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Research Article

Impact of Local Adaptation Plan of Action in Reducing Vulnerability and Enhancing Resilience of Poor and Vulnerable Households: A case of Hills of Nepal

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Abstract

Local Adaptation Plans of Action (LAPA) is a community-based adaptation plan that takes a ‘*vulnerability first*’ approach to climate change. It was initiated more than half a decade ago in Nepal and has crossed its planning and early implementation phase. The Mauja village of Kaski district and Ghermu village of Lamjung district were selected to examine the effectiveness of implemented plan to reduce the vulnerability and enhance their resilience of poor and vulnerable (P&V) households (HHs). For the collection of the required information, Household Questionnaire Survey, Focus Group Discussion, Key Informant Interview and Direct Field Observations were implied for the primary data collection while the intensive literature review was done to collect secondary data. Similarly, a Wilcoxon test was applied to check the effectiveness of LAPA implementation at 5% of the significance level. The study revealed that the participation of P&V HHs in LAPA formulation process was found to be more than average estimation. The respondents of Ghermu were found more consultative and action and interaction oriented than the respondents of Mauja. The respondents of Mauja dominated Ghermu inactiveness and involvement in a specific activity. Similarly, for the LAPA implementation process, the contribution of a government agency (35%) was maximum in Mauja and contribution of donor agency (37%) was maximum in Ghermu. In this regard, the contribution of P&V HHs was done in terms of physical contribution in both the villages. Spring and water source conservation activities, plantation of cash crops in *bari* land, beginning of the entrepreneurship were the major activities initiated by the inhabitants of both the villages after LAPA implementation. The implemented adaptation plan was found to be effective in terms of reducing vulnerability and enhancing the resilience of P&V HHs in both Ghermu and Mauja. This study recommends for the enabling environment for P&V HHs to take ownership and need to facilitate a process of cross learning and sharing between district level and local level.

Keywords: Local Adaptation Plan of Action; household vulnerability; resilience

Introduction

Climate change means changes in global temperature, precipitation and wind patterns. The least developed and mountainous country like Nepal is at forefront i.e. 4th ranked and listed as the most climate vulnerable countries in the world (Maplecroft, 2010). Climate change has been posing additional challenges to the country's socio-economic development (GoN, 2011). Therefore, Climate change adaptation is one of the major development agenda in many developing countries like Nepal where the majority of the population depends on farming (Tiwari *et al.*, 2015) and natural resources. The Climate Change Policy 2011 has a

mandatory provision to spend at least 80 % of the budget available for climate change need to be spent for the implementation of adaptation activities at the local level. Therefore, a local adaptation framework was felt necessary and thus LAPA framework was formulated (GoN, 2011). Local Adaptation Plans of Action (LAPAs) are community- based approaches that take a ‘*vulnerability first*’ approach to climate change adaptation through the proper identification of adaptation needs at the local/community level that focuses on reducing local-level climate risk and vulnerabilities and the ways of increasing resilience (Poudel and Shaw, 2016). According to ICIMOD (2013), indigenous and

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marginalized poor people in Nepal are most vulnerable to disasters because they live in fragile terrains exposed to risks from flash and seasonal floods and landslides. LAPA is expected to identify the local adaptation needs and focus on reducing local climate risks and vulnerabilities in order to support the first priority area of the NAPA of promoting community-based adaptation through integrated management of agriculture, water, forest and biodiversity sectors (Chaudhury *et al.*, 2014). Guiding principles of LAPA are bottom-up, inclusive, responsive, and flexible. LAPA planning incorporates climate change information, emphasizes local knowledge about climate change, uses scientific climate change data, integrates local and scientific knowledge, identifies and plan adaptation activities.

Practiced Adaptation Strategies and its Implications

Regmi. *et. al.*, 2008 has defined some of the categories that have been in practice (Poudel and Shaw, 2016) for the purpose of climate change adaptation as follows:

1. Water storage system to cope with water scarcity

Farmers are constructing water conservation pond during the monsoon in Kalabang of Kaski District. Farmers of Arba VDC in Kaski District use water harvesting tank to trap rainwater to be used in the dry season. Farmers practice wastewater collection and drip irrigation for vegetable farming in Begnas VDC of Kaski District.

2. Management practices

Farmers are using mulching in vegetable farming to increase soil moisture. Some farmers are constructing retention walls along terrace risers to check soil loss and are planting, vegetative barriers such as broom grass, mulberry, and Napier grass on sloping lands and roads.

Farmers are constructing drainage canals in bar lands to check spill loss from intense rainfall and using of vegetative barriers (Broom grass, Napier, Mulberry) to control gully erosion. Trail improvement is also carried out for soil conservation.

3. Change in crops

In Kalabang of Kaski District, due to drought, khet land (irrigated) was converted to *bari* land (rainfed), so rice was replaced by millet and mustard. Farmers are now growing drought-resistant crops in *tari* land (semi irrigated). Early maturing vegetable are preferred by farmers. Mustard replaced wheat, which requires less water. Drought resistance rice varieties, such as Mansara and Anga, are now preferred by farmers.

Farmers now sow high-quality rice like Jetho Budho, a local landrace which they sell in the market and buy cheaper rice like Mansuli. Farmers in Mustang and Dolpa Districts are now growing new vegetable species in their homestead due to change in temperature. Similarly, farmers in the flooding areas of Bardiya and Kailali Districts are growing

watermelon, sesame, black gram, peanuts, and sweet potato to cope with stress environment.

4. Improved storage system

Farmers have been making pits to store potatoes. According to farmers, this helps to reduce storage temperature so that they can store longer. Some farmers in PumdiBhumdi VDC of Kaski District are protecting the seeds from frost and chilling temperature by covering with plastic and hanging them in safe places.

Farmers of Joshipur VDC of Kailali District are using earthen vessels to store their paddy, maize, and other cereal seeds. These vessels are kept on raised beds to protect from flooding. Similarly, farmers are also raising their level of houses and cattle sheds to keep them safe during monsoon flooding.

