pest and diseases.</p> <p>In addition:</p> <ul style="list-style-type: none"> <li>- No soil erosion measurement and fertilizer application.</li> <li>- Great conversion of natural forest to other land use (774 ha from 2003 – 2010)</li> </ul> <p>⇒ flooding, soil erosion and low yield production.</p>	

Results				
<b>2. Climate change vulnerability:</b>				
<b>Table 1: Perception of local people about the trend of natural disaster</b>				
Trend of natural disaster		Percentage		
		Increase	Reduce	Stable
Flood		51	8	41
Typhoon		89	5	5
Drought		95	3	3
Cold period		70	30	0
Hot period		97	0	3

Results				
<b>2. Climate change vulnerability:</b>				
<b>Table 2: Perception of local people about extreme weather conditions</b>				
Extreme weather conditions		Percentage		
		Earlier	Later	Stable
Time of appearing cold period		8	92	0
Time of appearing flood period		46	22	32
Time of appearing hot period		95	5	0
Time of appearing droughts		89	8	3
Time of appearing typhoons		46	38	16

Results			
<b>3. Climate change adaptation measurement:</b>			
<b>Table 3: Adaptive measurements in daily production in Huong Son commune</b>			
Case		Yes	No
Apply soil conservation measurements		10.8	89.2
Change the seasonal calendar		86.5	13.5
Apply pest and disease removal measurement		59.5	40.5
Apply pest and disease prevention measurement		10.8	89.2

Results		
<b>3. Climate change adaptation measurement</b>		
<b>Table 5: Adaptive measurements in livestock and animal grazing</b>		
Type of grazing		Percentage
Caged		7.7
Free ranging		3.8
Both		88.5
Change in Castle grazing		
Increase		92.3
Reduce		0
Stop grazing		7.7
Change in small animal grazing		
Increase		0
Reduce		70.6
Stop grazing		29.4
Change in husbandry		
Increase		9.1
Reduce		36.4
Stop grazing		54.5

Results				
<b>3. Climate change adaptation measurement</b>				
<b>Table 6: Reason for changes in livestock grazing</b>				
		Percentage		
		Increase	Reduce	Stable
Disease		100.0	.0	.0
Folder availability		4.8	90.5	4.8
Quality of foraging area		5.0	95.0	.0
Impact of temperature change		20.0	13.3	66.7

## Results

### 4. Livelihood strategies:

**Table 7: Income from forest and household economic in Huong Son commune**

		Household economic status			
		Wealthy	Medium	Poor	Very poor
Contribution of plantation forest	Very important	42.9	57.1	.0	.0
	Important	31.8	59.1	9.1	.0
Contribution of NTFPs products	Not important	.0	.0	.0	.0
	Very important	.0	.0	.0	.0
	Important	25.0	62.5	12.5	.0
	Not important	25.0	50.0	25.0	.0

## Results

### 4. Livelihood strategies:

**Table 8: Participation of household in different livelihood options**

Income source	Percentage	
	Yes	No
Paddy field	73.0	27.0
Plantation forest	78.4	21.6
Livestock grazing	54.1	45.9
Husbandry gazing	43.2	56.8
Fishery and aquaculture	2.7	97.3
Swidden cultivation	83.8	26.2
Rubber plantation	64.9	35.1
NTFP harvesting	32.4	67.6
Small business	2.7	97.3
Labour for rent	24.4	74.6

## Results

### 4. Factors affecting adaptability of local people:

Adaptability of local people depended on:

- The economical condition of the household (The better off household has higher adaptability compared with the poor ones);
- The role of natural forest with household livelihoods (higher the role, lower the adaptability of local people)

=> The poor household group suffer most from the impact of climate change.

## Discussion

- Climate change is becoming more and more prominent in the area.
- Local people changed: seasonal calendar, number of livestock and husbandry, cultivation techniques, crop composition, pest and disease prevention measurement and apply new techniques into their daily production activities.
- Most of the adaptation activities of local people toward climate changes are from their own experience or they learnt from each other. There have no national program in the area.
- Local people are getting more and more concerned to learn about measurements to reduce risks and impacts of climate change

## Discussion

- Natural resources are important for local livelihood. However, they are degraded.
- Community forests were put at the lowest priority in climate change adaptation strategies (low vulnerability) compared to other options.
- In addition, poor allocated forests create low incentives.
- Economic condition and dependency on forest resources decide the adaptive capability of local people.
- Factors that help increase adaptability: Economic conditions, assets and infrastructure development, health and labour force, diversity in the livelihood options and education of local people, accessibility of local people to the mass media or educational programmes

