



Scaling-Up Climate Smart Agriculture in Nepal

VILLAGE BASELINE REPORT

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Content

Abbreviations.....	i
Glossaries.....	ii
Executive Summary.....	iii
I. Introduction	1
1.1. Context of CSA Project	1
1.2. Baseline in Context of CSA Project	2
1.3. About the VDC/Community Level Baseline Study.....	3
II. Methodology	5
2.1. Literature Review and Secondary Information/Data Collection	5
2.2. Primary Data Collection	5
2.3. Weather/Climate Data	8
2.4. Data Aggregation, Refining, and Analysis	8
2.5. GESI Perspective in the Baseline Study.....	9
2.6. Limitations of the Study.....	10
III. Findings.....	11
3.1. Climate Smart Agriculture: Definition and Concept	11
3.2. CSA in context of Nepal.....	12
3.3. Socioeconomic and Demographic Characteristics.....	16
3.4. Vulnerability Analysis.....	30
3.5. Community Institutions	52
3.6. Community Resource Map	58
3.7. GESI Issues and Opportunities.....	58
3.8. Policy and Institutional Baseline	59
3.9. Baseline Indicators and Values as per Objective Form	63
IV. Conclusion and Recommendations	66
V. Notes	71
VI. References	72
VII. Annexes.....	75

List of Tables

Table 1: Site Characteristics.....	16
Table 2: Farming System and Cropping Pattern	17
Table 3: Household Population, Household Size, and Sex Ratio	18
Table 4: Population by Caste/Ethnicity	19
Table 5: Absentee Population and Household	20
Table 6: Population Aged 5 Years and Above by Educational Attainment (Level Passed) and Sex	21
Table 7: Poverty Level of Selected VDCs.....	23
Table 8: Food Insufficiency of Selected VDCs.....	23
Table 9: Land Holding Characteristics.....	25
Table 10: Households by Main Source of Drinking Water	26
Table 11: Households by Usual Type of Fuel Used for Cooking	26
Table 12: Households by Usual Source of Lighting	27
Table 13: Households by Types of Household Facilities	28
Table 14: Awareness and Perception of Changes in Climatic Parameters and Its Effect on Selected Sites	29
Table 15: Pairwise Ranking of Hazards (Agyouli, Nawalparasi)	32
Table 16: Pairwise Ranking of Hazards (Majhthana, Kaski)	33
Table 17: Pairwise Ranking of Hazards (Ghanpokhara, Lamjung)	34
Table 18: Hazard Calendar (Agyouli, Nawalparasi)	36
Table 19: Hazard Calendar (Majhthana, Kaski).....	37
Table 20: Hazard Calendar (Ghanpokhara, Lamjung)	38
Table 21: Crop Calendar (Agyouli, Nawalparasi).....	41
Table 22: Crop Calendar (Majhthana, Kaski)	42
Table 23: Crop Calendar (Ghanpokhara, Lamjung).....	43
Table 24: Vulnerability Matrix (Agyouli, Nawalparasi)	45
Table 25: Vulnerability Matrix (Majhthana, Kaski).....	46
Table 26: Vulnerability Matrix (Ghanpokhara, Lamjung)	47
Table 27: Adaptation Matrix (Agyouli, Nawalparasi).....	49
Table 28: Adaptation Matrix (Majhthana, Kaski)	50
Table 29: Adaptation Matrix (Ghanpokhara, Lamjung).....	51
Table 30: Vulnerability of Different Groups of Households	52
Table 31: Institutional Base of Agyouli	55
Table 32: Institutional Base of Majhthana.....	56
Table 33: Institutional Base of Ghanpokhara.....	57

List of Figures

Figure 1: Map showing geographical sites of project implementation.....	2
Figure 2: Baseline Framework.....	3
Figure 3: Climate-Smart Agriculture	13
Figure 4: Conceptualizing CSA from Application Point of View	14
Figure 5: CSA from the Point of View of Unit of Application.....	15
Figure 6: Population Profile of Agyouli VDC.....	18
Figure 7: Population Profile of Majhthana VDC.....	18
Figure 8: Population Profile of Ghanpokhara VDC.....	19

Abbreviations

ACAP	Annapurna Conservation Area Project
asl	Above Sea Level
BS	Bikram Sambat
BTRT	Begnas Tal Rupa Tal Watershed Management Project
CAV	Climate Adaptive Village
CBM	Community-based Biodiversity Management
CBS	Central Bureau of Statistics (NPC/GoN)
CCAFS	Climate Change, Agriculture, and Food Security
CDKN	Climate and Development Knowledge Network
CGIAR	Consultative Group for International Agriculture Research
CSA	Climate Smart Agriculture
DADO	District Agriculture Development Office
DDC	District Development Committee (Office)
DHM	Department of Hydrology and Meteorology
DLSO	District Livestock Service Office
DSCO	District Soil Conservation Office
FY	Fiscal Year
GESI	Gender Equity and Social Inclusion
GID	Group Interactive Discussion
GoN	Government of Nepal
HH	Household(s)
km	Kilometer(s)
LCP	Local Crop Project
LI-BIRD	Local Initiatives for Biodiversity, Research, and Development
LLCCIP	Livestock, Livelihoods, and Climate Change Interaction Project
LR	Literacy Rate
m	Meter(s)
M&E	Monitoring and Evaluation
Max.	Maximum
Min.	Minimum
mm	Millimeter(s)
MoFALD	Ministry of Federal Affairs and Local Development
MVDC	Majhthana VDC Office
NPC	National Planning Commission (GoN)
NPR	Nepalese Rupees
NS	Not Stated
RCDC	Rural Community Development Center
VDC	Village Development Committee
WCC	Ward Coordination Committee

Glossaries

NPR: Refers to the currency of Nepal, the Nepalese Rupees. One US dollar is equivalent to around NPR 105 (as of mid-September 2015).

VDC: Refers to the administrative boundary of Nepal. The characteristics of the area is that it is predominantly rural area and dependent mostly on agriculture and natural resources.

Ward: Refers to the lowest administrative boundary of Nepal. A VDC comprise of 9 wards. However, municipality may comprise of any number of wards depending on its size (area).

Ropani: Unit of measurement of land, common in Nepal. One hectare is equal to around 20 ropani.

Terai: Refers to the plain areas of Nepal in the north/south region of the country that borders with India, extending from eastern region to western region.

BS: Short form of Bikram Sambat (Nepalese Year System), which is around 57 years ahead of AD-system (English Dates), that is, AD 2015 coincides approximately with BS 2072.

Executive Summary

This document is a situation analysis report (part of baseline report) for the project entitled “Scaling-up Climate Smart Agriculture in Nepal (CSA project)” that is being implemented by the Local Initiatives for Biodiversity, Research, and Development (LI-BIRD) and Climate Change, Agriculture, and Food Security (CCAFS) in three ecological zones viz. terai/plains, mid hills, and high hills for the period between Mar 2015 - Feb 2017 with the funding support from CDKN. The project aims to (a) identify, test, and screen CSA technologies and practices suitable for different geographic, agro-ecological, and socio-economic contexts of Nepal; (b) develop scaling up pathways and implementation plans of champion or highly promising CSA technologies and practices in the country; and (c) enhance public awareness and capacity of government and other key stakeholders to effectively implement and scale up CSA practices in the country in the long run.

As part of its deliverables, the project aims to complete its baseline in three phases: (i) situation analysis using secondary information and rapid surveys (this document); (ii) detailed data collection for the chosen CSA practices and households testing them using household surveys, interviews and direct field observations; and (iii) analysis of gap, challenges and opportunities of policies and institutions required to scale up CSA practices in Nepal using literature review and interactions with relevant stakeholders and policy makers.

In this phase the study adopted mainly two approaches: literature and document review, and primary information collection using rapid surveys. Literature such as project reports, government documents, LI-BIRD’s previous works, and other published reports were reviewed for site characteristics, socio-economy, demography, and other community level information. Focus Group Discussions were conducted, as complementary to secondary information, to understand local perceptions, vulnerability of climate change, local adaptation techniques, community institutions, and crop calendar. Weather data from nearby meteorological stations were also analyzed to understand the trend of climatic variability and triangulate the results with those obtained using other procedures. Finally, the findings were related with the project activities with respect to their relevance for planning, implementation, and evaluation of proposed work.

Three sites representing terai (Agyouli VDC from Nawalparasi district with 558m asl), mid-hills (Majhthana VDC of Kaski district ranging from 615-3062 m asl), and high-hills (Ghanpokhara VDC of Lamjung district ranging between 850-7900m asl, but farming is practiced below 3000m asl) have been selected for implementing the project. A total of 2,750, 833, and 648 households settle in Agyouli, Majhthana and Ghanpokhara, respectively, with a high female-male sex ratio (100:86, 100:72 and 100:88 in Agyouli, Majhthana, and Ghanpokhara, respectively). The Terai is dominated by Tharu communities, mid-hills by Brahmin and Chhetris, and high hills by Gurungs. Other ethnic groups living in the project sites include Bishwakarma, Tamang, Magar, Kami, Newar, Musahar, Thakuri, Sanyasi, Dholi Sarki, Gharti, Kathbaniya, Kumal, Lohar, Bote, Badi, Bhujel, Musalman, and Damai.

Average land holding is 9.24 ropani in Agyouli, 9.61 ropani in Majhthana and 12.11 ropani in Ghanpokhara, and sharing/renting-in/out of lands are common practices in all three sites. Hence, CSA practices to be tested need to address smallholder farmers’ challenges. The absentee landlordism restrains farmers from accessing government support and subsidies, as those renting-in land cannot present the land as collateral in the banks. They also have poor

say over what crop and technologies to choose, which limits the chance of adoption of new technologies.

Agriculture is the main source of livelihoods in all three sites, with its contribution equivalent to around 75%, 70%, and 60% of total income in Agyouli, Majhthana, and Ghanpokhara, respectively. In Ghanpokhara, remittance and pension together contribute to surprisingly high percentage (44.6%) of total household incomes. The variation in the project sites presents an opportunity to test local-specific technologies and develop pathways suitable for different ecological, socioeconomic, and cultural settings.

Farmers practice an integrated farming system in all three sites, with both crop and livestock playing pivotal role in the livelihoods. Farming is usually rainfed with no or low availability of year-round irrigation facilities and crops are cultivated usually in two domains: Khet (lowland) and Bari (upland). Terrace farming is also common in hilly regions. Major crops grown in three sites include rice, maize, wheat, millet, potato, and rapeseed (mustard). The major vegetables crops are cabbage, cauliflower, tomato, beans, radish, and pumpkin. Some farmers also cultivate fruits, spices and herbs, and some other cash crops.

Poverty head count in Majhthana was found to be 6%, whereas in Ghanpokhara and Agyouli it is 35% and 10% respectively. Food insecurity problem is relatively similar in all three sites: 33%, 31%, and 45% for Agyouli, Majhthana, and Ghanpokhara, respectively. Migration is common among all three sites, with Ghanpokhara ranking the highest (43% households with at least one migrant, of them 91% are male and 9% female), followed by Majhthana (40% households, 91% male and 9% female) and Agyouli (38% households, 89% male and 11% female). This clearly indicates that women are not only shouldering additional burden but becoming *de facto* household heads and decision makers, which means women-friendly farming practices, institutional mechanisms, and policies need to be put in place if CSA practices have to be scaled up.

Literacy rate is higher in Agyouli and Majhthana (70%) than Ghanpokhara (50%), and it is lower among women than men, which suggests that informal women-friendly or illiterate-friendly training materials and methods need to be adopted to disseminate information about CSA practices.

In Agyouli, 44% households depend on well for drinking water, which gives an opportunity for lifting water with the help of solar power and efficiently distributing it using micro-irrigation technologies for irrigating crops. In Majhthana 13% households own it, while in Ghanpokhara households owning it is extremely low (0.46%). In these two sites, households using taped water are more common (85% HHs in Majhthana and 92% in Ghanpokhara) than any other sources. The wastewater gray water from these sources can be collected in ponds or tanks and reused to irrigate vegetable crops mainly during dry period.

Nearly 93% households in Agyouli and Majhthana and 72% households in Ghanpokhara are electrified. Hence, there is high potential for introducing electric-based CSA practices such as Water-Lifting Pumps, Thresher. Mobile users in all three villages are also high at least in two sites (87% in Agyouli, 80% in Majhthana and 61% in Ghanpokhara), which means ICT-based technologies can be tested in those villages and scaling up pathways for them can be developed. For instance, text messages related to weather could be sent to farmers to help them plan their agricultural activities in advance, so that they don't have to lose yield due to adverse weather that they would otherwise experience when they failed to predict weather.

There are also a few computer and internet users, which suggests email can be another option to exchange information between farmers (problems) and technicians (solutions). Since the use of radio and television is widespread, messages related to CSA practices can be aired and relayed through various popular media programs.

Farmers in all three sites are experiencing changes in temperature, precipitation, and natural hazards such as thunderstorm, hailstone, drought, landslides, flooding, lightening, insects and disease pests, fire, windstorm, snowfall, and fog. Among them, the top hazards include flood and drought in Agyouli; hailstone, drought, and insect pest in Majhthana; and hailstone, drought, insect pest, and heavy downpour in Ghanpokhara. Hailstone and heavy rainfall usually during harvesting period are severely affecting crop yields and hence household incomes. CSA practices addressing these challenges can reduce hazard risk, improve local ability to adapt to changes, and improve crop yield.

Farmers have shifted crop calendars later for some of the crops such as rice, maize, rapeseed, lentil, and flaxseed in Agyouli; rice, miller, and potato in Majhthana; and rice and millet in Ghanpokhara. However, they have also shifted crop calendars earlier for some crops such as maize in Majhthana; and potato, soybean, and rapeseed in Ghanpokhara. Whereas none of the crops have shifted earlier in Agyouli. These changes in crop calendar could be because the winter season is shrinking thus allowing spring and summer season begin earlier and last longer. Crop maturity period of some of crops has also been shrunk likely due to increase in temperature. The main vulnerable sectors include agriculture (mainly staple crops), forest, livestock, water resources (drinking water and irrigation), and grazing lands. Whereas, daily wage labors and women's groups are among the hardest hit populations. This clearly underscores the importance of agriculture in general and CSA in specific.

In Agyouli, 18 local level institutions were reported, whereas in Majhthana and Ghanpokhara, 14 and 32 groups, respectively, were reported. These institutions have poor ability to generate resources locally for adopting new technologies and a low level of awareness to successfully adopt such technologies. In addition, there are some government and non-government organizations operating locally, yet their contribution is insufficient, scattered, and less focused on CSA tools, technologies and practices with potential for playing major role in livelihood. Hence, local level capacity building is a must before CSA practices are scaled up, which could be done by improved collaboration of locally operating institutions and consolidation of common approaches they practice.

Weather data showed mixed results with no clear linear trend in rainfall pattern. However, temperature is increasing each year in all sites except Agyouli where maximum temperature has been decreasing (by 0.02 degree Celsius). In Agyouli minimum temperature is increasing by 0.01 degree Celsius, whereas in Majhthana increase in temperature is 0.03 (maximum) and 0.05 (minimum) degree Celsius, which is 0.06 (maximum) and 0.08 (minimum) for Ghanpokhara. It shows that days are getting warmer.

I. Introduction

1.1. Context of CSA Project

The project "Scaling-up Climate Smart Agriculture (CSA) in Nepal (TAAS-0044)", CSA-project in short, is implemented by the Local Initiatives for Biodiversity, Research, and Development (LI-BIRD) with technical support from the Consultative Group for International Agriculture Research's (CGIAR) research program on Climate Change, Agriculture, and Food Security (CAAFS) and funding support from the Climate and Development Knowledge Network (CDKN). The project is being implemented in three sites representing Terai (Agyouli VDC from Nawalparasi district with 558m asl), mid-hills (Majhthana VDC of Kaski district ranging from 615-3062 m asl), and high-hills (Ghanpokhara VDC of Lamjung district ranging between 850-7900m asl, but farming is practiced below 3000m asl) for the period between March 2015 – February 2017 (Figure 1).

The objectives of the CSA project are as follows:

- Identify, test, and screen CSA technologies and practices suitable for different geographic, agro-ecological, and socio-economic contexts of Nepal by involving farmers, scientists, and government line agencies
- Develop scaling up pathways and implementation plans of champion or highly promising CSA technologies and practices in the country with active participation of local communities and government and other key stakeholders
- Enhance public awareness and capacity of government and other key stakeholders to effectively implement and scale up CSA practices in the country in the long run

Hence, with the close coordination and collaboration with the government level stakeholders operating at local to national level, the project will produce the following deliverables: A portfolio of champion CSA (technologies and practices) for the women and poor farming households of three agro-ecological zones (terai, mid hill, and high hill) of Nepal; Assessment report of institutional and policy status (opportunities and barriers) for scaling up of CSA technologies for women and poor farming households in Nepal; Climate analogue sites (recommendation domain) of the identified CSA portfolio; CSA scaling up pathways and implementation plan for Nepal; and Increased capacity of government stakeholders in designing sub national programs and plans for promoting CSA for women and poor farming households.

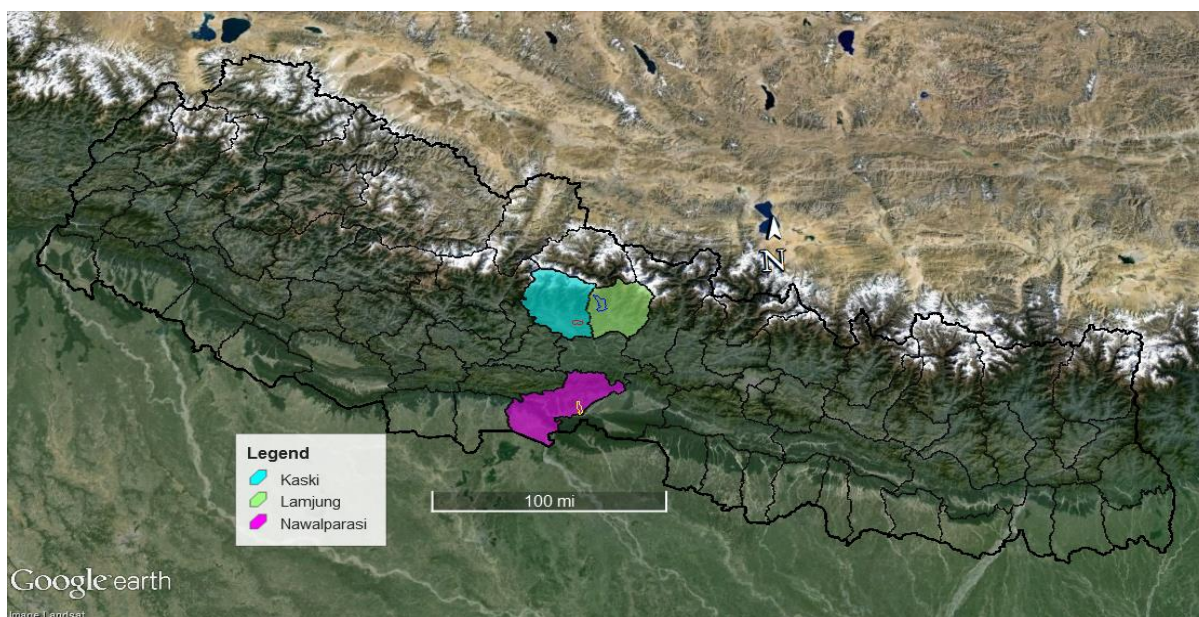


Figure 1: Map showing geographical sites of project implementation

1.2. Baseline in Context of CSA Project

Given the nature of the project, it is important to gather baseline information at different levels as well as in different aspects. At the community level, socioeconomic, demographic, cultural, climatic, and biophysical conditions, as well as stakeholders perceptions about CSA and climate change, and local institutional setting need to be understood. Such information will help us know how the results of the technologies tested in the regions can be extrapolated to different geographic, socio-economic and cultural settings and what mechanisms will be required in scaling up CSA practices in such settings.

Enhancing capacity of government officials to incorporate CSA practices into the local and national planning and policies is one of project goals. Therefore, it is imperative to understand current level of understanding and integration of CSA technologies and practices at the government level (policy makers, politicians, and bureaucrats). In addition, household and farm level information need to be collected and analyzed prior to testing CSA practices to assess the impacts of the technologies on the areas underlying the pillars of CSA. This benchmark information can be compared with the post-trial results to analyze benefits or losses of the technologies against the pillars of CSA. This study will depend on the technology trial being conducted and will be continuous throughout the project period.

Hence, the project will complete its baseline in three phases: (i) *VDC level baseline* - situation analysis using secondary information and rapid surveys (this document); (ii) *Technology and beneficiary baseline* - detailed data collection for the chosen CSA practices and households testing them using household surveys, interviews and direct field observations; and (iii) *Policy and institutional baseline* - analysis of gap, challenges and opportunities of policies and institutions required to scale up CSA practices in Nepal using literature review and interactions with relevant stakeholders and policy makers. Additional details about the baseline plan are depicted in Figure

(2). This document presents the findings of the first phase. Findings of other two phases will be prepared separately. For the second and third phases, relevant information are being compiled and thus respective reports will be finalized in the stated time.

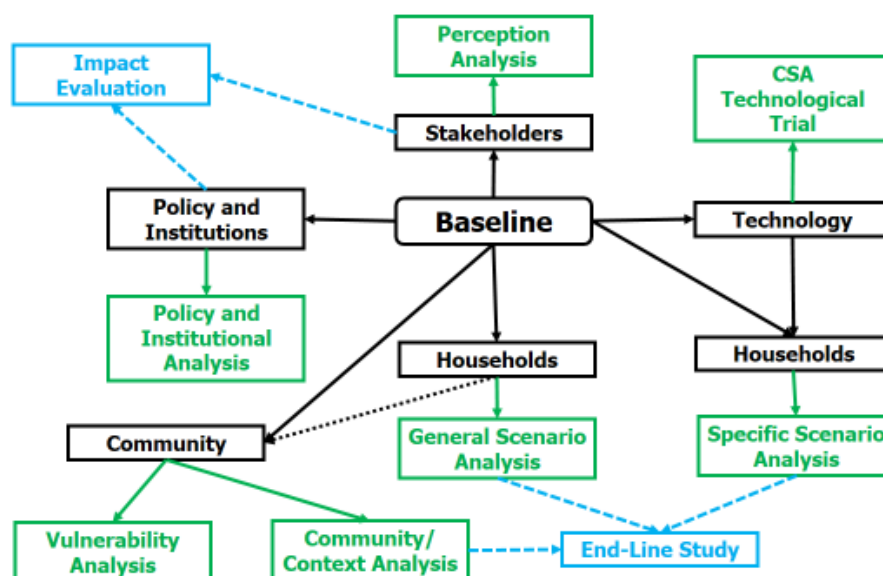


Figure 2: Baseline Framework

(Adapted from Bhatta, 2015)

(Note: Black boxes represents probable baseline studies; Green boxes represents specific analysis involved; Blue boxes represent proposed use of study, comparison purpose)

1.3. About the VDC/Community Level Baseline Study

In this phase, we have largely focused on village level or site specific data on socio-economics, demography, infrastructure, biophysical features, local knowledge, level of awareness on climate change, institutional setups, vulnerability, use of local CSA technologies and practices, barriers to scaling up CSA, and other relevant information. The results of vulnerability analysis done as per the recommendation of the national inception workshop are also presented here. In addition, climatic data for the project sites are analyzed and matched with local perceptions or experiences. The vulnerability analysis has helped understand the risk and hazard the communities are facing and link the results with CSA technologies and practices to be prioritized by the project. Besides, the impact of these hazards, current level of adaptation practices, coping strategies of the community, and the gaps in responding to hazards assessed here provide insights for appropriate targeting or right interventions for the project sites, assuring a high acceptability by the community.

The study is expected to provide the broader scenario at the community level. However, in some instances several important information on household could not be derived from this study due to lack of extensive primary data collection at household level, which is planned in the subsequent phases, especially after the selection of households for technology trial.

The major objective of this baseline is to compile site-specific data/information where piloting of CSA technologies and practices will be done. The specific objectives are as follows:

- To examine current socio-economic and demographic conditions and prepare a benchmark for household level characteristics based on generalized information and data;
- To understand the climatic variability using weather data for the past and assess the impacts of climate change on the livelihoods of community, current level of adaptation practices adopted by them, and alternative approaches feasible in the locality in order to screen appropriate technology for testing;
- To identify the need for data/information on variables/parameters of interest to the CSA project, which could be later collected through household surveys (household selected for technology trials);
- To provide synopsis of current status of policy and institutional mechanism with respect to CSA;
- To outline preliminary baseline values for output and outcome level indicators.

In the following sections, we describe methodologies employed in this phase, results obtained through various methods, and conclusion and recommendations drawn from the results.

II. Methodology

The VDC level baseline data/information collection was done through the adoption of following different approaches. First, the secondary literature was reviewed, specifically the VDC level statistics collected by the Central Bureau of Statistics was used. Second other documented/undocumented literatures from within the project/organization and/or from outside were referred. Third, some first-hand information were also collected through different means for primary data collection, especially using the modified vulnerability assessment exercise. Weather data from the nearest station to the selected sites were also used for climate change and associated analysis. These were discussed in the following sub-sections.

2.1. Literature Review and Secondary Information/Data Collection

Several secondary information for preparing the site profile were collected from published documents, websites, and other such secondary sources. The previous studies of the VDC conducted by different projects of LI-BIRD also provided some vital information. This, in turn, reduced the time and resources necessary for re-collecting the information. However, for Ghanpokhara (Lamjung), there was lack of previous vulnerability assessment and hence a fresh assessment was done as discussed in details in the following sections. On the other hand, the socioeconomic, demographic, and other site specific data were collected from the VDC level data of Central Bureau of Statistics.

2.2. Primary Data Collection

The modified vulnerability assessment approach and some of the tools for conducting this assessment were adopted for collecting baseline information from community/VDCs in the respective sites. However, in case of Agyouli (Nawalparasi) and Majhthana (Kaski), the vulnerability assessment had already been done to some extent by LI-BIRD and Majhthana VDC Office, respectively. Furthermore, DSCO (District Soil Conservation Office) also conducted a sort of vulnerability assessment exercise at the ward level in each of the wards at Majhthana VDC. Hence for these sites, for the purpose of this project, the validation exercise was conducted to validate the existing information as well as some new data that were missing (or evolved due to changed context) in these literatures were also collected from the respective sites.

The field visit was conducted at Nawalparasi on 13 September 2015. The detail list of participants in this event is provided in the Annex (1). Similarly, the event was organized in Kaski on 2 October 2015 and the detail list of participants in this event is provided in the Annex (2).

Due to lack of literature and documentation of any types of information/data in case of Ghanpokhara, the study relied on the detail assessment of this site. A two day event (from 5-6 October 2015) was organized in Besisahar, Lamjung - with participation of major stakeholders from the VDC to conduct the vulnerability assessment exercise. The detail list of participants in this event is provided in the Annex (3).

After the initial draft sharing, it was felt that vulnerability analysis needed to be done on a specific groups of people viz. women, Dalit, and Janajati only. And hence the exercise was repeated in all the three sites simultaneously from 5-7 November 2015. The focus of this exercise was, however, to assess the most important hazards from GESI focus group's point of view, its impact on them, and the adaptation or coping strategies adopted by them. The list of participants for these exercise are presented in the Annex (4) to (6). This opportunity was also utilized to collect some other missing information on socio-economic and household demographics that was discussed and agreed to be important for the baseline study. This is expected to provide useful information regarding these sub-group of population, which may be different than the whole population. The results obtained from this exercise are presented from the GESI perspective in each sub-sections and the overall findings are also presented in the section dedicated to GESI issues and opportunities in the findings.

The participant for these activities were selected randomly. In most of the cases, existing community based organizations like groups, associations and cooperatives were being used. They were invited by sending a formal letter (or through telephone) and requesting nomination of at least one representative from their institution. Precaution was also taken to ensure maximum representation from women members and socially marginalized and disadvantaged groups so as to include their voice in the process. Since, the outcome of the process is highly relevant for technology selection and testing, it becomes imperative to ensure participation and representation from different groups of people from the community.

2.2.1 Primary Data Collection Tools

The baseline data collection tools refer mainly to the vulnerability assessment tools. Some of the important tools for assessing the vulnerability context of the selected sites were used for primary data collection. However, a few other tools/approaches were also used. The following tools were specifically used (Thapa et al., 2011):

1. **Historical (Hazard) Timeline:** The historical events (hazards) from past few decades documented based on recall method of the participants
2. **Hazard Prioritization:** The major hazards along with the level of its impact as prioritized by the participants
3. **Hazard Seasonal Calendar:** The occurrence of major hazards in a typical year
4. **Vulnerability Matrix:** The effect of hazard on major livelihoods sector and the extent/level of its impact
5. **Crop Calendar:** The cropping pattern and major crops grown in a typical year.
6. **Adaptation Matrix:** The adaptation measures being employed by the community at present with its effectiveness, sustainability, and alternatives available.
7. **Institutional Assessment:** The community based organizations (like groups, cooperatives and associations), their membership, working area, objectives, etc.