5. Other coping mechanisms

Farmers of Belwa VDC of Bardiya District are planting crops early, dropping late maturing varieties and developing alternative irrigation systems (e.g. pump set). Use of new hybrid varieties such as short duration and drought tolerant varieties is also common in many areas of Nepal. But most of the farmers believe that local landraces have stress tolerant traits.

Significance of the study

LAPA plans were developed following all the process and procedure to improve the ability of communities and households (Silwal, 2016). However, the level of participation of P&V households in the adaptation planning process along with the degree of reducing their vulnerability and enhancing their resilience is considered as one most important issue in LAPA implementation. Thus, the GoN, different Projects, Stakeholders and other beneficiaries started the implementation of planned activities related to LAPA.

The research investigates: (i) To whom is the LAPA Plan for? (ii) Are those poor and vulnerable (P&V) households taking the ownership of the LAPA Plan? (iii) Does the LAPA Plan succeed to address the issues of reducing their vulnerability and enhancing their resilience? (iv) Are those LAPAs working effectively and efficiently?

Objective of study

The overall research goal of this study is to explore the impact of LAPA on reducing vulnerability and enhancing the resilience of P&V households.

Materials and Methods

Description of the study area

The study area Ghermu village lies in Marsyangdi Rural Municipality ward no. 5 which used to be a separate VDC before having the last administrative zone changes and is located at around 5468 ft. from mean sea level in Lamjung



District of Western Development Region of Nepal in Gandaki Province

The village has a total household 402 with total population of 1776. Based on ethnicity, Janajati is the dominant caste comprising about 88% of the population followed by Brahmin and Dalit consisting respectively 1% and 11% (CBS, 2014). Most important land use of the village is forest area and pasture land.

Another study area is Mauja village which in Pokhara Lekhnath Metropolitan. It used to be separate VDC before last administrative changes and is located around 4600 ft. from mean sea level in Kaski District Gandaki Province. The village has 397 households and 1399 total population. The population is almost dominated by Brahmin & Chettri with Gurung, Pariyar and other marginalized ethnic groups (CBS, 2014).

Research Design

Stratified random sampling was carried out. This sampling technique gave a better cross-section of the population so as to gain a higher degree of precision. Selected Villages were stratified based on socio-economic status, considering that it creates heterogeneity in the livelihoods of local people, especially on the factor related to the climatic variation (Weiss and Hassett, 1982). Out of 799 households of villages (Ghermu:402 & Mauja:397), only 160 households (80 households from each village) were selected randomly for an interview with the consultation of CFUG member. Altogether 160 samples constituting 77 P & V and 83 others were selected randomly by using stratified proportionate random sampling technique. To represent the P & V HHs impartially while selecting them for HH questionnaire, village level climate change adaptation and disasters management coordination committee and other stakeholders & key informants were consulted for the selection of sampling location through consultation of LAPA of Ghermu and Mauja villages.

Primary data was obtained from the field survey through key informant’s survey, focus group discussion, questionnaire survey, and field observation. A participatory wellbeing ranking of households was conducted to categorize the local population in terms of relative poverty into poor, medium and rich/well-off groups based on local criteria of wellbeing. From that, the poor were categorized as P & V HHs. While secondary data were collected from published and unpublished literatures. Then data was analyzed using both qualitatively and quantitatively. Qualitative data was analyzed through MS Excel and SPSS tools using descriptive statistics such as percentage, mean, frequency distribution. They were featured in graphs, tables, and other pictorial forms. Similarly, Quantitative data were analyzed using the Likert Scale and Friedman’s Ranking test was used for the priority ranking of issues prevalent in the village. Similarly, non-parametric Wilcoxon signed ranks test was used to

identify the effect of LAPA on the people of that area regarding issues related to changes in the environment, at $\alpha=5\%$.

Framework for Effectiveness

The framework for effectiveness was mentioned as in below Table 1.

Table 1: A list of statements and people’s perception regarding those were used through Wilcoxon test for analyzing the effectiveness of LAPA implementation in both villages.

S.N.	Statements
1	Decrease in Available water
2	Common diseases increase
3	Forest fire increases
4	Frequency and intensity of landslide increases
5	Agricultural Productivity increases
6	Climate change awareness increases

Results and Discussion

Socio-economic characteristics of Respondents

Of the total 160 respondents (80 respondents from Ghermu village and 80 respondents from Mauja village) majority were seen enthusiastic to talk about LAPA. In the case of Mauja village, majority of the respondents belong to the age group 18-35 but in contrast, respondents from Ghermu village belong most to age group of adults (36 and above). This is not similar to the actual population data of the villages as most male population are traveling. The family size of respondents is relatively average with most HHs around 4 members which is relative to overall population data 4.42 in Ghermu, 3.69 in Mauja (CBS, 2014). Out of the total respondent in Ghermu, 40 HHs fall under poor and vulnerable and 37 HHs from Mauja. Majority of families in Mauja village are of small family size with 2-4 members while people belonged to the medium family size of 5-8 in Ghermu village. In both villages, main respondents were female. This disparity is predicted as the result of adult male traveling out of the villages to earn living. Majority of the people in Mauja are engaged in agriculture and livestock for their livelihood and source of income compared to Ghermu with other occupations such as business, shops having a significant contribution. In Ghermu, Gurung community has dominated as 80% of the respondents were Gurung. Overall, out of 402 HHs, there are around 85% Gurung, which shows similarity in the sampling of respondents. In Mauja Village, out of 397 HHs, overall 30% population are Gurung of which 40% of respondents were Gurung as the highest population within the village of mixed diversity of ethnicity.

Communication Timing

Normally, people are rather busy and thus cannot make time for programs and gatherings in the village. The study was carried out to realize the most appropriate time gap required to notify the people in the village so that they can take part in orientation and other group organized training and programs. Effective field communication process was in lead at the field level without many hindrances. In Mauja, a formal written letter was the means of communication and in Ghermu, verbal communication or phone call was made for the communication. All the district level stakeholders for district-level orientation and field level stakeholders for village level orientation were communicated.

The study found that the information reached to the targeted stakeholders with a time variation of one to three weeks and to the CFUGs households. Fig. 1 elaborates the detailed time taken to communicate to the CFUGs households.