**Thank you**

## Climate Change and Livelihood: Nepalese Perspective

Khem Raj Dahal

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### Outline

- Climate Change: a discourse
- Climate change and livelihood
- Nepalese livelihood
- Agriculture and climate change
- What next? Adaptation
- Community adaptation
- Conclusion and Recommendations

### Climate Change: a discourse

- Climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity (IPCC, 2007)
- It is manifested through the change in mean weather conditions, the probability of extreme conditions, and/or in any other part of the statistical distribution of weather
- For ordinary person/farmer it is a typical uncertainty in normal seasonal or yearly weather calendar to which one is used

### Contd..

- There are several natural and anthropogenic factors responsible for climate change (Pidwirny, 2006).
- Naturally climate has been changing and it is an ongoing process, which is slow and steady and seems essential for living beings (Dahal et al, 2009)
- However, in recent decades, the earth is facing accelerated climate change and the human activity is very likely the cause for this (IPCC, 2007)

### Climate change and livelihood

- Climate change (unusual pattern of rain, increased frequency and intensity of droughts and floods, occurrence of typhoons, sea level rise, and outburst of glacial lakes, etc) is influencing the way we live and threaten our very survival (MO, 2009) through several negative consequences on people's livelihood, well-being and the world economy.

### Contd..

- Climate change affects livelihood mainly through agriculture, forestry, infrastructures, transport, energy, nature, tourism, water resources, and health and well-being (Taalas, 2009).
- Among these, the impact on agriculture is of a great concern at local, national and global levels as food production is the basis of all human activities (Dahal, et al, 2009).

### Nepalese livelihood

- Agriculture is the principal source of livelihood of Nepalese people and economic development of the country contributing about 34 percent to the national GDP and employing about 66 percent of the population (ABPSD, 2010).
- Agriculture has long been based on subsistence farming where peasants derive their living from fragmented plots of land, combined with livestock, cultivated in difficult conditions.

### Contd..

- With an introduction of “Green Revolution” Agriculture in 1960s and thereafter, capital intensive and chemical based commercial farming is being common in congenial agro-ecological pockets.
- Transhumance/livestock dominated systems in high hills; Maize-millet based in hills; rice-wheat in valleys and *Tarai*; intensive vegetable based systems in easy-access areas; and subsistent farming systems elsewhere are the dominating systems of agricultural production in Nepal

### Contd...

- Most of these systems operate on the judicious combinations of 5 *Ja*, *Jamin* (land), *Jal* (water), *Janawar* (animal), *Jangal* (forest) and *Janata* (people).
- All of these resources are sensitive to changing the conditions including the climate change and are getting degraded resulting in stagnated or declined food production in recent years.
- As a result, the country has become chronically food deficient especially after 1990s and the situation is becoming worse year by year.

### Agriculture and climate change

- Climate is the primary determinant of agricultural productivity and, hence changing climate is a major challenge for agriculture, food security and rural livelihoods.
- Agriculture is also the most vulnerable sector of human activities to climate change not only due to its high dependence on climate and weather but also people involved in agriculture tend to be poorer compared with urban counterparts (Jodha, 2011).

### Contd..

- Whilst Nepal does not significantly contribute to global CO<sub>2</sub> emissions, its fragile ecosystems are experiencing the consequences of climate change.
- Monsoon rain has become more intensive resulting in increased frequency of flash floods and landslides (Gurung, 2009). SAGUN (2009) has reported the increasing trend of weather-related extreme events such as excessive rainfall, longer drought periods, landslides and floods in term of both magnitude, as well as frequency.

### Contd..

- Studies have shown that farming communities already perceive unusual changes in weather parameters such as warmer temperatures, temperature extremes, alterations in monsoon patterns and erratic rainfalls (Dahal, et al, 2009; Manandhar, et al, 2010).
- These changes constitute additional threats to the farmers and rural population, who are habituated and dependent on certain rainfall and temperature patterns for their agricultural production (TDF, 2008).

### What next? Adaptation!

- IPCC defines adaptation as adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderate harm or exploits beneficial opportunities (IPCC, 2001).
- There are many management practices in agriculture that can restore wastelands, soils and ecosystems to enhance soil organic carbon and improve soil quality and health and, at the same time, help climate change mitigation and adaptation to it.