2.2.2. Primary Data Collection from FGDs/KIIs

Primary data collection from Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) were done for specific variables and/or for GESI specific groups, that is, Women, Dalit, and Janajati. In some cases, generalized data for the whole VDC has been collected while mostly these exercise (FGDs particularly) were used for GESI specific data collection. The methodology applied and the variables considered are discussed in detail below:

- i. **Poverty:** The information regarding poverty level of VDCs were available, however, poverty of GESI specific groups were analyzed from group exercise (FGDs). Each of the members from these groups were provided with 10 pieces of stones, maize grains, etc. They were then requested to analyze what percentage of population from their specific groups could be considered poor or non-poor. They were provided with sack representing the “poverty pit” where the respective number of stones representing poor population from their groups were to be put. Rest of the stones were collected in another sack. One stone is assumed to be representing 10% of the population. In case of women’s groups, they were requested to consider women headed households. The exercise is expected to provide proxy values for variables under consideration.
- ii. **Income:** Income data was also collected from group exercise. First, the groups were requested to enlist major source of livelihoods (around 5-8 or more). Then they were requested to prioritize major sources (around 3-4) and their respective shares on household (percent contribution to household income/livelihoods). Both verbal discussion and use of stones (10 stones representing 10% each) were done in this process. Again they were requested to enlist and prioritize major agriculture and livestock enterprises (up to 5) and estimate income from these. First, households with minimum and maximum income from these enterprises were recognized and their respective values (income levels) were identified, thereafter, average income (income of most of the households) was identified, which gave the average level of income from the said enterprise. This exercise was done for all agricultural and livestock enterprises recognized in the previous step.
- iii. **Daily Activity Clock:** Daily activity clocks were prepared by males and females separately. Male members as well as female members enlisted their daily activities with timeline starting from wake-up time to sleep time and the activities done during these two periods of time.
- iv. **Land Holding and Farming:** Average land holding size and categorization were available for the whole VDC level population from secondary source and hence this exercise was conducted only for GESI specific groups. Land is categorized into Khet, Bari, and Pakho. For each category, the households with minimum and maximum land holding size were identified along with their respective land holding size. Thereafter, the mode value (land holding size of most of the households) was also identified, which was then used to derive the average land holding size for the group. Similarly, the major crops and livestock for each region were enlisted and its presence/absence in these groups were also analyzed. This is expected to be proxy for land holding size and farming characteristics of these groups of population.

- v. **Awareness and Perception:** Awareness on climate change, CSA, and some other information were collected through group exercise. Tentative percentage of population having knowledge of the said concept were also recorded.
- vi. **Existing Technologies and Practices and Feasibility of Selected Ones:** FGDs were also conducted in different groups to understand the existing technology adoption pattern. Major technologies and practices currently being practiced were identified. The CSA project has a pool of potential CSA technologies and practices, according to three agro-ecological zones. These have been further refined through evaluation of 4 pillars and 11 criteria (plus two criteria of poor's condition and poor's position). The experts has ranked them according to criteria of suitability (marking from 3.4 to 17). The CSA technologies and practices having markings below 6 are considered low promising, from 6 to 9 are considered medium promising, 9 to 12 are considered high promising, and above 12 are considered potentially very high promising. For this exercise, high and very high promising CSA technologies and practices were enlisted and groups were probed for their knowledge of these technologies and practices as well as interest for testing/adopting them.
- vii. **Cropping Pattern:** Information of cropping pattern has been collected from a few person (KII approach) from within different groups selected for FGDs with validation from others.
- viii. **Institutions:** Major organizations and institutions working in the area were enlisted with available details on project, budget, beneficiary households, etc.

2.3. Weather/Climate Data

The weather data received from nearest station (to these VDCs) were also analyzed. The data received from Department of Hydrology and Meteorology (DHM), Government of Nepal was used for this purpose. The DHM office has multiple year daily records of temperature and rainfall, which is converted to required aggregate data and used for the analysis. There is a lack of data in some stances due to two reasons: (i) only traces has been obtained (rainfall) and (ii) data not recorded (both temperature and rainfall). In case of traces, these are treated as "0" (no rainfall) in case of this study. However, for the unavailable data (data not recorded), the data from the same day in the two years preceding and following are averaged and used. However, for using average data derived by taking means for multiple years, the unavailable data are simply discarded and data from only remaining years are averaged.

2.4. Data Aggregation, Refining, and Analysis

The data from primary exercise were directly collected in the required format (as per the tables in this report). The empty tables were prepared and the assessment process directly input the gathered data in these tables. These were presented with some basic calculations for means, etc. These were complemented and analyzed along with the weather data later on. Some secondary data were also used in this research. For instance the Climate Adaptive Village project of LI-BIRD conducted VDC level vulnerability assessment exercise, which is used as a secondary source of information for this study. However, as stated earlier, a validation exercise was being done in the respective VDC with the community members. Some additional information was

generated in this process and some data were refined. These were aggregated and used in inference (discussion). However, to the extent possible the tables and figures produced by the previous study were used as such.

2.5. GESI Perspective in the Baseline Study

Vulnerability affects women, children, and elderly people the most. Migration has drastically affected the household composition and nowadays women are the only adults found in the households, especially in the rural areas. Agriculture has also become the women-phenomenon with most of the workload on women's shoulder. Since, agriculture is the most vulnerable sector affected by the climate change, women's vulnerability has also increased by virtue of their direct relation with day-to-day farming activities. During this study, too, participants informed that due to climate change there are prolonged drought period, which have resulted in increased weeds and since weeding is primarily the job of women their workload has increased. Several other such examples came up during the study period. The effect of natural hazards and hazards have, therefore, highest impact on women. Besides, the sensitivity and coping ability (adaptation capacity) of the resource poor, landless, smallholder farmers, and marginalized and disadvantaged groups of people may also be different than others and hence the above statement equally applies to such socially marginalized groups of people. Thus it is evident that the impact of these hazards are also different for different genders and groups of people due to different levels of susceptibility and vulnerability. Hence, it is of utmost importance that GESI (Gender Equity and Social Inclusion) perspective should be considered wherever and whenever applicable. Looking at the possible differential impact of vulnerability on different groups of people, it is imperative that a different vulnerability exercise be conducted on sub-groups of population in the selected sites for understanding different aspects from GESI perspective in depth. It is suggested that following sub-groups be considered: Women; Dalits; Janajatis; Smallholder Farmers; and Poor Households.

In line with the above recommendation, primary data collection for this baseline study considered two issues: first, while conducting baseline study for the whole community population, it is ensured that at least half and preferably more than half of the participants should be women and from the disadvantaged groups of people (socially marginalized, Dalits, indigenous communities, etc.). The list of participants (Annex 1 to 3) also showed that to some extent the aim for inclusive participation has been achieved. Second, after the initial data collection, it was felt that GESI responsive sub-groups of population should be dealt specifically and hence following sub-groups of population were studied separately: women only, Dalits only, Janajatis only. However, due to lack of well-being ranking from landholding as well as income perspective, it became impossible to collect data based on size of farmers (smallholder farmers) as well as poverty (poor households).

Moreover, while collecting information from the mix groups also, due precaution was taken to collect the voices from these groups of people (Women, Dalits, and Janajati). They were encouraged wherever possible to put forth their perspective. A good example could be that of drought: in some cases male members were of the view that flood is problematic to the community compared to drought but the female members

strongly opposed and said that they have to travel a lot for fetching water if there is drought and hence from the household perspective drought should be taken seriously compared to flood. Furthermore, the impact of certain hazards were explored for specifically the women's group, which could be considered while promoting CSA technologies and practices so that these impact could be minimized. In several instances, such gender affirmative activities has been promoted throughout this study, especially during primary data collection.

On the other hand, while collecting secondary information, it was given top priority to disaggregate data based on gender and caste. However, in most cases such data was not available except for the gender-disaggregated ones and hence only the latter could be presented in this report. Especially, household characteristics (demographics) had such gender-disaggregated data. The findings from GESI analysis has been presented in the respective sections, where applicable, as well as in the specific section dedicated to it.

2.6. Limitations of the Study

As per the project document, the VDC/community level baseline report has been prepared based on rapid surveys with the help of FGDs and KIIs and hence there are very little quantitative information collected from primary sources. The country situation has been difficult due to the disastrous earthquake, which was followed by worsened political situation. This situation has created difficulty in conducting surveys and activities in the sites due to inconveniences and obstacles faced while travelling.

III. Findings

3.1. Climate Smart Agriculture: Definition and Concept

FAO estimates that feeding the world population will require a 60% increase in total agricultural production. With many of the resources needed for sustainable food security already stretched, the food security challenges are huge. At the same time climate change is already negatively impacting agricultural production globally and locally. Climate risks to cropping, livestock, and fisheries are expected to increase in coming decades, particularly in low-income countries where adaptive capacity is weaker. Impacts on agriculture threaten both food security and agriculture's pivotal role in rural livelihoods and broad-based development (CCAFS/FAO, 2015). The world's climate is changing fast, and will continue to do so for the foreseeable future, no matter what measures are now taken. For agriculture, change will also be significant, as temperatures rise, rainfall patterns change, and pests and diseases find new ranges, posing new risks to food and farming. Until recently, agriculture has tended to be on the sidelines of discussions concerning human-induced climate change, and has generally been seen as the victim. There is now, however, a growing recognition of agriculture's contribution to climate change, past and present, and of the means by which farming systems can adapt to cope with the changes, as well as the potential of agriculture to mitigate the climate impact. This recognition has led to the concept of climate-smart agriculture (Neate, 2013). CSA is an approach to help guide actions to transform and reorient agricultural systems to support development and food security under a changing climate. Agriculture is taken to cover crop and livestock production, and fisheries and forest management (SAIP, 2015). CSA is an integrated approach that has the potential to reduce vulnerability from exposure to stresses associated with environmental change, promote economic viability and, at the same time, maintain the integrity of ecosystems (Dochas, 2015).

The term "Climate-Smart Agriculture" is coined by the Food and Agriculture Organization (FAO) of the United Nations (UN) at the Hague Conference on Agriculture, Food Security, and Climate Change in 2010. It integrates the three dimensions of sustainable development (economic, social, and environmental) by jointly addressing food security and climate challenges. It is composed of three main pillars: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; reducing and/or removing greenhouse gases emissions, where possible (FAO, 2013).

CSA entails equipping farmers to better use and manage their natural resources and adopt more efficient methods of producing, processing and marketing agricultural goods (Dochas, 2015). The CSA also helps ensure that climate change adaptation and mitigation are directly incorporated into agricultural development planning and investment strategies. The perspective on CSA is sustainable agriculture, based upon integrated management of water, land, and ecosystems at landscape scale. CSA has the potential to increase productivity and resilience while reducing the vulnerability of hundreds of millions of smallholder farmers. CSA can benefit smallholder farmers

directly by increasing efficiency of precious inputs such as labor, seeds, and fertilizers, increasing food security, and creating opportunities for income generation. By protecting ecosystems and landscapes, CSA helps protect natural resources for future generations (Sullivan et al., 2012). Thus, CSA invites to consider these three objectives together at different scales - from farm to landscape - at different levels - from local to global - and over short and long time horizons, taking into account national and local specificities and priorities (CCAFS/FAO, 2015). CSA is an approach to developing the technical, policy, and investment conditions to achieve sustainable agricultural development for food security under climate change. The magnitude, immediacy, and broad scope of the effects of climate change on agricultural systems create a compelling need to ensure comprehensive integration of these effects into national agricultural planning, investments, and programs. The CSA approach is designed to identify and operationalize sustainable agricultural development within the explicit parameters of climate change (FAO, 2013).

What is new about CSA is an explicit consideration of climatic risks that are happening more rapidly and with greater intensity than in the past. New climate risks, require changes in agricultural technologies and approaches to improve the lives of those still locked in food insecurity and poverty, and to prevent the loss of gains already achieved. CSA approaches entail greater investment: managing climate risks; understanding and planning for adaptive transitions that may be needed, for example into new farming systems or livelihoods; and exploiting opportunities for reducing or removing greenhouse gas emissions where feasible (CCAFS/FAO, 2015). Thus, agriculture is considered to be climate-smart when it contributes to increasing food security, adaptation, and mitigation in a sustainable way. This new concept now dominates current discussions in agricultural development because of its capacity to unite the agendas of the agriculture, development and climate change communities under one brand. However, the concept needs to be evaluated critically because the relationship between the three dimensions is poorly understood, such that practically any improved agricultural practice can be considered climate-smart. This lack of clarity may have contributed to the broad appeal of the concept (Neufeldt, 2013). SAIP (2015) also stated that for CSA no such meaningful criteria has been defined for what it is and what it is not. Therefore in theory, practices that are unsustainable when looking at them through social, economic or even other (than climate) environmental lenses, could potentially be covered by the term. Therefore, in order to prevent any further confusion and possible reputation risks to the agricultural sector CSA's scope should be defined, that is, clarify practices that are effectively covered, and those that are not covered; and how CSA supports the overall sustainable agriculture picture.

This report will endeavor to provide basic conceptualization of CSA, especially in context of Nepal. With further progress in the project, it is expected that the idea will be broaden to cover other aspects too.

3.2. CSA in context of Nepal

Climate Smart Agriculture has been defined differently in case of different countries and region. There are several pillars and criteria for screening any system of agriculture as a climate smart one. Although, the project document have not dealt in

details on what could be the practical meaning of the CSA technologies and practices in the context of Nepal, the CSA project has been striving to define and contextualize it in case of Nepal. With several round of brainstorming sessions, the following three pillars, also accepted internationally to be the determining factors, are found to be decisive in defining any technologies and practices as CSA technologies and practices: food security and productivity, adaptation, and mitigation. In addition to these three pillars gender and social inclusion is also considered to be important and included as a vital component of CSA in the context of Nepal, as a cross-cutting theme (Figure 3). Again, each of these pillars have one or more well defined criteria for determining the value of CSA technologies and practices. For any technologies and practices to be food secure and enhancing productivity it must enhance benefit-cost (BC) ratio of food production system, increase productivity of the farms, and enhance food and nutrition security of the participating households. In case of adaptation and mitigation the technologies and practices should be knowledge-smart, weather-smart, nitrogen-smart, and water-smart (adaptation point of view) and carbon-smart and energy-smart (mitigation point of view). As a cross-cutting theme the technologies and practices should also contribute in enhancing the material condition as well as position of the women and socially excluded population.

Thus, in the context of Nepal, the Climate Smart Agriculture has been defined as “a system of agriculture that is adaptive to climate change, mitigates it effect, and improves food security and productivity along with improvement in the condition and position of women and socially excluded groups of people”. This is the ideal condition where CSA fulfills all the 13 criteria categorized into major four pillars.

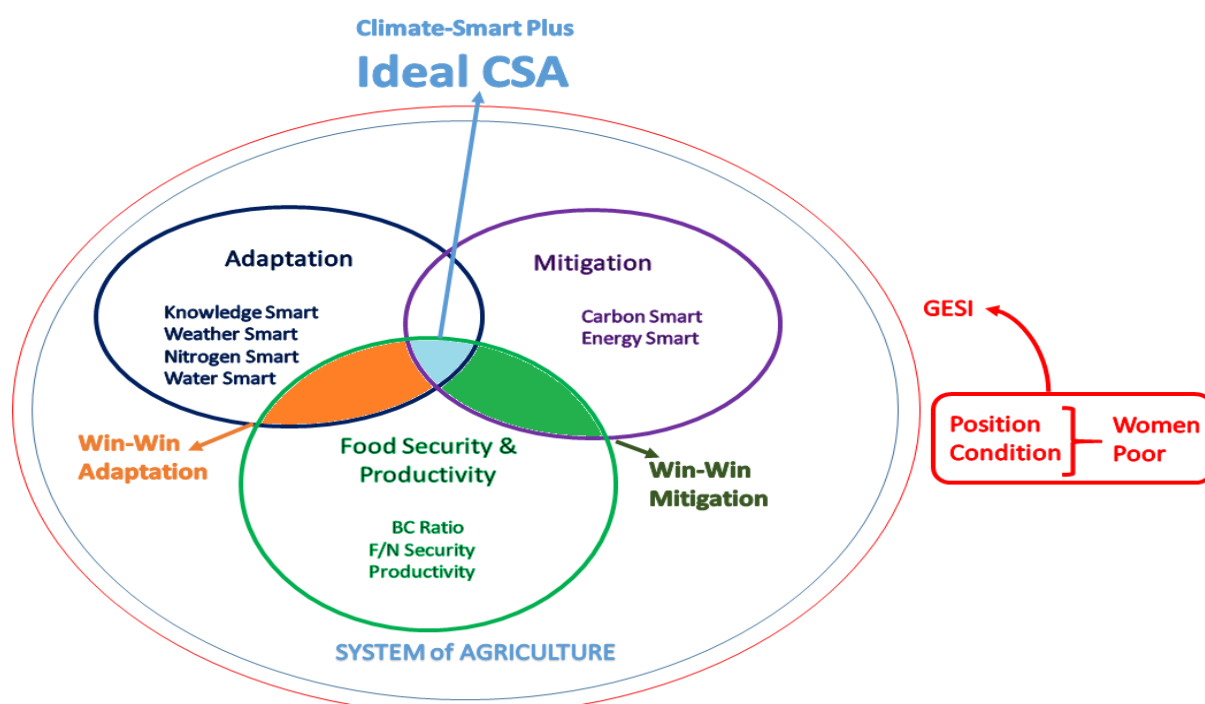


Figure 3: Climate-Smart Agriculture
(Adapted with Slight Modification from: Branca et al., 2011)

As could be obvious CSA technologies and practices fulfilling all the criteria stated above could be rare and hence it need to be defined from application point of view, the diagrammatic representation for which has been provided below (Figure 4). It shows that the ideal CSA technologies and practices are rare in the real world situation so much so that not a single such technologies and practices could be found that contributes positively to each and every criteria (pillars) for becoming CSA technologies and practices. So, technically, if any one of the criteria is positively affected and none others are negatively affected (or negligible negative effect found) then such technologies and practices could be technically termed as CSA technologies and practices. However, even the technically available CSA technologies and practices may not be acceptable for the farmers and in such case it could not be feasible practically. Since, one of the aim of this project is to suggest approaches for scaling-up of selected champion CSA technologies and practices, farmers' acceptability is a must so that more and more farmers are willing to take-up these technologies and practices. So, finally with the acceptance of farmers the selected technologies and practices could be practically the CSA technologies and practices. The aim of this project should be to screen and test such practically applicable CSA technologies and practices.

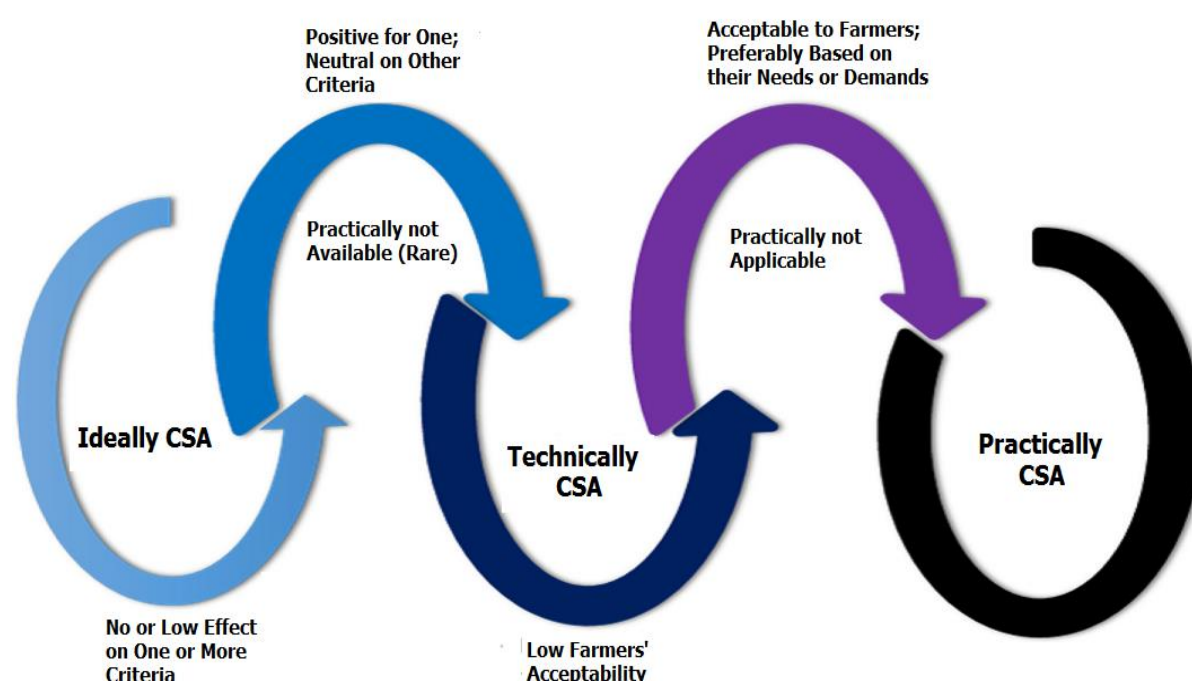


Figure 4: Conceptualizing CSA from Application Point of View

On the other hand, CSA could be viewed from two aspects regarding the unit of application: household level and system level (Figure 5). In general, CSA technologies and practices refers to those technologies that applies at the farm level and in this case the unit of application is the household. However, looking at the broader picture, none of the CSA technologies and practices applied at the household or farm level could be climate smart unless the whole system is climate adaptive. Grist (2015) also argued similar line of thought stating that CSA cannot be pursued solely at the farm

level. In other words, the effect of climate change and/or hazard is visible at the ecosystem level, say watershed or basin (sub-basin) level, and application of technologies at farm level could not counter the effect of these hazards that have impact at system level. It means that no matter how smart the technologies being applied at farm level are if the watershed is prone to landslide, the technology could not be feasible/applicable and its impact to the household will be zero. Hence, while considering the application of CSA technologies and practices the whole system should also be considered as a unit of application and again this should be based on the vulnerability of the areas. This is one of the reasons, why the baseline information prioritized vulnerability assessment as one of the core activities.

While selecting CSA technologies and practices for testing and piloting in this project, the unit of application, thus, should be both: farm and agro-ecosystem. A few of the activities conducted by this project should focus on broader level and some at household level. The mix of such technologies will render the community more adaptive from climate change perspective and not only the farm but the whole community will be benefitted by the increased resilience.

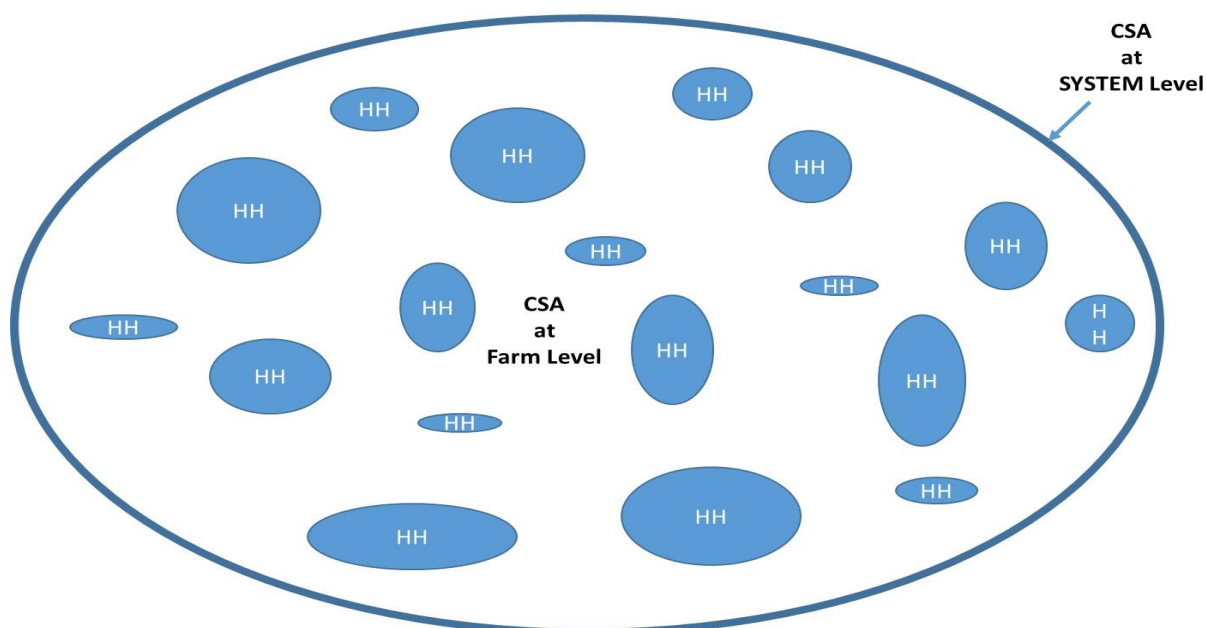


Figure 5: CSA from the Point of View of Unit of Application

Besides, as obvious from the above figure too, there are several households that could be considered as smallholder farmers with subsistence form of agriculture whereas some are also operating at the commercial to semi-commercial form having surplus of production. Therefore, for the CSA project both of these types of households should be considered with focus on - food security and agriculture diversification with possibility of surplus production from former group of farmers (smallholder farmers), and focus on commercialization of agriculture with emphasis on handful of particular crops and livestock with possibility of engagement in market and value chain (through participation in value addition of agricultural outputs) for latter group of farmers (semi-commercial/commercial).

3.3. Socioeconomic and Demographic Characteristics

3.3.1. Site Characteristics

For all the three VDCs - area, altitude, and climate are presented (Table 1). Agyouli VDC lies in terai region of Nawalparasi district and represents the plain areas of Nepal. Stretched in 19 square km in the center point of the East-West highway and also known as Tharu Heritage Site, the VDC is surrounded by forest in north and buffer zone of Chitwan National Park in the south (Sthapit and Neupane, 2015). Altitude of this VDC is about 557.78 m asl and has tropical climate (AVDC, 2012). Majhthana VDC lies in mid hills of Kaski district covering an area of 13 square km with altitude ranging from 615 to 3062 m asl with tropical to temperate climate (MVDC, 2014).

Ghanpokhara VDC lies in high hills of Lamjung district covering an area of 56.4 square km with altitude ranging from 850 to 7900 m asl, but settlements are at an altitude range between 850 to 2175 m asl. The VDC has sub-tropical to alpine climate with increase in altitude. Ghanpokhara VDC falls under Annapurna Conservation Area, with most of the forest area falling under the conservation area. Approximately 60% area is covered by forest and rangeland, whereas remaining is under human settlements and cultivation area (Baseline data collected by Local Crop Project, LCP, of LI-BIRD on 2015: Unpublished). Thus, the selected VDCs represent three agro-ecological zones, thus CSA practices tested and refined in these regions can be applicable to most of the areas of the country.

Table 1: Site Characteristics

Parameters	Agyouli	Majhthana	Ghanpokhara
Area (km ²)	19.0	13.0	56.4
Altitude (m asl)	557.78	615-3062	850-7900
Climate	Tropical	Tropical to Temperate	Sub-Tropical to Alpine

3.3.2. Farming System

In all the three VDCs, farmers practice integrated farming system with both crops and livestock playing key role in the livelihoods. Major cereal crops cultivated in Agyouli include rice, maize, millet, barley, buckwheat, and lentil whereas poultry, cattle, buffalo, goat, pig, and duck are the major livestock raised by the households. Vegetables, legumes, and fruits are also grown in small scale (Subedi et al., 2009). In Majhthana, rice, maize, millet, and legumes with some instances of vegetable and fruit cultivation are common (MVDC, 2010) whereas cattle, goat, and poultry are the major livestock. Similarly, the major crops in Ghanpokhara are rice, maize, finger millet, wheat, and potato. Similarly, beans and peas are commonly cultivated legumes but vegetables and fruits are not common (Baseline data collected by LCP Project of LI-BIRD on 2015: Unpublished). In Ghanpokhara, major livestock are sheep, cattle, goat, buffalo, and poultry. Crops are mainly grown in two major domains in all the three sites: lowland Khet and upland Bari. High hill areas also have land categorized as Pakho, usually with agro-forests, pastures, or barren land. Commercial livestock husbandry is not common in the selected sites, rather produces are used for home consumption. The farming system also represents most of the areas of the country and hence the recommendations derived from these sites will cover majority of the regions of the country. Additional details are presented in Table (2).

Table 2: Farming System and Cropping Pattern

Parameters	Agyouli	Majhthana	Ghanpokhara
Farming System	Integrated (Crop and Livestock)	Integrated (Crop and Livestock)	Integrated (Crop and Livestock)
Major Crops	Rice, maize, millet, barley, buckwheat, and lentil; vegetables, legumes, and fruits (small scale)	Rice, maize, millet, and legumes; some instances of vegetable and fruit	Rice, maize, finger millet, wheat, and potato; beans and peas are commonly cultivated legumes; vegetables and fruits are not common
Level of Commercialization (Crop)	Low	No	No
Cropping Domain	Khet and Bari	Khet and Bari	Khet and Bari (or Pakho)
Cropping Pattern (Khet)*	• Rice-Fallow-Maize • Rice/Lentil/Linseed-Maize • Rice-Mustard-Maize • Rice-Winter Vegetables-Maize • Rice (+Black gram)-Fallow-Maize	• Rice**-Fallow-Rice • Rice**-Fallow-Maize • Rice**-Potato • Rice**-Lentil-Fallow	• Rice**-Potato-Potato • Rice**-Fallow • Rice**-Fallow-Maize+Bean+Cowpea/Foxtail Millet/Finger Millet
Cropping Pattern (Bari)*	• Maize-Black gram-Mustard • Maize-Vegetables/Cowpea-Fallow/Mustard • Sesame-Fallow-Mustard • Sesame (+Cowpea)-Mustard/Fallow	• Maize-Millet (+Soybean)-Fallow • Maize-Millet-Mustard	• Maize+Finger Millet (+Soybean/+Cowpea)-Potato • Maize+Finger Millet (+Soybean/+Cowpea)-Fallow/Naked Barley/Mustard/Buckwheat
Major Livestock	Poultry, cattle, buffalo, goat, pig, and duck	Cattle, goat, and poultry	Sheep, cattle, goat, buffalo, and poultry
Level of Commercialization (Livestock)	Low	No	No

Note: * crops separated by "+" means inter-cropping, but that separated by brackets means cropped in Bunds, whereas that separated by "/" means any one of the crops is planted; **=soybean and black gram are usually grown in bunds of the rice field

3.3.3. Population Demographics

Results are presented in the table below (Table 3). The results show that Agyouli has 2750 households with total population of 12,923 (with sex ratio of 86.53 males per 100 females). Majhthana has 833 Households with total population of 2,993 (with sex ratio of 72.11 males per 100 females). Ghanpokhara has 648 households with total population of 2,893 (with sex ratio of 88.71 males per 100 females). Household sizes in all VDCs are lower than national average of 4.9, which shows that availability of labor for agriculture is low in these areas resulting in feminization in agriculture. This may also indicate migration of large proportion of household members. Besides, sex ratio is also lower than national average of around 94:100 for female:male (CBS, 2012). Hence, the CSA project should ensure increased and meaningful participation

of women in all stages of project cycle from technology screening to evidence generation.

