Enhanced Local Adaptation Plan for Action and its implication on Smallholders of Salyan and Dailekh Districts, Nepal

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Declaration

I hereby declare that this project entitled “Enhanced Local Adaptation Plan for Action and its implication on Smallholders of Salyan and Dailekh Districts, Nepal” is an original work and I have not committed, as far as to my knowledge, any academic dishonesty or remedied to plagiarism in writing the report. All the information sources, supports and assistance received during the course of the study are duly acknowledged.

Student’s signature: ..... Date:.....

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Abstract

Nepal is one of the poorest countries in the world with a Human Development Index of 0.574 as per the Human Development Report of 2017. Enhanced LAPA has been implemented as an approach to help the poor (vulnerable communities) through climate adaptation in 2015. However, no study has been conducted. Thus, this study was carried out to assess the effectiveness of LAPA interventions in study area and to study the environmental and socio economic impacts from LAPA interventions. Salyan and Dailekh districts were chosen as study area out of 7 mid- western regions of Nepal. Bhagawatimai Rural Municipality and Dullu Municipality from Dailekh district and Tribeni Rural Municipality from Salyan was selected for the interview using stratified random sampling method. The total of 397 respondents was selected for the interview using Yamane formula. It was found that over 66% of Nepal's population depends on subsistence farming for their livelihood. The 43.33% farmers were satisfied and 35.26% very satisfied with enhanced LAPA interventions. This showed that enhanced LAPA had benefited the smallholders of hilly region to increase the adaptive capacity of vulnerable communities through its intervention.

Keywords: *Adaptation measure, ASHA project, climate change impacts, Dailekh district, LAPA interventions, Salyan district and municipality.*

Abbreviation and Acronyms

ASAP	Adaptation for Smallholder Agriculture Programme
ASHA	Adaptation for Smallholders in Hilly Areas
CDM	Clean Development Mechanism
COP	Conference of Parties
ELAPA	Enhanced Local Adaptation Plan for Action
GLOF	Glacial Lake Outburst Flood
IFAD	International Forum for Agricultural Development
IPCC	Intergovernmental Panel on Climate Change
NAPA	National Adaptation Programme of Action
LAPA	Local Adaptation Plan for Action
UNFCCC	United Nations Framework Convention on Climate Change

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CHAPTER ONE
INTRODUCTION

1. 1 Background

Nepal is a landlocked country located in Hindu Kush-Himalayan mountain range with the total population of about 29,362,095 covering an area of 147, 181 sq. km. The topographically, Nepal can be divided into three regions: Himalaya in the north, the hill consisting of Mahabharata range and Churia hills in the middle and Teri to the south. However, Nepal is one of the fourth most vulnerable countries due to impacts of climate change though it is one of the least contributors to global green house gas emissions (Sapkota, 2016). The climate change impacts are seen in many key sectors such as agriculture, forestry and biodiversity, hydroelectricity, tourism, water source and food security.

National Adaptation Programme of Action (NAPA) is one of the approaches adopted under United Nations Framework Convention on Climate Change (UNFCCC) in least developed countries such as Bhutan and Nepal to reduce poverty, help communities to adapt with the adverse impacts of climate change and increase the adaptive capacity of vulnerable communities. Developing countries experience various intensity of impact depending upon its geographical location, social, cultural, economic and political situations. As a result, country requires diversity of adaptation measures. However there are cross cutting issues which can be applied across countries and regions. The impacts of climate change are seen on agriculture sector, water resource, terrestrial ecosystem and biodiversity, human health, food security and livelihood (UNFCCC, 2007).

In Nepal, Local Adaptation Plan for Action (LAPA) ensures that the process of integrating Climate Change resilience into national planning is bottom-up, inclusive, responsive and flexible. Diverse entry points including agriculture, forestry, public health, water and sanitation, watersheds and micro-finance are used to assess the ways climate resilience can be strengthened. A number of indicators and instruments were developed under NAPA to assess exposure, sensitivity and adaptive capacity of the community using vulnerability scale of 1-4 indicating scale 1 as least vulnerable to 4 as the highest. Prioritizing all these indicators, a study was conducted on enhanced local adaptation plan for action and its implication on smallholders of Salyan and Dailekh districts of Nepal.

Similarly, Bhutan is also landlocked country with the total population of 735,553 covering an area of 38, 394 sq.km. Geophysical feature of the country is mountainous with steep slopes. Bhutan is one of the least developed countries with 59% of total population dependent on agriculture. Most of the farming system is subsistence as total arable land is only 2.93% (National Statistics Bureau, 2017).

Bhutan developed NAPA in 2006 with the objectives of identifying immediate project and activities to help vulnerable communities to adapt to climate change. Nine priority adaptation projects were identified that need immediate actions. The project entitled reducing climate change risks and vulnerabilities from glacial lake outburst flood popularly known as GLOF project in Punakha, Wangdue and Bumthang was a pioneering adaptation project that reduced the risks in the region. Lowering of Thorthomi Lake, setting up early warning system and building capacity of local communities in vulnerable areas are some of the adaptations carried out under NAPA. In Bhutan, National Environment Commission (NEC) is focal organization to address the impacts of climate change from medium to long term under National Adaptation Plan (NAP) process. NAP was launched under UNFCCC to increase climate resilience and integrate climate change adaptation into development.