### Contd...

- In the face of global climate change, farmers must choose their practices to adapt to the changing temperatures and more frequent extreme weather events.
- This adaptation must first and foremost build resilience within the agro ecosystem, increase its ability to continue functioning even when faced with unexpected events (Borron, 2006).

### Contd..

- Such practices include agroforestry, organic agriculture, conservation tillage, mulching, cover crops, poly-farming, bio-intensive farming, biodiversity conservation, etc. the basic notion of which is managing the ecosystem better.
- Ecosystem and biodiversity management play a vital role in both ecosystem-based mitigation (carbon sequestration and storage) ecosystem based adaptation (e.g. societal adaptation to climate change impacts) in sustaining agriculture and livelihood.

### Contd...

- In managing agro-ecosystem agroforestry offers a great opportunity to the farmers in terms of soil, animal, human and environment health and thereby enhancing the adaptive capacity of community to changing climate.
- Similarly, organic agriculture, based on ecological processes to increase soil fertility and manage the whole production system, provides a broad set of practices that increase adaptive capacity and resilience in farms.

### Farmers' practice to adapt

- Communities have been using traditional methods of adaptations for generations based on local knowledge and innovations. Shifting to the alternatives where ever possible
  - Try to predict the timing of Monsoon and adjust their crop planting
  - Introduction of mixed farming to avert the risk of failure
  - Replacement of local crop varieties with more drought or pest tolerant varieties

### Contd...

- Changing entire cropping system- commonly replacing the rice crop with finger millet, black gram, fruit crops or fodder and forage crops and improved animal husbandry
- Collection and utilization of cattle urine for use as a plant tonic and the base material for bio-pesticide production
- (SSMP,2011)

### Contd..

- Based on the finding in Banke, Bardia, Dhading and Rasua)
  - Early warning system, Seasonal and off season vegetable cultivation (Bardia), establishing water pumps, forest management,
  - Cultivation of potato and maize one month earlier than before, planting of entire potato instead of cut tuber, focus on vegetable farming, rearing of poultry and goat as these require less water,
  - construct gabion walls to protect from land slide, and planting of stylo and Alnus in landslide sites,

### Contd..

- community managed water tank to store water, roof management against storms, etc.
- Installation of solar panel, water way drainage at the head of land slide areas.
- Use of pipes for water management, temporary well to collect water for irrigation, with less water requiring crops like millet, lentil mustard and tomato,

### Contd..

- NGO
  - Water harvesting, storage tank, organic farming, seed production, plantation programs, provision of drinking water, income generation activities, improved cooking stoves, etc
- Government
  - NAPA, LAPA and CAPA
  - Development of drought resistant varieties such as Sukha 1, 2 and 3.
  - Trying to develop flood tolerant rice
  - DSCO supporting with wire mesh protection and construction of embankments near the river bank erosion sites.

### Conclusions and suggestions

- There is a need to investigate whether or not existing local knowledge and livelihood assets, government and NGOs efforts are sufficient enough to enable the farmers to cope with the present and future climate change.
- Agriculture is not getting proper attention in national adaptation platform
- There is a serious need for suitable and implementable plan of action to niche specific adaptation plan to climate change

**THANK YOU !!!**  
 for  
 YOUR  
 ATTENTION



## Building climate resilient communities through community based adaptation planning and action: some empirical evidences from Nepal

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### Key contents

- Introduction
- Key impacts of climate change in Nepal
- Policy pathways which provide enabling environment in making community resilient in the context of climate change
- Process/ international and national dialogue/ initiatives
- Actions/interventions which promote skills, knowledge, networking, adaptive capacity and generate livelihood assets