Table 3: Household Population, Household Size, and Sex Ratio

VDC	Total HH	Population	Male	Female	Avg. Family Size	Sex Ratio
Agyouli (%)	2750	12923	5995	6928	4.70	86.53
		100.00	46.39	53.61		
Majhthana (%)	833	2993	1254	1739	3.59	72.11
		100.00	41.90	58.10		
Ghanpokhara (%)	648	2893	1360	1533	4.46	88.71
		100.00	47.01	52.99		

(Source: CBS, 2014)

Note: Avg.=Average; HH=Household

The populations based on different age groups are presented in Figure (6) to (8); Annex (7). The results show that in almost all VDCs in most age groups females dominate males in number. This again indicates women-friendly CSA technologies need to be identified and promoted.

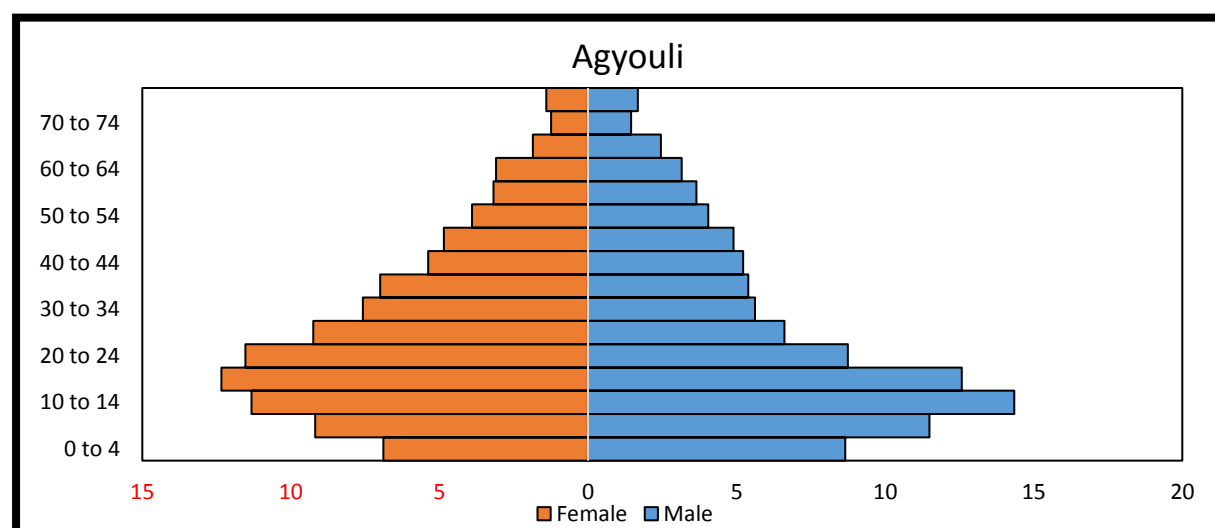


Figure 6: Population Profile of Agyouli VDC

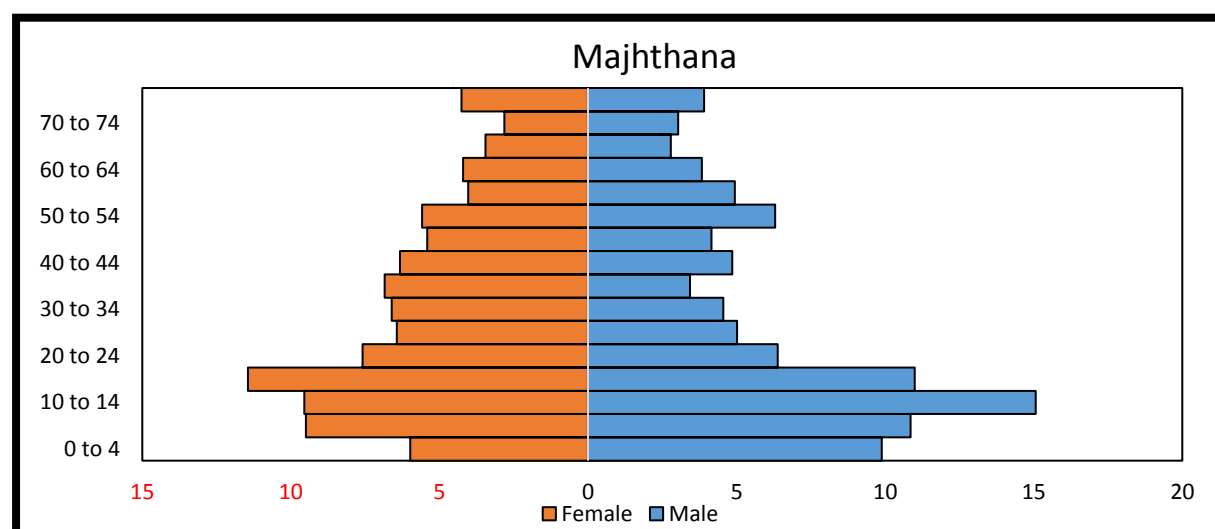


Figure 7: Population Profile of Majhthana VDC

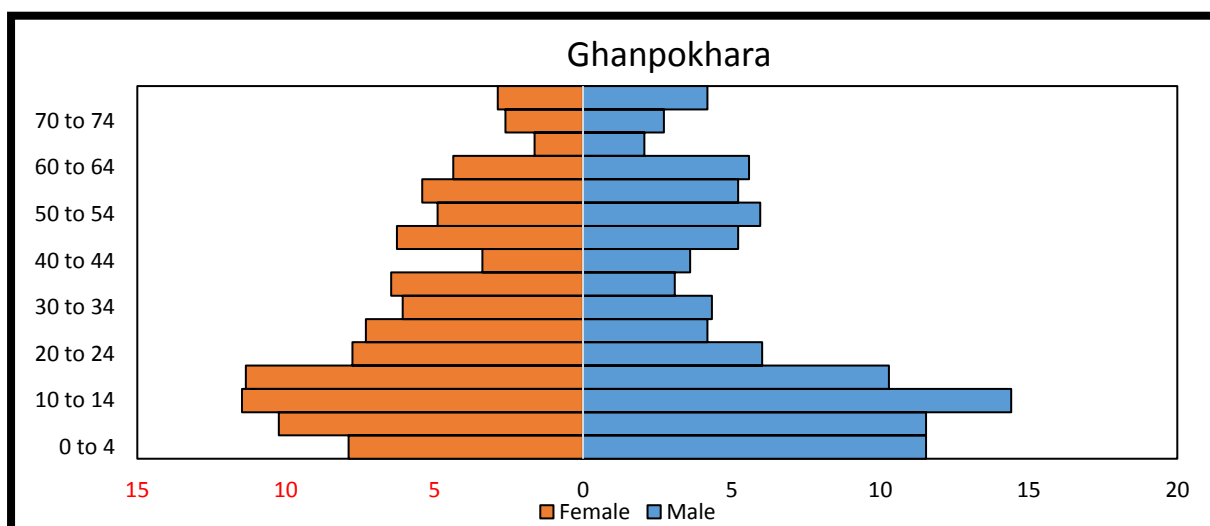


Figure 8: Population Profile of Ghanpokhara VDC

3.3.4. Caste and Ethnicity

In Nepal, caste and ethnicity are important socio-cultural aspects that determine choices and adoption of new technologies. In general, Dalit and Janajati are two most disadvantaged ethnic groups in Nepal. Hence, study of such population dynamics may be helpful for right targeting of CSA technologies and practices. Hence caste and ethnicity in the project sites are presented in Table (4) (and in detail in Annex 8). In Agyouli, there are mix ethnicities such as Tharu, Thakuri, Musahar, Biswakarma, Sanyasi, Brahmin, Chhetri, Bote, and Damai. The Tharu community is dominant (41.9%) followed by Brahmin (17.3%). In Majhthana, there are also mixed ethnicities such as Brahmin, Chhetri, Gurung, Biswakarma, Tamang, and Damai. The Brahmin community is dominant (46.8%) followed by Chhetri (21.2%). Whereas, in Ghanpokhara the major ethnicities are Gurung, Kami, Brahmin, Chhetri, and Tamang. The Gurung community is dominant (59.5%) followed by Dalit (34.6%). In general, the proportion of Dalits and Janajatis combined is significantly higher in Ghanpokhara (97.60%) as compared to Agyouli (68.24%) and Majhthana (30.20%), which suggests that during technology testing these groups need to be prioritized.

Table 4: Population by Caste/Ethnicity

VDC	Agyouli		Majhthana		Ghanpokhara		Nepal (%)
	Number	%	Number	%	Number	%	
Total	12923	100.00	2993	100.00	2893	100.00	100
BCT	3507	27.13	2037	68.06	69	2.39	31
Dalits	1633	12.64	451	15.10	1001	34.60	13
Janajati	7187	55.60	452	15.10	1821	63.00	37
Others	596	4.62	53	1.77	2	0.07	19

(Source: CBS, 2014)

Note: BCT=Brahmin, Chhetri, and Thakuri

3.3.5. Absenteeism and Migration

It was revealed that around 40% households have absentee population of which around 90% are males (Table 5), which is higher than the national average of about a quarter households with such case and 88% being male (CBS, 2012). Hence, CSA

project should give emphasis on technologies that help reduce women's workload, burden and drudgery. It also calls for ensuring increased involvement of women in decision-making role during technology selection to testing with their needs and demands. The CSA project should select, pilot, and recommend technologies and practices that are preferred by women and their groups. In the context of Nepal, CSA discourse should give due attention to GESI in addition to the already established and internationally accepted three main pillars.

Table 5: Absentee Population and Household

VDC	Total	Absent HH	Total Person	Male	Female
Agyouli	2750	1045	1449	1288	161
(%)	100.00	38.00	100.00	88.89	11.11
Majhthana	833	341	457	415	42
(%)	100.00	40.94	100.00	90.81	9.19
Ghanpokhara	648	281	388	353	35
(%)	100.00	43.36	100.00	90.98	9.02

(Source: CBS, 2014)

Note: HH=Household

3.3.6. Literacy

The literacy rates of the selected VDCs are high with over 70% (above national average of 66%: CBS, 2012) literate households in Agyouli and Majhthana, but about 55% in Ghanpokhara (Table 6). More males are literate than females. Many of the population were unable to attend school beyond Grade 10 (School Leaving Certificate-SLC level). Thus, there are very few graduates and technically educated population in all the three sites. In Ghanpokhara, this is more aggravated with population generally attending schools up to lower secondary schooling levels only (up to Grade 8). The CSA project, therefore, should design Information, Education, and Communication (IEC) materials that are suited for these communities. Besides, CSA project should approach males and females differently, considering the difference in their level of understanding, literacy, and education.

Table 6: Population Aged 5 Years and Above by Educational Attainment (Level Passed) and Sex

VDC	Agyouli						Majhthana						Ghanpokhara					
	T (%)	M (%)	F (%)	T (%)	M (%)	F (%)	T (%)	M (%)	F (%)	T (%)	M (%)	F (%)	T (%)	M (%)	F (%)	T (%)	M (%)	F (%)
TP	11927	100.00	5476	100.00	6451	100.00	2765	100.00	1130	100.00	1635	100.00	2615	100.00	1203	100.00	1412	100.00
UE	2936	24.62	921	16.82	2015	31.24	754	27.27	139	12.30	615	37.61	1071	40.96	374	31.09	697	49.36
LP	8740	73.28	4432	80.93	4308	66.78	1984	71.75	975	86.28	1009	61.71	1426	54.53	783	65.09	643	45.54
BR	414	4.58	227	4.94	187	4.21	43	2.14	22	2.23	21	2.05	105	7.09	52	6.43	53	7.89
1-5	3080	34.06	1606	34.94	1474	33.16	705	35.09	344	34.89	361	35.29	729	49.22	397	49.07	332	49.40
6 -8	2173	24.03	1097	23.86	1076	24.21	547	27.23	223	22.62	324	31.67	304	20.53	156	19.28	148	22.02
9 -10	1244	13.76	598	13.01	646	14.53	309	15.38	168	17.04	141	13.78	143	9.66	80	9.89	63	9.38
SLC	1005	11.11	529	11.51	476	10.71	236	11.75	120	12.17	116	11.34	91	6.14	55	6.80	36	5.36
IM	504	5.57	274	5.96	230	5.17	94	4.68	60	6.09	34	3.32	49	3.31	33	4.08	16	2.38
GD	108	1.19	68	1.48	40	0.90	18	0.90	13	1.32	5	0.49	4	0.27	3	0.37	1	0.15
PG	33	0.36	24	0.52	9	0.20	4	0.20	4	0.41	0	0.00	1	0.07	1	0.12	0	0.00
NF	447	4.94	158	3.44	289	6.50	42	2.09	25	2.54	17	1.66	53	3.58	32	3.96	21	3.13
Other	15	0.17	7	0.15	8	0.18	0	0.00	0	0.00	0	0.00	1	0.07	0	0.00	1	0.15
NS	19	0.21	9	0.20	10	0.22	11	0.55	7	0.71	4	0.39	1	0.07	0	0.00	1	0.15

(Source: CBS, 2014)

Note: TP=Total Population (above 5 years of age); UE=Uneducated Population (those who cannot read and write); LP=Literate Population (Literacy Rate); FE=Formally Educated (population); BR= Beginners; IM= Intermediate; GD=Graduate; NF=Non-Formal Education; M=Male; F=Female; SLC=School Leaving Certificate (Level); NS=Not Stated; PG=Post Graduate or Above

3.3.7. Sources of Livelihood

In Agyouli, agriculture is a major source of livelihood followed by wage labor and remittance (Subedi et al., 2009). According to the VDC profile of Majhthana, 88.5% of the population has agriculture as its major occupation, followed by labor (5.6%), and business (3.2%) (MVDC, 2010). Recent survey at Ghanpokhara conducted by LI-BIRD for LCP Project shows that 100% of population is involved in agriculture, with only 41% making an earning from it, followed by remittance (28.9%), and pension (15.7%) (Baseline data collected by LCP Project of LI-BIRD on 2015: Unpublished). The national average for contribution of farm income in household is around 28% (around 37% non-farm, and rest is from remittance and other sources) (CBS, 2011). This clearly underscores the importance of agriculture in general and CSA practices in specific.

The sources of livelihood for different groups of people (women, Janajati, Dalit) were also analyzed separately (Annex 9). There are small variations among these groups in all the three sites. Janajatis are more dependent on remittance, while Dalit families mainly rely on wage labor (mainly in Ghanpokhara) and livestock for household incomes. Women-headed families are involved in vegetable farming besides getting income from remittance. Since Dalit families own little land, mostly bari/uplands, they mostly grow maize, contrary to other groups who grow rice. The composition of some animals varies among these households, depending on culture. For example, pig is raised by Janajatis and Dalits, but is culturally unacceptable to Brahmins and Chhetris.

3.3.8. Poverty and Food Security

The national poverty line of NPR 19,261 per capita per year has been used for poverty analysis. The population with per capita consumption above this line are considered non-poor and below are considered poor. The poverty at both Agyouli and Majhthana seems to be low with headcount below 10% (Table 7). However, Ghanpokhara has high prevalence of poverty with around 35% household below national poverty line (CBS, 2013). Similarly, both the gap between households and severity of poverty are higher in case of Ghanpokhara VDC compared to other two VDCs that are more or less similar. Ghanpokhara is also worse than the overall country situation.

Within the respective districts, Agyouli is better off than Nawalparasi district in overall, but Majhthana and Ghanpokhara are worse off as compared to the overall situation of respective district. Per capita consumption also showed similar pattern in these VDCs. This showed that the CSA project should follow different strategies in different sites. In terai and mid hills the population are relatively well-off, so they can make cash contribution if required. Whereas, while testing technologies in high hills, appropriate compensation mechanism for their resources and time should be established.

Poverty was also analyzed for different castes and gender in all three sites (Annex 10). Results show an interesting trend. In Agyouli and Majhthana, women perceive themselves

to be poorer than other groups. But, in Ghanpokhara, women perceived themselves not to be poorer than other groups.

Table 7: Poverty Level of Selected VDCs

VDC	HCR	PGR	SPGR	Per Capita Consumption (NPR)
Agyouli	9.52	1.73	0.49	39,682
Majhthana	6.24	1.17	0.35	46,297
Ghanpokhara	34.22	8.93	3.33	26,916
Nepal	25.16	5.43	1.81	34,829
Nawalparasi	17.03	3.80	1.27	39,031
Kaski	4.02	0.79	0.25	64,209
Lamjung	16.79	3.86	1.33	37,679

(Source: CBS, 2011; CBS, 2012; CBS, 2013)

Note: HCR=Head Count Ratio, is the percentage of population below the poverty line. Technically, it is the proportion of the population for whom consumption expenditure (or income) is less than the poverty line; PGR=Poverty Gap Ratio, is a measure of the poverty deficit of the entire population also called the depth of the poverty, where the notion of poverty deficit captures the resources that would be needed to lift all the poor out of poverty through perfectly targeted cash transfers; SPGR=Squared Poverty Gap Ratio, captures changes in consumption-expenditure (incomes) within the poor. This is often described as the measure of the severity of poverty and takes the square of the distance separating poor from the poverty line into account. The poverty gap is weighted by itself so as to give more weight to the very poor. Said differently, it takes into account the inequality among poor

Food sufficiency situation has also been analyzed for the selected VDCs (Table 8). The survey conducted by CBS has taken continuous settlements covering one or more VDCs as a single unit for measuring food poverty, so it is presented here with assumption that the prevailing situation in the adjacent villages are similar. The report shows that low caloric intake is prevalent in around 30% households in case of both Agyouli and Majhthana, however it is slightly more than 40% for Ghanpokhara (CBS, 2006). Similarly, the inequality in caloric intake and severity are also high in case of Ghanpokhara VDC compared to other two, which is higher than national average too. Other two VDCs have lower values than national averages. Compared to averages of respective districts, only Agyouli is better and other two VDCs are worse. Hence, CSA technologies that improve family nutrition along with other benefits should be prioritized.

Table 8: Food Insufficiency of Selected VDCs

VDC	CIP	CIG	CIS
Agyouli	33.40	6.00	1.70
Majhthana	30.60	5.20	1.40
Ghanpokhara	44.70	10.20	3.50
Nepal	39.80	7.60	2.20
Nawalparasi	38.70	7.20	2.10
Kaski	28.80	5.10	1.40
Lamjung	39.40	8.10	2.50

(Source: CBS, 2006)

Note: CIP=Caloric Intake Prevalence; CIG=Caloric Intake Gap; CIS=Caloric Intake Severity; CIP corresponds to HCR, CIG to PGR, and CIS to SPGR, where poverty line refers to minimum caloric requirement per capita per year

Several studies conducted by different projects of LI-BIRD and other organizations also confirmed prevalence of high level of food insufficiency in the selected VDCs. Around 40% of the population in Agyouli is below the food self-sufficiency level (that is, annual

staple food/cereals consumption met by the production from households' owned land). Their production only sustains for 3-9 months. The sufficiency level is 80% for leafy vegetables, 70% for other vegetables, 40% for pulses, 98% for fruits, 85% for spices, 88% for milk, meat and eggs (Baseline data collected by CBM project of LI-BIRD on 2013; unpublished).

As per VDC profile of Majhthana, 3.4% of population is landless and cereal crop production is sufficient for up to 8 months on average. Similarly, 1.82% has less than 3 months food sufficiency, 89.1% has 4 to 12 months of food sufficiency and 9.1% sell crop produces. Again, leafy vegetable is sufficient for 3.5 months, vegetable for 4.3 months, and legumes for 5.1 month from their own production (MVDC, 2010).

According to VDC profile of Ghanpokhara, 4.5% of households are landless. Again, according to well-being ranking conducted by Ghanpokhara DDC in 2011, 28.8% have food sufficiency of less than 3 months, 25.6% have food sufficiency of 3 to 6 months, 28.3% have food sufficiency of 6 to 9 months, and 17.6% have food sufficiency of 12 months (Baseline data collected by LCP Project of LI-BIRD on 2015: Unpublished). Since several households are food insufficient, food security should receive top priority (weightage) among the three pillars of CSA while selecting CSA technologies and practices to be tested in these sites.

3.3.5. Land Holdings and Characteristics

For an agrarian economy land is an important asset and hence its distribution among the community members play a vital role in technology adoption and investment. Land holdings in the project sites are presented in Table (9). The national average land holding size is around 14 ropani and proportion of smallholder farmers is 53% (CBS, 2011). Average landholding per household is 9.24 ropani in Agyouli, 9.6 ropani in Majhthana and 12.11 ropani in Ghanpokhara.

The farmers were also categorized into small (landholding size below 10 ropani), medium (landholding size between 10 to 20 ropani), and large (landholding size above 20 ropani) farmers based on the categorization of Agricultural Development Strategy (2015-2035) of Government of Nepal. The proportions of small, medium and large farmers in Agyouli are 67.39%, 22.83% and 9.78%, respectively. In Majhthana, their proportions are 60.49%, 29.63% and 9.88, while in Ghanpokhara, these are 58.54%, 23.17% and 18.29%, respectively. It clearly shows all three sites have a large proportion of smallholder farmers owning less than 10 ropani land, which might be a limiting factor for adoption of new technologies if appropriate policy and institutional mechanisms are not in place. For instance, small land might be too little to put up their lands as collateral for bank loans. Low interest loan and collateral free loan could be an option to get them involved and benefited from CSA practices. These figures along with average land holdings and percentage of total cultivable lands are presented in Table (9) below.

Land distribution of women, Janajati, and Dalit was also analyzed (Annex 11). In Agyouli, Janajatis (the Tharu community) were found to have large land holding size, around twice the average (17.5 ropani). Women-headed and Dalit households mainly constitute the poor landholders. In case of Majhthana and Ghanpokhara too Dalit have lower land holding size than other ethnic groups. Women's situation in these two sites is better than that of Agyouli.

The CSA project should focus both on subsistence and commercial farming. Farmers with poor land holding can be organized in groups and support can be provided in group or community-based CSA practices. For medium and large farmers owning nearly two-thirds of available land, the focus should be on commercialization, market linkage, and value addition. Scaling up pathways for them may also differ. Besides, focus should be on technologies and practices suitable for marginal and unproductive lands with poor soil quality and irrigation facilities that are the characteristics of most Dalit households.

Table 9: Land Holding Characteristics

Parameters		Agyouli	Majhthana	Ghanpokhara
Average Landholding Size (Ropani)		9.24	9.61	12.11
Percent Land Holding	Small Farmers	67.39	60.49	58.54
	Medium Farmers	22.83	29.63	23.17
	Large Farmers	9.78	9.88	18.29
	Total	100.00	100.00	100.00
Average Land Holding Size (Ropani)	Small Farmers	4.73	4.94	5.75
	Medium Farmers	14.57	13.37	13.53
	Large Farmers	26.96	26.92	30.70
	Total	100.00	100.00	100.00
Land Holding Size (% of Total Cultivated Land)	Small Farmers	34.81	31.10	27.76
	Medium Farmers	36.36	41.23	25.87
	Large Farmers	28.83	27.67	46.36
	Total	100.00	100.00	100.00

Note: Small Farmers=Having land size less than 10 ropani (0.5 hectares); Medium Farmers=Having land size from 10-20 ropani; Large Farmers=Having land size more than 20 ropani

3.3.11. Other Household Characteristics

Several sources of drinking water can also be used for irrigation in climate-stress and rainfed conditions. So, sources of drinking water of the selected VDCs have been analyzed (Table 10). Interestingly, the results shows that taped/piped water are common in mid and high hills compared to terai, where ground/under-ground water sources such as hand pumps and wells are more common. It shows that there are little water sources in hills and mid-hills due to low availability of ground and underground water sources. This shows that water-efficient or water-smart CSA technologies need to be promoted in all three sites. Some of such technologies include water harvest pond, water collection tank, gray water harvest pond, micro-irrigation technologies, multi-water use systems, promotion of crops and varieties grown in water-stress environments.

Table 10: Households by Main Source of Drinking Water

VDC	Agyouli (%)		Majhthana (%)		Ghanpokhara (%)	
Total	2750	100.00	833	100.00	648	100.00
Tap / Piped	352	12.80	706	84.75	599	92.44
Tube-well / Hand-pump	1171	42.58	0	0.00	0	0.00
Covered Well	550	20.00	25	3.00	0	0.00
Uncovered Well	668	24.29	85	10.20	3	0.46
Spout	4	0.15	14	1.68	31	4.78
River Stream	0	0.00	0	0.00	12	1.85
NS	5	0.18	3	0.36	3	0.46

(Source: CBS, 2014)

Note: NS=Not Stated

Since energy efficiency is one of the principles of CSA, fuel for preparing food and livestock feed is one of the important aspects to be considered. It can be used as a proxy for fuel use for agricultural activities, especially the post-harvest processing like drying (energy efficient cooking stove, dryer, etc., may be useful for this purpose). Firewood is a major source of fuel for cooking and cattle feed preparation, mainly in the mid and high hills (Table 11). Increased level of firewood extractions lead to deforestation with direct impact on hydrology, soil fertility, and biophysical properties of agricultural land. Firewood collection is also related to women drudgery and poor health, since it involves considerable time and power to collect and carry firewood back home, and high levels of carbon dioxide and other gas are emitted while burning. In terai, around 15% households use Low Petroleum Gas (LPG) and around 10% use biogas. LPG can reduce the use of fire wood and thus reduce the emission of carbon through fire wood burning while sequestering carbon on forest stock.

Biogas use is very limited (around 1%) in mid hills and is not used at all in high hills. May be the altitude plays vital role in biogas production and hence results in decreasing potential as one goes up. Biogas can be promoted together with improved cattle shed management, manure preparation, and home gardening activities (manure and bio-pesticides). Solar energy-based CSA technologies and practices could be another option.

Table 11: Households by Usual Type of Fuel Used for Cooking

VDC	Agyouli (%)		Majhthana (%)		Ghanpokhara (%)	
Total	2750	100.00	833	100.00	648	100.00
Firewood	2030	73.82	801	96.16	638	98.46
Kerosene	10	0.36	0	0.00	3	0.46
LP Gas	406	14.76	19	2.28	4	0.62
Cow Dung	2	0.07	0	0.00	0	0.00
Biogas	289	10.51	10	1.20	0	0.00
Electricity	5	0.18	0	0.00	0	0.00
Others	4	0.15	0	0.00	0	0.00
NS	4	0.15	3	0.36	3	0.46

(Source: CBS, 2014)

Note: NS=Not Stated; LP=Liquid Petroleum

Source of lighting is also useful to understand the source of energy for different purposes and hence is analyzed (Table 12). Electricity seems to be major source of lighting in terai and mid hills but interestingly the use of solar is common in high hills (rare in other areas). Besides, in high hills, kerosene is also major source of lighting. On the other hand, in terai, few households were found to be using biogas for lighting purpose. This indicates electric-operated CSA technologies (e.g. millet thresher) are imperative to improve work efficiency, and attracting women and youth to agricultural activities. Solar-based technologies such as lifting water from ponds, lakes, and streams for irrigation can be promoted. Farmers' reach to subsidies given by the government on solar energy for water supply needs to be enhanced.

Table 12: Households by Usual Source of Lighting

VDC	Agyouli (%)		Majhthana (%)		Ghanpokhara (%)	
Total	2750	100.00	833	100.00	648	100.00
Electricity	2556	92.95	778	93.40	464	71.60
Kerosene	177	6.44	50	6.00	157	24.23
Biogas	3	0.11	0	0.00	0	0.00
Solar	0	0.00	1	0.12	21	3.24
Others	9	0.33	1	0.12	3	0.46
NS	5	0.18	3	0.36	3	0.46

(Source: CBS, 2014)

Note: NS=Not Stated

Availability of different types of household facilities, especially mass communication equipment, could be important for targeting to raise awareness and disseminate information communication based technologies (ICT, that is, knowledge smart CSA products). For instance, the use of different mass communication devices like radio, television, and internet could be helpful to disseminate agriculture and weather related information. The results showed some interesting findings (Table 13). It is found that radio is still used by more than half of the population in all three sites with mid hills having coverage of two-thirds of entire population. The population of mobile phone users is even higher. Even in Ghanpokhara, the mobile usage is found to be 60% whereas it is around 87% in terai. Given the low level of climate awareness and low access to climate information and services of farmers, CSA project should promote mobile based ICT technologies to improve access to market information, weather forecast, and agro-advisory (varieties/breeds, cultivation practices, pest and disease management) for reducing climatic hazards and enhance livelihood opportunities.

