Surkhet
District Assessment Report

This publication contains the results of a village level assessment carried out by Caritas Nepal in 4 SAF-BIN project villages in Surkhet district, Nepal.
The base for this report was literature review conducted by the Caritas Nepal team. Additionally interactions with the involved communities were used to conduct Participatory Rural Appraisal, household surveys, focus group discussions and in depth interviews.

Front matter: Farmer of Surkhet, with her rice harvest © SAF-BIN/Caritas Nepal

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Building Resilience to Climate Change through Strengthening Adaptive Small Scale Farming System in Rain-Fed Areas in Bangladesh, India and Nepal (SAF-BIN)

A summary report of four SAF-BIN clusters from Surkhet district of Nepal

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ACRONYMS

BLM	Broad Leaf Mustard
E	East
EU	European Union
Ha	Hectares
HH	Households
IPM	Integrated Pest Management
masl	meters above sea level
N	North
PRA	Participatory Rural Appraisal
VDC	Village Development Committee

1   BACKGROUND

1.1   CLIMATE CHANGE AND ITS IMPACT

In Nepal, temperature has increased more significantly (Shrestha et al., 1999, cited in Chaulagain, 2006) owing to the changing climate. The temperature increased at higher rates in mountainous areas than in plain areas. The uncertainty in weather patterns especially due to late onset of monsoon rain, intense rainfall during harvesting time and lack of rainfall during winter due to rapid climate change has induced lots of natural disasters. This has increased the incidence of crop failure, flash floods, and drought. Besides changing climate, unique geophysical situation triggered natural disasters such as flash floods, drought, and landslides and intensity of their damages. These turn of events are especially disastrous to small farm families. Especially crop failure due to change in weather pattern have profound negative impacts – from food security situation to health and livelihoods situation especially in case of subsistence farmers. In future also, potential change in climates will have dire consequences on livelihood of locals, natural resources situation and ecological situation as Nepal has very low adaptive capacities.

1.2   CLIMATE CHANGE AND AGRICULTURAL LIVELIHOOD

Nepalese farmers rely upon natural weather conditions for agriculture and traditional farming practices. Hence, changing climate observed as change in timings of monsoon rain and increasing temperature negatively affect crop yields. The long spell of drought due to shift or delay in monsoon rain or lack of rainfall during winter season owing to climate change has decreased the yield of the agriculture commodities such as rice, wheat, maize and millet. This has profound negative effect in the food security situation of Nepal especially the small farm holders. The impact of climate change is worse in countries like Nepal, where still majority of agricultural land are rain-fed. Many reported increase in pest and disease infestation due to lack of rainfall during monsoon period for crops like paddy. In many areas, wheat has been replaced by other crops that require less water due to lack of winter rainfall during critical root initiation stage of wheat plant.

The woes of small farmers are added by the fact they have inadequate understanding of climate change issue. In addition, they are ill equipped to adapt and cope climate change through technological innovation. For example, in eastern terai during 2005/2006, rainfall deficit led to

decline in yield of crops by 12.5% on national basis (Malla, 2008; Karki and Gurung, 2012, p. 22) whereas due to incessant rainfall in Midwestern region in the year 2005/06, crop production slumped by 30% (Malla, 2008; Regmi, 2007; Karki and Gurung, 2012, p. 20). Extreme climatic situations observed frequently have affected agricultural sector decreasing productivity and increasing vulnerability of poor which in turn stimulate out-migration misbalancing the local economy as economically active population migrates (Khanal, 2009; Karki and Gurung, 2012, p. 20).

Changing climate induced natural disasters in the form of flash floods, drought, hailstorm, late/early precipitation, mass movement, soil erosion, glacial lake outburst floods (GLOFs) caused physical damage. Likewise, climate change increased the pest or disease infestation in the crops, reducing the crop yield by 30% to 70% in far western regions of Nepal (World Food Programme, 2010)**.** Around 60% farm households are food insecure in hilly and mountainous areas, due to effect of disasters, lack of productive land and lack of technological advancement such as irrigation facility, good quality seed etc.