### APPROACHES/PROCESS Applied for this study



### Climate resilient communities

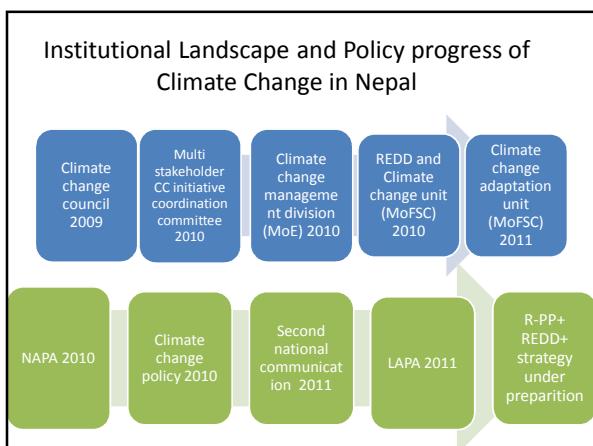
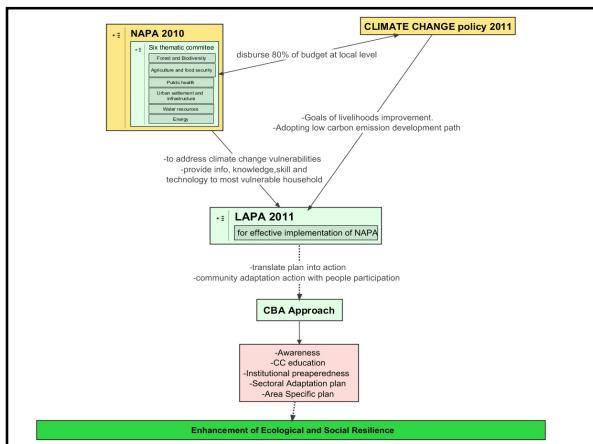
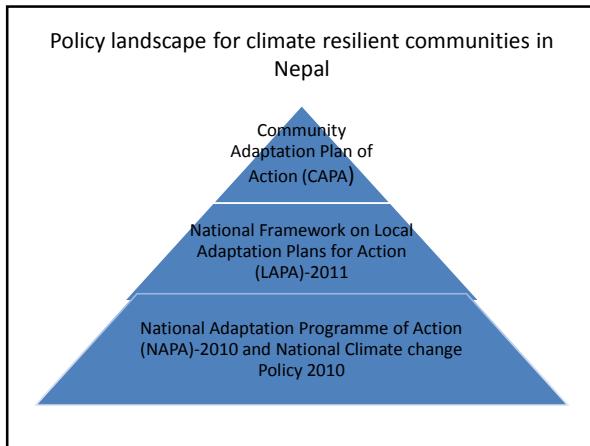
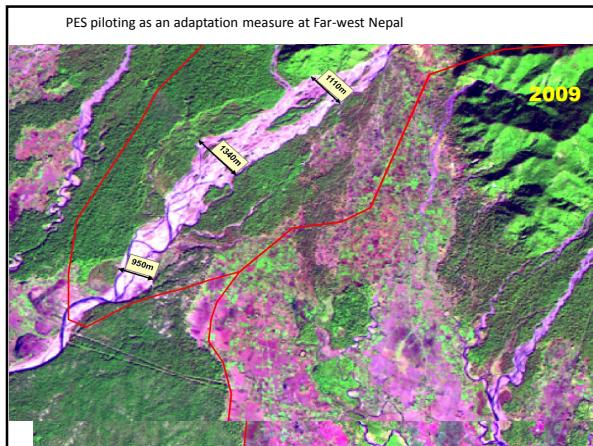
- The adaptive capacity of the communities that emerge due to the impact of climate change and which also mean to minimize the risk embedded with daily needs, live and livelihoods ( LAPA, 2011)
- Working definition: Making rural communities competent ( skills, knowledge, networking) in generating the livelihoods assets, and secure livelihoods by reducing adversities of climate change ( risk and vulnerability)
- Community based adaptation planning: Plans prepared by local communities to minimize the risk and vulnerability resulted from climate change.

### Key impacts of Climate Change in Nepal

- The average annual temperature rise in Nepal is 0.06 degree C.
- Significant warming, particularly at higher elevations, leading to reductions in snow and ice coverage which also lead to result into GLOF
- Climate change impacts are increasingly evident in agriculture, forests, wetlands, biodiversity, infrastructure and human health.
- Increased climatic variability and frequency of extreme events like erratic rain fall, increased frequency of forest fire, floods and droughts;

### CC Impact in Nepal.....

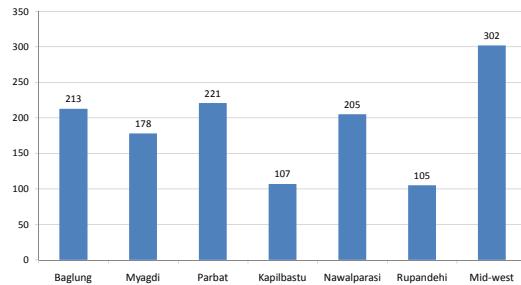
- Grow and spreads of invasive species (e.g. *Mikania Micrantha*, *Chromolaena Odorata*)
- Decrease of agriculture productivity in Mountain region
- Drying up the water sources
- Unknown diseases are seen in plants, trees, livestock and human beings