Table 13: Households by Types of Household Facilities

VDC	Agyouli (%)		Majhthana (%)		Ghanpokhara (%)	
Total	2750	100.00	833	100.00	648	100.00
Without Any Facilities	83	3.02	62	7.44	50	7.72
At Least One Facility	2658	96.65	730	87.64	495	76.39
Radio	1508	54.84	587	70.47	375	57.87
Television	1665	60.55	370	44.42	63	9.72
Cable Television	370	13.45	72	8.64	112	17.28
Computer	233	8.47	8	0.96	2	0.31
Internet	67	2.44	7	0.84	0	0.00
Telephone	75	2.73	22	2.64	3	0.46
Mobile	2390	86.91	665	79.83	394	60.80
Phone	27	0.98	2	0.24	0	0.00

(Source: CBS, 2014)

3.3.12. Farmer's Perception and Awareness

Perceptions of farmers in the selected VDCs were also analyzed (Table 14). Around 10-50% of the households were aware of climate change and its impact but only a few of them have heard about CSA. Women were found to be more aware than men and Dalits were quite unaware of the climate changes and its impacts. On the other hand, very few have knowledge on CSA although some of the practices they adopt qualify for CSA. Hence, there is a need for increasing the awareness on climate change and specifically of CSA and its technologies and practices and the project should organize such activities for women, poor farmers and local institutions.

The households usually carry out farming activities mostly on their own without external support (even government support as well as access to them is low), as many of them have little knowledge about what information they can obtain from outside for improving their day-to-day activities (Annex 12). Farmers rely on peer-to-peer method for technology dissemination. When discussed about possible options for technology dissemination, farmers showed willingness to use climate and market related information. They were excited about the idea of using mobile phones, but due to unfamiliarity with communicating through text messages, they preferred voice messages. Moreover, if these are on their local language, the likelihood of adoption could increase.

The perception about climate change also varies between regions. A change in rainfall pattern is a major visible impact of climate change in all three VDCs. Rising temperatures have been felt in Agyouli and Majhthana. Hailstones and droughts have been felt in Ghanpokhara. Climate change has altered flowering period in many fruits, delayed in crop cultivation period due to delayed monsoon, reduced yield, increased insect-pest and disease incidence, and increased the incidence of wild animals - mouse, monkey, and squirrel among others. It seems that people in the hill areas do not adequately follow adaptation practices. In the plain areas people are mostly adapting by altering the timings or modifying farming practices such as planting improved and tolerant crop varieties.

The FGDs conducted in the three sites show that usually climate change is linked with hazards (more discussion on vulnerability assessment). The visible problems include increased intensity of flooding and haphazard pattern of river flow, increased intensity of hailstones and wind, prolonged drought period, introduction of pest and diseases in crops, untimely occurrence of different hazards like downpour, wind, hailstones, etc. Further, drying up of water sources due to drought, destruction of crops (rice due to drought during planting season and heavy rainfall during harvesting season in Agyouli and Majhthana, maize by hailstone in Majhthana and Ghanpokhara, increased blight occurrence in potato, etc.) due to weed and pest infestation, increased illness of livestock are becoming more common than in the past.

Table 14: Awareness and Perception of Changes in Climatic Parameters and Its Effect on Selected Sites

Particular	Agyouli, Nawalparasi	Majhthana, Kaski	Ghanpokhara, Lamjung
Have knowledge about climate change*	30-40%	10-50%	10-30%
Have knowledge about CSA*	5-10%	0%	0%
Farmers perception on climate change	Change in rainfall patterns, increasing temperature	Change in rainfall patterns, increasing temperature	Change in rainfall patterns, hailstone, and droughts
Impact of climate change	Change in flowering period in many fruits, delay of rice planning due to late monsoon, and realization of crop yield losses	Change in flowering period in many fruits, delay in monsoon severely affecting in rain-fed agriculture system	Change in flowering period in many fruits, severe crop damage from hailstone, increase in incidence of pest and diseases
Adaptation practices	Change in planting time, use of improved varieties of some crops, drought tolerant rice	Low awareness about adaptation practices	Low awareness about adaptation practices

Note: *=Rough Estimates (Percent of Participants aware of these terminologies) during conduction of different FGDs

3.3.13. Awareness and Feasibility of Prioritized CSA technologies and practices

The local awareness of different groups of population on selected CSA technologies and practices were also analyzed (results are presented in Annex 13 to 15). Results show that most of the technologies are new to the people of respective sites, especially the Dalits are among the least aware. Women groups are most knowledgeable among all and the terai population are more aware of the latest technologies than the other two regions. However, all groups of population are equally interested to try and test these technologies.

3.4. Vulnerability Analysis

Vulnerability analysis is important to understand the risk posed by different hazards on the life and property of the community. Such analysis is important to devise appropriate interventions (farm or agro-eco system) to counter the risks and their effects. Since timing, frequency and intensity of climate is changing, the risks resulted from those changes are also changing. CSA technologies and practices can reduce the risk and vulnerability of the community and secure sustained increase in food production and productivity to feed the ever increasing population. Hence vulnerability assessment exercise was done using several tools, which are discussed in the subsequent sections.

3.4.1. Historical Timeline

The historical timeline in case of Agyouli has been prepared based on recall method for past 30 years (Annex 16). The community emphasized that flood and drought are the major challenges affecting their livelihoods. All these events have high impact on the local livelihoods and the magnitude of these hazards ranged from high to severe. Wind and insect-pest are also other issues of concern but they are less severe. Floods sweep riverbanks, farmlands, public land, nearby forests, and pastures and sometimes flow through the villages. This can cause severe impact on the farming, properties and human lives. Drought lead to reduced productivity and production. Strong wind is observed sometimes, although, it does not affects the community directly. Insect-pests are controlled using chemicals, which cause direct health hazards.

In Majhthana (Kaski), wind, lightning, hailstone, fire, drought, insect and disease pest are recurring problems, but these have little impact on the livelihoods of people. There are also several small-scale landslides in the VDC, which have little or no affect. There were two major landslides some 27-28 years ago affecting life and property. But recently there have been no such causality although high-magnitude landslides occur outside the human settlements. In the recent years, incidence of insect-pests and drought have been increasing. In 2015 (BS 2072), the earthquake had affected almost all houses (damaged partially), with half of them rendered unusable and one human casualty. The major events are presented for reference in Annex (17).

Hazard timeline of Ghanpokhara shows that hailstone, landslides, drought, lightening and wind are some of major recurring problems every year (Annex 18). Landslide causes major impact on lives and livelihoods. Recently droughts have been increasing along with occurrence of several diseases in almost all crops. Dense/thick fog and increased snowfall are also common but with little direct impact. Sometimes, they rather have positive impacts. People of this VDC recall that around a decade ago heavy hailstone had destroyed almost all standing crops.

Women are largely affected by the hazards since they affect agriculture that is increasingly becoming women's domain. Increased weeds and pests increase women's

workload in controlling them. On the other hand, Dalits and Janajatis are found to be more vulnerable than other ethnic groups.

3.4.2. Hazard Prioritization

In Agyouli the most disastrous hazard is considered to be flood, followed by drought and insect pests (Table 15). These facts are drawn from the report prepared by CAV project, and reconfirmed through interaction with farmers. FGD revealed that if rainfall continues for three or more days, a flood follows. Thick fog is also a major emerging problem, especially in winter, which is conducive to fungal diseases like blight in potato. Thus, at present potato is being replaced by other crops (like mustard and lentil). Other vegetable cultivation has also become difficult due to this problem. The problem of weed has also increased in the recent years.

Majhthana community prioritized hailstone as one of the most problematic hazards since it directly affects the livelihoods of people by destroying crop cultivation. It is followed by drought, insect-pests and landslides. The pairwise ranking of these hazards has been presented in the table below (Table 16). A problem tree analysis also shows these three as the major problems of the VDC.

People of Ghanpokhara felt that landslide is the major problem in their area, however, some of the participants equally prioritized hailstone (Table 17). Besides, these two, insect-pest is also emerging to be a major problem. Downpour or heavy rainfall during harvesting has also been identified as emerging problem nowadays. Although lightning, wind, and fog are common every year, they are categorized to be less disastrous causing low impact on people and their resources.

CSA practices chosen for testing and promoting should be able to address the most challenging problems first. It was found that hazards that directly affect farming system (drought, weed, etc) are considered to be more important for women whereas those requiring power and labor (flood, landslide, etc.) are less important for them, since male members are responsible for tackling such problems. Moreover, Dalits and Janajatis usually have marginal and fragile land and the impact of hazards are more felt by them (Annex 19).

In Agyouli, women and Dalit prioritize similar hazards. Janajatis did not prioritize flood since they usually settle inside the village, away from the riverbanks. In Majhthana, women have prioritized drought as important hazard followed by hailstone, insect-pest and wind; Janajatis have prioritized hailstone, drought, insect-pest and wind; and Dalits have prioritized hailstone, drought, wind and insect-pest. Dalits are more prone to hazard due to low adaptive capacity and high susceptibility. Women prioritized hazards that directly affect them. In Ghanpokhara, women prioritized insect-pest, hailstone, downpour and drought whereas Dalits prioritized hailstones, insect-pest, wind and landslide. It is understood that women have different concerns compared to men. In case of Dalits, it

again reinforced the idea that they have marginal and vulnerable land so that hazards like wind and landslide (that further deteriorates or renders land unusable) are more problematic for these groups compared to other groups.

Therefore, while designing CSA interventions, site specific climatic hazards should be taken into consideration. Hazard mapping may be important and technologies and practices specific to the hazard needs to be identified. GESI specific interventions are also a dire need. For instance, those having Khet (like in case of most of the non-Dalits) need timely irrigation and water availability may be important for them whereas those having Bari (Dalits) land may prefer interventions benefiting livestock or stress-tolerant crop varieties.

Table 15: Pairwise Ranking of Hazards (Agyouli, Nawalparasi)

Hazards	Flood	Drought	Insect-Pest
Flood			
Drought	Flood		
Insect-Pest	Flood	Drought	
Total	2	1	0

(Source: Sthapit and Neupane, Unpublished/2015; validated)

Table 16: Pairwise Ranking of Hazards (Majhthana, Kaski)

Hazards	Flood	Landslide	Lightning	Wind	Fire	Drought	Hailstone	Insect-Pest
Flood								
Landslide	Landslide							
Lightning	Lightning	Landslide						
Wind	Wind	Landslide	Lightning					
Fire	Fire	Landslide	Fire	Fire				
Drought	Drought	Drought	Drought	Drought	Drought			
Hailstone	Hailstone	Hailstone	Hailstone	Hailstone	Hailstone	Hailstone		
Insect-Pest	Insect-Pest	Insect-Pest	Insect-Pest	Insect-Pest	Insect-Pest	Drought	Hailstone	
Total	0	4	2	1	3	6	7	5

(Source: MVDC, 2014; validated)

Table 17: Pairwise Ranking of Hazards (Ghanpokhara, Lamjung)

Hazards	Landslide	Hailstone	Wind	Insect-pest	Drought	Lightning	Downpour	Fog
Landslide								
Hailstone	Landslide/Hailstone							
Wind	Landslide	Hailstone						
Insect-pest	Landslide	Hailstone	Insect-pest					
Drought	Landslide	Hailstone	Drought	Insect-pest				
Lightning	Landslide	Hailstone	Wind	Insect-pest	Drought			
Downpour	Landslide	Hailstone	Downpour	Insect-pest	Drought	Downpour		
Fog	Landslide	Hailstone	Wind	Insect-pest	Drought	Fog	Downpour	
Total	6/7	6/7	2	5	4	0	3	1

3.4.3. Hazard Calendar

For preparing hazard calendar, two reference periods were taken into account: Recent years, meaning last 5 years (from 2011 onwards); about 10 years ago has been taken as reference period for the past, which refers to period before 2001. Thus, two reference periods "Before 2001" and "After2011" has been compared in case of hazard seasonal calendar.

The seasonality of hazard is found to be changed due to climate change compared to a decade ago. Onset of rainfall has delayed nowadays and so is the flood. Period of drought is extended. Both the rainfall and drought have become more intense too. Thick and dense fog during winter is increasingly becoming a major problem causing farming more difficult. Winter is characterized by increased insect-pest infestation (Table 18).

In Majhthana people are little confused on the seasonal changes of the hazard, however, they linked change in rainfall to most of the changes in weather. Due to low rainfall, flooding has been reduced and are limited to monsoon season (July/August and August/September) but landslide seems to have unchanged pattern (Table 19). Drought period has extended up to June/July, the rice planting season. Hailstone, wind, lightning and fire are somewhat random. Insect pests are increasing nowadays that were absent in the past.

In case of Ghanpokhara too people have not experienced changes in hazard occurrence period in a particular year. However, the exercise is conducted with two different groups for different time periods and hence there are some visible changes in hazard calendar (Table 20). It shows that landslides, hailstone, insect-pests and most other hazards have increased recently, occurring in different months scattered throughout the year, which were relatively low/absent in the past.

Table 18: Hazard Calendar (Agyouli, Nawalparasi)

Month ²	Reference Time	Baisakh (Apr./May)	Jestha (May/June)	Ashad (June/July)	Shrawan (July/Aug.)	Bhadra (Aug./Sept.)	Ashwin (Sept./Oct.)	Kartik (Oct./Nov.)	Mangshir (Nov./Dec.)	Paush (Dec./Jan.)	Magh (Jan./Feb.)	Falgun (Feb./Mar.)	Chaitra (Mar./Apr.)
Flood	Past												
	Present												
Drought	Past												
	Present												
Insect/Pest	Past												
	Present												

(Source: Sthapit and Neupane, Unpublished/2015; validated)

Note: Based on Nepali Calendar; First month is Baisakh and the twelfth month is Chaitra; Baisakh corresponds near about mid-April to mid-May; Past=around 10 years ago; Present=Nowadays

Table 19: Hazard Calendar (Majhthana, Kaski)

Month	Reference Time	Baisakh (Apr./May)	Jestha (May/June)	Ashad (June/July)	Shrawan (July/Aug.)	Bhadra (Aug./Sept.)	Ashwin (Sept./Oct.)	Kartik (Oct./Nov.)	Mangshir (Nov./Dec.)	Paush (Dec./Jan.)	Magh (Jan./Feb.)	Falgun (Feb./Mar.)	Chaitra (Mar./Apr.)
Landslide	Past												
	Present												
Flood	Past												
	Present												
Fire	Past												
	Present												
Lightning	Past												
	Present												
Drought	Past												
	Present												
Hailstone	Past												
	Present												
Wind	Past												
	Present												
Insect-Pest	Past												
	Present												

Table 20: Hazard Calendar (Ghanpokhara, Lamjung)

Month	Reference Time	Baisakh (Apr./May)	Jestha (May/June)	Ashad (June/July)	Shrawan (July/Aug.)	Bhadra (Aug./Sept.)	Ashwin (Sept./Oct.)	Kartik (Oct./Nov.)	Mangshir (Nov./Dec.)	Paush (Dec./Jan.)	Magh (Jan./Feb.)	Falgun (Feb./Mar.)	Chaitra (Mar./Apr.)
Landslide	Past												
	Present												
Hailstone	Past												
	Present												
Wind	Past												
	Present												
Insect-Pest	Past												
	Present												
Drought	Past												
	Present												
Lightning	Past												
	Present												
Downpour	Past												
	Present												
Fog	Past												
	Present												

3.4.4. Crop Calendar

In Agyouli, as in most other places of Nepal, rainfall is important for farming activities, as a large amount of land is rainfed. Due to unpredictability of weather, farming has also been uncertain as planning of farming activities fail to correspond rainfall. To cope with this, farmers have shifted their planting and harvesting time of different crops (Table 21). Production of several crops is increasingly becoming infeasible. For instance, vegetable production in winter is becoming a major problem due to increased foggy days and less sunny days. Increasing insect pest is the result of such weather pattern. Problems were also seen in rice production causing reduction in yield. Maize production was severely affected this year (2015). Wheat has been completely replaced by mustard, lentil and other crops. Earlier wheat was cultivated in around half of that of rice growing land. Potato also has been completely replaced. Frequency of weeding is increased due to increased weed infestation, and many farmers are applying herbicide as opposed to occasional hand weeding in the past. Local varieties are replaced by improved varieties as part of coping strategy.

In Majhthana, due to abundant rainfall, rice used to be planted in early June, and now it has shifted about a month later (Table 22). Harvesting time started from late October but it has shifted to early November. The cultivation period of millet has shortened starting from early August to late August and ending in early November to late November (Before it used to last from late July to early December). A decade ago, some varieties of millet were available which could be planted in mid-May and harvested in early October. Maize is cultivated between early March in Khet and late March in Bari, which remains somewhat unchanged when compared to two time periods and harvesting was done in early July in Khet and late July in Bari. Some variety of maize nowadays are planted in early February too. In case of wheat, the season doesn't seem to change, with cultivation done from November to December and harvesting by early April. Rapeseed is similar with cultivation starting in early December in Khet and first half in Bari but it used to start in late November earlier. Harvesting is done during early March in khet and late March in Bari but earlier it could have extended up to early April. Potato is cultivated in late October earlier, which has moved to late November nowadays. Some varieties of potato are even cultivated in early July nowadays. Harvesting was done in late January a decade ago, which has shifted from early-March to early-April nowadays.

Major crops grown in the Ghanpokhara VDC has remained somewhat unchanged but some crops like cardamom have been recently introduced. Crop calendar, however, does not seem to vary much unlike hazard calendar (Table 23). However, introduction of new varieties might have changed the cropping time so much so that they could be planted little earlier or later and again harvested likewise. Rice planting has shifted around fortnight later and also could be harvested around one months later, maize planting as well as harvesting season has changed drastically, millet crop cycle has reduced by around half months, potato could also be planted and harvested little bit earlier nowadays. Other crops also showed that these either are sown/planted little bit earlier

as well as the harvesting time has also changed. According to the farmers, this has been observed mainly due to shift of rainfall (monsoon is late), new varieties that can be planted earlier and have shorter growth cycle.

The shift in crop cultivation timings is mainly due to late onset of rainy season. Usually, it has been found that farmers wait for first showers of rain and then only plant their crops. In several cases, in such circumstances, the land is kept fallow. For crops like rice, seedling shouldn't wait long in the nursery. At any cost it needs to be planted. The soil conditions are such that there is no/low level of water and it is very hard to pull out as well as plant the rice seedlings causing difficulties especially to women. Other marginal groups (Dalit, Janajati) who have little khet (lowland) without irrigation facilities, and who work as daily wage labors also face similar problems. High temperature also makes it difficult to work on farm.

As could be obvious from weather pattern (described in detail in subsequent section), temperature has been increasing constantly year after year leading to early maturity of crops thereby shifting harvesting time earlier in most of the cases.

Table 21: Crop Calendar (Agyouli, Nawalparasi)

Month	Reference	Baisakh	Jestha	Ashad	Shrawan	Bhadra	Ashwin	Kartik	Mangshir	Paush	Magh	Falgun	Chaitra
Crops	Time	(Apr./May)	(May/June)	(June/July)	(July/Aug.)	(Aug./Sept.)	(Sept./Oct.)	(Oct./Nov.)	(Nov./Dec.)	(Dec./Jan.)	(Jan./Feb.)	(Feb./Mar.)	(Mar./Apr.)
Rice	Past												
	Present												
Maize	Past												
	Present												
Rapeseed	Past												
	Present												
Lentil	Past												
	Present												
Flaxseed	Past												
	Present												

(Source: Sthapit and Neupane, Unpublished/2015; validated and modified)

Note: Based on Nepali Calendar; First month is Baisakh and the twelfth month is Chaitra; Baisakh corresponds near about mid-April to mid-May; Past=around 10 years ago (2001); Present=Nowadays, recent 5 years (base is 2011)

Table 22: Crop Calendar (Majhthana, Kaski)

Month	Reference Time	Baisakh (Apr./May)	Jestha (May/June)	Ashad (June/July)	Shrawan (July/Aug.)	Bhadra (Aug./Sept.)	Ashwin (Sept./Oct.)	Kartik (Oct./Nov.)	Mangshir (Nov./Dec.)	Paush (Dec./Jan.)	Magh (Jan./Feb.)	Falgun (Feb./Mar.)	Chaitra (Mar./Apr.)
Rice	Past												
	Present												
Maize	Past												
	Present												
Millet	Past												
	Present												
Wheat	Past												
	Present												
Rapeseed	Past												
	Present												
Potato	Past												
	Present												

Note: Based on Nepali Calendar; First month is Baisakh and the twelfth month is Chaitra; Baisakh corresponds near about mid-April to mid-May; Past=around 10 years ago (2001); Present=Nowadays, recent 5 years (base is 2011)

Table 23: Crop Calendar (Ghanpokhara, Lamjung)

Month	Reference Time	Baisakh (Apr./May)	Jestha (May/June)	Ashad (June/July)	Shrawan (July/Aug.)	Bhadra (Aug./Sept.)	Ashwin (Sept./Oct.)	Kartik (Oct./Nov.)	Mangshir (Nov./Dec.)	Paush (Dec./Jan.)	Magh (Jan./Feb.)	Falgun (Feb./Mar.)	Chaitra (Mar./Apr.)
Rice	Past												
	Present												
Maize	Past												
	Present												
Millet	Past												
	Present												
Potato	Past												
	Present												
Soybean	Past												
	Present												
Black gram	Past												
	Present												
Rapeseed	Past												
	Present												

Note: Based on Nepali Calendar; First month is Baisakh and the twelfth month is Chaitra; Baisakh corresponds near about mid-April to mid-May; Past=around 10 years ago (2001); Present=Nowadays, recent 5 years (base is 2011)

3.4.5. Vulnerability Matrix

The magnitude and level of impact of different types of hazards on various natural capital (the major livelihood resource for an agrarian economy) of the community has been analyzed (Table 24 to 26). It gives a better understanding of interaction between these two factors. Ghanpokhara is the most affected area by natural hazards. However, Nawalparasi residents have found flood affecting almost all livelihood resources and it has also received a highest point in ranking exercise (30), in comparison with landslide (26) and hailstone (25) of Ghanpokhara and drought (16) of Majhthana. Looking at the individual component, staple crops are most affected in all three VDCs with total impact points of 8 in Agyouli, 9 in Majhthana, and 14 in Ghanpokhara. The sum total of all impacts also seems to be highest in Ghanpokhara.

It has been found that the impact of different types of hazards are different for men and women as well as for different ethnic groups due to certain differences between them (Annex 20 to 22). For instance, women believe that hazards like landslide and floods have little impact on them since both the preventive and curative measures are taken by male members and the damage caused by it is of little concern to women unless it directly affected their life (and property). However, since farming is their primary job, any hazard that affects crop of livestock is of their utmost concern. In this sense, in most cases drought is considered the most disastrous hazard followed by insect-pests/diseases, wind, downpour, fog, etc. Whereas in case of Dalits and Janajatis (except for Ghanpokhara) due to low levels of assets and marginal/vulnerable land, they are susceptible to all major hazards and impact on them is big. Besides, their dependence on wage labor as well as workload increases with the negative impact of the hazards. For instance, drought will make their job difficult (land plowing, tilling, uprooting need more power and labor), insect-pest infestation will render them jobless (since no farm work is available if there are no crops).

The whole analysis in all the groups shows that agriculture is the most vulnerable sector of all with some effects of hazards on livestock, pasture, forest, and water sources. Other resources/capitals are not affected that much. This also provides evidence in favor of and calls for the need for CSA.

Table 24: Vulnerability Matrix (Agyouli, Nawalparasi)

Livelihood Resources (Capital)		Impact Score (0=No; 1=Low; 2=Medium; 3=High)			Total
		Flood	Drought	Insect-Pest	
Natural	Forest	1	3	0	4
	Water Source	2	3	0	5
	Grazing Land	3	3	0	6
	Staple Crops	3	3	2	8
	Livestock	2	3	2	7
Physical	Road	2	0	0	2
	Irrigation System	3	0	0	3
	School	2	0	0	2
	Market/Haat	2	0	0	2
	Houses	2	0	0	2
	Comm. INST	0	0	0	0
Human	Health Worker	2	2	3	7
	Teacher	0	0	0	0
	Social Worker	1	1	0	2
Social	Women's Group	2	2	0	4
	Cooperatives	0	0	0	0
Financial	Banks	0	0	0	0
	Labor/Daily Wages	3	3	0	6
Total		30	23	7	-

(Source: Sthapit and Neupane, Unpublished/ 2015)

Table 25: Vulnerability Matrix (Majhthana, Kaski)

Livelihood Resources (Capital)		Impact Score (0=No; 1=Low; 2=Medium; 3=High)								
		Flood	Landslide	Lightning	Wind	Fire	Drought	Hailstone	Insect-Pest	Total
Natural	Forest	1	2	0	1	2	0	0	0	6
	Water Source	0	1	0	0	0	2	0	0	5
	Grazing Land	0	0	0	0	1	0	0	0	1
	Staple Crops	1	1	0	2	0	2	2	1	9
	Livestock	0	0	0	0	0	1	0	1	2
Physical	Road	2	2	0	0	0	0	0	0	4
	Irrigation System	2	2	0	0	0	2	0	0	6
	School	0	0	0	0	0	1	0	0	1
	Market/Haat	0	0	0	0	0	1	0	0	1
	Houses	0	1	0	1	0	2	1	0	6
	Comm. INST	0	0	0	0	0	1	0	0	1
Human	Health Worker	0	1	0	0	0	0	0	0	2
	Teacher	0	1	0	0	0	0	0	0	2
	Social Worker	0	1	0	0	0	1	0	0	3
Social	Women's Group	0	0	0	0	0	2	1	1	5
	Cooperatives	0	1	0	0	0	0	0	0	2
Financial	Banks	0	1	0	0	0	0	0	0	2
	Daily Wages	0	1	0	0	0	1	1	0	4
Total		6	15	0	4	3	16	5	3	

Table 26: Vulnerability Matrix (Ghanpokhara, Lamjung)

Livelihood Resources (Capital)		Impact Score (0=No; 1=Low; 2=Medium; 3=High)								Total
		Hailstone	Landslide	Insect-pest	Downpour	Wind	Drought	Fog	Lightning	
Natural	Forest	2	2	1	1	2	2	1	1	12
	Water Source	1	2	1	2	1	2	0	0	9
	Grazing Land	2	1	1	1	1	1	1	0	8
	Staple Crops	3	2	2	2	2	2	1	0	14
	Livestock	2	1	2	1	1	1	1	1	10
Physical	Road	2	3	0	2	0	0	0	0	7
	Irrigation System	1	2	0	1	0	2	0	0	6
	School	1	1	0	1	2	1	0	1	7
	Market/Haat	1	0	0	1	1	0	0	0	3
	Houses	1	2	0	1	1	1	0	1	7
	Comm. INST	1	1	0	1	1	0	0	0	4
Human	Health Worker	1	1	0	1	1	0	0	0	4
	Teacher	1	1	0	1	1	0	0	0	4
	Social Worker	1	2	0	1	1	0	0	0	5
Social	Women's Group	1	1	0	1	1	1	0	0	5
	Cooperatives	1	1	0	1	1	0	0	0	4
Financial	Banks	1	1	0	1	1	0	0	0	4
	Labor/Daily Wages	2	2	0	2	2	1	1	0	10
Total		25	26	7	22	20	14	5	4	-

3.4.6. Adaptation Matrix

Information from Agyouli shows that people have been adopting different measures to adapt to the changing climate and associated hazards (Table 27). For instance, construction of gabion wall is common to control flooding although it was not sufficient given limited resources the community can leverage from their personal influences. Transplanting of tree saplings and forage plants are also done to stop sweeping away of riverbanks. For drought, there is little possibility of using ground water, hence deep boring is only available option. Insect-pests are not so common, so preventive measures are taken by the communities through application of insecticides and pesticides. These are not sustainable and it was felt a need for bio-pesticide, IPM, and other such technologies. Resistant and locally adapted varieties are also important and hence need of community seed bank is being felt.

Regarding the adaptation measures adopted in Majhthana, people use local methods. Although such technologies are easy to operate, their effectiveness and sustainability can be questioned partly due to lack of financial resources. The community people echoed the need for Emergency Fund to cope with climate change related hazards (Table 28). The major alternatives or necessary provisions related to up-scaling of the activities done at present include awareness raising, insurance (crops, livestock, etc.), and provision of emergency fund so that community can act promptly when needed.

In Ghanpokhara, people are poorly aware of the preventive measures to hazards. They are generally doing nothing scientifically to adapt to the climatic hazards and to combat climate change effects (Table 29). Some of the approaches are also related to superstitions and have no direct adaptive value. Thus, it seems that much is needed to be done at this VDC compared to others. The starting point could be from awareness raising with side by side demonstrations of CSA related adaptive measures.

The analysis shows that the adaptation measures are not sustainable and effective because the tools used in those measures need frequent (yearly) repair and maintenance. Since the community requires labor contribution, it may affect the women's workload since they are the one left behind at home. There is no significant difference in adaptation measures between men and women. On the other hand, awareness level of Dalit groups were found to be lowest and hence any CSA technologies and practices intervention targeted to these communities must accompany appropriate awareness and capacity building programs. The best approach would be to build a package of programs with following components: awareness raising; capacity building; engagement of local institutions and stakeholders; technical support; hardware support; creating enabling environment for marketing and value chain participation.