1.3   CLIMATE CHANGE ADAPTATION MEASURES IN AGRICULTURE

It is important to reduce the harmful impacts of climate change in agriculture especially to poor vulnerable farm households by developing adaptive measures. Adaptive measures should be introduced at strategic level and local level involving farmers. At local level, adaptive measures can be introduced with the help of developmental agencies in co-ordination with local communities. Adaption at local level will help to lessen the probability of households to move into poverty but will certainly not help the households to be non-poor (Joshi, 2011). The adaptive measures for reducing the vulnerability situation of farmers from crop failure can be done by incorporating climate change with technical intervention with good extension activities that interlinks research, extension and capacity building of the small farm holders. These adaptive measures such as choosing suitable drought tolerant or stress tolerant variety, integrated pest management activities, crop diversification and diversifying the source of incomes through off-farm or on-farm activities can build resilience and adaptive capacity against climate change.

1.4   ON-FARM ACTION RESEARCH AS AN ADAPTATION MEASURE

In Nepal and its South Asian counterparts, the activities involving active participation of farmers to adapt against climate change is very few. Realizing this, Caritas with the help of European

Union is launching action research based project activities on major crops of particular project location for selecting suitable seed variety and cultivation practices to help small holder farm families to mitigate and adapt against climate change in Nepal, Bangladesh and India under SAF-BIN project. As a part of that program, Caritas Nepal, through EU funded SAF-BIN project intervened in 30 farm clusters of Nawalparasi, Bardiya, Kaski and Surkhet districts of Nepal for building resilience of small farm households to climate change issues.

2   METHODOLOGY

2.1   SITE AND BENEFICIARY SELECTION

While choosing the project sites, agro-ecological diversity was considered. Hence, sites belonging to plains as well as hills were chosen. In Bardiya and parts of Nawalparasi, plain areas were chosen where as in Surkhet, Kaski and some parts of Nawalparasi, hilly areas were chosen as a research site. These project locations of Bardiya district were selected after interactions with District Development Committee and District Agriculture Development Officers. The suitability of location was evaluated by performing exploratory visits to the sites. The project team held interactions with District Agriculture Development Officers, District Development Officers, other local stakeholders including agricultural scientists and locals while selecting the potential project sites. Four clusters from Surkhet were chosen as a site of project intervention. Within each cluster, three hamlets were formed. Each of the hamlets consists of 15 farmers following rain-fed agriculture with small farm holdings. In general, following aspects have been considered during the selection of Small Household Farmers (SHF) collectives:

- Diversity in climatic zones: Tropical & Sub tropical
- Geographical setting which includes: Inner terai, mid-hill and high hill and also the type of land such as flat land and sloping land
- Diversity in Rainfall Patterns: High, moderate and low rainfall area
- Cropping diversities which include: Maize, millet, rice etc with other crops
- Existence of rain-fed situation
- Ethnic diversity of target groups
- Socio-economic set up – inclusion of marginalized groups

2.2   SOURCES OF DATA

For the preparation of this report, both qualitative and quantitative data were collected using tools such as Participatory Rural Appraisal, Household survey for baseline data collection and village screening workshop to identify and find past and present trends of farming practices of key crops, and rate the most important problem, helping research team choose proper theme of research. Before conducting these activities, orientation about SAF-BIN project and its activities were given to local stakeholders including potential beneficiaries, research scientists and government officers.

PRA tools used for collecting baseline information included Village Landscape Transect Map, Resource Map, Social Map, Agro-ecology & Foodscape Map, Venn Diagram, Time Trend, Technology Adoption Map, Food In and Food Out (FIFO), Agro & Food Seasonality, Bio Resource Flow Diagram, Wealth Ranking and Problem Matrix, tree & Analysis) and a structured village level data collection questionnaires, mainly around food security of small holder farmers in the context of climate change.

2.3   DATA COMPILATION AND ANALYSIS

The data collected through different tools and techniques were fed in Excel spread sheet and a general statistical tool such as frequency tabulation was used whenever needed. Separate thematic worksheets were prepared for in-depth analysis such as for preparing information derived from screening workshop in presentable form, Food in and food out information etc. Detailed information of these is presented in the village level reports. In this report, we will focus on Surkhet district.