1.2 Objectives

- To assess the effectiveness of LAPA interventions in Salyan and Dailekh districts of Nepal.
- To study the environmental and socio economic impacts from LAPA interventions**.**

CHAPTER TWO
LITERATURE REVIEW

2.1 Local Adaptation Plan for Action in Nepal

Least developed countries receive prioritized support such as in the form of funding and specialized programmes to develop some adaptation and mitigation measure to reduce climate change impacts. According to Bahadur *et al.,* (2017), National Adaptation Programs of Action (NAPA) is one of the mitigation measures developed under UNFCCC in 2001 to assist developing countries to adapt to climate change. Therefore, Nepal developed NAPA in 2010 to reduce climate change related impacts at national level. The Ministry of Science Technology and Environment (MoSTE) (2015) also developed national framework on Local Adaptation Plan for Action (LAPA) in 2011 to implement NAPA prioritized adaptation actions. The LAPA ensures the full participation of climate vulnerable local communities to adapt to climate change (Bahadur *et al.,* 2017).

The LAPA's purpose is to (i) enable communities to understand the changing and uncertain future climatic conditions and effectively engage them in the process of developing adaptation priorities, (ii) implement climate-resilient plans that are flexible enough to respond to changing and uncertain climatic conditions and (iii) inform sector's programmes, and catalyze integrated approaches between various sectors and sub-sectors. The LAPA ensures that the process of integrating climate change resilience into national planning is bottom-up, inclusive, responsive and flexible. Diverse entry points including agriculture, forestry, public health, water and sanitation, watersheds and micro-finance are used to assess the ways climate resilience can be strengthened.

The government of Nepal and IFAD are also financing Adaptation for Smallholders Agriculture Programme (ASAP) and Adaptation for Smallholders in Hilly Areas (ASHA) to help 7 mid-western districts of Kalikot, Dailekh, East and West Rukum, Salyan, Jakarkot and Rolpa as these regions are identified as most vulnerable to climate change. The ASHA is an IFAD funded project started on 26 February 2015 and is scheduled to be completed in February 2021. The project aims at strengthening the adaptive capacity of community and institutions to better contended with climate change risk in 7 western districts of Nepal. The LAPA supports the

NAPA priorities activities by facilitating the integration of climate change resilience into development planning processes and outcomes from local-to-national levels.

2.2 Environmental impacts of climate change in Nepal

An adverse environmental impact due to climate change is an emerging global concern due to emission of greenhouse gases (GHGs) mostly from anthropogenic activities. It is one of the most global issues faced by both developing and developed countries as it has multiple and complex interactions as well as direct and indirect impacts on almost all livelihood sectors such as agriculture, health and water resources and forest (Leahy, 2018). However, the intensity of impacts felt are not same everywhere as the poor, small and marginalized people living in rural and fragile mountains of developing countries such as Nepal are highly vulnerable to climate change due to geographical locations and less adaptive capacity (Parker *et al.*, 2017). In addition, Nepal is particularly vulnerable to climate change impacts due to numerous environmental, social and economic reasons.

According to Shrestha & Aryal (2011), average temperatures have been rising steadily since the 1970s. Most of the mountain ranges within Nepal are home to extensive glaciers which are experiencing widespread retreat. Glacial discharge in turn impacts the hydrological regimes of rivers downstream and causes rapid growth of glacial lakes and glacier lake outburst floods (GLOFs) are one of many climate change phenomena with the potential to pose extreme risk to populations, infrastructure, etc (Shrestha & Aryal, 2011).

2.3 Social and economic impacts of climate change in Nepal

The people living in the regions particularly Salyan and Dailekh Districts are fully dependent on agro-based economy where farming system is mostly subsistence and climate sensitive. Poverty, lack of individual and institutional capacity is one of the primary reasons that the population of Nepal is highly vulnerable to climate change and almost more than 80% of Nepal's population lives in remote and hilly areas which is prone to flooding and landslides (Pokharel & Bhattarai, 2014). In addition, three quarters of the population relies on agriculture for their livelihood and the sector contributes only one-quarter of Nepal's gross domestic product and further agriculture is highly sensitive to climactic and biophysical changes (Thapa *et al.*, 2015).

As per MoSTE (2015), the populations concentrated in the mid and far- western regions of Nepal are the most vulnerable, largely due to poverty and high reliance on subsistence agriculture. Economic losses from natural disasters between 2005 and 2015 have been estimated to be more than 1.3 trillion US dollars (MoSTE, 2015). Although Nepal had developed NAPA to reduce poverty and to increase the capacity of local communities to adapt to climate change impacts, Nepal lacks long-term baseline data on climate change, monitoring capacity and forecasting systems. Without these, climate change risk assessments are difficult. In Nepal, the LAPA initiative is regarded as a positive step forward to promote location- and context-specific adaptation actions that are identified, prioritized and implemented by local communities to address climate change impacts. However, most of the international experience shows that majority of NAPA in developing countries failed to reduce climate change risk and vulnerability and hence vulnerability to disaster is still exist.

The changes in temperature and rainfall pattern vary in the region affecting higher altitudes and lower altitudes differently. One of the impacts that threaten Nepal in higher altitude region is from glacial lake outburst flood (GLOFs) whereas low lying areas with floods and unpredictable heavy rainfall. Other impacts of increased temperature include water scarcity and decline in agricultural production mainly in developing countries. Karki *et al.,* (2014) also stated that climate change pose great concern for SAARC countries particularly Nepal because of rapid rise in temperature, erratic rainfalls and increase in frequency of extreme events such as floods and drought. In addition, growing population and economies in the regions are based on natural resources. Changes in weather and climate are already having impact on regional ecosystem from melting of glaciers, scarcity of water for irrigation, agriculture and scarcity of drinking water as regions experience different climate depending upon type of topography. So, if the intensity of adverse climate change impacts is compared, developing countries like Nepal face more impacts due to less adaptive capacity. Therefore, to reduce adverse social and economic impacts in Nepal, LAPA can be implemented in any geographical or administrative areas such as watersheds, ecosystems, administrative Districts, municipalities, villages or settlements.