Table 27: Adaptation Matrix (Agyouli, Nawalparasi)

Hazard	Adaptation Measures	Effectiveness	Sustainability	Alternatives
Flood	Construction of gabion wall in areas most prone to erosion by river; Transplantation of tree saplings and forage plants	Yes (Not sufficient)	Yes	Construction of gabion wall covering large area (for river training) so that it need not be replaced each year; Restore bioengineering and conservation area in degraded area with extensive re-plantation and restriction of livestock access
Drought	Construction of deep boring well	Yes (Not sufficient)	Yes (Not complete due to limited funding)	Support for the construction of deep boring
Insect-Pest	Apply chemical measures before infestation (prevention)	Yes	No	Training on bio-pesticide preparation; Support to community seed bank

(Source: Sthapit and Neupane, 2015)

Table 28: Adaptation Matrix (Majhthana, Kaski)

Hazard	Adaptation Measures	Effectiveness	Sustainability	Alternatives
Hailstone	Plastic house; netting; bamboo shading; early varieties that escapes hailstone season	High but access low due to high cost (only by limited)	Good	Need for tough plastic; research to develop resistant variety; scaling-up plan for appropriate methods
Lightning	None but awareness about preventive measures (no long tree plant near house)	Low	Low	Dumping of electricity in earth; awareness; emergency fund
Drought	Plantation; plastic pond; community pond; drought tolerant varieties; drip irrigation	Low due to lack of budget (not implemented much)	Yet to be tested	Lift irrigation from water source; awareness; water conservation; effective use method
Landslide	Gabion wire, check dam, plantation	Low	Low	Emergency fund; awareness; coordination
Wind	None yet but budgeted/planned for planting hedgerow	Low	Low	Planting crops with low height; planting varieties that can be harvested earlier than wind season; emergency fund
Insect-Pest	Insecticides and pesticides, low IPM	High	Good	IPM need to be promoted and scaled up; Crop insurance
Fire	Fire line; awareness	Low (not used yet)	Yet to be tested	Fire line; awareness; emergency fund (disaster)
Flood	Gabion wire, check dam, plantation	Good where adaptation measures are applied (not enough due to low budget)	Low due to low coverage	Emergency fund; fulfill mandatory criteria; conservation planning

Table 29: Adaptation Matrix (Ghanpokhara, Lamjung)

Hazard	Adaptation Measures	Effectiveness	Sustainability	Alternatives
Hailstone	Small plastic houses covering little area; Escaping the season; Putting Khukuri (Nepalese knife) in Oodan (Iron Stove for cooking using firewood)	Low; believe disastrous hailstone would not come	Low	Plastic tunnel for seeding; tolerant varieties; crop insurance
Landslide	Plantation; Bury plough in the borderline between skidded and non-skidded land (made by recent landslide)	Good but not sufficient	Good	Check-dam; gabion wire boxes; plantation (increased coverage)
Insect-Pest	Insecticides on vegetables; indigenous pesticides	Good	Low	IPM training; cattle-shed improvement; low use of inorganic chemicals
Downpour	None	N.A.	N.A.	Plastic tunnel for vegetable crops
Wind	None	N.A.	N.A.	No idea
Drought	None	N.A.	N.A.	Alternative irrigation approaches; plastic pond; rainwater harvesting system
Fog	None	N.A.	N.A.	Mulching; plastic tunnel for vegetable farming
Lightning	Putting Trisul (Metallic rod with three tips at top, armor used by Hindu gods)	N.A.	N.A.	Earthing on house; superstitious methods suggested

3.4.7. Overall Vulnerability Analysis

The CSA project Team has also brainstormed and analyzed the overall vulnerability to different groups of population. The results are presented in Table (30). The results reinforce that Dalits are more vulnerable compared to other groups of people while the situation of women and Janajatis are relatively similar.

Table 30: Vulnerability of Different Groups of Households

Criteria	All Households	Women	Janajati	Dalit
Poverty	+	++	++	+++
Landholding Size	+++	++	++	++
Land Type and Quality	+++	+++	+++	++
Hazard Vulnerability	+	++	++	+++
Knowledge of Climate Change	++	++	++	+
Knowledge of CSA	+	+	-	-
Impact on Assets	+	+	+	++
Adaptation Response	+	+	+	-
Overall Vulnerability	+	++	++	+++

Note: Based on Expert's Opinion

3.5. Community Institutions

In Agyouli, Local Adaptation Plans for Action (LAPA) hasn't been prepared by the government so far. There are also only a handful of projects/programs: Climate Adaptive Village project of LI-BIRD (funded by Development Fund, Norway: NPR 2.25 million) working on conservation, disaster prevention, and climate adaptation (around 500 households); and Environment Friendly Program of Kawasoti Municipality (funded by MoFALD: around NPR 1.2 to 2.0 million) working on conservation of natural water resources (around 200 households). In Majhthana, the VDC office has already prepared LAPA in 2014 (see MVDC, 2014). There are also few organizations working in climate change issues like USAID's ICCA (Initiative for Climate Change Adaptation) project implemented by iDE (International Development Enterprise) Nepal at national level and Rupantaran Nepal and Resource Identification and Management Society (RIMS) Nepal at district level. Other than these organizations, there are very few or no organization working for either climate change or CSA. In Ghanpokhara, there are no organizations working as of yet, hence obviously no LAPA is prepared yet. However, it is learnt that World Wide Fund for Nature or World Wildlife Fund/WWF (through Hariyo Ban project) will be preparing LAPA for Ghanpokhara in 2016 through a local NGO, Rural Community Development Center (RCDC). The list of

some organizations working at national level is presented in the Annex (29), along with organizations working at CSA project district (Annex 30).

On the other hand, in Nawalparasi, there are numerous community based institutions, especially local groups, clubs, cooperatives, etc. Many of these are registered with Division Cooperative Office of GoN and some with DDC. Few others are informal and not registered with any government authorities. There are also some groups formed by private banks to provide collateral free loans (Table 31). Most of these institutions are involved in saving and credits, and many are established with the aim of social service. There are also some institutions that provide services in terms of buying and selling of consumable goods and/or fertilizers.

There are several community-based institutions at Majhthana. Looking at the situation, it was found that every outside organization operating in this VDC wishes to establish its own structure and mechanism instead of using the existing ones. Therefore, there are several cooperatives with duplication of membership. Several institutions like clubs, associations, groups, etc. also exist in the VDC (Table 32). Hence, the community is rich in social and community level institutional base. But this might have unnecessarily increased the burden of the communities in terms of time and money. This may also increase problems in future like that of multiple lending. Participation may also reduce in meetings and other events organized by these institutions. It would have been better if few focused institutions played a vital role rather than all having their own set of interventions. In context of merger between large cooperatives at national level, it is highly desirable that several cooperatives with similar objectives be merged, and saving and credit activities conducted by it.

Information from Ghanpokhara shows that ACAP has formed one Ama Samuha (mother's group), Bau Samuha (Father's group), and Yuva Club (youth club) in each ward of the VDC (Table 33). Some of these groups are registered with the government offices but the majority are not registered as a formal entity. Besides, there are some other specific activity-based groups/cooperatives like Alaichi Samuha (cardamom group), Tarkari Samuha (vegetable growers' group), and Bachat Samuha (saving and credit group). There is no definite record so far of how many are registered or not registered, but information collection from each group is underway. There is also presence of formally registered cooperatives working in several wards of the VDC. The objective of these groups/associations are usually to discuss social issues; sort out community problems; promote saving and credit; support development activities; inspire the youth; support education and health related activities; and play advisory roles, to mention a few. It would be unwise to add more such institutions. Furthermore, it is recommended that "Krishi Vikas Tatha Sanrakshan Krishak Samiti (known as BCDC in past)" in Agyouli,

“Village Climate Change Coordination Committee (VC4)” in Majhthana, and “Conservation Area Management Committee (CAMC)” in Ghanpokhara can be used for coordinating CSA activities.

Looking from GESI perspective, there are several community institutions focusing on women issues and working with women only. This have increased women’s awareness level, capacitated them, and also increased their representation in different formal/informal institutions and decision-making processes. However, no such positive discrimination or affirmative action has been found for Dalit and Janajati groups in particular, although some sort of mandatory participation of these groups of population in development activities seem to have ensured by some groups. The CSA project should also target on capacity building of these institutions, with special focus on women, Dalits and Janajatis.

Table 31: Institutional Base of Agyouli

Name	Registration Status	Member HH Number	Active Wards	Objective
Sana Kisan Krishi Sahakari Sanstha	DCO	2300	4 VDCs (Kawasoti, Deurali, Agyouli, Kumarwanti)	S&C
Tribhuvantar Bahumukhi Sahakari Sanstha	DCO	1300-1400	5 VDCs (Kawasoti, Deurali, Agyouli, Kumarwanti, Kalhuwa)	Fertilizers supply (buy and sell)
Agyouli Uddhami Mahila Sahakari	DCO	1115	1, 2, 3, 7, 8	S&C; Sales of goods, fertilizers, etc
Sahara Mahila Bachat Sahakari	DCO	500-600	9	S&C
Himkiran Bachat Tatha Rin Sahakari	DCO	600-700	2 VDCs (Agyouli and Kumarwanti)	S&C
Amaltari Madhyawarti Sahakari	DCO	600-700	2 VDCs (Agyouli and Kumarwanti)	S&C
Sahid Smriti Samudayik Sahakari	DCO	3000	5 VDCs (Kawasoti, Deurali, Agyouli, Kumarwanti, Kalhuwa)	S&C
Mahila Samuha and Other Samuhas (60)	Private Banks	25 each	Several VDCs (6-7)	Lending without collateral
Krishi Vikas Tatha Sanrakshan Krishak Samiti (BCDC)	DDC	890	All VDC	S&C; biodiversity management; community seed bank
Krishak Samuha (39)	NR	50 each	All VDC	S&C; livelihoods and IGA; biodiversity and seed bank
Kerung Yuva Club	DDC	60	3	Social work
Sunrise Youth Club	DDC	30	7	Social work
Indreni Youth Club	DDC	40-50	7	Social work
Tribhuwantar Youth Club	DDC	30-40	7	Social work
Youth Club (10)	R/NR	30-40 each	All VDC	Social work
Mahila Samuha / Ama Samuha (150)	R/NR	20-25 each	All VDC	S&C
Purush Samuha (40)	NR	20-25 each	All VDC	S&C
Ghas Samuha (7)	R/NR	20-25 each	All VDC	S&C; IGA

Note: R=Registered; NR=Not Registered; S&C=Saving and Credit; IGA=Income Generating Activities

Table 32: Institutional Base of Majhthana

Name	Registration Status	Member Number	HH	Active Wards	Objective
Majhthana Krishi Sahakari	R	228		All wards	Saving and Credit (S&C) related to agriculture and livestock
Sana Kisan Krishi Sahakari	R	1300		2 VDC (+Kalika)	S&C
Tualsi-Mehar Bachat Tatha Rin Sahakari	R	165		All Wards	S&C
Krishi Samuha	DADO	Around 25 each		1 or more in each ward, 15 groups in total	Conduct activities by DADO
Bhagwati Swavalamban Bachat Tatha Rin Sahakari	DADO	180 (30 per VDC)		Established in 6 VDCs for single women	S&C
Majhthana Upabhokta Sahakari	DCO	60		W.N. 9	Marketing of consumable goods
Jivandhara Dugdha Sahakari	DCO	150		W.N. 6	Collection and marketing of milk
Power Samuha	DSCO	Around 15-25 per group		Covers all VDC	S&C; poverty reduction
Aama Samuha	R/NR	25 or more		Randomly within wards; 18 in total	Women empowerment
Yuva Club	DAO	25 or more		Each ward	Social transformation (youth of 16-35 years)
Bal Samuha/Club	District Child Club, DDC	15-20 each		Each ward level; 1 umbrella at school; total 10	Child rights (below 16 years age)
Community Forestry Users' Groups	DFO	20 or more		Random; around 34 groups	Forest conservation and rationale use by community
Bhagwati Samudayik Adhyayan Kendra	DEO	25 or more		W.N. 2; servicing to 4 VDCs	Awareness
Mahila Vikas Samiti	DDC	Around 20-25		Whole VDC	Women empowerment
Village Climate Change Coordination Committee (VC4)	VDC	13*		All Wards	LAPA Implementation and Other Works

Note: R=Registered; NR=Not Registered; *=Representatives from different groups of people from within the VDC with VDC Secretary as Ex-Officio President with 13 members in the executive committee

Table 33: Institutional Base of Ghanpokhara

Name	Registration Status	Member Number	HH	Active Wards	Objective
Alaichi Samuha (4)	DADO	15-35 per group		5 & 7, 6, 7, 8	
Tarkari Samuha	NR	20-25		5	
Krisak Samuha	NR	100		1	Commercial Agriculture promotion
Ama Samuha	ACAP	117		1	Discuss social issues; sort out problems; S&C; support development activities; inspire the youths; support education and health related activities; advisory roles
Yuva Club	DAO	50		1	
Bau Samuha	NR	100		1	
Ama Samuha	ACAP	27		2	
Yuva Club	ACAP	30		2	
Bau Samuha	ACAP	43		2	
Ama Samuha	ACAP	50		3 & 4	
Yuva Club	ACAP	50		3 & 4	
Bau Samuha	ACAP	50		3 & 4	
Ama Samuha	ACAP	80-90		5	
Yuva Club	NR	35		5	
Bau Samuha	NR	80-90		5	
Ama Samuha	NR	22		6	
Yuva Club	NR	28		6	
Bau Samuha	NR	22		6	
Ama Samuha	NR	73		7	
Yuva Club	DAO	47		7	
Bau Samuha	NR	71		7	
Ama Samuha (2)	ACAP	37, 58		8	
Yuva Club (2)	DAO	22, 50		8	
Bau Samuha (2)	NR	37, 55		8	
Ama Samuha	ACAP, DAO	60		9	
Yuva Club	NR	30		9	
Bau Samuha	NR	60		9	
Sahakari	DAO	200		1, 5, 7, 8	S&C
Bachat Samuha	NR	63		9	
Conservation Area Management Committee (CAMC)	ACAP	All Wards*		All Wards	Conservation and Other Works

Note: R=Registered; NR=Not Registered; S&C=Saving and Credit; ACAP=Annapurna Conservation Area Project; *=chosen by all wards in the VDC

3.6. Community Resource Map

To understand about the available community resources and identify possible hazardous areas, community resource maps are prepared for each VDC, by involving community members, which was later verified by others. These maps are shown in the Annex (31) to (33). These maps will be helpful in designing appropriate CSA technologies and practices for the selected sites based on hazard risk. This will also help select appropriate technologies for the two domains (unit of application): farm and ecosystem (as discussed in the introduction section).

3.7. GESI Issues and Opportunities

3.7.1. Differential Impact of Vulnerability on GESI

Climate change affects different groups of population differently. There is a simple case of drought versus flood provided in earlier sections. There are women specific impacts of hazards and their vulnerability and capacity are different. It also applies equally to the discriminated and disadvantaged groups of people, especially the Dalits and Janajatis. As observed during FGDs, usually women, Dalits and Janajatis have limited access to natural resources, are dependent on marginal and vulnerable lands for their livelihoods, and have little opportunities outside agriculture. Hence, due consideration needs to be given for their specific 'condition'. In this regard, prioritizing women, Dalits, Janajatis, smallholder farmers, poor households, etc. is necessary while piloting CSA practices. Next, appropriate consideration should be made on hazards like drought, insect-pest, hailstone, heavy rainfall (downpour) that have direct impact on their livelihoods. For this, appropriate technologies and practices such as those related with soil water retention and conservation, nutrient management, biological pest (insect, pests, weed, etc.) management, agriculture water management, livestock management and improved crop management should be promoted at the household level.

3.7.2. Intra-Household Labor Division

Daily activity clock records the major activities being performed by people in the selected sites (Annex 34 to 39). We investigated work division of males and females using this tool. Each group (men and women) enlisted their major activities as well as that of opposite group. The analysis showed that females bear more workload in all the three sites compared to males and this has also been accepted by the male members. Females are found to be equally participating in farm works with their male counterparts (including caring/tending of livestock) but unlike male members they are also doing all the household chores and have little leisure time, if any. On the other hand, male members have enough leisure time and are taking intermittent rests during daytime too. The wakeup and sleep times also differ between males and females, with latter having less total sleep hours in most of the cases.

3.7.3. Women Emergence as a Decision-Maker and Resource Manager

With less youth (mainly men) and more aged population due to increased influx of men outside the country, women are the only source of labor available for farming in a large number of households. Thus, the phenomenon of feminization of agriculture is prominent. Women are also coming as resource managers, with increased number of women-headed households in the community. Hence, there is an increased need for treating women as a major player in the rural settings. The CSA project should, therefore, make strategy to consider women as an important partner. Their role would be vital from the technology selection and piloting stage. CSA practices should be women friendly and their participation is a must, right from the initial stage of the project. CSA project has prepared and adopted rigorous GESI framework whereby the approach is to enhance or at least be neutral towards promoting 'condition and position' of women (through enhancing access to and control of women in productive resources).

3.7.4. Need for Affirmative Action towards GESI

As already mentioned, women are key players in the rural agrarian economy nowadays. However, the status of women with regards to education, awareness, knowledge and skills are below those of their male counterparts. Similar is the case of Dalits and Janajatis. Hence, there is a specific need for special attention to these groups of people. Capacity building becomes imminent. In line with the selection of appropriate CSA practices it also becomes imperative to increase their awareness level, build appropriate capacity, and enhance their knowledge and skills.

The high receptiveness of these groups of people and their enthusiasm calls for high success rates if they are appropriately engaged in this project. However, given low resources and need for daily participation in wage labor market, their participation in project activities could be a problem if planning is not done in advance. Due compensation for their time, labor and resources should be provided to increase their active and voluntary participation. In case of their contribution in the project activities, we should limit to labor contribution as cash contribution from them is virtually impossible. Their participation will make their voices heard and increase their role in the decision-making process. Besides, the project would make all possible efforts and strive to increase access and control of gender and socially excluded groups to productive assets. On the other hand, to the extent possible their access to government services and facilities, access to finance, and access to information also need to be enhanced by the project.

3.8. Policy and Institutional Baseline

Although, as discussed in the introduction section, policy and institutional baseline will be a separate exercise and will be documented in detail later on, a brief scenario is presented below.

3.8.1. Policy Context

The Government of Nepal (GoN) has emphasized climate change as one of the pertaining issues challenging development efforts. Several policy documents reflect government commitment to combat the ill-effects of climate change. The country Climate Change Policy (2011) prioritizes research and promotion of technologies that are climate resilient as well as contribute to reduction of emission of greenhouse gases (MoE, 2011). The National Adaptation Programme of Action (NAPA) has identified most urgent and immediate adaptation priorities like appropriate mitigation action as a voluntary effort that would develop along a lower carbon path increasing the activities related to climate change adaptation and mitigation (MoE, 2010). Nepal Biodiversity Strategy and Action Plan (2014) under the cross-thematic and cross-sectoral strategies and priority action, that is, adaptation to the effects of climate change has identified climate change adaptation as an important priority action, which includes but is not limited to promotion of environment-friendly farming systems and CSA programs to be implemented by the Ministry of Agricultural Development (MoAD) with support from the Nepal Agricultural Research Council (NARC). It has also stated that knowledge in climate risk assessment and initiation of forest and CSA management programs will be developed by 2020 and number of CSA programs developed is set as M&E indicator (MoFSC, 2014).

At the local level, guided by NAPA, CSA practices comprise important component of agriculture adaptation of the LAPA, Village Periodic Development Plans, District Periodic Development Plans, and Annual Plans of agricultural extension agencies mainly District Agriculture Development Offices (DADOs). LAPA is one of the practical approaches to address site-specific climate issues in participation of local people (MoE, 2010). The thirteenth Periodic Development Plan (2014/15-2016/17) includes climate change adaptive development plans with emphasis on food production and conservation of environmental and natural resources (NPC, 2014), which also provides political space for CSA research and development in the national development plan.

The NARC strategic vision for Agriculture Research Policy (2011-2030) outlines research agenda for upcoming 20 years in order to contribute to a national campaign of increasing productivity, reducing poverty, together with promotion of commercialization and competitiveness of the agriculture and natural resource sectors through the generation and promotion of technology, knowledge, and information that responds to client demand and climate change. Research priority areas are crops and horticulture, livestock and fisheries, natural resource management and climate change, eco-friendly management practices, technology dissemination and extension, and coping with negative impacts of climate change

and global warming (Sova and Chaudhary, 2-14). These research priorities to clear the path for evidence-based research on CSA for its scaling-up.

The Nepal Agriculture and Food Security Country Investment Plan (2010) has identified National Agriculture Sector Development Priority with overall goal to reduce poverty and household food insecurity on a sustainable basis and to strengthen national economy. The document has mentioned the need for enhancing institutional and technical capacity of MoAD at the national level and relevant district level offices for climate risk management, disaster preparedness and prevention from agricultural perspective (Sova and Chaudhary, 2014).

Agricultural Development Strategy (ADS), 2015-35, prepared by the Ministry of Agricultural Development has been endorsed in July 2015, which will be the main strategic document for implementing plans, programs and policies related to agriculture for the next 20 years. The objective of ADS is to present the overall strategy including a 10-year Action Plan and Roadmap and a rationale based on past and current assessment in order to move towards a self-reliant, sustainable, competitive, and inclusive agricultural sector contributing to economic growth together with improved livelihoods, food, and nutrition security. Activities prioritized by ADS are focused on bio-diversity conservation, climate change adaptation, improved infrastructure and equipment for agriculture and livestock service centers, promotion of private and community based seed production, research on stress tolerant varieties and breeds, climate information, and weather indexation systems, early warning system for crop plantation and harvesting, agriculture insurance, improving capacity of extension staff and farmers in climate smart agriculture practices, among others (MoAD, 2015).

To summarize, it seems that there are several key policies emphasizing government focus and commitment on climate change issues/problems. However, there is a need to refine it to specifically address the challenges and tap the benefits posed by climate change. Adoption of climate smart agricultural practices and technologies could provide the right platform in this regard. Besides, since many of the concepts on CSA are still new to policy makers as well as service providers and implementers, it is of dire need to build their capacity for enhancing decision-making efficiency as well as implementation at the grassroots level.

3.8.2. Institutional Context

The Ministry of Agricultural Development (MoAD) of the GoN is the key national level institution to oversee policies and strategies related to reducing climate change vulnerability of agriculture sector and improving food production. The Food Security and Environment division of MoAD, led by the Joint Secretary, is the national focal division for agriculture and climate change. The division has recently

established a unit to deal with environment and climate change named as 'Environmental and Climate Change Unit'. The unit is led by an officer level staff.

The NARC is the institutions with mandate on agricultural research. The Planning and Environment Division of NARC is the main division responsible for conducting research on climate change and CSA.

The Department of Agriculture (DoA) of the GoN is responsible for ensuring extension of appropriate climate smart technologies and approaches through its regional, district, and local level units. The Planning and HR division of the DoA, led by the Deputy Director General, is the key division to ensure planning and capacity building of the DoA staffs. The division is the key unit to promote CSA in DoA system. At the regional level, the Regional Agricultural Directorates are the key structures and mechanisms to coordinate planning, implementation, and monitoring of agricultural extension at regional as well as district level (through District Agriculture Development Offices/DADO and Agricultural Service Centers/ASC). The quarterly progress review and planning meetings of the Regional Agricultural Directorate are the appropriate platforms for strengthening CSA discourse and consultation. Department of Livestock Services (DoLS) is the responsible government department to promote climate smart livestock management interventions through their local implementing units such as District Livestock Service Office (DLSO), and Livestock Service Centers (LSCs).

At district level, DADO is the key institution to plan and implement agricultural development activities. The District Agriculture Development Committee, a committee for agricultural component of the DDC, is the district level mechanism to strengthen discourse on CSA and mainstream climate smart agriculture approaches and technologies at the district development plan and DADO plan.

The Village council at VDC level, chaired by the VDC secretary or VDC chairperson (in case of elected government), is the key institution to promote CSA at local level. The institutions at smallest units in a VDC such as Ward Citizen Forum (WCF), and Community Awareness Center (CAC) are the structures at the bottom level to ensure CSA integration at the VDC planning through the 14 step planning process of the GoN.

In terms of institutions, GoN has been responsive through the creation of Climate Change Units and by revisiting its roles and responsibilities, and in some cases sending directives to the implementing units at district level. However, with respect to CSA research and extension, there is a capacity gap to understand CSA, design research, and promote no-regret CSA technologies through planning. The ADS clearly reflects capacity building program for the government stakeholders on CSA. During the inception phase, interaction of project team with local communities,

DADOs, DoA, and MoAD officials reveal the importance of trainings, short courses, and exposures for government extension agencies and farmers in the CSA for research and scaling up.

3.9. Baseline Indicators and Values as per Objective Form

The Objective Form for CSA project has already been prepared. It has information on output and outcome level expected results, their respective indicators, and the baseline value for it.

3.9.1. Baseline Indicators and Values for Output Level Results

Output 1

A portfolio of champion CSA (technologies and practices) for the women and poor farming households of three agro-ecological zones (terai, mid-hill, and high hill) of Nepal.

Indicators: A pool of potential CSA technologies and practices for the women and poor farming households of three agro-ecological zones prepared by end of July 2015; At least 45 potential CSA technologies (15 per agro-ecology) for the women and poor farming households screened for field piloting and/or verification by August 2015; At least, 15 champion CSA technologies (5 per agro-ecology) for the women and poor farming households screened through field piloting and verification, and/or categorized into 4 portfolios (soil, seed, water, and pest) by December 2016.

Baseline Value: There are potential CSA technologies recommended by various organizations, however, portfolio of champion CSA for 3 agro-ecological zones in consolidated form is not recorded and analyzed; No any potential CSA technologies and practices tested for the selected three agro-ecological zones; No any champion CSA technologies and practices specifically recommended for the selected three agro-ecological zones.

Output 2

Assessment report of institutional and policy status (opportunities and barriers) for scaling up of CSA technologies for women and poor farming households in Nepal by the DoA, Nepal.

Indicators: Policy and institutional barriers, opportunities and recommendations on CSA in Nepal by May 2016; A comprehensive database of CSA initiatives about institutional frameworks and financial mechanisms including opportunities and barriers of CSA scaling up at farmer level by May 2016.

Baseline Value: Policy and institutional analysis are fragmented. A comprehensive report with focus on the barriers and opportunities of CSA scaling up in the broader political context in Nepal is not available.

Output 3

Climate analogue sites (recommendation domain) of the identified CSA portfolio.

Indicators: Climate Analogue maps (current and future climate) of at least 3 reference sites represent 3 agro-ecology of Nepal with the climate matching sites for CSA extrapolation by December 2016.

Baseline Value: Access to software is free; Online data available for free; Few trained human resources at NARC and LI-BIRD; No analogue map for CSA portfolio.

Output 4

CSA scaling up pathways and implementation plan for Nepal.

Indicators: Project Steering Committee (PSC) agreed CSA scaling up pathways for agriculture sector in Nepal considering existing financing mechanism, institutional approaches, involvement of various stakeholders, and process of technology transfer by Feb 2017; PSC agreed implementation plan considering existing financing mechanism, institutional approaches, involvement of various stakeholders, and process of technology transfer by February 2017.

Baseline Value: Research on dissemination pathways of sustainable agricultural interventions in general is low in Nepal; No pathways and implementation plan of CSA scaling up in Nepal.

Output 5

Increased capacity (knowledge, skill and understanding) of GoN stakeholders in designing sub national programs and plans for promoting CSA for women and poor farming households.

Indicators: Capacity of 10 policy makers (senior government officials from MoAD, DoA, NPC, MoSTE, MoFALD, AEC, and NARC) strengthened on technical and political dimension of CSA scaling up by December 2016 by engaging the senior government officials at different stages of CSA technology/practices testing, for example in participatory planning, joint monitoring and evaluation of CSA technologies on the ground, giving them opportunity to interact with farmers; 20 agricultural extension agents, and 10 planning officers of District Development Committees (DDCs) at district level trained on technical and socio economic dimension of CSA technologies and practices by June 2016.

Baseline Value: Government agriculture programs are very thin and less focused in Climate Change due to inadequate capacity of government staffs and very little research back up in Nepal related.

3.9.2. Baseline Indicators and Values for Outcome Level Results

Outcome 1:

Selected champion CSA technologies and their scaling up pathways reflected in the planning document of MoAD, DoA, DADOs, and DDCs, to mitigate the challenges of climate change and variability faced women and poor farming households.

Indicators: CSA technologies and practices suitable for different geographic, agro-ecological, and socioeconomic contexts targeting women and poor farming households are correctly identified and adopted sufficiently into the annual plans of MoAD and DoA by 2020; The DADOs and DDCs of the recommendation domains (climate analogue sites) of CSA technologies use CSA technologies in their annual / periodic plans by 2020; CSA strategies and technologies and strategies will be used in 200 Local Adaptation Plans of Action (LAPAs) in Nepal by 2020.

Baseline Value: CSA is identified as a priority area by Agriculture Development Strategy of Nepal, but CSA strategies in program planning of MoAD, DoA, DADOs, and DDCs is not used; There are no LAPAs integrating CSA technologies and approaches to adapt to climate change impacts.

Outcome 2

Climate Smart Agriculture integrated as a strategy to agricultural development in the National Periodic Development Plan of Nepal formulated by National Planning Commission (NPC) of Nepal.

Indicators: GoN's national periodic development plan with CSA as an important strategy in the agriculture and food security component formulated by NPC by 2020.