2.4   PREPARATION OF REPORTS

Based upon the information collected, reviewing secondary literatures about climate change issues in Nepal and triangulating the field information repeatedly when needed, reports were prepared. We have tried to maintain uniformity in all the report formats. However, there are differences in the format of the report or table of contents as data for each project cluster has more or less some variability.

2.5   CONTENT OF THE REPORT

This report is the compilation of information generated from four clusters belonging to Surkhet district. The collective insights of Surkhet district based upon data collected from the 4 clusters

are given in this report, and wherever possible comparative insights will also be given. The collective insights will be based upon -

1. Information on demographic, socio-economic and educational situation, asset situation (natural, physical, social, human & financial) in general and in the context of food security of small holder farmers with respect to climate change issues.
2. Food insecurity situation of the locality and practices of food handling and management
3. Agriculture and livestock situation in terms of production system, production, consumption and productivity patterns
4. Key problems while following traditional cropping practices

Nevertheless, the detailed information of particular cluster are discussed and presented in village level reports.

3   RESULTS

3.1   BRIEF COMPARATIVE OVERVIEW OF THE PROJECT CLUSTERS

Surkhet district lies in mid western region of Nepal under Bheri zone. In Surkhet district, SAF-BIN has been intervened in 4 project clusters namely Lekhgaun, Gadhi, Latikoili and Ramghat which are relatively in hilly belts with humid sub-tropical climate. The details of project clusters in the Surkhet district are given in Table 1.

Table 1: Details on project intervention clusters of Surkhet

Project clusters VDC	Latitude	Longitude	Altitude in masl	Total cluster area in ha	Agri-land and horticultural in ha (% of total land occupied for agriculture)
Gadhi	N28˚38.408'	E081˚34.704'	1480	780	437 (56.03 %)
Latikoili	N28˚32.543'	E081˚36.107'	641	367	333 (90.74 %)
Lekhgaun	N 28˚39.030'	E 081˚34.288'	1463	755	433 (57.35%)
Ramghat	N 28˚28.266'	E 081˚45.384'	501	179	22 (12.29 %) + 3 (1.68 %) =25 (13.97%)
Total of Surkhet cluster				*2081*	*1228 (59.01%)*

SAF-BIN clusters of Surkhet occupy 2081 ha area of which 58.86% is used for agriculture. Map 1 provides the geographic position of the project VDCs within the Surkhet district.

MAP 1: Location of SAF-BIN cluster VDCs in Surkhet District

3.2   DEMOGRAPHIC INFORMATION

Socio-demographic characteristics such as educational, household characteristics (gender and caste wise) of the clusters of Surkhet district are presented in the demographic information.

3.2.1   Population and household characteristics

The Table 2 below shows the general overview on population. The total population size is **3275** within 546 HHs of four Surkhet clusters. The average household size is 6.01. Of the 4 clusters, Lekhgaun has higher population.

Table 2: Population and household characteristics of the Surkhet cluster

SAF-BIN clusters	Population characteristics			Household (HH) characteristics			
	Male	Female	**Total**	Total HH size	Average HH size	Women headed HH	HH with differently able
Gadhi	433	403	*836*	163	5.13	12	3
Latikoili	350	353	*703*	124	5.66	10	4
Lekhgaun	493	509	*1002*	125	8.01	8	7
Ramghat	366	368	*734*	134	5.48	14	7
Summary of Surkhet cluster	*1642 (50.14%)*	*1633 (49.86%)*	*3275 (100%)*	*546*	*6.01*	*44*	*21*

Figures in parentheses are in percentage

Source: Village data sheet 2011/2012 and PRA 2012, SAF-BIN

3.2.2   Ethnic characteristics of the Surkhet cluster

The ethnic diversity of the Surkhet cluster is presented in table 3. The data reveals that the cluster chosen for SAF-BIN contained majority of advantaged group followed by dalit households.