2.4 Mechanisms to mitigate climate change

The United Nations Framework Convention on Climate Change (UNFCCC) recommended the development of National Adaptation Plan for Action (NAPA) for leased developed countries in

Nepal to provide immediate and urgent needs. The government of Nepal completed NAPA in 2010 with aim of increasing the adaptive capacity of vulnerable communities through various activities to promote community development, environment protection and agricultural production. Nepal also prepared Local Adaptation Plan for Action (LAPA) in 2011 to increase the adaptive capacity of vulnerable communities and to implement NAPA. The main purpose of this manual is to share the use of enhanced approaches in carrying out climate change adaptation activities (Bahadur *et al.,* 2017).

Other mechanisms include GIS based sub watershed and participatory scenario development (PSD) as it is useful to support ecosystem by addressing upstream and downstream linkages and also to balance community development and ecosystem needs. Besides LAPA, adaptation for smallholders agriculture programme is also one of the IFAD funded programme established in 2012 to help smallholder farmers in building their resilience to climate change. It also focuses on increasing participation of women in climate change adaptation activities and natural resource management. The PSD also aims to enhance LAPA planning process by envisioning future vulnerability beyond current vulnerability through scenarios developed in different climatic variables.

2.5 Adaptation strategies developed by Nepal

Adaptation is vital for developing countries to adapt to adverse impacts of climate change as most of their economy is resource based such as agriculture and hydropower. Nepal developed national framework on Local Adaptation Plan for Action (LAPA) in 2011 to implement prioritized adaptation actions to assist in reducing the impacts as adaptation is a priority for Nepal. NAPA was also adopted to provide urgent and immediate measures to address the impacts of climate change and promote sustainable development in the country. Glacial lake outburst floods (GLOF), windstorms, forest fires and landslides are major disasters that require attention and collective effort. Without these, it will cause significant impacts on downstream livelihoods and ecosystems (Bartlett *et al.,* 2010).

The hydropower, industrial growth and agriculture in Nepal are the major revenue generation sources but all these sectors are highly vulnerable to adverse impacts of climate change. To address such issues, International Fund for Agricultural Development (IFAD) is helping poor and least developed countries like Nepal to develop climate adaptation projects to help reduce

poverty and increase the livelihood of poor people. Adaptation measures proved to be effective in increasing agricultural production, increased household incomes and enhanced environmental services. Like Nepal, adaptation measures in Bhutan were also successful. As it stands, it is not simply carbon neutral it is carbon negative one of the most rarities amongst many countries in the world (Tshering, 2019). In addition, the forest covers is reinforced by a constitutional mandate that a minimum of 60% of country's total land be maintained under forest cover for all times (Royal Government of Bhutan, 2010).

CHAPTER THREE
METHODOLOGY

3.1 Study Area

Salyan and Dailekh districts were chosen as study areas for this study among 7 mid western districts of Nepal as Adaptation for Smallholders in Hilly Areas (ASHA) had already implemented LAPA interventions in these two districts (Figure 1). Salyan is located at 28°22'0.01" N, 82°10'0.01" E and 1530 meters elevation covering an area of 1,462 km^2 consisting 3 municipalities and 7 rural municipalities. Dailekh district is located at 28°50’15’’ N, 81°42’28’’ E. It is one of the low income districts from agricultural productions. However, maize, wheat, beans, paddy and vegetables are major crops grown as well as NTFP (Non timber forest products). Agriculture is the major source of income for the people living in the area. They also depend on off farm works for their livelihood. Some of the off farm activities include; construction, tailoring and bamboo craft products. Buffalo, goat, chicken and cow were raised in small scale despite opportunity for commercial livestock rearing.