Baseline Value: Climate change adaptation are integrated in the development plan but there is lack of systematic integration and evidences of CSA in the national periodic development plan.

IV. Conclusion and Recommendations

Conceptualizing CSA in the Context of Nepal

Based on the review of literature, and Nepalese context, climate smart agriculture in Nepalese context could be defined as “a system of agriculture that is adaptive to climate change, mitigates its effect, and improves food security and productivity along with improvement in the condition and position of women and socially excluded groups of people (poor)”. These CSA technologies and practices also need to be acceptable to farmers and considered from both farm as well as landscape level. The CSA should also differentiate subsistence as well as commercial (semi-commercial) farms (having surplus production).

Site Characteristics

The CSA project is spread in all three representative major agro-ecological zones of Nepal. The idea is to collect evidence for major CSA technologies and practices for the representative sites, which could later be recommended for most of the locations of Nepal, especially the areas where farming could be practiced (that is, the cultivable area). The Agyouli representing terai areas, Majhthana representing mid-hills, and Ghanpokhara representing high-hills were the sites selected for this research-based project. The sites are representative of most areas of Nepal and hence the CSA technologies and practices recommended for these sites could be equally applied in most other areas analogous to these sites. The terai represents altitudes below 1000m asl, mid-hills up to 2000m asl, and high hills up to around 3000m asl (settlements could be found up to around 3000m asl).

Socio-Demographics, Farming, and Livelihoods

Agriculture is the mainstay of the Nepalese households and the three selected sites are no different with existence of integrated farming system comprising both crop and livestock. Major crops are dominated by rice, maize, and millet with potato, rapeseed (mustard), and other crops are also common. Vegetables are also grown in small scale in these areas with some households having fruits and spices. Farming is usually rainfed with no or low availability of year-round irrigation facilities and crops are cultivated usually in two domains: Khet (lowland) and Bari (upland). The number of household of the VDCs ranges from around 700 (mid to high hills) to 2700 (terai), with sex ratio dominated by females (72 males per 100 females in mid-hills). Thus, female population at home and available for farming is increasing in the hill regions with similar scenario in other agro ecological zones. This is further exacerbated by high rates of migration of males and absentee households (around 40%). Terai is dominated by Tharu communities, mid-hills by Brahmin/Chhetri, and high hills by Gurung. Literacy rate is higher in terai and lower in high hills. Terai area is also characterized by high availability of good quality cultivated land which becomes rare as one moves up the hills although Bari and pakho land are high in hills, thus, making average land holding higher as one goes

up. Average land holding is around 10 ropani (half hectare), and sharing/renting-in/out are common practices. There are several smallholder farmers in all regions (around two-third on average) with some even without any land. Agriculture is the main source of livelihood in all the regions but there is increasing share of remittance due to high foreign migration (higher migration rates observed compared to national data). Poverty head count showed Majhthana to be fairer with low rates around 10%, whereas highest in Ghanpokhara with around 35% poorer households. Food insecurity, however, is relatively equally distributed among these three sites, ranging from 33-45%. These rates of poverty and food security are usually higher than the district averages.

It is also found that terai has sufficient ground as well as underground water sources, whereas hill regions are lacking sufficient water sources. Water lifting for irrigations is, thus, an option. There is also opportunity to expand biogas in terai as an alternative for power source (mainly cooking) but this seems less feasible for hills. There is a scope of solar use for power and light in all three sites. Again, looking at the household facilities, interestingly, it is found that mobile penetration is as high as 87% (minimum at Ghanpokhara, around 61%). Hence, there is scope for ICT based agriculture information system with appropriate trainings and capacity building.

Perception on Climate Change and CSA

Regarding the climate change, all the three sites have seen the changes in different weather and climatic parameters, with occurrence of natural hazards, which has direct impact on the crops being cultivated. Farming has seen some drastic changes like shift in sowing/planting and harvesting time, changed flowering behavior (early or delayed), increased incidence of diseases, insects, and pests, etc. Due to low awareness, people in these sites have more or less accepted it as their fate. The FGDs show that as low as 10% of the household having knowledge of climate change and its impact. They have also little knowledge of CSA technologies and practices but are enthusiastic to try these to improve their farming and ultimately their livelihoods.

Vulnerability Assessment

The baseline study also considers vulnerability assessment to be an important component as well as major tool for data collection at community or VDC level. The results provided some of the important information, which have direct bearing on the technologies being tested at these sites, since farm could not be a standalone unit for CSA application.

The vulnerability analysis shows that flood and drought are important hazards for Agyouli but hailstone, drought and landslides are common in hills (mid and high). Wind, lightning, fog and fire are also common problems occurring almost every

year but they have little impact on life and property. However, most probably due to changing climate, the incidence of insects, diseases and pests are increasing nowadays. Besides, heavy rainfall usually in the harvesting period is also becoming nuisance affecting crop yields and hence household incomes severely. The behavior of these hazards has also changed and the timing, frequency, quantity, and quality have also changed. Compared to a typical year some 10-15 years ago, the occurrence of these hazards has changed, that is, the distribution of hazard occurrence pattern by months has changed. The most visible impact is from the precipitation, which is directly related to most of the hazards like drought, downpour (heavy rainfall), landslides, floods, etc. Low or heavy rainfall at times bring about hazards.

The weather pattern also show that in general temperature has increased in the selected districts. This has resulted in changes in cropping pattern. Most of the crops in these areas are planted and harvested at different times than in the past. Use of early/late varieties as well as stress-tolerant and hardy varieties are also increasing gradually replacing the local varieties and crops. Staple crops are the most affected by the changing climate and hence changing vulnerabilities. Besides, these have also affected most other livelihood options and resources. The poor and marginalized groups of people with little livelihood resources and much dependency on wage labor are affected the most. Due to low/no resources, the communities of the selected VDCs are less adapted to the vulnerabilities and there are not much preventive or curative measures taken.

Vulnerability of Population and Sector

The analysis shows that the most vulnerable sector is crop followed by livestock, forest, pastures, water sources, etc. The most vulnerable group of population are those with limited and fragile land, mainly the smallholder farmers, women, Dalits and Janajatis.

Institutions and Policy

Although there are several community based institutions in all three sites, they are not capable to generate and mobilize the required resources and low level of awareness is hindering the successful adoption of scientific methods. Again, there are several external organizations supporting them but these are insufficient, scattered, and are less focused on major livelihood components and climate change. This have been compounded by low level of available local community resources as well as high number of smallholder and poor farmers.

The analysis of Community Resource Map also confirmed existence of low levels of natural resources and highly disaster prone areas. Policy and institutional analysis show that although there are several documents that have considered climate change as important factor to be considered, there is lack of focused and

integrated approach to combat the ill-effects of climate change as well as to turn challenges posed by it to opportunities. Besides, the capacity of decision/policy makers needs to be enhanced to mainstream climate change or more specifically CSA in the policy documents. CSA is yet to be clearly accepted and integrated as the major factor for agricultural development in Nepal. The problem is also in the institutional mechanism since, besides ministries and department of agriculture, there are ministry and department of environment, NARC, NPC, etc., at national level and several government authorities at local level with conflicting/confusing roles and responsibilities.

Institutional Base

There are a handful of national and district level organizations working in climate change sector of which a few are focusing on CSA. But there are very few organizations working in the selected sites. However, there are several community-based institutions working for development of the VDC. For the CSA project, the following institutions can be important for using as an entry point for carrying out its activities: BCDC in Agyouli, VC4 in Majhthana, and CAMC in Ghanpokhara.

Performance Indicators' Benchmark

Baseline values for outcome level indicators also clarify that CSA is prioritized by ADS but not integrated by MoAD, DoA, DADOs, DDCs, etc. NAPA and LAPA are also yet to be fully implemented. There is also lack of systematic integration of CSA in national periodic development plans. Besides, at the output level, CSA technologies and practices are not available for any agro ecological domains; policy and institutional mechanisms are fragmented; research is due for providing appropriate scaling-up pathways, implementation plan, and financing mechanism; and capacity of policy makers needs enhancement for focused efforts.

Gender Equity and Social Inclusion

Women and Dalits are found to be most vulnerable groups of population. In context of their rising role on rural economy and acceptance of their equal participation and representation at all levels (structures and mechanisms), it becomes imperative that the project should ensure women participation with proper analysis of their 'condition' and 'position' in all the project activities from the very beginning. This should be complemented, however, by appropriate capacity building endeavor to address the low levels of awareness and knowledge on part of these groups of population.

Recommendations

Given all these discussions, it can be said that there is high potential for successful intervention of CSA practices in these communities. Awareness raising, supplemented by training and technical and material support, could make long lasting and readily visible impact in these communities. Although the dominant

communities in the project sites are indigenous people with low education, they are highly receptive and eager to improve their quality of living. The hard living conditions have rendered them supportive of research and development initiatives and the project could benefit from this due to high level of ownership and possibility of sustainability. However, given low level of individual assets and income it is recommended that the project should provide adequate compensation for research trials as well as the share of community should be more based on in-kind contribution like labor rather than cash contribution. The CSA practices should address with the local needs and demands, consider the system perspective. The following recommendations are inferred for successful implementation of the CSA project:

Intervention Approach

The pocket areas should be developed by finding out the niche and a complete package of technologies and practices should be piloted in the participating farms. This should also serve as demonstration farms for scaling-up in the later stages.

Targeted Beneficiaries for CSA Project

The CSA project should be targeting different groups of people with differentiated approaches. The differentiated technologies and practices appropriate for each groups of population should be prepared and prioritized. The following groups of population should be targeted (preference given): Dalit households, women headed households, and Janajati households. From the point of view of production, both the subsistence and commercial farms (value chains) with surplus production should be considered. The technologies and practices should be piloted and tested for different types of land: upland and lowland. The unit of application should be both farm (household) as well as landscape.

Knowledge and Capacity Building

Knowledge on climate change and CSA of the local people is very low which implies the need for rigorous capacity building activities. Awareness raising campaigns with frequent sessions of capacity building activities in the forms of trainings and interactions, and improved access to information and technology should be organized for the targeted communities. It becomes vital especially for the women households, Dalits, Janajatis, and smallholder farmers.

Resource Leverage, Mobilization, and Local Financing

The project should strive to leverage local resources by building synergy with other organizations/projects working in the area, including the government organizations and private sector. The sharing of project financial needs by the communities should also be ensured. In case of communities that cannot contribute cash, provision for replacement by in-kind contribution (like labor) should be made.

V. Notes

Agyouli VDC: While preparing the proposal for this project Agyouli was categorized as a VDC, however, recently the GoN decided to include some of the wards from this VDC in the newly formed municipality, the Kawasoti municipality. However, this project treated the previous administrative boundary of the VDC as a unit for implementing this project.

Nepalese Calendar: The Nepalese calendar is different than the English calendar. The names of the months are also different. The Nepalese months are (from first to twelfth): Baisakh, Jestha, Ashad, Shrawan, Bhadra, Ashwin, Kartik, Mangshir, Paush, Magh, Falgun, and Chaitra, respectively. Besides, the first month of Nepalese calendar does not also corresponds to the first month of English calendar. For instance, Baisakh usually corresponds with mid-April to mid-May, the dates of which also differ each year. This is because the number of days in each month of Nepalese calendar differs each year and is between 29 to 32 days. The calendar years are also different than the English calendar and is around 57 years ahead, that is, AD 2015 corresponds approximately with BS 2072.

Dalit: Traditionally, they are the group of people considered to be of lower caste. Although, the government has abolished such practices, it is deep rooted in the society. These groups of people are usually resource poor and the most disadvantaged groups in the society with low education, less skills, and hence low earning opportunities.

Janajati: They are indigenous group of people living in the respective regions from undated period. There are several such groups of people characterized by low levels of access to productive resources and low levels of representation in formal structures and mechanisms. They are dependent mainly on natural resources for their livelihoods and are less educated and skilled.

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VII. Annexes

Annex 1: List of Participants in Baseline Survey, Nawalparasi

Name	Sex	Ethnicity			Affiliation
		D	J	O	
Puspa Mahato	F		J		Member, Woman Farmers Group
Sumitra Mahato	F		J		Member, Woman Farmers Group
Mahaniriya Mahato	F		J		Member, Woman Farmers Group
Sikhan Kumari Mahato	F		J		Member, Woman Farmers Group
Sabita Mardania	F		J		Member, Woman Farmers Group
Moti kumari Mahato	F		J		Member, Woman Farmers Group
Jaya Kumari Gurau	F		J		Member, Woman Farmers Group
Kamala Pariyar	F	D			Member, Woman Farmers Group
Sita Mahato	F		J		Member, Woman Farmers Group
Lalmati Mardaniya	F		J		Member, Woman Farmers Group
Ram Kumari mardaniya	F		J		Chairperson, Woman Farmers Group
Rupani Gurau	F		J		Member, Woman Farmers Group
Janaki Chaudhary	F		J		Member, Woman Farmers Group
Parwati Bhandari	F			O	Chairperson, BCDC
Buddhi Ram Mahato	M		J		Secretary, BCDC
Draupadi Basnet	F			O	Member, BCDC
Amrita Mahato	F		J		Ward Representative, BCDC
Saraswati Mahato	F		J		Member, BCDC
Bhumi P. Shrestha	M		J		Member, BCDC
Arjun Shrestha	M		J		Member, BCDC
Dan B. Mahato	M		J		Member, BCDC
Devnarayan Mahato	M		J		Member, BCDC
Uttar P. Sigdel	M			O	Member, BCDC
Chet Narayan Mahato	M		J		Member, BCDC
Mina Kumari Mahato	F		J		Member, BCDC
Krishna P. Mahato	M		J		Chairperson, Dandabar Sub-farmer Group
Januka BK	F	D			Member, Sundarbasti Tole Improvement Committee
Khim B. BK	M	D			Chairperson, Sundarbasti Tole Improvement Committee
Dilmaya Shrestha	F		J		Chairperson, Dandabar Sub-farmer Group
Phaliram Mahato	M		J		Advisor, BCDC
Amritiya Mahato	F		J		Member, Dandabar Sub-farmer Group

Note: M=Male; F=Female; D=Dalit; J=Janajati; O=Other Ethnicity; B.=Bahadur; P.=Prasad; BK=Bishwakarma; BCDC=Biodiversity Conservation and Development Committee

Annex 2: List of Participants in Baseline Survey, Majhthana, Kaski

Name	Sex	Ethnicity			Affiliation
		D	J	O	
Indra B. Khatri	M			O	Vice Chairman, VC4
Ram Chandra Tiwari	M			O	VDC President, Nepali Congress
Khim B. Thapa Magar	M		J		Chairman, SC3
Dipak Nepali	M	D			Secretary, Chetanshil Krishak Samuha
Padam P. Poudel	M			O	Chairman, Small Farmer Agriculture Cooperative
Nirmala Gurung	F		J		Chairman, Aama Samuha, Majhthana-4
Gopal B. Bhujel	M		J		Member, Indreni Krishi Samuha
Nar B. Nepali	M	D			Secretary, VC4
Chhabil Adhikari	M			O	VDC Vice-President, NCP, Maobadi
Durga Bhattarai	F			O	Treasurer, Sahanshil Power Samuha
Radha Bhurtel	F			O	Chairman, Power Samuha, Majhthana-6
Sita Devi Tiwari	F			O	Chairman, Deurali Krishi Samuha
Hira Lal Sah	M				Junior Technician, Agriculture Service Center (GoN)
Parbati Bhujel	F		J		Treasurer, Indreni Krishi Samuha
Sharmila Poudel	F			O	Social Mobilizer, LGCDP, Majhthana
Bhoj B. Adhikari	M			O	Chairman, Majhthana Agriculture Cooperative
Kaushila Nepali	F	D			Chairman, Power Samuha, Majhthana-2
Debi Acharya	F			O	Chairman, Power Samuha, Majhthana-1
Gita Tiwari	F			O	Chairman, Mankamana Krishi Samuha
Bishnumaya Bastola	F			O	Member, VC4
Kiran Babu Bhujel	M		J		AHW, Majhthana Health Post
Chinta Gurung	F		J		Member, Power Samuha, Majhthana-4
Santosh Tiwari	M			O	Member, Aalainchibari CFUG, Majhthana-1
Yavnath Bhurtel	M			O	Community Motivator, ICCA/DCDO/CM
Ram Krishna Bhurtel	M			O	Ward Coordinator, Majhthana-6
Mina Tiwari	F			O	Treasurer, Aama Samuha, Majhthana-1
Mansuba Pariyar	F	D			Member, Power Samuha, Majhthana-8
Rishiram Tiwari	M			O	Ward Coordinator, Majhthana-5
Imanath Kandel	M			O	Member, VC4
Surya P. Bhandari	M			O	Junior Technical Assistant, Livestock Service Center (GoN)
Hari P. Bastola	M			O	Local Farmer
Bishnu P. Tiwari	M			O	VDC Chairman, NCP (A.Ma.Le.)

Note: M=Male; F=Female; D=Dalit; J=Janajati; O=Other Ethnicity; B.=Bahadur; P.=Prasad; VC4=Village Climate Change Coordination Committee; SC3=Soil Conservation Co-ordination Committee; NCP=Nepal Communist Party; CFUG=Community Forestry Users Group

Annex 3: List of Participants in Baseline Survey, Lamjung

Name	Sex	Ethnicity			Affiliation
		D	J	O	
Anita Gurung	F		J		Himchuli Woman Group
Anjana Gurung	F		J		Himchuli Woman Group
Sabitri Gurung	F		J		Himchuli Woman Group
Hom Kumari Gurung	F		J		Saraswati Woman Group
Hemant Gurung	M		J		Saraswati Woman Group
Sun Kumari Gurung	F		J		Santi Jyoti Woman Group
Brek Maya Gurung	F		J		Himchuli Woman Group
Kiran Kasi Gurung	F		J		Janakalyan Woman Group
Bhakta B. Gurung	M		J		Member, Ward Citizen Forum
Puk Man Gurung	M		J		Member, Ward Citizen Forum
Tul Jung Gurung	M		J		Local Farmer
Alisa Gurung	F		J		Santi Jyoti Woman Group
Rasmaya Gurung	F		J		Amrit Woman Group
Babita Gurung	F		J		Social Worker, Volunteer
Chandra Kasi Gurung	F		J		Chairperson, Woman Group
Naramaya BK	F	D			Woman Group Member
Chali Maya BK	F	D			Woman Group Member
Rajendra K. BK	M	D			Social Organizer
Purnakasi Gurung	F		J		Member, Conservation Area Management Committee
Kasimaya Gurung	F		J		Local Farmer
Prem B. Gurung	M		J		Member, Conservation Area Management Committee
Buddhi P. Gurung	M		J		Member, Conservation Area Management Committee
Bhakta B. Gurung	M		J		Member, Ward Citizen Forum
Chet B. Gurung	M		J		Chairperson, Conservation Area Management Committee
Krishna B. BK	M	D			Secretary, Conservation Area Management Committee
Cham B. Gurung	M		J		Member, Conservation Area Management Committee
Bil B. Tamang	M		J		Member, Conservation Area Management Committee
Dad Man Gurung	M		J		Member, Conservation Area Management Committee
Chun B. Gurung	M		J		Member, Conservation Area Management Committee
Durga B. Gurung	M		J		Member, Conservation Area Management Committee
Suvakher Rimal	M			O	Junior Technician, Agriculture Service Center, Khudi

Note: M=Male; F=Female; D=Dalit; J=Janajati; O=Other Ethnicity; B.=Bahadur; BK=Bishwakarma

Annex 4: List of GESI Segregated Participants for Baseline Study (Agyouli)

Women	Sex	Janajati	Sex	Dalits	Sex
Dil kumari Thanet	F	Dan B Thanet	M	Jankai B.K.	F
Mina kumari Thanet	F	Ramali Mahato	F	Sabitri Sunar	F
Pushpa kumari Thanet	F	Chet Bahadur Mahato	M	Sagar Sunar	M
Hira GC	F	Dil Bahadur Mahato	M	Chandar Kala Sunar	F
Gita Mahato	F	Lok Man Mahato	M	Sita Gahatraj	F
Sarita Mahato (1)	F	Dilli Ram Mahato	M	Beena B.K.	F
Menuka Dhungana	F	Dina Ram Mahato	M	Manmaya pariyar	F
Sarita Mahato (2)	F	Nasi Ram Mahato	M	Gayatri B.K.	F
Parwati Mahato	F	Deo Narayan Mahato	M	Bishnu SunAr	M
Jay Kumari Mahato	F	Yam Bahadur Mahato	M	Um BK	M
Ram kumari Mardangiya	F	Sikha Ram Mahato	M	Maya Sunar	F
Sanita Bhattarai	F	Parbati Mahato	F	Laxmi Pariyar	F
Vim kumari Mahato	F	Kamala Mahato	F	Kamala Pariyar	F
Tanak kumari mahato	F	Dhan Kumari Mahato	F	Madhumaya Pariyar	F
Mahabirya mahato	F	Budhi Ram Mahato	M		
Parwati Mardngiya	F	Dil Kumari Mahato	F		
Priti thapa	F	Sushila Mahato	F		
Sabita Mardaniya	F	Lila Mahato	F		
Shanti Kumari Shrestha	F	Dal Mati Mahato	F		
Moti Kumari Mahato	F	Mina Mahato	F		
Rupani Gurau	F				
Drauadi Mahato	F				
Lalmati Mardaniya	F				

Note: M=Male; F=Female

Annex 5: List of GESI Segregated Participants for Baseline Study (Majhthana)

Women	Sex	Janajati	Sex	Dalit	Sex
Ambika Tiwari	F	Khim Bahadur Thapa	M	Bijaya Pariyar	M
Parbati Tiwari	F	Parbati Bhujel	F	Babita Nepali	F
Bishnu Maya Poudel	F	Padam Kumari Bhujel	F	Kaushila Nepali	F
Rama Tiwari	F	Iman Singh Gurung	M	Shanti Pariyar	F
Durga Bhattarai	F	Dumaya Gurung	F	Jamuna Sunar	F
Yashoda Acharya	F	Surya Maya Gurung	F	Bimala Sunar	F
Radha Dawadi	F	Rita Gurung	F	Bhakta Bahadur Sunar	M
Shiv Adhikari	F	Surya Maya Gurung	F	Sukmaya Rai	F
Sita Bastola	F	Dhana Maya Gurung	F	Babita Pariyar	F
Debi Acharya	F	Aarati Bhujel	F	Anita Pariyar	F
Tulasi Thapa	F	Bhabish Gurung	M	Ganesh Pariyar	M
Sabitri Tiwari	F	Khem Gurung	M	Binita Pariyar	F
		Nirmala Gurung	F		
		Aaiti Maya Gurung	F		
		Lal Maya Pun	F		
		Sushila Bhujel	F		
		Min Gurung	M		

Note: M=Male; F=Female

Annex 6: List of GESI Segregated Participants for Baseline Study (Ghanpokhara)

Women Participants	Dalit Participants
Sul Kumai Gurung	Sanu BK
Chandra Kumari Gurung	Chhali BK
Man Kumari Gurung	Sita BK
Buddha Kashi Gurung	Nita BK
Chandra Kumari BK	Dhan Kumari BK
Sita Gurung	Bishnu BK
Anjana Devi Gurung	Fulamati BK
Hema Gurung	Buddhimaya BK
Maya Gurung	Sunmati BK (1)
Jomaya Gurung	Maite BK
Purna Kashi Gurung	Chhak Man BK
Sima BK	Som Maya BK
Kusum Gurung	Nirmala BK
Agamsari Gurung	Sujata BK
	Shanti BK
	Bimaya BK
	Shanti Kumari BK
	Ritu BK
	Aasmaya BK
	Srijana BK
	Narmaya BK
	Sanu Maya BK
	Tara Devi BK
	Laxmi BK
	Puja Gurung
	Sunmati BK (2)

Note: M=Male; F=Female

Annex 7: Population by 5 Years Age Group and Sex

VDC	Agyouli						Majhthana						Ghanpokhara					
	T (%)		M (%)		F (%)		T (%)		M (%)		F (%)		T (%)		M (%)		F (%)	
Total	12923	100.00	5995	100.00	6928	100.00	2993	100.00	1254	100.00	1739	100.00	2893	100.00	1360	100.00	1533	100.00
0 to 4	996	7.71	519	8.66	477	6.89	228	7.62	124	9.89	104	5.98	278	9.61	157	11.54	121	7.89
5 to 9	1325	10.25	689	11.49	636	9.18	301	10.06	136	10.85	165	9.49	314	10.85	157	11.54	157	10.24
10 to 14	1645	12.73	860	14.35	785	11.33	355	11.86	189	15.07	166	9.55	372	12.86	196	14.41	176	11.48
15 to 19	1609	12.45	754	12.58	855	12.34	337	11.26	138	11.00	199	11.44	314	10.85	140	10.29	174	11.35
20 to 24	1323	10.24	524	8.74	799	11.53	212	7.08	80	6.38	132	7.59	201	6.95	82	6.03	119	7.76
25 to 29	1037	8.02	396	6.61	641	9.25	175	5.85	63	5.02	112	6.44	169	5.84	57	4.19	112	7.31
30 to 34	862	6.67	337	5.62	525	7.58	172	5.75	57	4.55	115	6.61	152	5.25	59	4.34	93	6.07
35 to 39	807	6.24	323	5.39	484	6.99	162	5.41	43	3.43	119	6.84	141	4.87	42	3.09	99	6.46
40 to 44	686	5.31	313	5.22	373	5.38	171	5.71	61	4.86	110	6.33	101	3.49	49	3.60	52	3.39
45 to 49	630	4.88	294	4.90	336	4.85	146	4.88	52	4.15	94	5.41	167	5.77	71	5.22	96	6.26
50 to 54	513	3.97	243	4.05	270	3.90	176	5.88	79	6.30	97	5.58	156	5.39	81	5.96	75	4.89
55 to 59	439	3.40	219	3.65	220	3.18	132	4.41	62	4.94	70	4.03	154	5.32	71	5.22	83	5.41
60 to 64	404	3.13	189	3.15	215	3.10	121	4.04	48	3.83	73	4.20	143	4.94	76	5.59	67	4.37
65 to 69	276	2.14	147	2.45	129	1.86	95	3.17	35	2.79	60	3.45	53	1.83	28	2.06	25	1.63
70 to 74	173	1.34	87	1.45	86	1.24	87	2.91	38	3.03	49	2.82	77	2.66	37	2.72	40	2.61
75 & above	198	1.53	101	1.68	97	1.40	123	4.11	49	3.91	74	4.26	101	3.49	57	4.19	44	2.87

(Source: CBS, 2014)

Note: T=Total, M=Male, F=Female

Annex 8: Distribution of Population by Caste/Ethnicity and Sex

VDC	Agryouli						Majhthana						Ghanpokhara					
	T (%)		M (%)		F (%)		T (%)		M (%)		F (%)		T (%)		M (%)		F (%)	
Total	12923	100.00	5995	100.00	6928	100.00	2993	100.00	1254	100.00	1739	100.00	2893	100.00	1360	100.00	1533	100.00
Chhetri	1198	9.27	542	9.04	656	9.47	636	21.25	268	21.37	368	21.16	28	0.97	10	0.74	18	1.17
Brahman (Hill)	2235	17.29	1001	16.70	1234	17.81	1401	46.81	567	45.22	834	47.96	41	1.42	25	1.84	16	1.04
Magar	286	2.21	125	2.09	161	2.32	33	1.10	13	1.04	20	1.15	0	0.00	0	0.00	0	0.00
Tamang	34	0.26	17	0.28	17	0.25	25	0.84	15	1.20	10	0.58	100	3.46	53	3.90	47	3.07
Musalman	45	0.35	36	0.60	9	0.13	11	0.37	4	0.32	7	0.40	0	0.00	0	0.00	0	0.00
Kami	712	5.51	322	5.37	390	5.63	133	4.44	51	4.07	82	4.72	1001	34.60	483	35.51	518	33.79
Gurung	147	1.14	64	1.07	83	1.20	314	10.49	137	10.93	177	10.18	1721	59.49	788	57.94	933	60.86
Damai/Dholi	556	4.30	286	4.77	270	3.90	160	5.35	75	5.98	85	4.89	0	0.00	0	0.00	0	0.00
Sarki	48	0.37	26	0.43	22	0.32	158	5.28	76	6.06	82	4.72	0	0.00	0	0.00	0	0.00
Sanyasi/Dashnami	431	3.34	210	3.50	221	3.19	26	0.87	9	0.72	17	0.98	0	0.00	0	0.00	0	0.00
Gharti/Bhujel	70	0.54	31	0.52	39	0.56	80	2.67	34	2.71	46	2.65	0	0.00	0	0.00	0	0.00
Tharu	5424	41.97	2518	42.00	2906	41.95	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Newar	728	5.63	318	5.30	410	5.92	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Thakuri	74	0.57	37	0.62	37	0.53	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Musahar	275	2.13	132	2.20	143	2.06	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kathbaniyan	32	0.25	26	0.43	6	0.09	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kumal	93	0.72	41	0.68	52	0.75	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Lohar	19	0.15	8	0.13	11	0.16	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Bote	405	3.13	190	3.17	215	3.10	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Badi	23	0.18	11	0.18	12	0.17	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Terai Others	15	0.12	9	0.15	6	0.09	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Others	73	0.56	45	0.75	28	0.40	16	0.53	5	0.40	11	0.63	2	0.07	1	0.07	1	0.07