Table 3: Ethnic diversity in Surkhet clusters

SAF-BIN clusters	Ethnic characteristics of the HHs			
	Ethnic groups/ Janajati	Advantaged caste groups	Dalits/ Disadvantaged groups	Total HH
Gadhi	30 (18.4%)	101 (61.96%)	32 (16.93%)	163 (100%)
Latikoili	3 (2.42%)	117 (94.35%)	4 (3.23%)	124 (100%)
Lekhgaun	54 (43.2%)	68 (54.4%)	3 (2.40%)	125 (100%)
Ramghat	1 (0.75%)	20 (14.93%)	113 (84.33%)	134 (100%)
Summary of Surkhet cluster	**88 (16.12%)**	**306 (56.04%)**	**152 (27.84%)**	**546 (100%)**

Figures in parentheses are in percentage

Source: Village data sheet 2011/2012 and PRA 2012, SAF-BIN

In Nepal, Hill Brahmin and Chhetris belonging to advantageous caste groups are put into advantageous group. They are termed as advantageous groups as they occupy dominant position in power structure of the country (K. Hachhethu, 2003). Meanwhile, rest of the groups – *Janajati (ethnic and indigenous groups), and disadvantaged caste groups/Dalit*, who occupy marginalized space in country's social, economic and political are termed as minority or disadvantaged groups.

Advantaged caste groups – includes Brahmin, Chhetri and Thakuri communities, having Nepali as mother tongue and Hinduism as a main religion

Janajati/Ethnic or Indigenous communities - includes people originally following different religion than Hinduism and speaking different language than Nepali e.g. Newars, Gurung, Tharu, Magar, Tamang, Bote, Chepang etc. In the Surkhet clusters, ethnic groups are from Magar, Tharu, and Gurung communities.

Disadvantaged caste groups - includes people having Nepali as mother tongue and Hinduism as a main religion, but belonging to lower caste groups. Kami (Blacksmith), Damai/Dholi (tailors/musicians), Sarki (cobblers), sunar (goldsmith) are the low caste groups in Surkhet cluster.

Source: K. Hachhethu, 2003

As per social justice point of view, Caritas Nepal advocates the right of marginalized people of Nepal and other South Asian countries for international support to adapt to climate change. Hence, while choosing the group members, Caritas has been inclusive to marginalized groups to adapt against climate change.

3.2.3   Gender wise educational status

The frequency tabulation of the educational status of the four clusters population showed that percentage of literates in Latikoili cluster is higher as compared to the other clusters. Gadhi seems to have much less percentage of literates as compared to others. The details are on table 4.

Table 4: Educational status of the locals of four SAF-BIN clusters from Surkhet

SAF-BIN clusters	% of literates in the Surkhet cluster		
	Male	Female	Average

Gadhi	202 (46.65%)	98 (24.31%)	300 (35.88%)
Latikoili	273 (78%)	193(54.67%)	466 (66.29%)
Lekhgaun	335 (67.96%)	296 (58.20%)	631 (62.97%)
Ramghat	204 (55.73%)	168 (45.65%)	372 (50.68%)
Summary of Surkhet cluster	**1014 (62.09%)**	**755 (45.71%)**	**1769 (53.95%)**

Source: Village data sheet 2011/2012, SAF-BIN

3.3 LAND HOLDING PATTERN

In Nepal, farmers having land holding size of 0.5 ha and less are considered as small and marginal farmers. Considering the village level report data, it is revealed that majority of the farm households are small with less than or equal to 0.5 ha of lands. Table 5 shows the land holding pattern of Surkhet cluster.

Table 5: Land holding pattern of Surkhet SAF-BIN clusters

Surkhet SAF-BIN clusters	% of landless (absolute agriculture landless)	% with 0-0.25ha	% with 0.26-0.5 ha	% with 0.51- 1 ha	% with 1.1-2 ha	% with > 2ha	Total in %
Gadhi	0.61	89.02	6.71	1.83	1.22	0.61	**100**
Latikoili	3.2	21.6	68.8	6.4	0	0	**100**
Lekhgaun	2.33	33.33	31.78	28.68	3.88	0	**100**
Ramghat	5.93	80.74	9.63	3.7	0	0	**100**

Source: Village data sheet 2011/2012, SAF-BIN

3.4 LAND USE PATTERN

The area occupied by 4 clusters of Surkhet district is 2081 ha of which 1225 ha (58.87%) of land is used for agricultural purposes. The details of land use pattern of the cluster are shown in the Table 6 below.