Planned Vs Real Participation

The graph of planned and real participation in both the district (Fig. 2) and village (Fig. 3) level helps to elaborate the level of interest people have in LAPA and its influence in the mindset of people in those area. In both villages, the number of real participants exceeds the supposed number.

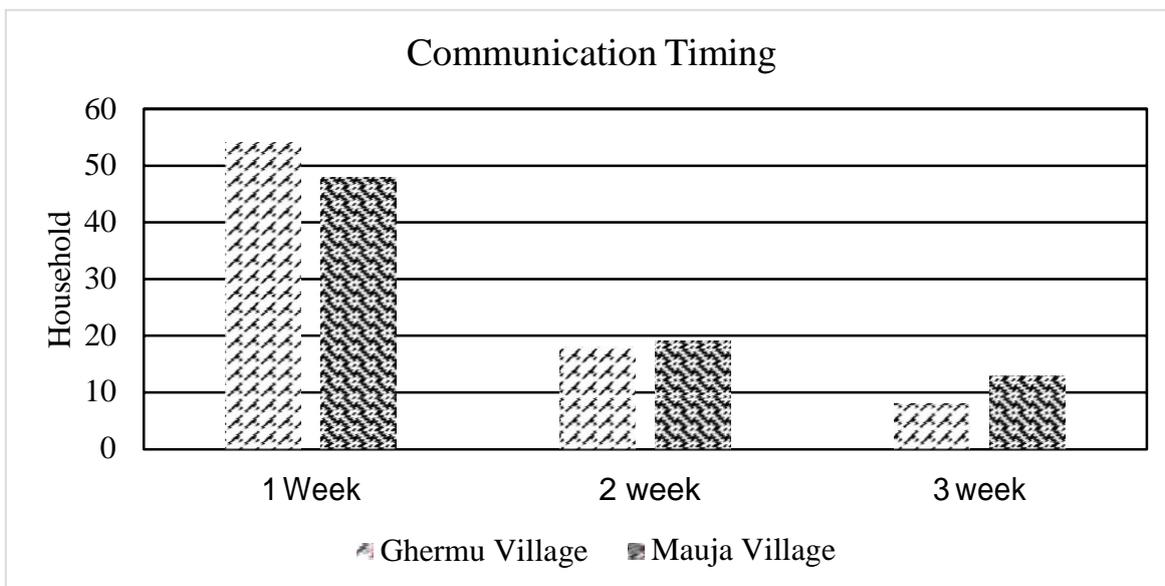


Fig. 1: Communication timing of households of Ghermu and Mauja Village

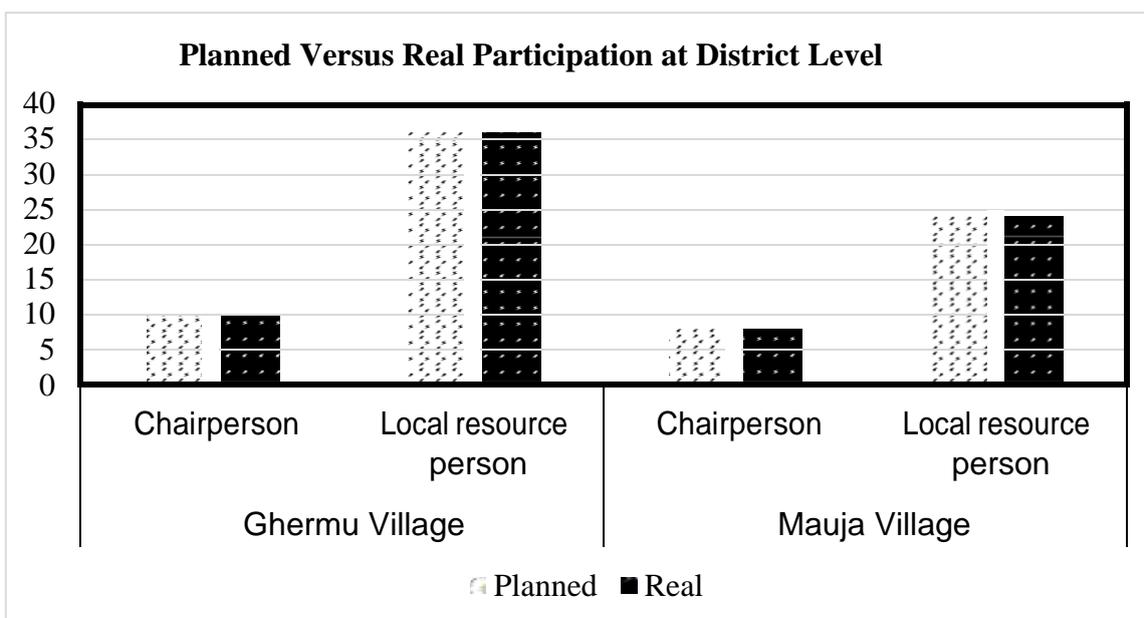


Fig. 2: Number of real and planned participation of chairperson and local resource person of Ghermu and Mauja Village