Annex 9: Income and Source of Livelihoods of GESI Specific Groups

Parameters		Agyouli			Majhthana			Ghanpokhara	
		Women	Janajati	Dalit	Women	Janajati	Dalit	Women	Dalit
Primary Source of Livelihoods		Agriculture, Livestock, Remittance, Wage Labor, Trade	Agriculture, Livestock, Wage Labor	Agriculture, Livestock, Remittance, Wage Labor, Business	Agriculture, Livestock, Remittance, Pension, Salary, Business, Wage	Agriculture, Livestock, Remittance, Wage	Agriculture, Livestock, Remittance, Wage	Agriculture and Livestock, Remittance, Self-Employment (Choya), Pension, Salary	Agriculture and Livestock, Self-Employment (Choya), Pension, Wage Labor, Herbs Collection
Contribution to Household Income	Agriculture	50	70	60	50	60	40	55	60
	Livestock	20	10	20	20	10	30		
	Foreign Employment (Remittance)	20	10	10	20	25	20	15	-
	Pension	-	-	-	-	-	-	20	10
	Wage Labor*	-	-	-	-	-	-	-	20
	Others	10	10	10	10	5	10	10	10
Contribution of Agriculture/Livestock Income to Households (NPR), Yearly**	Rice	10,000	40,000	15,000	25,000	30,000	15,000	-	-
	Maize	5,000	-	5,000	22,000	22,000	30,000	-	-
	Millet	-	-	-	-	10,000	15,000	10,000	5,000
	Vegetables	20,000	5,000	10,000	50,000	-	-	-	-
	Cattle/Buffalo	20,000	5,000	5,000	50,000	60,000	40,000	10,000	8,000
	Goat	5,000	5,000	-	15,000	20,000	20,000		
	Cardamom	-	-	-	-	-	-	100,000	-
	Honey	-	-	-	-	-	-	8,000	7,000
	Choya	-	-	-	-	-	-	-	10,000
	Coffee	-	-	-	-	-	-	15,000	-
	Poultry	-	-	2,000	-	-	-	-	-
	Pig	-	5,000	-	-	-	-	-	-
Total Agricultural Income	Major Enterprises	60,000	60,000	37,000	162,000	142,000	120,000	143,000	30,000

Note: *=Wage Labor is also major livelihood source but does not comprise among top three sources and hence not provided share in other areas except for Dalits in Ghanpokhara; **=Mode Values, that is, income of most of the households

Annex 10: Poverty of GESI Specific Groups

Parameters	Agyouli			Majhthana			Ghanpokhara	
	Women	Janajati	Dalit	Women	Janajati	Dalit	Women	Dalit
Poor %	56.12	17.50	29.13	70.00	57.65	62.22	52.50	70.48
Non-Poor %	43.88	82.50	70.87	30.00	42.35	37.78	47.50	29.52
Self-Evaluation (Poor %)	78.26	30.00	84.62	90.00	100.00	100.00	38.50	100.00
Number of Samples	23	20	14	11	17	9	12	21

Annex 11: Land Holding Size (Ropani) and Major Crops/Livestock Animals of GESI Specific Groups

Parameters	Agyouli			Majhthana			Ghanpokhara	
	Women	Janajati	Dalit	Women	Janajati	Dalit	Women	Dalit
Khet	3.9	17.5	6.9	4.0	4.0	2.0	5.3	1.1
Bari				2.0	2.0	3.0	5.1	3.3
Total Land	3.9	17.5	6.9	6.0	6.0	5.0	10.4	4.4
Major Crops	Rice, maize, oilseed, legume, vegetable, wheat (30%)	Rice, oilseed, legume, vegetable, maize (50%)	Rice, maize, oilseed, legume, vegetable (50%)	Rice, Maize, Millet, Mustard, Potato, Pulses, Vegetables, Fruits (70-80%)	Rice, Maize, Millet, Mustard (40-50%), Potato (70-80%), Pulses, Vegetables, Fruits (70-80%)	Rice, Maize, Millet, Mustard, Potato (70-80%), Pulses, Vegetables (40-50%), Fruits (70-80%)	Rice, Finger Millet, Potato, Mustard, Soybean, Cardamom (20-30%)	Rice, Finger Millet, Potato, Mustard, Soybean, Cardamom (10%)
Major Livestock	Cattle, goat, poultry	Cattle, buffalo, goat, pig, poultry, duck	Cattle, buffalo, goat, poultry	Cattle/Buffalo, Goat, Poultry (50-60%)	Cattle/Buffalo, Goat, Poultry (80-90%)	Cattle/Buffalo, Goat, Poultry (60-70%)	Sheep/goat, cattle/buffalo, and poultry	Sheep/goat, cattle/buffalo, and poultry

Annex 12: Source/Access to Information

Parameters	Agyouli			Majhthana			Ghanpokhara	
	Women	Janajati	Dalit	Women	Janajati	Dalit	Women	Dalit
Climate Change*	40	30	30	50	30	10	30	10
CSA*	10	5	5	0	0	0	0	0
Information Need	Yes but don't know	Yes but don't know	Yes but don't know	Variety, breed, technologies and practices	Yes but don't know	Don't know	Weather, market, crops	Weather, crops, market
Source of Information	Organization, Friends/Relatives, Experience	Organization, TV	Radio, TV, Friends, Organizations	TV, radio, organizations, technicians	Technician	None	Friend, radio	Radio, technicians
Preferred Source	Organization/Friends	Organization	Organization/Friends	Technicians	Technician	Technician	Mobile	Mobile
View on Mobile as SOI	Good but may not read	Good but may not read	Good but may not read	Good	Can't read mostly	Can't read, voice preferred	Preferred	Preferred
Service of ASC/LSC	Low	Low	Low	Low level	involves cost	Low	Lead farmers are receiving	Go to ASC/LSC
Ease of Access to ASC/LSC	Low access	Low access	Low access	Low access	Untimely	Low	Low, only by Lead Farmers	Low
Access to Finance	Good, Small Amount	Good, Small Amount	Good, Small Amount	Easy	Easy, group guarantee	Easy, small amount	Have, Limited amount	Have, Limited amount

Note: *=Percent of population having knowledge; SOI=Source of Information

Annex 13: CSA technologies and practices Feasibility Study (Agyouli)

technologies and practices	Women		Janajati		Dalit	
	Have Knowledge*	Are Interested**	Have Knowledge*	Are Interested**	Have Knowledge*	Are Interested**
Organic manure/vermicomposting	N	Y	N	Y	N	N
Farmers field school for IPM, integrated nutrient management, organic manure and liquid manure	N	Y	N	Y	N	Y
Community seed bank	Y	Y	Y	Y	Y	Y
Livestock Management(fodder, forages)	Y	Y	Y	Y	Y	Y
i-button	N	Y	N	Y	N	Y
Seed cleaning machine	N	Y	N	Y	N	Y
Climate Analogue Tools	N	Y	N	Y	N	Y
Pond Water Harvesting Using Solar Pumps	Y	N	Y	N	N	Y
Land levelling and raised beds method	Y	Y	Y	Y	N	Y
System of Rice Intensification	N	N	Y	N	N	Y
Urine application through drip irrigation for bitter gourd production, cauliflower and cucumber	N	Y	N	Y	N	Y
Small well (electricity based pulling mechanism)	Y	Y	Y	Y	Y	Y
Green Manure	Y	Y	Y	Y	Y	Y
Plastic house for offseason vegetable cultivation	Y	N	Y	Y	N	Y
Home garden	Y	Y	Y	Y	Y	Y
Direct Seeded Rice	Y	N	Y	N	Y	N
Cultivation of Garlic in rice stubble with mulch (local available materials)	Y	Y	N	Y	Y	Y
Integrated Rice and Duck Farming	Y	N	Y	Y	Y	Y
Legume integration	Y	Y	N	Y	N	Y
Promotion of Stress tolerant crops and varieties	Y	Y	Y	Y	Y	Y
Electric shallow tube well (Small)	Y	Y	Y	Y	Y	Y
Plastic mulch with drip irrigation	N	N	N	N	N	Y
Mulching with Local materials	Y	Y	Y	Y	Y	Y
Leaf Color Chart	N	N	N	N	N	N
Mixed Cropping	N	Y	Y	Y	N	Y
Low Cost Drip Irrigation	N	Y	Y	Y	N	Y
Minimum tillage and crop residue management	Y	N	N	Y	N	Y
Agroforestry	N	Y	Y	Y	N	Y

Annex 14: CSA technologies and practices Feasibility Study (Majhthana)

technologies and practices	Women		Janajati		Dalit	
	Have Knowledge*	Are Interested**	Have Knowledge*	Are Interested**	Have Knowledge*	Are Interested**
Gobar Gas	Y	Y	Y	Y	Y	Y
Krishak School	N	Y	N	Y	N	Y
Krishi Ban	Y	N	Y	N	N	N
Sprinkler Irrigation	Y	Y	Y	Y	N	Y
Plastic House	Y	Y	Y	Y	N	Y
RWH	Y	Y	Y	Y	Y	Y
Drip Irrigation	Y	Y	Y	Y	Y	N
Rice cum Duck	N	Y	N	N	N	Y
Plastic Pond	Y	Y	Y	Y	Y	Y
ICT	N	Y	N	N	N	N
Green Manure	Y	Y	Y	Y	Y	Y
Bio Briquette	Y	N	Y	N	N	N
Bio Char	Y	Y	Y	Y	N	Y
Storage	Y	Y	Y	Y	N	Y
Bamboo Check Dam	Y	Y	N	Y	Y	Y
Goth Sudhar	Y	Y	Y	Y	Y	Y
Organic Manure	Y	Y	Y	Y	N	Y
Vermi Compost	N	Y	N	Y	N	Y
Solar Water Lifting	N	Y	N	Y	N	Y
Slopy Farming	Y	Y	Y	Y	Y	Y
IPM	Y	Y	Y	N	N	N
Jhol Mal	Y	Y	Y	Y	Y	Y
Offseason	Y	Y	Y	Y	Y	Y
Soit Test	Y	Y	N	Y	N	Y
LCC	N	N	N	Y	N	N
Haistone Resistant	N	Y	N	Y	N	Y
Runoff Resistant	N	N	N	Y	N	Y

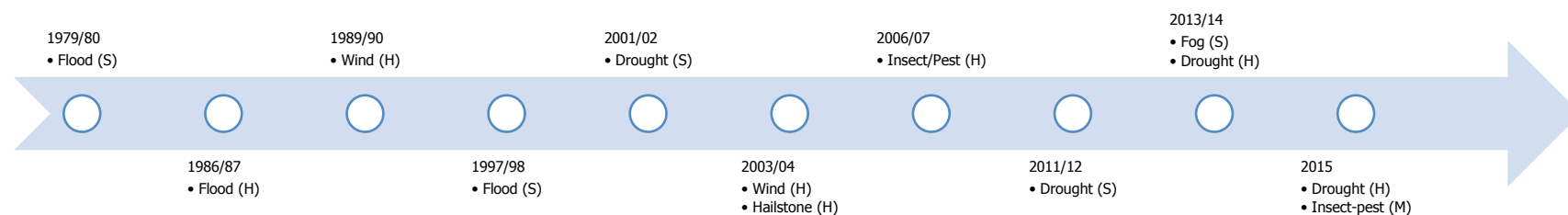
Note: Y=Yes; N=No

Annex 15: CSA technologies and practices Feasibility Study (Ghanpokhara)

technologies and practices	Women		Dalit	
	Have Knowledge*	Are Interested**	Have Knowledge*	Are Interested**
Soil test (to cultivate the crops according to the soil condition)	Y	Y	N	Y
Promotion of Stress tolerant crops and varieties	Y	Y	N	Y
Bio-Gas	Y	Y	Y	N
Minimum tillage and crop residue management	N	Y	N	Y
Livestock Management	Y	Y	N	Y
Promotion of Stress Tolerant Rice varieties like Chumrung dhan, Lekali 1, Lekali 3, Machapuchre 3	N	Y	N	Y
Rain Water Harvesting	N	Y	N	N
Plastic lined conservation pond	Y	Y	N	Y
Crop protection through IPM and safety nets	N	Y	Y	Y
Exposure visit to similar agro-ecological zone where CSA has been practiced e.g. Kavre	N	Y	N	Y
Agroforestry	Y	Y	Y	Y
Plastic house for offseason vegetable cultivation	N	Y	Y	Y
Fruits orchard in abandoned lands	Y	Y	Y	Y
Improved cowshed management for urine collection	N	Y	N	Y
Liquid manure for cereals and vegetables	Y	Y	N	Y
Organic manure/vermicomposting	Y	Y	N	Y
Mainstreaming and integration of LAPA prepared by Village Climate Change Coordination Committee	Y	N	Y	Y
ICT	N	Y	N	Y
Training on CSA	Y	Y	N	Y

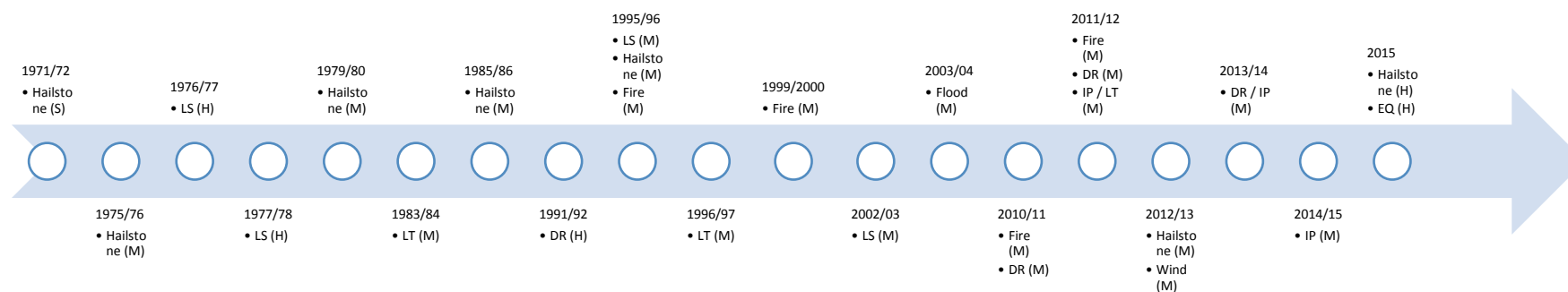
Note: Y=Yes; N=No

Annex 16: Historical Timeline of Climatic Hazards of Agyouli (Nawalparasi)



(Source: Sthapit and Neupane, Unpublished/2015; validated and modified)
 Note: L=Low, M=Medium, H=High, S=Severe Impact

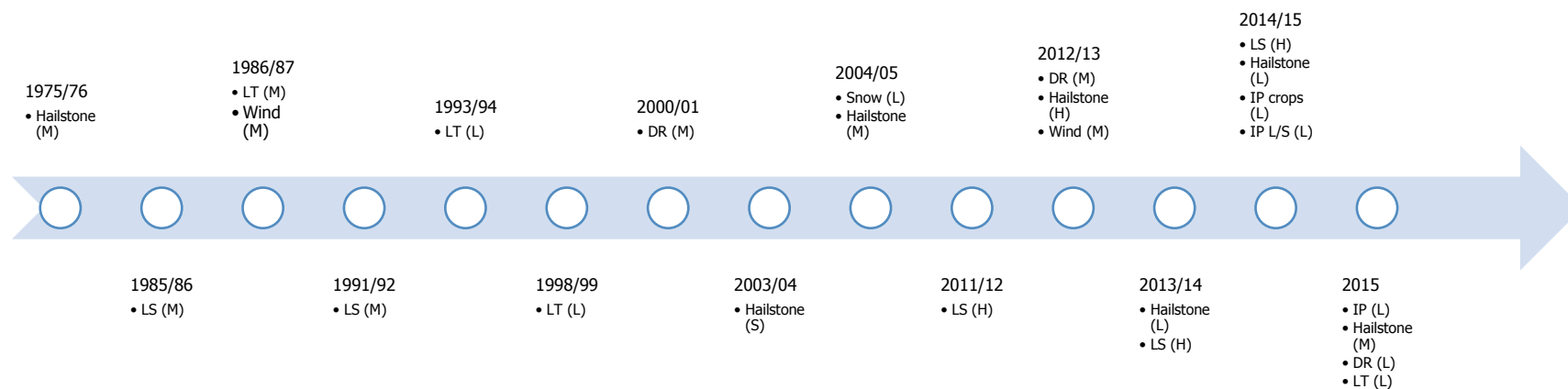
Annex 17: Historical Timeline of Climatic Hazards of Majhthana (Kaski)



(Source: MVDC, 2014; validated and modified)

Note: L=Low, M=Medium, H=High, S=Severe Impact; LS=Landslide; LT=lightning; IP=Insect-Pests; DR=Drought; EQ=Earthquake; Many small impact hazards occurring frequently has been dropped

Annex 18: Historical Timeline of Climatic Hazards of Ghanpokhara (Lamjung)



Note: L=Low, M=Medium, H=High, S=Severe Impact; LS=Landslide; LT=lightning; IP=Insect-Pests; DR=Drought; L/S=Livestock; Many small impact hazards occurring frequently has been dropped

Annex 19: Pairwise Ranking of Hazards for GESI Groups

GESI Group	Rank	Agyouli	Majhthana	Ghanpokhara
Women	1	Flood	Drought	Insect-Pest
	2	Drought	Hailstone	Hailstone
	3	Insect-Pest	Insect-Pest	Downpour
	4	-	Wind	Drought
Janajati	1	Drought	Hailstone	-
	2	Insect-Pest	Drought	-
	3	Flood	Insect-Pest	-
	4	-	Wind	-
Dalit	1	Flood	Hailstone	Hailstone
	2	Drought	Drought	Insect-Pest
	3	Insect-Pest	Wind	Wind
	4	-	Insect-Pest	Landslide

Annex 20: Vulnerability Matrix for GESI Groups, Agyouli, Nawalparasi

Livelihood Resources and Capitals	Women				Janajati			Dalit			
	Flood	Drought	Insect/pest	Total	Drought	Insect/pest	Total	Flood	Drought	Insect/pest	Total
Forest	1	2	0	3	1	0	1	2	2	0	4
Water Sources	1	3	0	4	3	0	3	1	3	0	4
Pasture	1	2	0	3	1	0	1	1	2	0	3
Staple crops	3	3	2	8	3	2	5	3	3	0	6
Livestock	1	1	2	4	0	0	0	1	1	1	3
Road	0	0	0	0	0	0	0	0	0	0	0
Irrigation	0	2	0	2	2	0	2	1	1	0	2
School	0	0	0	0	0	0	0	0	0	0	0
Market	0	1	1	2	0	1	1	0	0	0	0
House	2	1	0	3	0	0	0	2	0	0	2
Comm. Institution	0	0	0	0	0	0	0	0	0	0	0
Health worker	0	1	1	2	0	0	0	0	0	0	0
Teacher	0	1	2	3	0	0	0	0	0	0	0
Social worker	0	1	1	2	0	0	0	0	0	0	0
Women group	0	1	2	3	0	2	2	0	2	0	2
Cooperatives	0	0	0	0	0	0	0	0	0	0	0
Banks	0	0	0	0	0	0	0	0	0	0	0
Labor/daily wages	0	0	0	0	0	0	0	0	0	0	0
Total	9	19	11	39	10	5	15	11	14	1	26

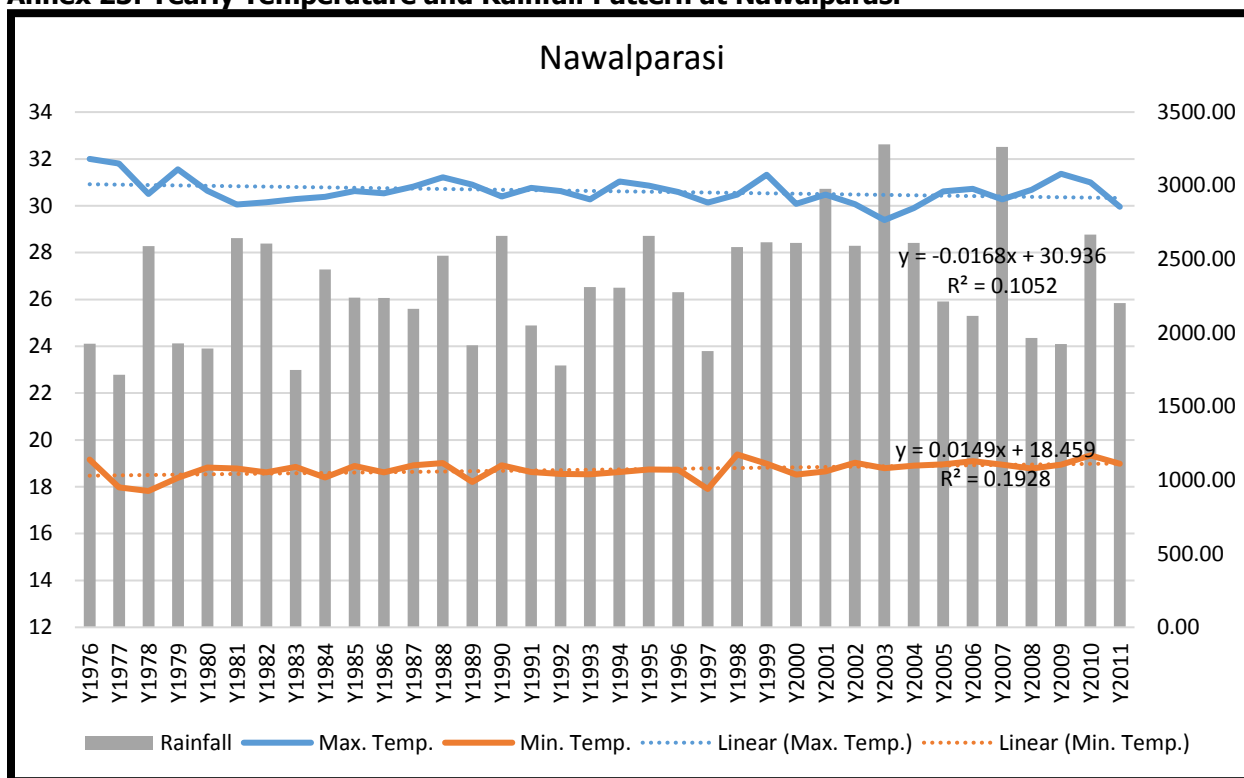
Annex 21: Vulnerability Matrix for GESI Groups, Majhthana, Kaski

Livelihood Resources and Capitals	Women					Janajati					Dalit				
	Hailstone	Drought	Insect-Pest	Wind	Total	Hailstone	Drought	Insect-Pest	Wind	Total	Hailstone	Drought	Insect-Pest	Wind	Total
Forest	1	2	1	2	6	1	2	1	2	6	2	2	2	1	7
Water Sources	0	3	0	2	5	0	3	2	0	5	0	3	1	0	4
Pasture	2	2	2	0	6	2	2	1	0	5	1	2	1	1	5
Staple crops	3	3	3	3	12	3	3	3	3	12	3	2	2	2	9
Livestock	1	2	3	1	7	1	2	2	1	6	1	2	2	1	6
Road	0	0	0	1	1	1	1	0	1	3	0	0	0	0	0
Irrigation	0	3	1	1	5	0	1	0	0	1	0	2	1	0	3
School	1	1	0	1	3	1	1	1	1	4	1	1	1	2	5
Market	2	1	0	2	5	1	1	1	1	4	1	1	2	2	6
House	1	1	0	2	4	1	1	1	1	4	1	0	1	2	4
Comm. Institution	1	0	0	1	2	1	1	1	1	4	1	0	1	2	4
Health worker	1	0	0	1	2	1	1	1	1	4	1	1	1	1	4
Teacher	1	0	0	1	2	1	1	1	1	4	1	1	1	1	4
Social worker	1	0	0	1	2	1	1	1	1	4	1	1	1	1	4
Women group	1	0	0	1	2	1	2	1	1	5	1	1	2	1	5
Cooperatives	1	0	0	1	2	1	1	1	1	4	1	1	1	1	4
Banks	1	0	0	1	2	1	1	1	1	4	1	1	1	1	4
Labor/daily wages	3	2	0	3	8	2	2	2	2	8	2	2	2	2	8
Total	21	20	10	25	76	20	27	21	19	87	19	23	23	21	86

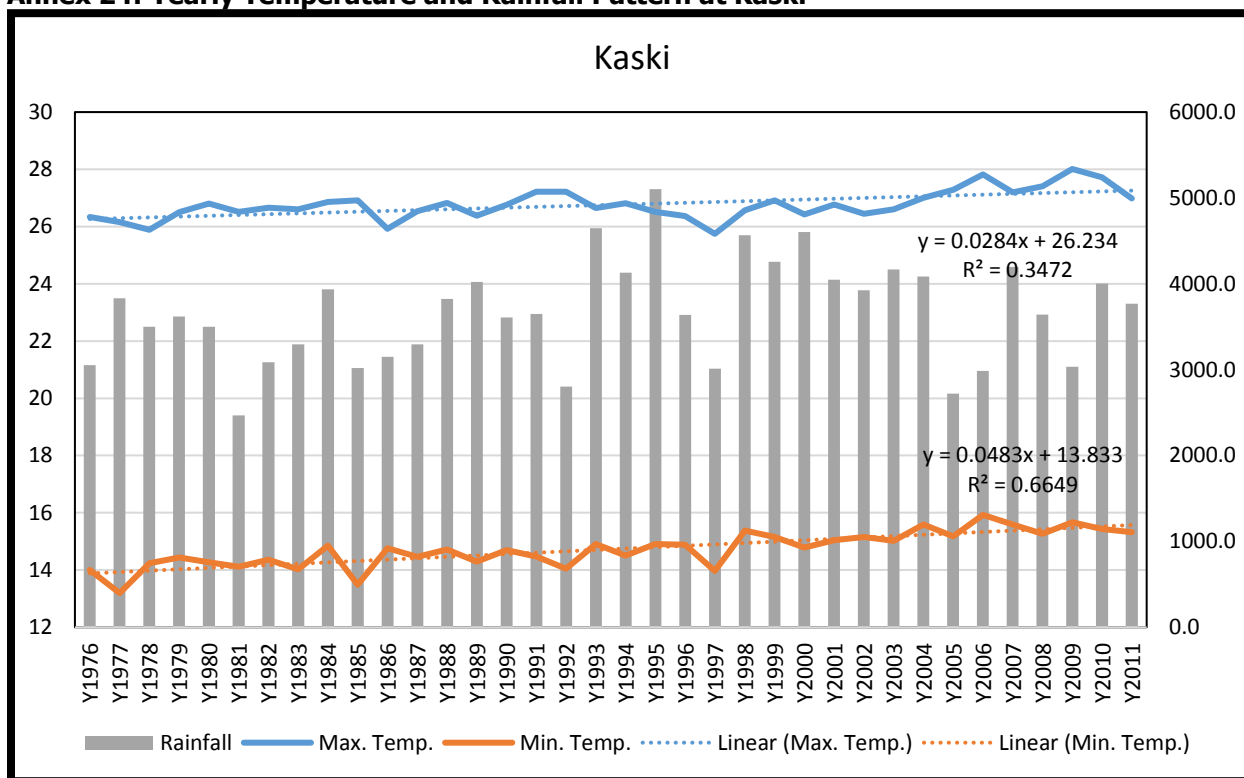
Annex 22: Vulnerability Matrix for GESI Groups, Ghanpokhara, Lamjung

Livelihood Resources and Capitals	Women					Dalit				
	Hailstone	Insect-Pest	Downpour	Drought	Total	Hailstone	Insect-Pest	Wind	Landslide	Total
Forest	2	1	0	1	4	1	2	2	2	7
Water Sources	0	0	1	2	3	0	0	0	1	1
Pasture	1	0	0	2	3	1	0	0	1	2
Staple crops	3	3	2	2	10	3	2	2	2	9
Livestock	1	2	1	2	6	1	2	0	1	4
Road	0	0	2	0	2	0	0	0	2	2
Irrigation	0	0	2	2	4	0	0	0	1	1
School	0	0	0	0	0	1	0	1	1	3
Market	0	0	1	0	1	1	0	1	0	2
House	0	0	0	0	0	0	0	2	1	3
Comm. Institution	0	0	0	0	0	0	0	0	0	0
Health worker	1	0	1	0	2	0	0	0	0	0
Teacher	1	0	1	0	2	1	0	0	0	1
Social worker	1	0	1	0	2	1	0	0	0	1
Women group	2	1	2	2	7	2	2	2	0	6
Cooperatives	0	0	0	0	0	0	0	0	0	0
Banks	0	0	0	0	0	0	0	0	0	0
Labor/daily wages	0	0	0	1	1	2	0	1	0	3
Total	12	7	14	14	47	14	8	11	12	45