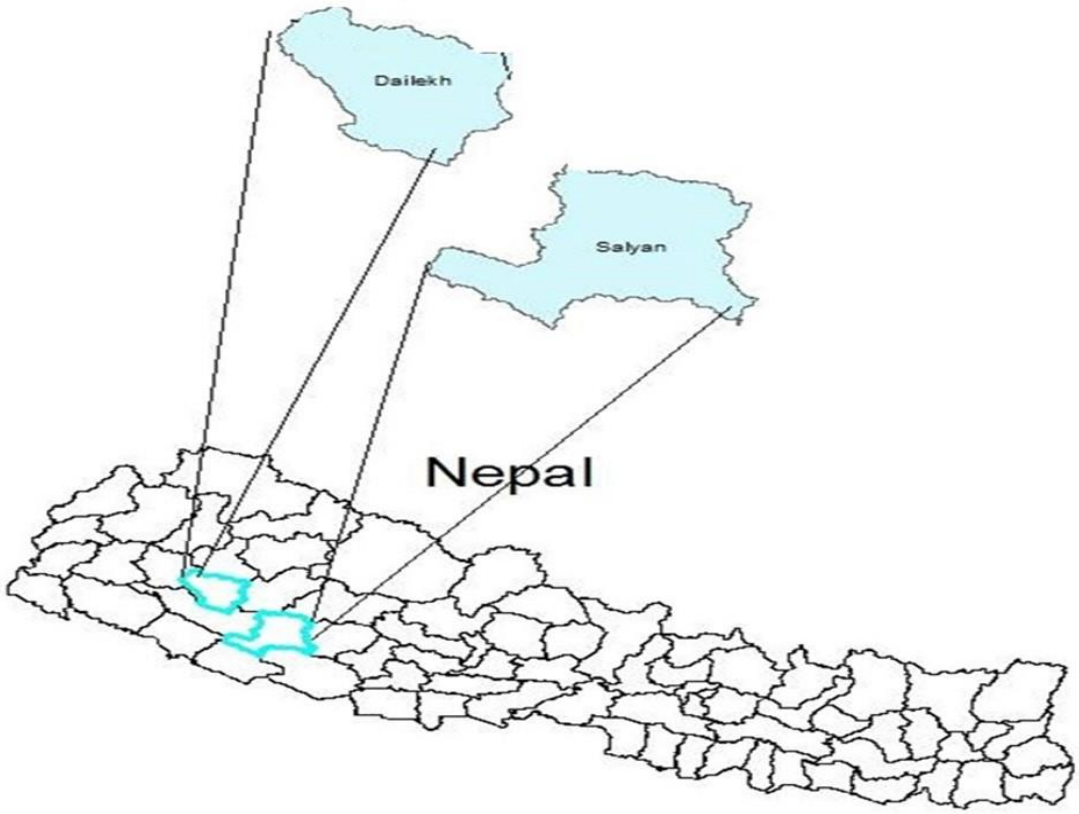

Figure 1: Map of study area

Dailekh district covers an area of 1,502 km² with elevation ranging from 544 to 4168 meters above sea level. Most of the rural municipality in Dailekh is connected with road networks, However only few are accessible during monsoon. Agriculture, livestock and cottage industries are the major source of income for the people living in the area. Agriculture is the major source of income and 93.22% of the households depend on agriculture for their livelihood. Dailekh district has 11 municipalities geographically located on hilly area having variation in topography and climatic condition. Maize, wheat, beans, paddy, potatoes and seasonal vegetables were the major income generating crops. Similar to Salyan district, buffalo, cow, goat and chicken were raised in small scale.

3.2 Sample size and sampling method

In total there are three rural municipalities in Salyan district and similarly there are two rural municipalities in Dailekh district. This study was conducted in one rural municipality from Salyan and two municipalities from Dailekh district. As the chosen municipality were under the Adaptation for Smallholders in Hilly Areas (ASHA) project as it has implemented LAPA interventions. Total household in the study area (Tribeni rural municipality, Dullu municipality, Bhagawati rural municipality) was 76942. Out of 76942 households, only 397 households were selected for interview using Yamane formula. The sample sizes of 397 respondents were randomly selected from one Tribeni rural municipality of Salyan district and Dullu municipality and Bhagawatimai rural municipality from Dailekh district depending upon population size. The stratified random sampling method was also used to select the sample size in the chosen study area.

Formula: $n = \frac{\mathrm{N}}{1+\mathrm{N}e^2}$

Total population = 76,942

Where:

n = Sample size

N= Total Population

e = is the margin of error at 5%

Sample size calculation $= \frac{76{,}942}{1+76{,}942*0.05^2}$=397

Table 1: Total household in the study area

Sl. No.	Name of municipality	Household number
1	Bhagawati Rural Municipality	18778
2	Dullu Municipality	41540
3	Tribeni Rural Municipality	16624
	Total	**76942**

3.3 Data collection

Data were collected using semi structured questionnaire and focus group discussion. A focus group discussion was conducted with the smallholders of selected district due to topography and time constraint. The key informant for the interview involves multiple group of participation such as policy makers, district stakeholders, beneficiaries of LAPA intervention and smallholders of selected districts. A total of 397 respondents were selected for this study from three municipality of Salyan and Dailekh districts of Nepal based on their perceptions on climate change adaptation. Stratified random sampling was used to select the respondents from different municipalities. Observations were also made through field visits. A stratified random sampling method was used to select the number of respondents from each municipality of Salyan and Dailekh districts of Nepal. The secondary data on LAPA manuals, baseline data and other reports and documents were also referred.

3.4 Data analysis

Data collected from the survey was properly coded and descriptive statistic analysis was used to analysis data for this study. Descriptive statistic analysis was used mainly to compare the association income earned from before and after interventions. Microsoft Excel was also used to analyze the data and generate graphs, charts and tables that were required for this study. A Bhagawatimai rural municipality and Dullu municipality from Dailekh district and Tribeni rural municipality from Salyan district were selected for this study to assess the effectiveness of LAPA interventions.

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Household Information

The Figure 2 shows total number of family members of the study area which shows that most of the respondents have less than 5 members and between 5 to 10 members. On the other hand 14 households have total more than 10 family members which indicate that some of the households have large population size. In general, it shows that most of the households have enough labour as majority has 4-6 working population (Figure 2).