Table 6: Land use pattern in clusters of Surkhet district in hectares (ha)

SAF-BIN Surkhet clusters	Agricultural land	Horticultural land	Dense forest	Area under open forest	Cultivable waste fallow land	Uncultivable waste fallow land	Housing and other settlements/ Others	Total in ha
Gadhi	437 (56.03 %)	-	**-**	266 (34.10%)	68 (8.72%)	-	*9 (1.15%)*	780 (100%)
Latikoili	333 (90.74 %)	-	34 (9.26 %)	-	-	-	-	367 (100%)
Lekhgaun	433 (57.35%)	-	**-**	127 (16.82%)	3 (0.4%)	192 (25.43%)	-	755 (100%)
Ramghat	22 (12.29 %)	3 (1.68 %)	154 (86.03%)	-	-	-	-	179 (100%)
Total	**1225 (58.87%)**	**3 (0.14%)**	**188 (9.03%)**	**393 (18.89%)**	**71 (3.41%)**	**192 (9.23%)**	**9 (0.43%)**	**2081 (100%)**

Figures in parentheses are in percentage

Source: Village data sheet 2011/2012, SAF-BIN

3.5   SOIL AND LAND TYPE

3.5.1   Soil Characteristics

The soil types vary depending upon the land characteristics within the Surkhet cluster. The area consists of sandy and clayey soils.   The soil characteristics presented here consider only registered land. The details of soil and land type are given in Table 7.

Table 7: Soil characteristics in clusters of Surkhet district

SAF-BIN clusters of NWP	Types of soil and their characteristics					
	Sandy loam	*Loamy*	*Sandy*	*Clayey*	*Red*	*Black*
Gadhi	-	-	Yellow color	Light yellow	-	-
Latikoili	-	-	Brown color	Brown color	-	-
Lekhgaun	-	-	Brown color	Yellow color	-	-
Ramghat	-	-	-	Yellow color	-	-
Surkhet clusters by soil type	-	-	*Gadhi, Latikoili, Lekhgaun*	*Gadhi, Latikoili, Lekhgaun, Ramghat*	-	-

Source: Village data sheet 2011/2012, SAF-BIN

3.5.2   Land Characteristics

The land characteristics vary depending upon topography, elevation, soil properties and even weather conditions. The land characteristics presented here consider only registered land. The plain areas are more fertile as compared to the slopy land. Likewise, the area with perennial source of irrigation yields more than dry areas. The details of land type are given in table 8.

Table 8: Land characteristics in clusters of Surkhet district

SAF-BIN clusters of Surkhet	Land type				
	Type I (Abbal)[1]	*Type II (Doyam)[2]*	*Type III (Sim)[3]*	*Type IV (Chahar)[4]*	*Total agricultural land in ha*
Gadhi	20 (4.58 %)	374 (85.58 %)	43 (9.84%)	-	**437 (100%)**
Latikoili	70 (21.02 %)	261 (78.38%)	2 (0.60%)	-	**333 (100%)**
Lekhgaun	10 (2.31 %)	390 (90.07%)	33 (7. 62%)	-	**433 (100%)**
Ramghat	6 (24.0 %)	12 (48.0 %)	7 (28.0%)	-	**132 (100%)**

Figures in parentheses are in percentage

Source: Village data sheet 2011/2012, SAF-BIN

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[1] Best quality soil for agricultural purposes
[2] Good soil for agricultural purposes
[3] Not good for agricultural purposes
[4] Unsuitable for agricultural purposes

In Surkhet, except for Latikoili which is a valley, all other clusters belong to hilly regions.

3.6 METEOROLOGICAL INFORMATION

Since, the weather trends data for particular cluster is not available, we chose nearby weather station of Birendranagar from Surkhet district as a representation of meteorological information of Latikoili cluster from Surkhet. Based upon the data from Department of Hydrology and Meteorology, Practical Action (2009) calculated average maximum temperature, average minimum temperature and average monthly rainfall (Table 9), figures of which are given below. In addition, the weather attributes are subjected to trend analysis (figure 1, 2 and 3).