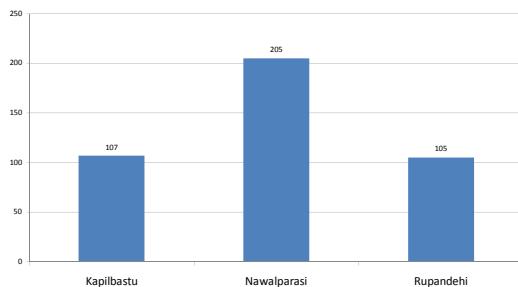
### Local communities and community based adaptation

- 17685 Community forest users Group (CFUGs)- 1,652,654 ha of forest land
- 195 Collaborative forest management groups- 45678.44 ha forest land
- 6712 Leasehold Forest management groups-38917.58 ha forest land
- 973 Public land/ wasteland management group- 7697 ha of non-forest land
- Buffer zone user groups are 4,088 and managing 5076 sq km of forests land involving 700,000 population

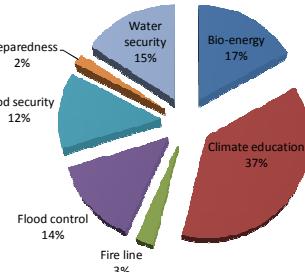
### Community adaptation plans prepared



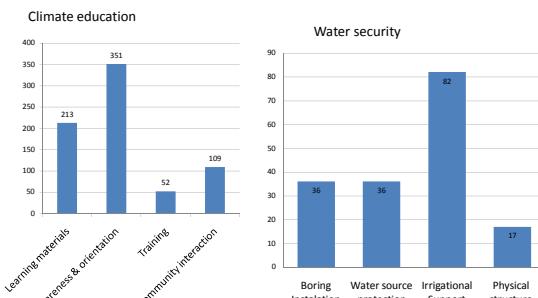
### CAP of three Plane districts



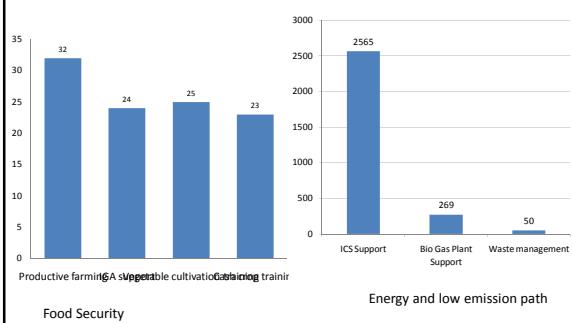
### Community Adaptation Plan, and priority (LFP 2009-2011)



### Inside the community adaptation plan



### Inside community adaptation planning



### Examples of Community based adaptation

**Economic use of invasive species**

Community Forest Users Groups in Lalitpur district of Nepal has started to control by using Chromolaena Odorata (Banmara) as a raw material to make Bio-briquette

Study says that the C. Odorata is now become a serious problem in many Asian countries.



- *Chromolaena odorata*, one of the world's 100 worst invasive species;
- This cryptic heliophyte originating from central America invaded the understory of many tropical forest ecosystems throughout the world
- *C. odorata* is a cryptic invader hidden under the forest canopy up to 1500m in Nepal

### Glimpse of community involvement in Bio-Briquette making



### Deep boring pump construction as an adaptive measure at Kailali district

- Construction of Water pump
- Community forestry (Up and down): plantation of grass, and other NTFPs to control soil erosion
- Fire line construction
- Reduce grazing



Adaptation practices	Why	Since
Harvesting Rainwater in Plastic Pond	To fulfill the need of water for home garden during the time of water scarcity	1993
Community Seed Bank	To promote conservation and use of local genetic resources, access to seeds among poor farmer during crop failure and seed shortage thus reducing vulnerability to crop loss	1993
Participatory Plant Breeding	Reintroducing local varieties and land races of rice, motivated as a result of gradual decrease in yield and disease and pest outbreaks in modern varieties	
Shift to NTFP Farming	Utilization of bare sloppy land, high productivity and commercial value compared to traditional farming of Millet and Maize	1990
Rupa Lake Conservation and Fishery Development Cooperative	Improving local livelihood and enhancing forest and biodiversity conservation	2002
Crop and Livestock Insurance	Minimizing the risk of crop failure and livestock death due to weather-induced hazards or disease outbreaks	2011