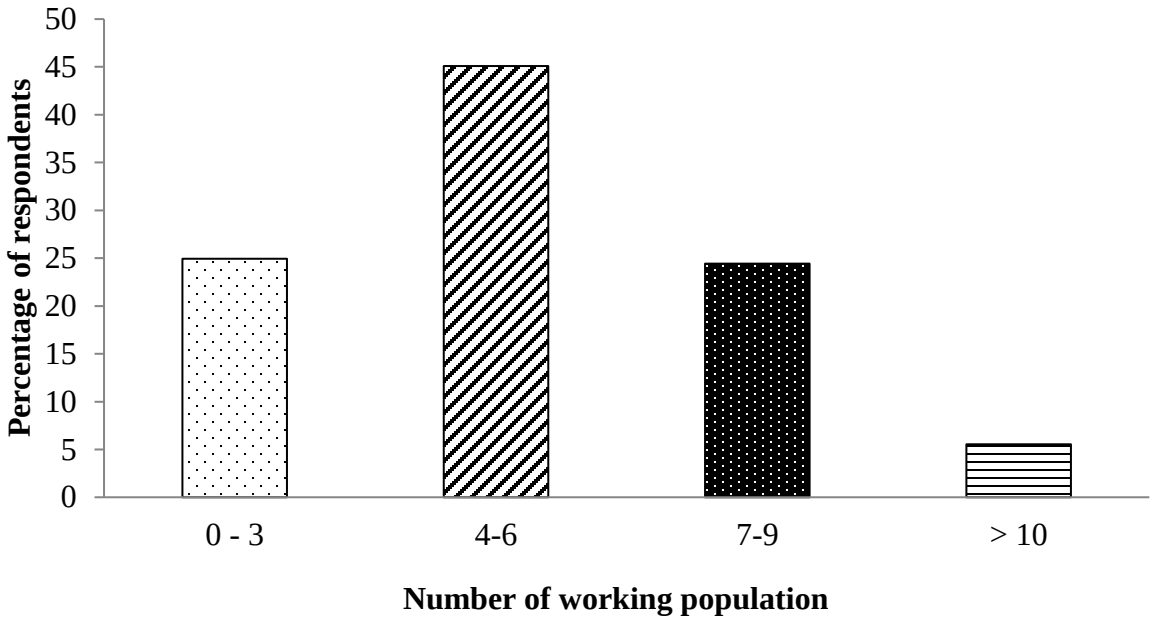

Figure 2: Total number of working populations

4.2 Farming system

The farming system was mostly dominated by subsistence farming. Commercial farming was carried out only by few farmers due to inaccessibility to market. The income contributed by agriculture and remittance were 33.5% and 38.29% respectively as shown in Figure 3. Farmers from Bhagawatimai rural municipality practice subsistence farming as their settlements are far from market and size of the land they own is small. Additionally, most of the respondents had land size less than 1 acre. Similar finding was reported by Deshar (2013) that subsistence farming was practiced due to decreased in land holding size per family and field sizes during recent years. Agriculture lands are located on steep slopes and water scarcity area such as in Dullu

municipality where most of the water source has been dried due to climate change. Therefore most of the farmers harvest rain water for drinking and other domestic purposes.

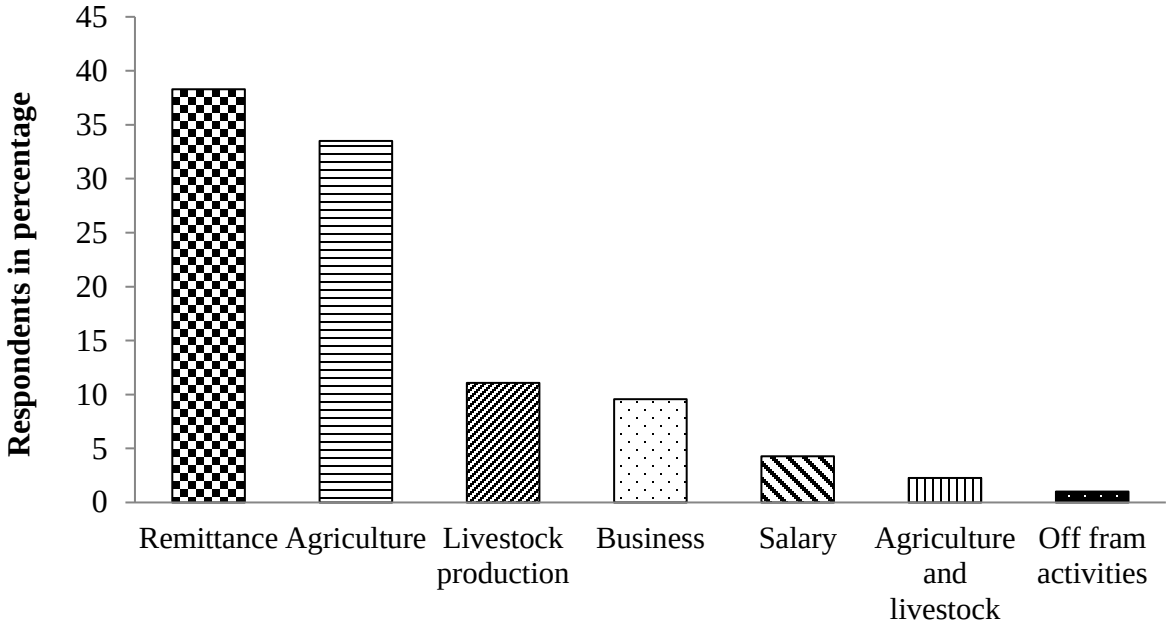

Figure 3: Source of income for the family in study area

4.3 LAPA intervention in Salyan and Dailekh districts

The Adaptation for Small Holders in Hilly Areas (ASHA) has carried out many LAPA activities in Salyan and Dailekh districts (Figure 4). In Salyan district, the priority was given to water source conservation and irrigation channel construction as most of the settlements were located within the watershed area. Sustainable land management approaches include construction of check dams, gabbin wall and plantation of tree along riverside to control erosion.

Similarly, in Dailekh district, the water source conservation was carried out as one of the top most LAPA activities as water scarcity was one of the main impacts of climate change faced by the farmers of Dullu municipality. They also practices rain water harvesting developed by Nepal Climate Change Support Programme. These kinds of adaptation measures were important to prioritize as 28% of total land is degraded and additionally 10% is poorly managed sloping agriculture terraces (Deshar, 2013).