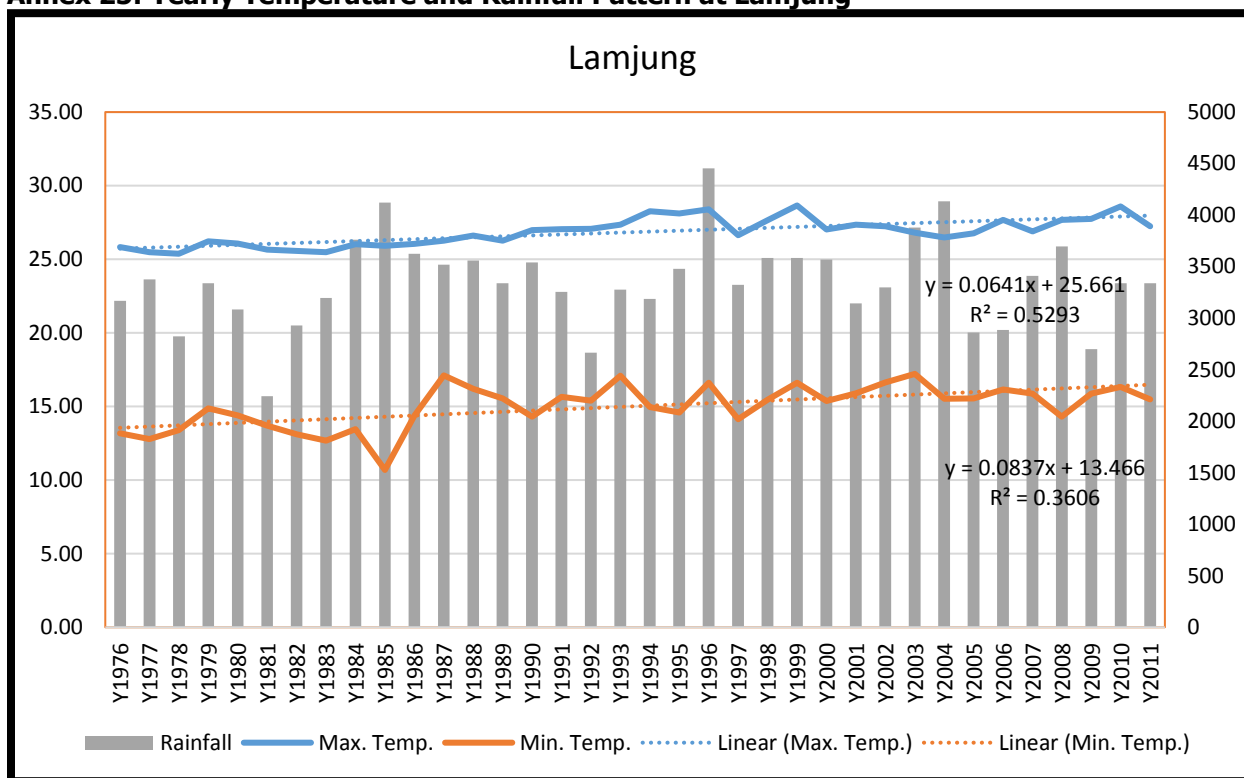
Annex 23: Yearly Temperature and Rainfall Pattern at Nawalparasi



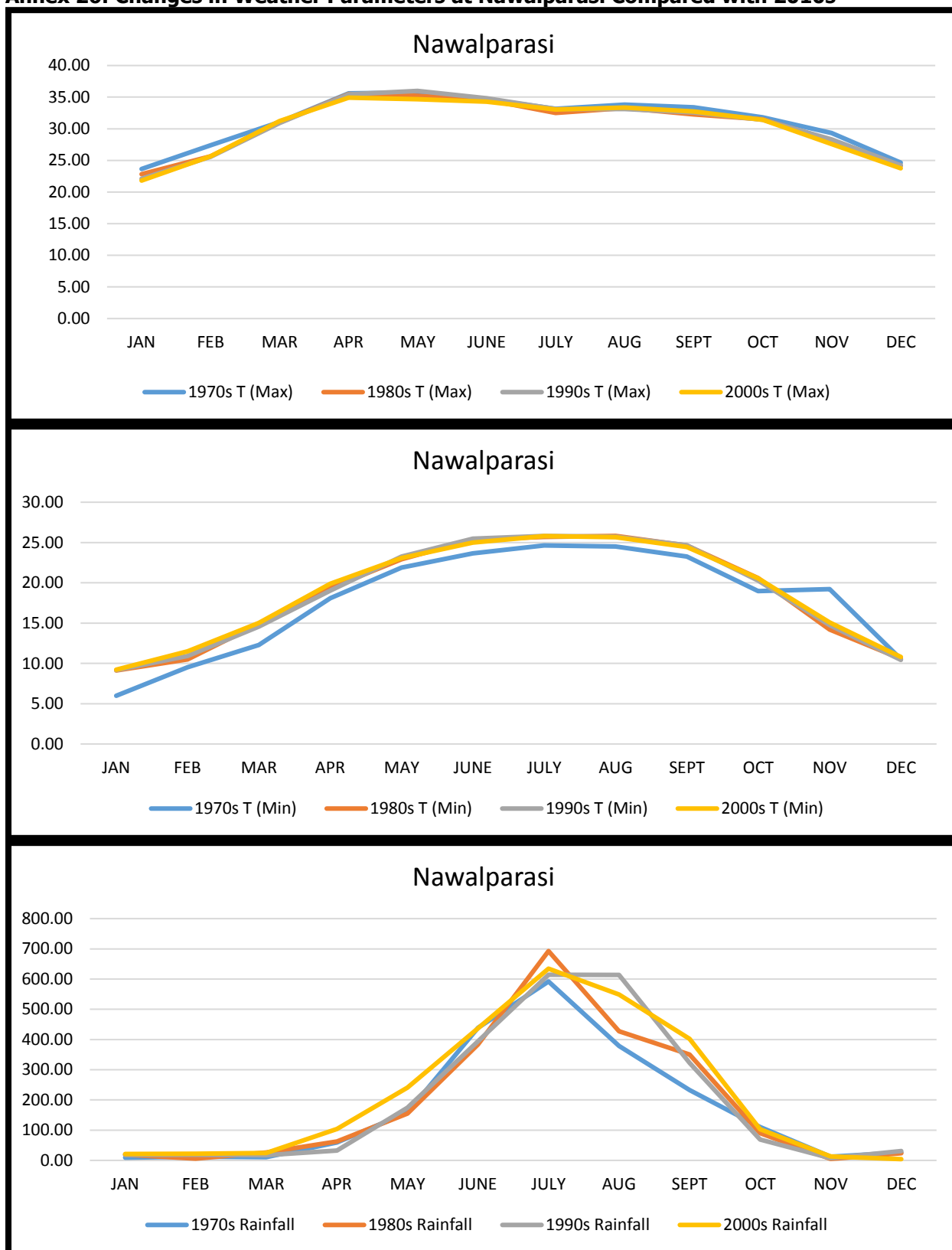
Annex 24: Yearly Temperature and Rainfall Pattern at Kaski



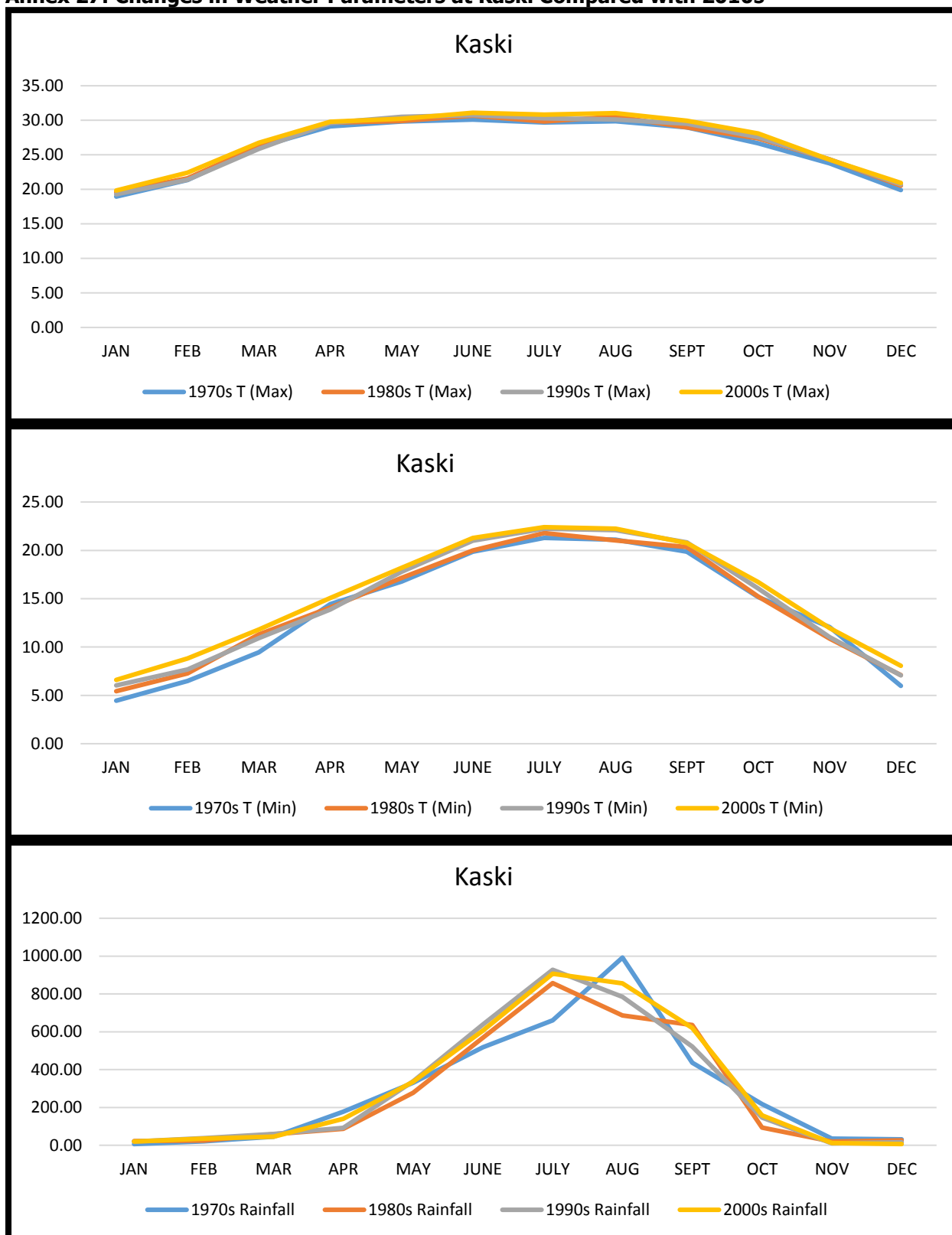
Annex 25: Yearly Temperature and Rainfall Pattern at Lamjung



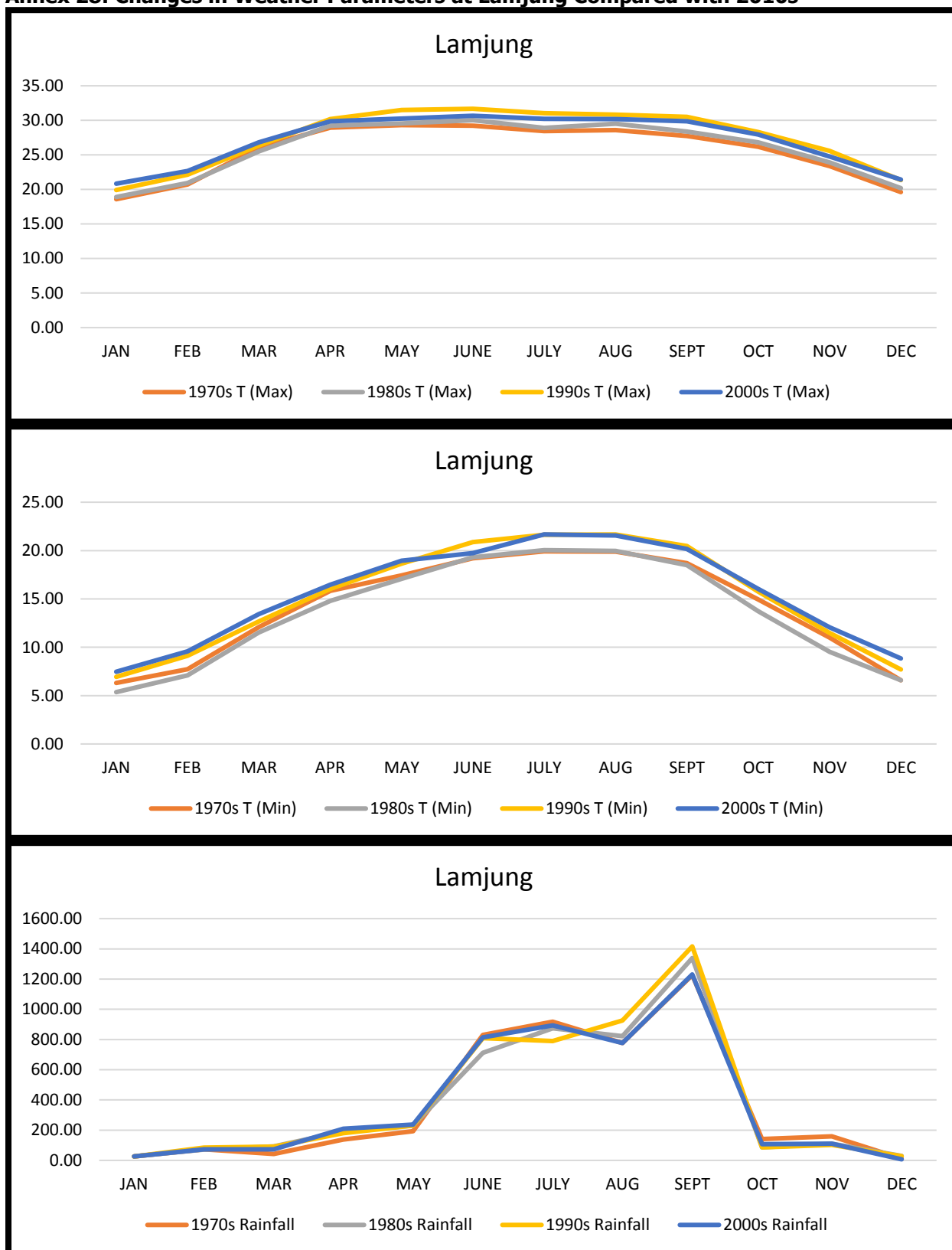
Annex 26: Changes in Weather Parameters at Nawalparasi Compared with 2010s



Annex 27: Changes in Weather Parameters at Kaski Compared with 2010s



Annex 28: Changes in Weather Parameters at Lamjung Compared with 2010s



Annex 29: List of Organizations working in CSA Theme at National Level

Name of the Project	Implementing Agency	Duration	Districts	Funding Agency
Climate Smart Agriculture Programme	SNV	2013-2015	Districts of Surkhet and Jumla Clusters	Dutch Ministry for Foreign Affairs (DGIS)
Nepal Climate Change Support Programme, NCCSP	MoSTE, GoN	2012-2016	Several Districts of Mid and Far Western Regions	DFID/EU/UNDP
Himalayan Climate Change Adaptation Programme	ICIMOD; CEAPRED	2014-2017	Kavre	Government of Norway; Government of Sweden
Promoting Climate Resilient Agriculture Pilot Programme for Climate Resilience in Nepal	Practical Action Consulting; CCAFS	2013-2017	Several Districts of Terai	IFC
Anukulan: Driving Small Farmer Investment In Climate Smart Technologies	iDE; Rupantaran; SAPPROS; RIMS; IWMI; NTAG; ADRA; NETAFIM; Middlesex University London; CIMMYT; Renewable World	2015-2018	Bardiya; Dadeldhura; Doti; Kailali; Kanchanpur; Surkhet	DFID
Ecosystems Based Adaptation Programme Resilience of Nepalese Communities to Climate Change	UNDP; UNEP; IUCN	2012-2015	Several Districts in Western Nepal	German International Climate Initiative
Pilot Programme for Climate Resilience	MoSTE, GoN	2011 onwards*	Several Districts / Regions	Climate Investment Fund**

Note: CEAPRED=Centre for Environment and Agriculture Policy Research, Extension, and Development; *=Several new components are being included and the project is ongoing with possible extension and/or introduction of new components; **=Managed by Asian Development Bank, World bank, and IFC; IFC=International Finance Corporation

Annex 30: Climate Change Initiatives in CSA Project Implementing Districts

District	Project	Implementing Agency	Duration	Donor
Nawalparasi	Hariyo Ban Program	WWF; CARE; FECOFUN; NTNC	2013-2017	USAID
	Community Based Biodiversity Management Nepal	LI-BIRD	2012-2016	DF, Norway
	Climate Smart Village Project	LI-BIRD	2015-2017	CCAFS
Kaski	Seed For Survival	LI-BIRD		USC, Canada
	MSFP	LI-BIRD; ENPRED	2014-2017	SDC
	Project-Innovations For Terrace Farmers In Nepal And Testing Of Private Sector Scaling Up Using Sustainable Agriculture Kits	LI-BIRD	2014-2017	University of Guelph, Canada
Lamjung	Local Crop Project	LI-BIRD		GEF
	Transhumance System	LI-BIRD; South Dakota State University		USAID

This is a detailed historical map of the Tiber River valley in Rome, Italy. The map shows the city's layout, including the Tiber River, the city walls, and the surrounding hills. The map is oriented with North at the top. The Tiber River flows from the top left towards the bottom right. The city is divided into several districts, each labeled with a name. The map includes numerous labels in Latin and Italian, identifying various landmarks, streets, and districts. A legend in the bottom right corner explains the symbols used on the map, such as the Tiber River, the city walls, and the surrounding hills. The map is a valuable historical document, providing a detailed view of the city of Rome in the 17th century.

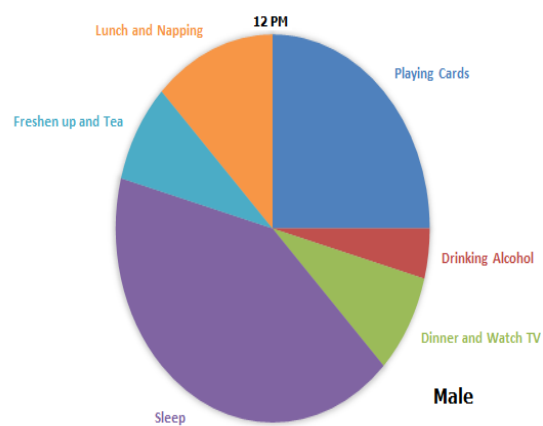
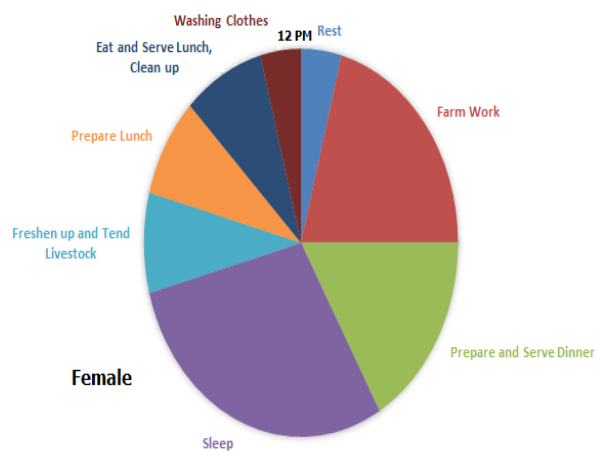
Annex 32: Community Map of Majhthana VDC, Kaski



Annex 33: Community Map of Ghanpokhara VDC, Lamjung

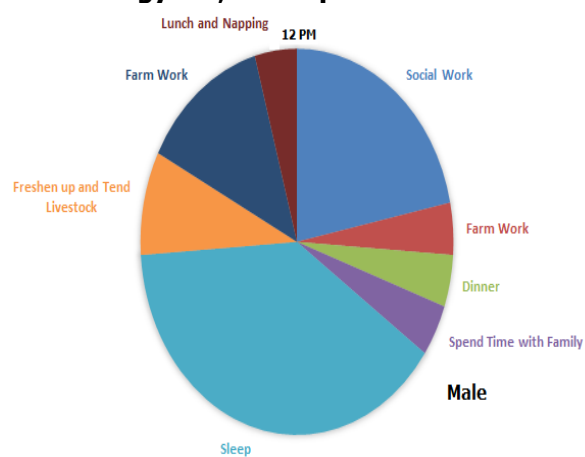
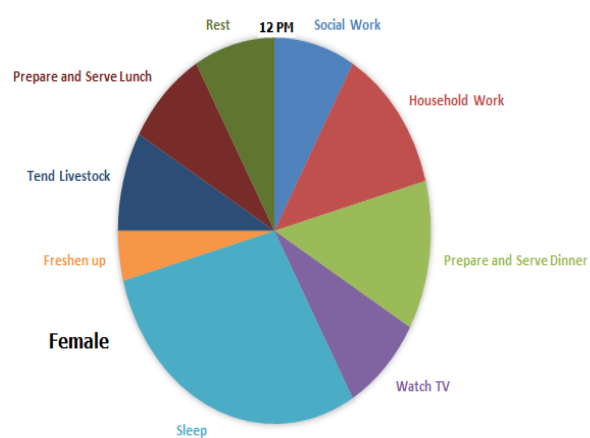


Annex 34: Daily Activity Clock Prepared by Females for Agyouli, Nawalparasi



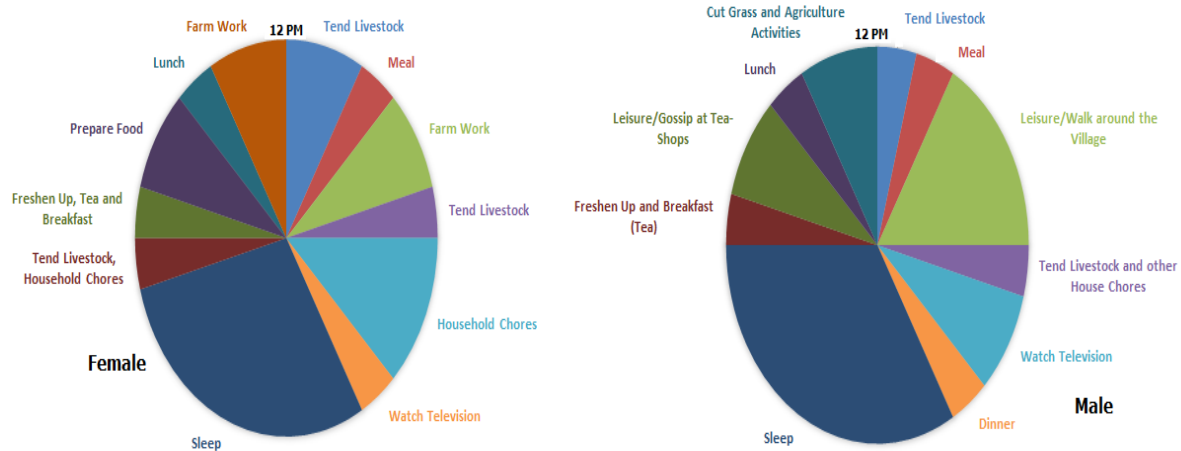
(Adapted from Sthapit and Neupane, 2015)

Annex 35: Daily Activity Clock Prepared by Males for Agyouli, Nawalparasi

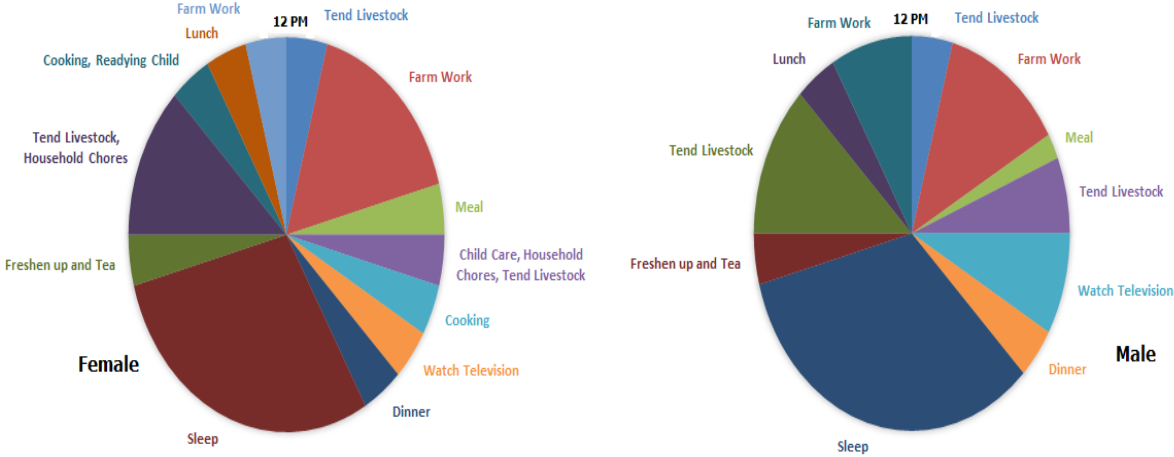


(Adapted from Sthapit and Neupane, 2015)

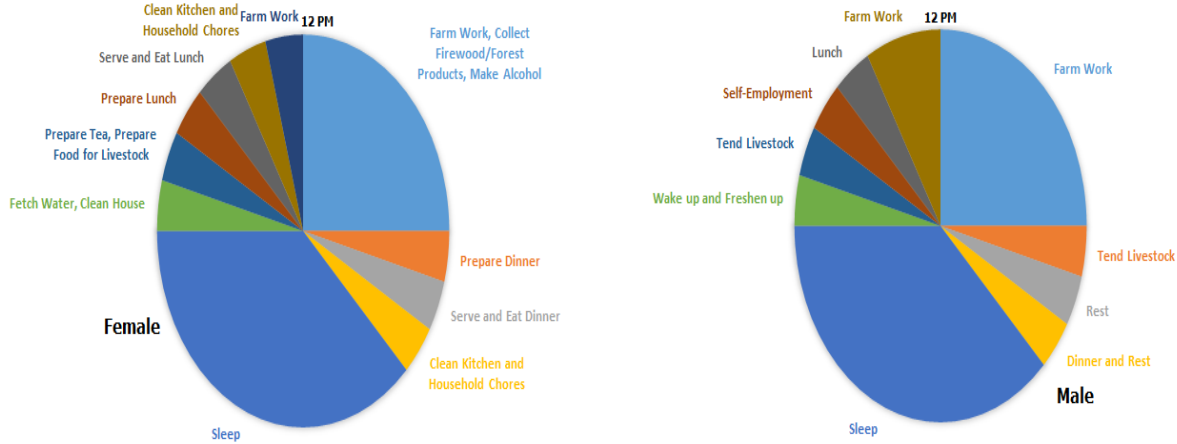
Annex 36: Daily Activity Clock Prepared by Females for Majhthana, Kaski



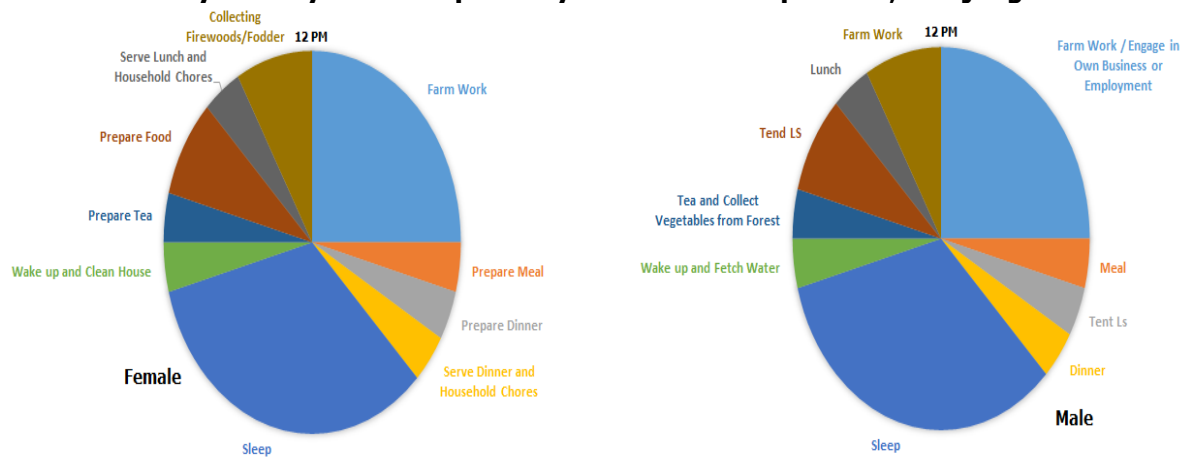
Annex 37: Daily Activity Clock Prepared by Males for Majhthana, Kaski



Annex 38: Daily Activity Clock Prepared by Females for Ghanpokhara, Lamjung



Annex 39: Daily Activity Clock Prepared by Males for Ghanpokhara, Lamjung



Some Glimpses of Baseline Study at the Field Level



Interaction with Participants, Agyouli, Nawalparasi: 2015.09.13



Interaction with Participants, Majhthana, Kaski: 2015.10.02



Interaction with Participants, Ghanpokhara, Lamjung: 2015.10.05



Interaction with GESI-Specific Participants, Agyouli, Nawalparasi: 2015.11.06



Interaction with GESI-Specific (Women Only) Participants, Majhthana, Kaski: 2015.11.06



Interaction with GESI-Specific (Janajatis Only) Participants, Majhthana, Kaski: 2015.11.06



Interaction with GESI-Specific (Dalits Only) Participants, Majhthana, Kaski: 2015.11.07



Interaction with GESI-Specific (Women Only) Participants, Ghanpokhara, Lamjung: 2015.11.06



Interaction with GESI-Specific (Dalits Only) Participants, Ghanpokhara, Lamjung: 2015.11.06



Participants in Action, Majhthana, Kaski: 2015.10.02



Participants in Action, Ghanpokhara, Lamjung: 2015.10.05



Baseline Work at Progress, Majhthana, Kaski: 2015.10.02



Stacking 10 grains of Maize seed for Income and Poverty Analysis



Glimpse of Agro-Eco System, Agyouli, Nawalparasi



Glimpse of Agro-Eco System, Majhthana, Kaski



Glimpse of Agro-Eco System, Ghanpokhara, Lamjung

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