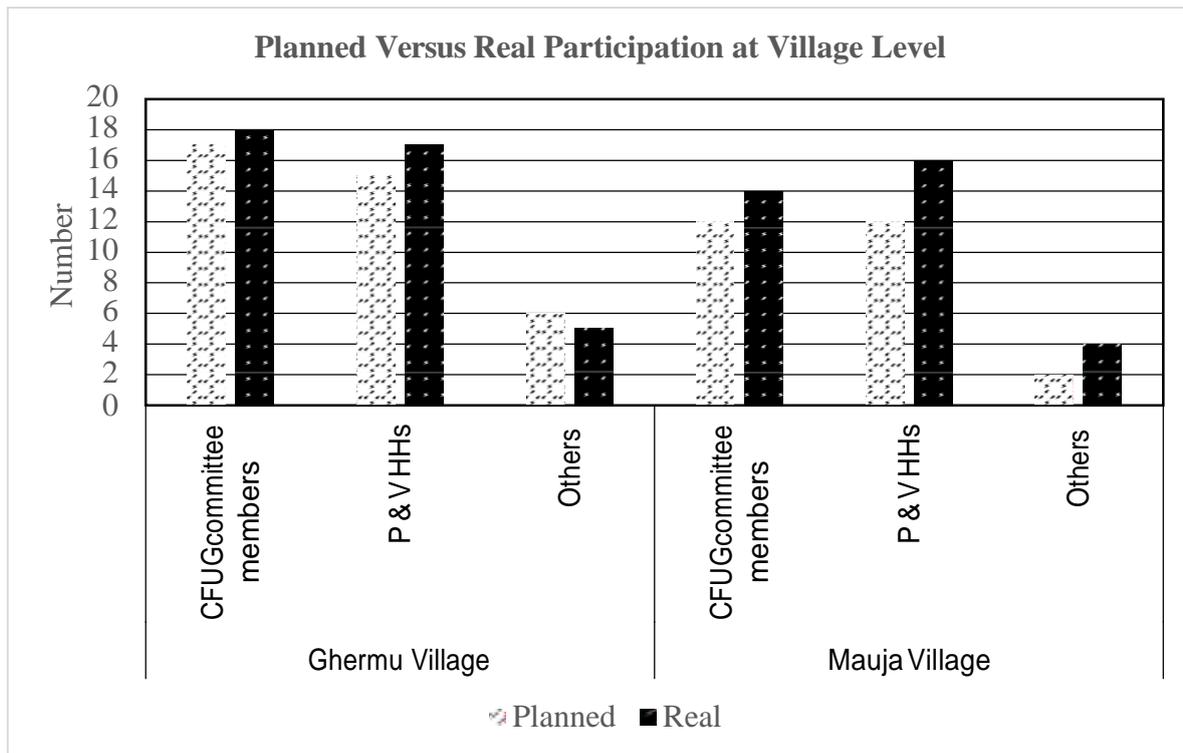


Fig. 3: Number of real and planned participation of CFUG committee members, P & V HHs and others of Ghermu and Mauja Village

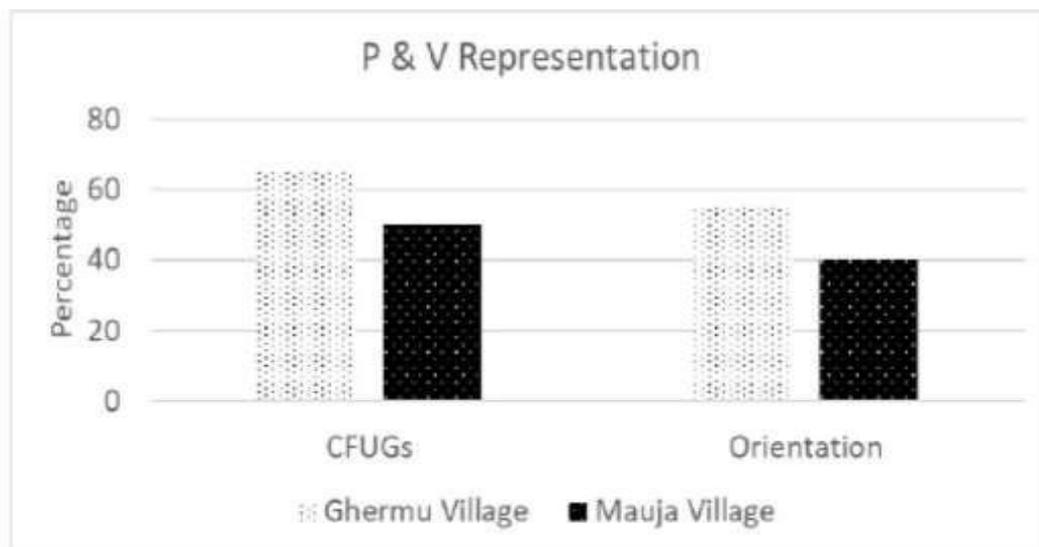


Fig. 4: Percentage of P & V representation of CFUGs and Orientation of Ghermu and Mauja village

The ratio of P & V in villages and their representation in LAPA formulation

In Ghermu village, there were 20% (80) P & V households and in Mauja, 15.86% (63), however, only about 11% in Ghermu and 9% in Mauja were involved in LAPA formulation. In Ghermu village, around 65% P & V HHs were members of CFUGS and 55% of them were present in orientation.

However, In Mauja, 50% P & V HHs are in CFUGs and only 40% were a participant of the orientation program. Voices

were rose by the dominant interest groups-Local political leaders, Government officials, Teachers, and other elites and dominated P&V households (Fig. 4). Voices towards LAPA implementation and effectiveness were raised by both dominant and dominated which were documented for the plan purpose. The study found that, to some extent, P&V households are capable enough to put the voice on the floor despite all those differences in caste and class.

So, the representations of poor and vulnerable households in the formulation of LAPA process was satisfactory as each

household were informed about the formulation of LAPA setting the time gap of two weeks before the formulation process. As per the typology of participation addressed by Agarwal (2001), the participation of P & V HHs was addressed into four different categories. For the level of participation for P & V HHs in LAPA formulation process, respondents of Ghermu were found to be more consultative and action and interaction oriented than the respondents of Mauja. However, the respondents of Mauja dominated Ghermu in activeness and involvement in specific activity (Fig 5).

Contributions of P&V households and Non- P & V households for LAPA implementation

Most of the CFUGs are now pro-poor friendly (meeting demands of marginalized groups first) and even some CFUGs are P&V friendly (aiding in livelihood upliftment through external resources) as well as programs and different plan of actions are oriented towards lifting their living standards and they are given leeway for resource utilization. For the financial contribution, it is clearly stated in CFUG's constitution to support bottom-up planned activities and activities that support P&V households. There was no any compulsion for CFUGs or P&V households to support the adaptation plan financially rather, the physical contribution made by CFUGs, poor and vulnerable households were calculated in terms of financial contribution.