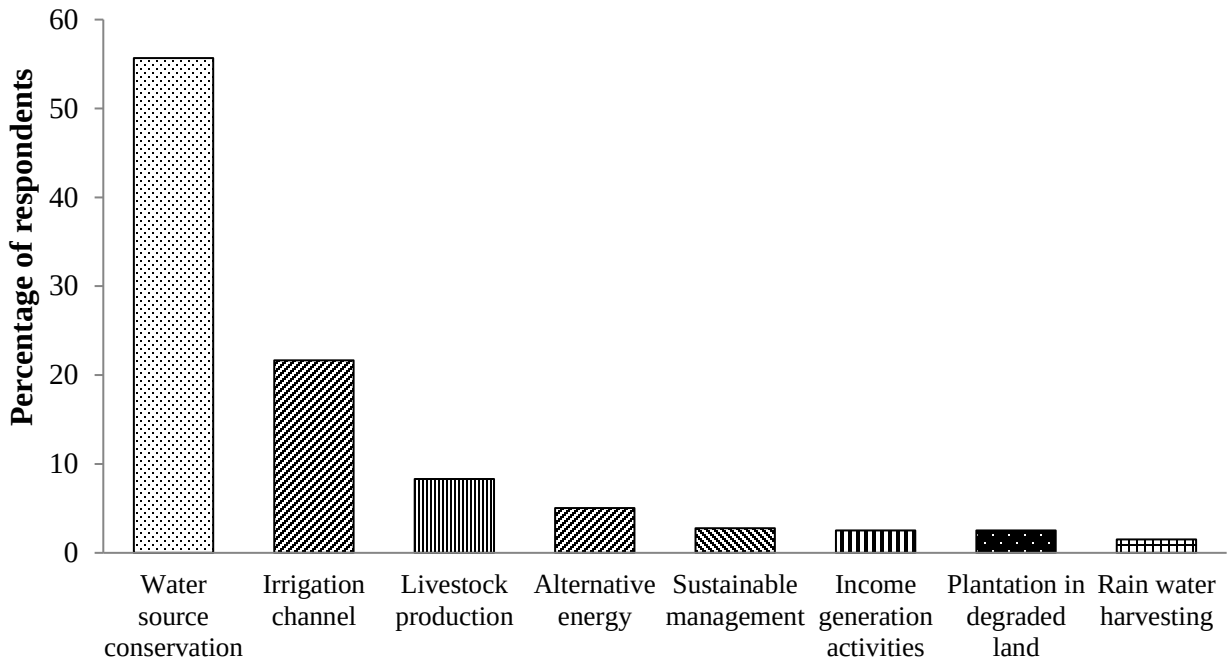

Figure 4: LAPA activities in Salyan and Dailekh Districts

4.4 Household vulnerability ranking

The households in study area were classified into four vulnerable categories: V1 (low), V2 (medium), V3 (high) and V4 (very high). About 8.2% households were found less vulnerable, 27.3% medium level vulnerable, 37.9% highly vulnerable and 26.6% most vulnerable (V4) (Table 2). The results showed that most of the households fall under highly vulnerable and very vulnerable to climate change. The vulnerability is a function of exposure, sensitivity and adaptive capacity (MoFSC, 2017). Adaptive capacity, among others, plays crucial role in determining the magnitude of vulnerability of a system or an individual. It requires adaptation planning to overcome problems. Vulnerable ranking was also carried out by other researchers by locating the most climate-vulnerable hotspots and communities and identifying adaptation options mainly to lessen the impacts of climate change and help them tackle the future impacts as well (Chaudhury *et al.*, 2014).

Beside climate change, there are number of other factors such as level of access to resource management, socio-political environment, governance, culture, geography and the access to basic service can block the efficiency of adaptive capacity. Therefore, the project had prioritized adaptation option through two approaches that is GIS based sub watershed analysis being carried

out and participatory scenario development approaches through conduct of researches and work shop to collect information from selected sample population of each ward at the settlement level.

Table 2: Household vulnerability ranking

Label	V1 (Low)	V2 (Medium)	V3 (High)	V4(Very high)	Grand Total
Salyan	1	25	27	14	67
Dailekh	20	45	70	54	189
Grand Total	21	75	97	68	256

4.5 Impacts of climate change and adaptation measures

The impacts of climate change on agriculture include longer drought period, landslides and sometimes unpredictable heavy rainfall as climate of Nepal varies from subtropical to arctic, all within a distance of approximately 180 kilometers (Paudel, 2016). The impacts of climate change experienced by the respondents include drying up of water sources, land degradation, decline of crop production and outbreak of pests and disease. Among all, drying up of water sources was the main impact faced by both the Salyan and Dailekh districts of Nepal. Therefore, water source conservation is one of the main LAPA activities carried out by ASHA project through construction of water supply tank and water source conservation pond in each district. The adaptation strategies being developed by the enhanced LAPA were crop diversification, improved irrigation system through construction of irrigation channel, organic farming and cultivation of various climate resilient crops and plastics tunnel.

In addition, the farmers from Bhagawatimai and Dullu municipality practiced sustainable land management through plantation in degraded land to improve crop production and control soil erosion. Similarly, farmers from Tribeni rural municipality practiced sustainable land management through construction of check dams and gabbin wall near the rivers to control flood and reduce landslides.

4.6 Types of irrigation system

The farmers in the study area use irrigation system such as drip irrigation, conservation pond, sprinkler irrigation and irrigation channel. The study reveals that majority of the farmers use sprinkler irrigation and water source conservation pond provided by the project. The farmers of Dullu municipality practices rain water harvesting while the farmers of Bhagawatimai use water source conservation pond to irrigate their fields (Figure 5). Farmers of Bhagawatimai also use tap water for kitchen garden and livestock purposes. However, the duration of irrigation depends upon the type of crops they grow.

Before LAPA intervention, scarcity of water to irrigate their field was one of the major problems faced by both Salyan and Dailekh districts due to drying up of water sources. Similar water scarcity was reported by Paudel (2016). After LAPA's intervention, farmers were provided cemented irrigation channel and water source conservation ponds to have enough water to irrigate their fields. The types of irrigation systems initiated after LAPA's intervention were: drip irrigation, rainwater harvesting, and sprinkler irrigation, reuse of grey water tap, irrigation channel and conservation ponds as it has prioritized the most vulnerable communities who also tend to be among the poorest (Huq & Khan, 2017).