Table 9: Meteorological information of Meteorological Station of Birendranagar, Surkhet district

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Average monthly rainfall measured in mm (1976-2005)	36	39.9	25.1	31.2	87.1	251.7	460.7	423.9	190.5	38.8	9.5	20.7
Average maximum temperature in °C over the last 30 years (1980-2011)	19.6	22.2	27.4	32.6	34	33	30.5	30.5	29.8	28.3	24.9	21
Minimum temperature in °C over the last 30 years (1980-2005)	5.3	7.6	11.7	16.3	20.3	22.8	23.4	23.1	21.4	15.7	10.2	6.2

Source: Birendranagar Meteorological Station, Surkhet under Department of Hydrology and Meteorology (Practical Action 2009)

Figure 1: Trend analysis of the maximum temperature in Surkhet District

(Source: Department of Hydrology and Meteorology data)

Figure 2: Analysis of the change in minimum temperature in Surkhet District

(Source: Department of Hydrology and Meteorology data)

Figure 3: Analysis of the change in the rainfall in Surkhet District

 (Source: Department of Hydrology and Meteorology data)

3.7   CAPITAL ASSETS SITUATION

The local people's ability to deal and cope with shocks and vulnerable situation depends on their assets situation (physical, financial, social, human and natural capital). The population who are rich in these assets can develop survival strategy and have higher resilience capacity if exposed with riskier situation than their asset poor counterparts. In this section, focus is on the presentation of the assets situation of the clusters.

3.7.1   Physical assets

This section will give an overview of the situation of physical infrastructure such as road connectivity, electricity services, telecom facilities, schools, health centers, veterinary service centres, VDC office, market, etc. Surely, availability of these assets can have good impact on the local people such as road connectivity can increase access to market. Table 10 shows the availability and types of physical assets in various clusters of Surkhet.

Table 10: Physical assets in the clusters of Surkhet

Physical assets	Clusters of Surkhet			
	Gadhi	**Latikoili**	**Lekhgaun**	**Ramghat**
All weathered road connectivity	No	Yes	No	Yes
Electricity facility	Yes	Yes	Yes	Yes
Mobile network coverage	Yes	Yes	Yes	Yes
Access to internet	No	No	No	No
Primary school	Yes	Yes	No	Yes
Secondary school	No	No	Yes	No
Community meeting place	No	Yes	Yes	Yes
Health centre	No	No	Yes	No
Veterinary service centre (VSC)	No	No	No	No
Cottage industries/Agro-enterprises	No	Yes	No	Yes
VDC/GP/Union Office	No	No	Yes	No
Concrete drains	No	No	No	No
Markets for farm produce	No	Yes	No	No
Grocery and other shops	Yes	Yes	Yes	Yes
Remarks	Health post/ VDC-2 km far, Market, VSC -14km far	Services 5-7 km far	VSC/VDC-3 km far, market-16km away	Facilities 3-4 km away

Source: Village data sheet 2011/2012, SAF-BIN

All weathered roads are not available in Gadhi and Lekhgaun clusters of Surkhet making it difficult for villagers to access market and other facilities. Meanwhile, Latikoili and Ramghat clusters are well connected with all weathered roads, which give them privilege to access various services offered within nearby town. Hence, though they might not have facilities within the area, the people of clusters from Latikoili and Ramghat clusters of Surkhet have better access to basic amenities due to availability of the road.

[Being connected with power grid through electric poles do not ensure availability of electricity in Nepal, as in the winter time due to low production and ever increasing demand of electricity, load shedding can go up to 16 hours per day.]

3.7.2 Social, human and financial assets

Besides physical assets that provide services, social, human and financial capitals are equally important to reduce vulnerability against any disasters. In table 11, we note on these assets – social, human and financial assets present in the Surkhet clusters.