In Ghermu, out of the total allocated budget for LAPA implementation, 60% has been exhausted while only 55% of the allocated budget in Mauja has been mobilized. Even though P & V HHs couldn't contribute financially, they partake in some of the programs and activities. Some of the programs were oriented for P & V, some only for non-P & V while some for both.

Physical contributions such as building, infrastructures, manual labors were mostly done by CFUGs, and P & V households as P & V HHs could not afford any financial contributions. There were no contributions from stakeholders' side. But, for CFUGs regardless of the aged people, every single person must make a physical contribution for communities' prioritized activities. No difference was there for whether well-off households or P&V households. But there was a provision of paying to the skilled labors for their physical contribution (e.g.: In Ghermu village, Rs. 900/ skilled; Rs. 700/semi-skilled & Rs. 650/unskilled manpower, whereas in Mauja village, Rs. 950/ skilled; Rs. 730/semi-skilled & Rs. 650/unskilled manpower). Each P & V HHs contributed around 10 to 15 working days which was converted into their financial contribution as per the provisioned paying wage. The ratio of contributions made by P&V households, CFUGs and stakeholders are represented by the bar-graph given in Fig 6.

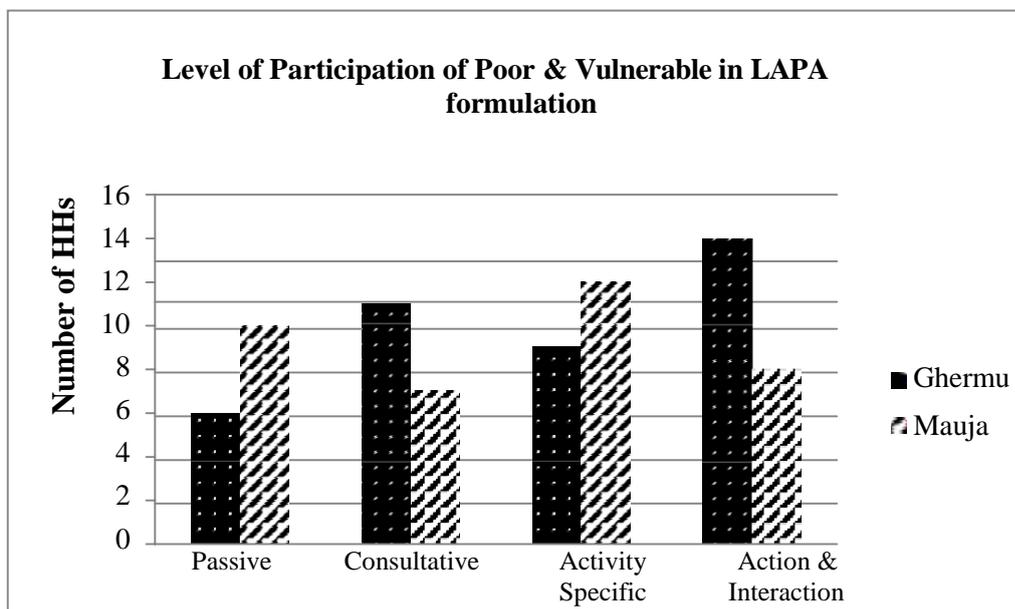


Fig. 5: Level of participation of poor and vulnerable in people in LAPA formulation.

Table 2: Name of programmes oriented for P&V HHs and Non P&V HHs

Programmes		
P&V HHs	Non P&V HHs	Both
IGA	Rain water harvesting	Check dam construction & bioengineering
NTPF Plantation i. e. Elaichi & Amliso	Alternative energy promotion	Construction of conservation ponds
Improved iron cooking stoves	Waste management	Native species plantation & Drought tolerant plantation and promotion
Drop irrigation	Health camps	NTPF processing unit establishment

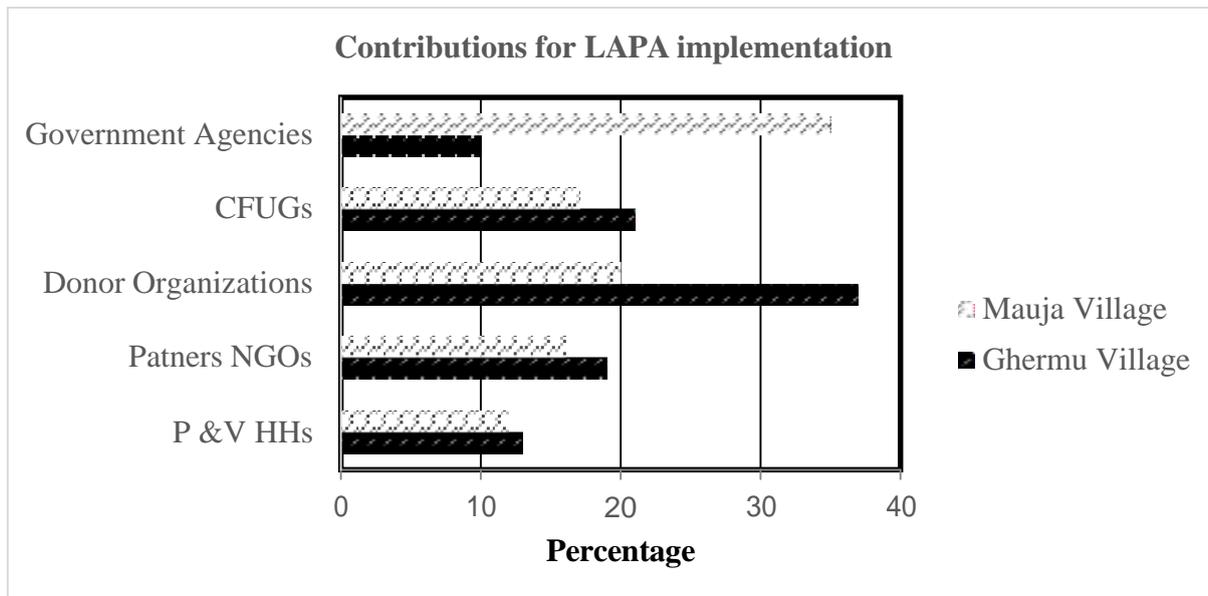


Fig. 6: The percentage of contributions made by P&V households, CFUGs and stakeholders of Ghermu and Mauja village

According to data collected by Rai *et al.* (2015), In Gupteshwor, Bhojpur, 42.34 % of contribution was done by VDC, 22.98% by NGOs, 10.37% by CFUGs.