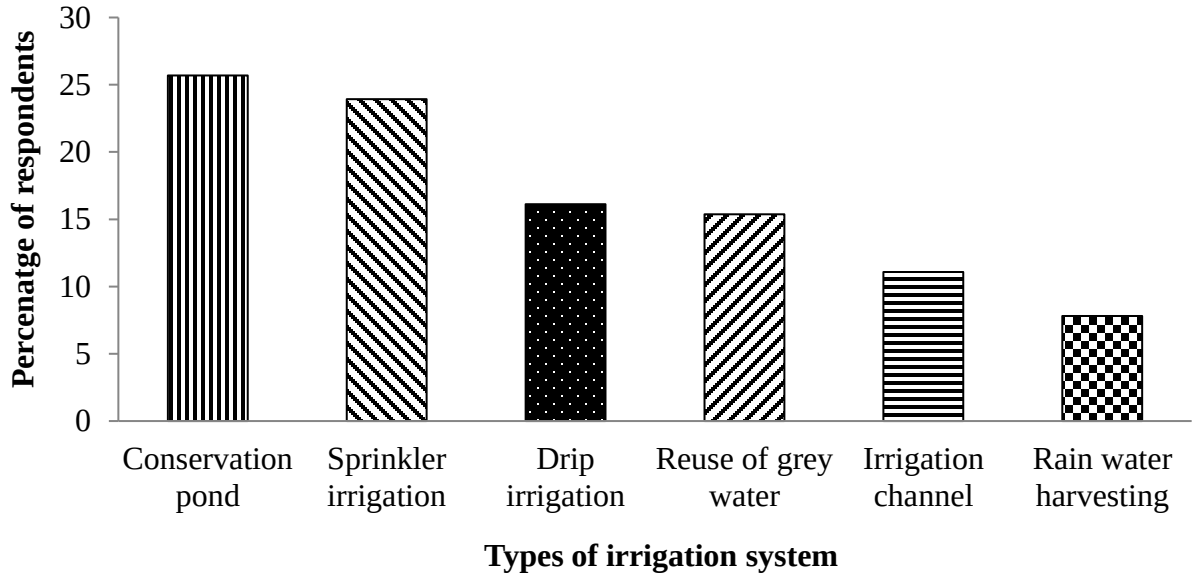

Figure 5: Irrigation system practiced in study area

4.7 Livestock and stall feeding

The farmers in the study area raise livestock such as goat, cow, oxen, chicken and buffalo mainly for sell and for their own consumption. Oxen are used for ploughing. Cow and buffalos were being kept for milk and other dairy products. As livestock is also one of the main sources of income for the farmers of Salyan and Dailekh district, Enhanced LAPA has implemented its intervention on livestock by distributing goats and other livestock to each household. LAPA has played effective role in shaping farmers livelihood as total number of buffalos were increased to 50.8% from 39%. Similarly, the percentage of goats in each household in the study area was increased from 58% to 89%.

Stall feeding is one of the traditional ways of feeding cattle with fodder grass collected from forest by not letting their cattle graze freely in the forest. Almost 64% of the respondents practiced stall feeding by collecting fodder grass from forest or fodder grown in their own land. Besides stall feeding, farmers of Salyan district built separate house for their livestock which is provided by the project. Almost 25% of the farmers from Salyan district keep their cattle in cemented shed which is separate home while 47% of the farmers from both the districts keep their cattle outside their homes without any protection (Figure 6). And the rest 28% of the farmers from Bhagawatimai rural municipality in Dailekh district keeps their cattle in the ground floor of their house.

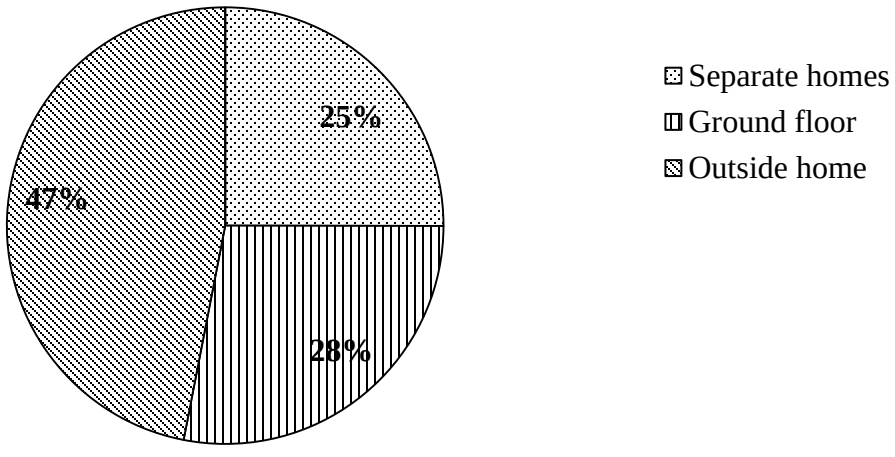

Figure 6: Different ways of keeping cattle

4.8 Income Generation Activities

The farmers in the study area has been engaged in income generation activities such as tailoring, transport, bamboo craft products and other include labour and mother group as shown in Figure 7. The money earned from income generation activities has been used for buying necessary household items and other expenditure such as education, health and construction of homes.