Adaptation Practice	Why	Since
Forest Management (Grafting, 3 tire)	To increase the economic and ecological balance of forest	2007
Watershed management around the pond	To sustain the irrigation for farming during the period of water scarcity	2002
Bagar Farming (Peanut) In River Cutting Area	Livelihood improvement through utilization of sandy loam soil near river eroded area for peanut's growth and development	2002
Zatropa farming	To promote biodiesel as low carbon alternative to fossil fuel	2008
Construction of bed on the field	To control water logging and improving agricultural productivity	2005





## Conclusion

- High-sound policy processes are under preparation/formulation at policy level, but still their linkage with community adaptation planning and their sustainable implementation is questionable.
- A need of adaptation is felt at local level to cope with different types of problems resulted from climate change, but mainstream of development yet materialize the adaptation into the development interventions
- Most of the adaptation measure are initiated by projects, except few examples of self initiated local practices based on local knowledge

Thank you very much



## Appendix 4

### Household Questionnaire form

#### INTERVIEWEE INFORMATION

1. Name: \_\_\_\_\_ (optional), Ethnicity.....
2. Sex: Male ( ) Female ( )
3. Age:
4. Education level (primary, secondary, higher secondary, university level)
5. Size of Family: \_\_\_\_\_ Male(\_\_\_\_), Female (\_\_\_\_)
6. Village Name: \_\_\_\_\_ District/ Providence: .....
7. Occupation  
Agriculture ( ), Forest Dependent ( ) Private Services ( ), Government Services( ), Business ( ) Day Laborer ( )

#### FARM INFORMATION

8. Do you own land? Yes ( ) No ( )
9. What is the area of land you own? Please provide the following information

Land type	Land tenure type (area)		Total Area	Number of months with irrigation facility	Contribution in food sufficiency (in month)
	rented in	rented out			

10. What are the crops grown (sowing/planting to harvesting) in your field? (fill in the table provided according to month)

Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Please use S for sowing, P for planting and H for harvesting.

11. Have you make any changes in crop calendar in recent 5-10 years? Yes ( ) No ( )

11a. If yes, please specify why and what?

Changes crop (name)	What was changed	Why changed

11b. If No, do you plan or see any requirement to change crop calendar? Please explain

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12. Have you noticed any change in crop performance in last 10 or 10+ year?

Effect on crop performance	Increased	Decreased	Reasons for Changed
Crop yield			
Crop biomass Yield			
Grain Size			
Grain Quality			
Crop Taste			
Other			

13. Have you notice any change in crop growth in the last 10 or 10+ yrs?

Effects on growth	Crops Affected	Perception for changes
Earlier crop emergence		
Later crop emergence		
Earlier crop flowering		
Later crop flowering		
Shortened crop flowering period		
Prolonged crop flowering period		
Shortened crop maturity period		
Prolonged crop maturity period		

14. Has there been annual change in yield in recent years? Decrease ( ) Increase ( ) Stable ( )

14a. Please specify amount of change and what factor do you think causing change?

Crop	Change in amount of yield	Factor responsible

15. Have you shifted to growing new crops? Yes ( ) No ( ).

15 a. If yes, please fill this box.

Old crop	Replaced crop	Reason for change

16. Have you shifted growing season of any crops? Yes ( ) No ( ).

16 a. If yes, Please fill the box.

Crop	Old growing season	New growing season	Reason for Change

17. Have you adopted new cropping pattern (i.e. rice-wheat-maize to rice-vegetable-maize/potato)

Old cropping pattern	New cropping pattern	Reasons for changed

18. Do you face food shortage (i) Every year (ii) Sometimes (iii) Never

18a. If yes, how do you managed to cope with food shortage problem? \_\_\_\_\_

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19. Has amount of chemical fertilizers used in agriculture change? Increase ( ) Decrease ( )  
Stable ( )

20. Has there been increase in incidence of pests and diseases in agricultural crops?

Crop	Pests/Diseases	Period of year/Frequency	Any measures adopted

#### **WATER INFORMATION**

21. What is the source of water for (i) domestic purpose \_\_\_\_\_ (ii)  
Irrigation purpose \_\_\_\_\_

22. Has there been any change in availability of water and water resources (on the basis of water availability in the last 20 years)