Effectiveness of the implemented adaptation plan to reduce their vulnerability and enhance their resilience of HHs

Key problems of the site before the implementation of LAPA

As per the household surveys in each Village, focus group discussion (5 FGD) and stakeholders, the key problems were:

- Unhygienic drinking water, natural calamities like landslides, floods, some chronic disease like dysentery, etc.
- Drying up of ponds/ water resources, problems of rearing livestock and farming crops.
- Unaware of climate change impacts and adaptation measures.

Using Friedman’s Ranking test, the priority ranking of the major issues in both villages was carried out which can be seen in the Table 3.

According to the data collected in the field, people in Ghermu believe problems in agriculture as the most important key problem for them, while, Landslide is the greatest problem in Mauja. Some respondents gave more than one opinion as the key problem. It is seen that people not being aware of climate change is the least of their problems in the present context. According to JVS/ GWP-Nepal, 2016 have identified the drying up of water sources, increase in drought, floods & landslide and decrease in agriculture production. The expected effects of climate change on water availability are linked to findings on the

communities’ vulnerability to the changes (Gawith *et al.*, 2017).

Table 3. Ranking of key problems (before LAPA implementation) of Ghermu and Mauja village

Key problems before LAPA implementation	Ghermu Village	Mauja village
	Rank	Rank
Agriculture	1	4
Water resources	2	2
Health	3	3
Landslide	4	1
Fire	5	3
Unaware of CC	6	6

Coping Methods for Key Problems

The study reveals that there are several measures to overcome those problems as listed. But there were still some problems to which they don’t have any measures to come with. Upon the discussion with CFUGs users and P&V households, we have learned that P&V households were more affected than the other users as they are totally dependent on local infrastructures and resources.

As seen as major problems both during the past and present context, from the people’s perspective, there were seven problems and the coping strategies that have been used to ameliorate those problems. There are limits to these coping strategies adopted by communities to deal with climate



extremes. The coping range and thresholds are determined by the extent of climate variability and capacity and resources of communities to respond individually to the adverse impact of climate change (Adger *et al.*, 2009).

Table 4: Key problems and coping strategies of Ghermu and Mauja village

Key problems	Coping strategy
Drying up of water source	Construction of community level water tanks
Unhygienic water	Purification of drinking water using earthen pot filters
Landslide	Plantation of Amliso, Elaichi, construction of Gabion box and use of bioengineering measures
Health	Local indigenous knowledge about using plants e.g. Chiraito for skin problem, Kurilo for diarrhea and fever, Timur for digestive problems
Agriculture	Use of same crop and variety with usage of chemical fertilizers for commercial farming
Forest fire	Fire line construction with aid of District Forest Office
Unaware on climate change	Informal education

About 91% of the farming households have adopted at least one practice to minimize the adverse impacts of climate change and it is imperative to involve farmers in climate change adaptation planning processes if the full benefits of such policy action are to be realized (Khanal *et al.*, 2018).

The chronic problem within the study area was the water. Water sources were drying up due cutting down of trees and landslides. Sources, where they were found, were unhygienic for health. There were no solutions to get the

required water. Baral *et al.* (2010) found that landslides and flood directly affected drinking water and low rainfall affected the water resources. So, especially P&V households must make water reservoirs to collect water.

Similarly, they just needed to be extra careful before using water for drinking and cooking food due to unhygienic drinking water. There were some problems to which they didn't have solutions, for example, there were no proper equipment and means to control fire in Mauja Village. The major underlying reasons behind such problems are lack of proper infrastructures and financial resources to cope with demands of the local people.

Adaptation strategies to cope with climate change and variability must also prove adaptive within a larger context of ongoing economic, political, technological, and environmental dynamics, many of which are not driven by climate (Crane *et al.*, 2010).

Occurred Changes

a) Non-parametric Wilcoxon signed rank test depicted that the issues relating to the effectiveness of LAPA in ameliorating environmental impacts due to climate change as per the studies before and after LAPA implementation is significant. People, in both villages perceive that LAPA has been effective in its goals. Local people shared some experiences of climatic conditions, ecosystem function and process, and biological system, however most of the respondents were not aware about scientific facts and information regarding climate change, but they understood as rainfall and warming system.

Moreover, respondents were unaware about changing climate and its impacts at the local level but their knowledge in the local level changes cannot be overlooked. Local peoples responded based on their experience that warming days, erratic rainfall patterns, ecological variability, biological change and their adverse effects on human beings have increased (Tiwari *et al.*, 2014).

People's perception of changes in precipitation varied across the study areas. Most of the respondents (79%) claimed that there was less rainfall in winter; 29% mentioned that there were some changes in quantity and duration, and 19% mentioned that the rainfall was more intense in summer. All the respondents of the VDCs had similar perceptions about the decreased rainfall during winter (December to February) and intense rainfall in summer (June to August). According to 14% of respondents in Kunchha, 54% in Khudi and 20% in Ilam pokhari, the quantity and duration of the summer precipitation had changed, and rainfall was more intense in the summer (Poudel and Shaw, 2016).