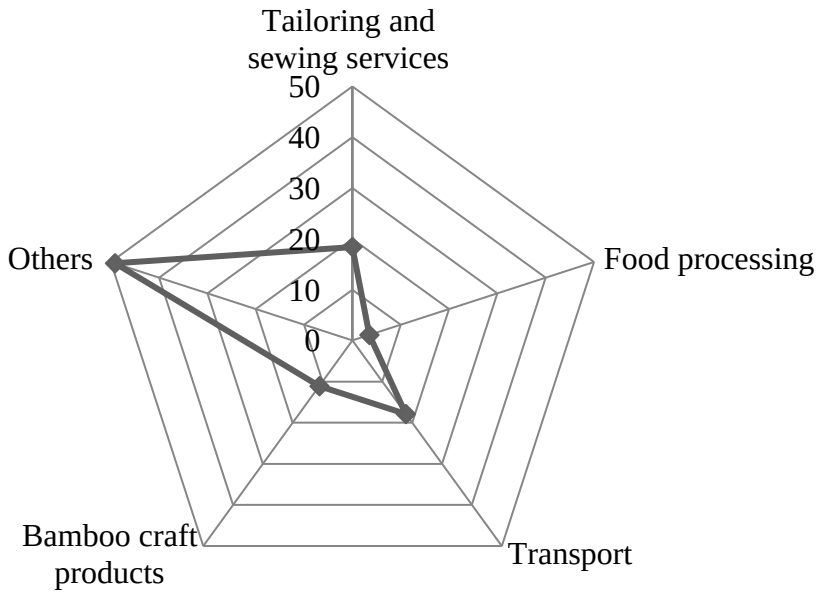

Figure 7: Income generation activities

4.9 Adoption of renewable source of energy

The study revealed that the use of renewable source of energy for domestic purposes had increased over the years after LAPA intervention. More than 218 households have started using alternative energy particularly for lighting purpose since the access to electricity facility in the districts was very limited. Enhanced LAPA provided solar energy to most of the households in Bhagawatimai rural municipality in Dailekh district. Unlike in Bhagawatimai, most of the households in Tribeni and Dullu municipality have access to electricity and solar energy. So, majority of the households use solar energy for lighting. However, some households still use firewood for cooking as there is no electricity.

Table 3: Different ways of using renewable source of energy

Types of energy	Lighting only	Lighting and heating	Alternative	Cooking and lighting	Cooking on1ly	Total HH
Solar energy	218	16	22	0	0	256
Electricity	0	130	9	49	72	256
Firewood	0	5	66	67	118	256

4.10 Livelihood status after LAPA intervention

The livelihood of farmers in Salyan and Dailekh district are mainly dependent on agriculture and livestock products as their main source of income. The enhanced LAPA had implemented activities such as water source conservation and livestock production and vegetable production. After LAPA's intervention, the 68% of the respondents stated that their living standards have improved. Most of the farmers also shared that their livelihood improved because of the better irrigation systems and water source conservation provided by the ASHA project.

4.11 Level of satisfaction on LAPA intervention

The study revealed that 35.26% of the households from Salyan and Dailekh district were very satisfied with LAPA activities as it has really helped in adapting to climate change impacts. Majority (43.33%) of the respondents were satisfied with LAPA activities although 21.41% of the households were not satisfied with the LAPA interventions carried within their District (Figure 8). As majority of the respondents stated they were satisfied, this indicates that LAPA activities carried out by ASHA project particularly in Salyan and Dailekh districts were successful and were benefited from the projects.

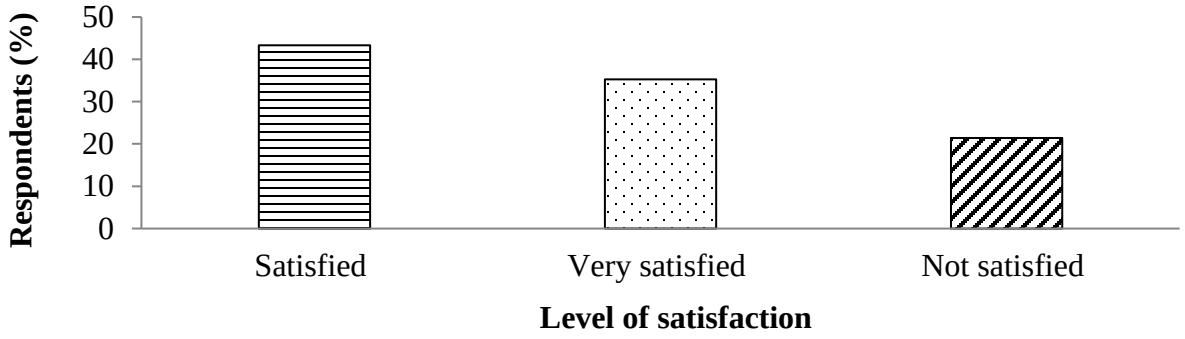

Figure 8: Level of satisfaction on LAPA activities

CHAPTER FIVE
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Enhanced LAPA had benefited the small holders of hilly region to increase the adaptive capacity of vulnerable communities mainly through GIS based sub watershed analysis and participatory scenario development approach. The ASHA project had benefited the smallholders of Salyan and Dailekh Districts to reduce the poverty contented with climate change through Enhanced LAPA interventions such as water source conservation, livestock production, solar energy, cemented irrigation channel, water source conservation ponds, sustainable land management, construction of check dams and Gabbin walls. The 68% of the respondents stated that their living standards have improved. As majority of the respondents stated they were satisfied (43.33%), this indicates that LAPA activities carried out by ASHA project particularly in Salyan and Dailekh districts were successful and were benefited from the projects.

5.2 Recommendations

1. One of the challenges faced by the smallholders in the study area includes lack of market to sell their products. Another challenge was water scarcity although enhanced LAPA had provided drinking water supply to some beneficiaries. Majority of the households do not have access to drinking water. Therefore, the smallholders of Dailekh and Salyan will be benefited if the enhanced LAPA could provide drinking water supply to each municipality.
2. The farmers of Salyan and Dailekh districts will be benefitted if enhanced LAPA can provide sustainable land management training to the smallholders of both the districts as it is located on the hilly areas which are vulnerable to climate change impacts mainly floods and landslides.

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