Number of water resources (i.e. ponds, lakes, rivers, tributaries)	Volume of water (increase/decrease, quantify if possible)	Level of water (increase / decrease, quantify if possible)

23. Have you changed your consumption pattern in response to such changes? Yes ( ) No ( )

23 a. If yes, please specify the changes you have made. \_\_\_\_\_

24. Have you constructed any infrastructure (pond, ditches, dam etc) to preserve water and water resources?

Name of Infrastructure	Number	Month of Water supply

25. Major causes responsible to decline in water resources (less precipitation, deforestation, landslide and earthquake, long term dryness in the area, siltation of pond, river, etc)

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#### LIVESTOCK INFORMATION

26. Livestock resources

Type of livestock	Feeding Type		
	Stall fed	Grazed	Both
Buffalo			

27. Have you observed any changes among the types of animals during last 10 years?

Name of animal	What was the nature of change observed	What could be the reason

28. Have you noticed any of the following difficulties in rearing livestock?

	Increased	Decreased	Stable	Reasons for changes
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Occurrence of disease/parasites				
Availability of fodder/forage				
Quality of Grazing land				
Availability of water				
Other/Comments				

#### FOREST INFORMATION

29. On average, how far do the individuals in the community live from the forest? > 1 km ( ) 1-5 km ( ) <5km ( )

30. Are you depended on forest resources? Yes ( ) No ( )

30a. If yes, for which products are you depended on forest and how do you rank your dependency?

Type of product	Degree of dependency				
	Very high	High	Medium	Low	Very low

31. Has there been any restriction for you for access over forest resources? Yes ( )

No ( )

31a. If yes, what kind of restriction and do you think it is necessary?

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32. Has there been change in availability of forest resources?

Forest resource	Amount harvested	Change	Perceived Reason

	(kg/month)	(Increase/decrease/stable)	
Leaves & branches			
Fuel wood			
Timber			
NTFP (spell out)			
Others (Please specify)			

33. Have there been any changes in time taken to harvest forest resources?

Yes ( ) No ( )

33 a. If yes, please specify time taken before and now. Before ( m.) After ( m.)

34. How you have dealt with changed availability of forest products.

Forest resource	Alternative resource	Perceived Reason
Leaves & branches		
Fuel wood		
Timber		
NTFP (spell out)		
Others (Please specify)		

35. Have you observed changes in distribution of vegetation (no. of species?)

Increased \_\_\_\_\_ Decreased \_\_\_\_\_

36. Have you observed changes in count of species (count of one species?)

Species name: \_\_\_\_\_

Increased \_\_\_\_\_ Decreased \_\_\_\_\_

37. Have you observed number of forest fire occurrences?

Increased \_\_\_\_\_ Decreased \_\_\_\_\_

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38. Have you observed any seasonal changes in flowering season/fruiting of forest trees? Yes ( )  
No ( )

38 a. If yes, please specify changes. \_\_\_\_\_

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39. Have you observed any seasonal changes in abundance of any birds or animals?

Yes ( ) No ( )

39a. If yes, please specify such changes. \_\_\_\_\_

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40. Has there been emergence of any new invasive plant species, new pests and insects?

Yes ( ) No ( )

40a. If yes, please specify. \_\_\_\_\_

41. Have community done any major activities related to forest management that contribute to adapt in over all better forest condition?

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Activities	Volume	Process
Plantation		
Grazing control		
Water resources build inside the forest to maintain water level		
Restriction on harvesting of products		
Pest control		
Change in harvesting rules		
Introduction of new technology that could leads less use of products (i.e. improved stove, biogas)		
Encouragement or distribution of improved grass seed or fodder trees to fulfill the demand		
Promote grass seed and seedlings as agro-forestry to fulfill forest demand		

IGA activates from forest		
Economic Innovation		
Promote social forestry activities in forest land		

#### INSTITUTIONAL SETUP

42. Are there any local organizations for

- Water management ( )
- Forest management ( )
- Agriculture management ( )
- Agricultural credits ( )
- Disaster relief and rescue ( )
- Other organizations (please specify) \_\_\_\_\_

42 a. Are you member of any organizations?

Organization type	Membership type	Level of your participation

Level of attendance: - regular ( ), sometimes ( ), never ( )

43. Are you benefiting from the membership? Yes ( ) No ( )

43a. If yes, what are benefits?