**Table 5:** People's Perception towards LAPA and Its Implementation (Ghermu Village)

Statement	Response in percentage								Wilcoxon Sign Ranked Test
	Before LAPA Implementation				After LAPA Implementation				
	Agree	Neutral	Disagree	WM	Agree	Neutral	Disagree	WM	
Decrease in Available water #	17.5	45	37.5	2.200	7.5	12.5	80	2.730	4.199 ^b *
Common diseases increase #	81.3	10	8.8	1.275	23.8	13.8	62.5	2.388	5.959 ^b *
Forest fire increases #	49.4	32.9	17.7	1.684	11.3	15	73.8	2.625	5.909 ^b *
Frequency and intensity of landslide increases #	71.3	11.3	17.5	1.263	8.8	11.3	80	2.713	6.941 ^b *
Agricultural Productivity increases	17.5	42.5	40	2.225	65	27.5	7.5	1.425	5.284 ^c *
Climate change awareness increases	22.5	25	52.5	2.300	63.8	16.3	20	1.563	4.302 ^c *

= negative statement * = significant at $P < 0.01$; b = based on negative ranks; c = based on positive ranks

Table 6: People's Perception towards LAPA and Its Implementation (Mauja Village)

Statement	Response in percentage								Wilcoxon Sign Ranked Test
	Before LAPA Implementation				After LAPA Implementation				
	Agree	Neutral	Disagree	WM	Agree	Neutral	Disagree	WM	
Decrease in Available water #	26.3	43.8	30	2.038	12.5	10	77.5	2.650	5.318 ^b *
Common diseases increase #	73.8	13.8	12.5	1.388	21.3	11.3	67.5	2.463	6.434 ^b *
Forest fire increases #	41.3	31.3	27.5	1.863	22.5	26.3	51.3	2.288	3.283 ^b *
Frequency and intensity of landslide increases #	70	12.5	17.5	1.475	10	18.8	71.3	2.613	6.637 ^b *
Agricultural Productivity increases	8.8	38.8	52.5	2.438	57.5	27.5	15	1.575	5.809 ^c *
Climate change awareness increases	15	28.8	56.3	2.413	63.8	21.3	15	1.513	5.927 ^c *

= negative statement * = significant at $P < 0.01$; b = based on negative ranks; c = based on positive ranks



b) Key Differences in Particular site

Conserved springs and enabling water resources

After, the implementation of LAPA, there was change in attitude of people towards necessity of conservation which caused many ponds to become well managed. Water tank were constructed and reconstructed, plantations were done around the water resources, controlled grazing practices and control of soil loss through proper agricultural practices. People started to realize the importance of clean drinking water and started to keep small scale water containers such as buckets in their home. All these have led to the proper conservation of the springs and water resources as these activities helped stabilize the upstream and downstream water resources

Control of the spread of diseases

Most of the respondents responded that there was a huge problem of water-borne diseases like diarrhoea, dysentery, etc. As, drinking water was impure at the very time every people could not drink water by boiling which compelled them to drink impure water.

Better understanding on climate change

People normally don't believe that the change in climate which is an act of nature can be mitigated and thus shun the concept of climate change without embracing it. Changes in the temperature, rainfall patterns have overall effects on the crop production and the livelihood of people.

Reduction in frequency of landslide

Before, there were several cases of a landslide causing huge loss in aspect to both physical and financial. Climate change played as one of the causal agents for landslide, torrential rain, drying of water sources and soil. There weren't infrastructures to control soil movement and streams & other water sources were left unattended. Other reasons for landslide such as deforestation, uncontrolled grazing, fire, were present as well which aided the effects of climate change as well.

c) Key Differences in P & V HHs

Busy on working in their limited own 'Baari' or in other 'Baari' replacing traditional crops with cash crops

People were used to being busy working in their own land known as 'baari' for farming. They are now aware of climate change and have started cultivating cash crops replacing the traditional practice of raising food crops only. The main vegetables they used to cultivate were cauliflower, cabbage, spinach, chilies, etc. which were source of livelihood in the economy of CFUGs and P&V's household. In the present context, they have been practicing growing of Elaichi (*Elettaria cardamomum*), Amliso (*Thysanolaena maxima*) and some other cash crops.

As an important cultivation activity, vegetables farming was encouraged due to availability of market and road facilities particularly in Mauja village. In Ghermu village,

poor and vulnerable HHs are encouraged for livestock farming as other HHs are mostly engaged in business, shops.

Change in cropping pattern from Cereal crops to intensive vegetable farming in High mountain and Mid mountain region was found to significantly improve household's income and means of adaptation practices on climate change as well as improve the food security. The economy is agriculturally driven with 80% of the population engaged in subsistence farming or dependent on agriculture for their livelihoods (Ransom *et al.*, 2003). The majority of Nepal's agricultural landscape consists of *bari* land (rain-fed step terraces in the Mid-Hills) where agricultural productivity is fundamental for ensuring food security. Some strategies reported by respondents, such as planting drought- and flood-resistant varieties and raising vegetables in plastic tunnels (Tiwari *et al.*, 2014), can be linked to climate.

Engaged in Meat and Milk based animal rearing

Rearing animals has also become more common as it's not that they did not used to rear before but now the numbers of livestock per household have increased. They specially rear the meat – based and milk – based animals so, that they can sell the milk and meat. They also use the wasted vegetables leaf in feeding their livestock. Now, they don't have to depend on other people for livelihood. In Mauja, people rear cows, buffaloes mainly whereas in Ghermu, goats and hens are common. Before LAPA implementation, people were only rearing animals for their household purpose which has now been transformed gradually into commercial. LAPA, along with different NGOs, modernization of people's thought has made people get into commercial rearing of animals and develop a market for meat, egg, milk, etc.

Conclusion

Socio-economic data shows that the number of female populations exceeds the number of male populations in both villages. The study reveals that there was an effective communication process. The information reached to the targeted stakeholders with a time variation of one to three weeks with most responses within the first week.

The representation of poor and vulnerable households in the formulation of LAPA is quite appreciative, as most of the households were informed about the formulation of LAPA at local level. It is learned that P&V households are capable and confident enough to put the voice on the floor despite all those differences in caste and class as they were actively participating during implementation. For the level of participation for P & V HHs in LAPA formulation process, respondents of Ghermu were found to be more consultative and action and interaction oriented than the respondents of Mauja. However, the respondents of Mauja dominated Ghermu in activeness and involvement in specific activity.



There lie some gaps in the ratio of P&V in CFUGs and their representation in orientation as only around half of them were involved in these. P & V HHs were busy and some of them showed disinterest towards LAPA.

Between both villages, planned and real participation in both district and village level was similar as there were either same or greater number of real participants than planned ones. P & V HHs were interested with greater representation in Mauja village.

For the Financial contribution, it is clearly stated in CFUG's Constitution to support bottom up planned activities, and activities that support P&V Households. For planning and implementation of LAPA, any fund was not asked or demanded from P&V households. More funds were available to the Ghermu Village by Donor organizations while government agencies were the greatest contributed for Mauja. Physical contribution was done by the CFUGs, P&V households; and there was not any physical aid from stakeholders' side. Contribution of P & V HHs in both villages was relatively equal.

Three key areas of problems were identified before the LAPA implementation: Water and its sources, Landslide, Health, Farming and Forest fire; and Unaware of Climate Change. It is learned from the field that local people have various ways and means to cope with severity. The study concluded that after the implementation of LAPA, spring conservation activities were accelerated and enabled the water resources; local people especially P&V households started applying adaptive measures with their local innovations and external knowledge. Wilcoxon test was applied to check the effectiveness of LAPA implementation and its effect on the people's perception towards environmental changes. As per the Wilcoxon test, the implemented adaptation plan was effective as people were responsive positive changes such as decrease in landslide, increase in climate change awareness, increase in agricultural productivity and such.

Due to access to water and awareness, their Baari Land are cultivated and covered with cash crops. Due to fund access and their interest, they are at the beginning stage of entrepreneurship by selling Broomsticks made from Amliso and selling Elaichi fruits. They are engaged on meat based and milk-based animal rearing. While the effectiveness of LAPA can be readily seen within both the villages, as LAPA was implemented in Ghermu village five years ago, there was a much significant changes and people's attitude was positive towards implementation of LAPA. Poor and Vulnerable HHs in Mauja village requires more consideration compared to Ghermu for uplifting their livelihood.

Recommendation

1. By theory, the approach of LAPA is 'vulnerability first'. To make it work in the field, presence of P & V in the front paralleled with other stakeholders is required for the entire planning, monitoring, and evaluation process. There should be an enabling environment so that those poor and vulnerable households take a stake and take ownership.
2. More time and more resources should be allocated to engage concerned stakeholders at the district level and local level. It is a more rigorous planning process seeking extra time and extra resources. On the other hand, Adaptation planning means not only about forestry or not only about agriculture, it is beyond that which should encompass every infrastructure, social and cultural aspect. Thus, a multi-sectoral approach should be applied to hit this issue.
3. It is important to develop and implement a clear responsibility and accountability for district level line agencies. For this sake, the district level government should allocate relevant responsibilities to line offices to like district forest offices, district agriculture development office, district livestock support office; and irrigation and drinking water division.

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References

- Adger WN, Dessai S, Goulden M, Hulme M, Lorenzoni I, Nelson DR, Naess LO, Wolf J and Wreford A (2009) Are there Social Limits to Adaptation to Climate Change? *Climatic Change*, **93**(3): 335-354.
- Agrawal A (2010) Local institutions and adaptation to climate change. *Social dimensions of climate change: equity and vulnerability in a warming world*. World Bank, Washington, pp. 173-198
- Baral S, Gauli K, Paudel A and Karna YK (2010) Vulnerability of indigenous mountainous communities to climate change



- and their coping strategies. In Forest people interaction (Proceedings of a National Conference, 230 pp. Pokhara, Nepal, June 7 and 8, 2010), Institute of Forestry, Pokhara, Nepal.
- CBS (Central Bureau of Statistics) (2014) National Population and Housing Census 2011 (Village Development Committee/Municipality), Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, Kathmandu, Nepal.
- Chaudhury AS, Sova CA, Rasheed T, Thornton TF, Baral P, Zeb A (2014) Deconstructing Local Adaptation Plans for Action (LAPAs) - Analysis of Nepal and Pakistan LAPA initiatives. Working Paper No. 67. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen
- Crane TA, Roncoli C, Paz J, Breuer N, Broad K, Ingram KT and Hoogenboom G (2010). Forecast skill and farmers' skills: Seasonal climate forecasts and agricultural risk management in the Southeastern United States. *Weather, Climate, and Society* 2: 44–59.
- Gawith D, Hill D and Kingston D (2017) Determinants of vulnerability to the hydrological effects of climate change in rural communities: evidence from Nepal. *Climate and Development* 9(1): 50–65.
- GoN (2011) Strategic Programme on Climate Resilience. Kathmandu: Government of Nepal
- ICIMOD (2013) Case studies on flash food risk management in the Himalayas. In support of specific flash flood policies. Kathmandu: ICIMOD.
- Khanal U, Wilson C, Lee B. and Hoang V-N (2018) *Climatic Change*, 147: 507. <https://doi.org/10.1007/s10584-018-2168-4>
- Maplecroft (2010) Climate risk index, BRICs and N11 countries top Maplecroft's natural disaster risk ranking- France, Italy, USA at "high risk" Maplecroft, UK. Available July 2011.
- Poudel S and Shaw R (2016) The relationships between climate variability and crop yield in a Mountainous environment: A case study in Lamjung District, Nepal.
- Rai JK, Gurung G and Pathak A (2015) Climate Change Adaptation in MSFP Working Districts: Lessons from LAPA and CAPA Preparation and Implementation in the Koshi Hill Region. Forest Action Nepal and RRN, Kathmandu.
- Ransom JK, Paudyal K and Adhikari K (2003) Adoption of improved maize varieties in the hills of Nepal. *Agricultural Economics*, 29: 299–305.
- Silwal P (2016) Local Adaptation Plans of Action (LAPAs): An analysis of approaches to planning for climate change in Nepal
- Tiwari KR, Rayamajhi S, Pokharel RK and Balla MK (2014) Does Nepal's Climate Change Adaptation Policy and Practices Address Poor and Vulnerable Communities. *Journal of Law, Policy and Globalization*, 23: 28-38
- Tiwari KR, Rayamajhi S, Pokharel RK and Balla MK (2015) Determinants of the Climate Change Adaptation in Rural Farming in Nepal Himalaya. *International Journal of Multidisciplinary and Current Research*.
- Weiss N and Hasset M (1982) *Introductory Statistics*. Addison-Wesley Publ. Co. Amsterdam 1982. VIII, 651 pp.