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43b. If no, why? \_\_\_\_\_

44. How do you rate performance of organization committee and why?

Organization type	Performance	reason

Performance: Very good, good, fair, poor, very poor

45. Do you know about any form of external support that you or community receives?

External agent	Type of support	Level of satisfaction

Level of satisfaction: High, Medium, Low

46. What kind of services does VDC provide?

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47. What do you expect/ what should local government do for resilience of CC impact?

#### NATURAL ENVIRONMENT

48. Have you experienced any changes or deviation in weather parameters over the past 10 Years? Yes ( ) No ( )

49. Have you noticed changes in the following weather conditions?

Weather	Increased	Decreased	No change	Don't know	Comments
Temperature level (summer season)					
Temperature (winter season)					
Rainfall intensity					
Rainfall frequency					
Landslide/ flooding severity					
Landslide/flooding frequency					
Drought length and severity					
Drought frequency					
Snow/hailstorm amount & severity					
Frost/dew amount & severity					

March/April cold spell-amount & severity					
Sept/Oct cold spell-amount & severity					
Cloudy weather					

50. Have you noticed changes in timing of weather patterns?

Weather Patterns	Earlier	Later	No change	Don't know	Comments
Starting of summer season (temperature level)					
Starting of winter season (temperature level)					
Timing of summer/monsoon rainfall					
Timing of winter rainfall					
Timing of snowfall/Hailstorm					
Other					

51. Have you noticed any significant changes in your community since you settled in this village?

Yes ( )      No ( )      No idea ( )

51 a. What are the changes have you noticed?

Changed noticed	Reasons for change	Modification done

#### HAZARDS ASSESSMENTS

52. Have you incurred any losses to extreme climatic events? Yes ( ) No ( )

52 a. If yes, please fill in the table.

Type of Extreme climatic event	Type of loss	Year of loss	Frequency	Trend	Season/month in which it occurred

Frequency: frequently, sometimes, and rarely

Trend: Increasing, stable, and decreasing

52 b. If yes, have you recovered from the losses incurred due to disaster? Yes ( )

No ( )

52 c. If yes how long did it take you to recover?

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52 d. If no, please explain the causes.

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53. Are there any social practices observed during times of disasters? Yes ( ) No ( ) 53 a. If yes, please explain?

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54. In the event of disasters, have you received any external support? Yes ( ) No ( ) 54 a. If yes, please explain?

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55. Do you have warning information on extreme climatic events? Yes ( ) No ( )

56. Do you have insurance for your property? Yes ( ) No ( )

56 a. If yes, for what and are you satisfied with compensation? \_\_\_\_\_

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57. Have any of your family members been affected by heat waves or cold waves in recent years? Yes ( ) No ( ).

57a. If yes, please specify.\_\_\_\_\_

58. Has anybody migrated out from this place due to floods/landslide or other natural disasters?  
Yes ( ) No ( ).

58a. If yes, please provide details about why, when and where? \_\_\_\_\_

59 Have you given up any cultural-social practices practiced before due to natural disasters? Yes ( ) No ( ).

59a. If yes, please explain which and why? \_\_\_\_\_

#### ADOPTION MEASURES

60. Have you adopted any of the following additional techniques?

Techniques	Yes	No	Reasons
Changing of crop/tree species			
Irrigation practices			
Water Harvesting Techniques			
Agro-forestry/planting trees for shading SALT			
Mulching, mix cropping			
Increased fallow period			
Use of bio-pesticides to control pests/disease			
Minimize chemical fertilizers/use of compost/FYM			
Changing from crops to livestock			

61. Have you adopted any measures to solve following problems?

Problems	Measures	Period of adoption
Flood and land slides		
Heat waves		
Cold waves		
Water stress/drought		
Forest degradation		
Soil and land degradation		

Reduction in agricultural yield		
Others specify		

62. Have you followed any soil & water conservation methods in your home garden for the last 20 years? Yes ( ) No ( )

62 a. If yes, provide details about soil and water conservation methods.

Conservation method	Year started	Reasons to adopting
Cover cropping		
Mulching		
Shading		
Using low water consuming plants		
Rain water-harvesting scheme		
Terraces using timber		
Terraces using coconut husk		
Live terraces		

63. Are these measures (please tick) (i) locally developed ( ) (ii) Introduced by external organization ( ).

63 a. If introduced and supported by external organization, please specify about organization and form of support. \_\_\_\_\_

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**Name of Surveyor:**

**Date:**