Table 11: Status of social, human and financial assets in Surkhet clusters

Assets situation in four Surkhet clusters	Gadhi	Latikoili	Lekhgaun	Ramghat
Financial Assets				
Self-help groups/Microfinance	No	No	No	No
Cooperative (credit/marketing)	Yes	Yes	Yes	No
Branch of Rural/Cooperative Bank	No	No	No	No
Branch of Commercial Bank	No	No	No	No
Money lender	Yes	No	Yes	Yes
Social Assets				
Local self governance units/VDC	Yes	Yes	Yes	Yes
Farmers' organizations	Yes	Yes	Yes	No
Community Forest User Groups	Yes	Yes	No	Yes
Water users' group	Yes	No	No	No
Communal/Ethnic institution	No	No	No	No
Community based organization	No	No	No	No
Youth club	No	No	No	No
Religious/festival committee	No	No	No	No
Grain/food bank	No	No	No	No
Emergency response	No	No	No	No
Human Assets				
Organic farming	Yes	Yes	Yes	Yes
Resource/leader farmer	No	Yes	No	No
Gardner/nursery raiser	No	No	No	No

Source: Village data sheet 2011/2012, SAF-BIN

In Latikoili, Gadhi and Lekhgaun, there are cooperatives which provide financial aid during the need at the interest rate of 16-18%. Presence of cooperatives helps the locals to access financial resources through formal institutions; otherwise they have to depend solely upon village money lenders. In all the clusters, farmers or local communities are in one or other way aligned with particular groups or organizations. This is surely important as being in a group can make their voices heard in public and social domain. However, in-depth analyses of group dynamics are necessary to find whether the groups are functioning well or not.

3.8   MAJOR CROPS AND CROPPING PATTERNS

In Surkhet, maize is a major crop followed by rice and wheat. Lentil is also one of the key crops in all the clusters except Ramghat. Table 12 shows some key crops and their yield in tonnes/hectares (t/ha), major cropping system and food scape. Rice and maize are dominant food in Surkhet food scape, though not grown in sufficient. Demand of rice and other crops not grown in the region is fulfilled by importing.

Table 12: Major crops, cropping system and food scape of the Surkhet cluster

SURKHET SAF-BIN clusters	Rice yield (t/ha)	Wheat yield (t/ha) Crops	Maize yield (t/ha)	Lentil yield (t/ha)	Cropping pattern		Food scape in order of priority
					Past	Present	
Gadhi	3.1	2	1.5	-	Maize-Millet	Maize-Wheat/Potato, Maize/Rice-Lentil/Mustard	Maize>Wheat>Pulses/Potato
Latikoili	3.9	2.3	3.5	1.7	Rice-Maize	Rice/Maize-Lentil/Wheat	Rice>Maize>Potato/Pulses
Lekhgaun (*upland rice*)	3.2	1.5-2	1.2	-	Maize-Millet	Maize/Rice-Lentil/Mustard	Maize>Rice>Wheat/Pulses/Potato
Ramghat	2.5	-	3	1.3	Maize-Fallow, Maize-Millet	Maize-Millet	Rice>Maize>Potato/pulses

Source: Village data sheet 2011/2012, SAF-BIN

In Surkhet, maize is most widely grown crop in all the clusters during Kharif season. After maize, rice is 2nd widely grown kharif crop. Rice is cultivated mainly in Latikoili cluster, where as upland cultivar of rice/paddy is grown widely in Ramghat. Wheat is a key crop cultivated in Latikoili, Ramghat and Lekhgaun. In Latikoili, potato is important winter crop (**Rana, 2012**).

Besides above mentioned cereal crops, fruits specifically mango is produced in Surkhet. Ramghat cluster is famous for its mango cultivation capacity in Mid-western region of Nepal. The productivity of mango is 40mt/ha. In case of vegetables product, potato is major vegetable with productivity of 6mt/ha. Tomato, cucumber, and pumpkin are widely produced vegetables with productivity of 10mt/ha, 3mt/ha and 5mt/ha respectively. Cauliflower is cultivated only in Ramghat with yield of 1.5 mt/ha. In addition to these, garlic, mustard and chilli are also important part of cropping system in Surkhet clusters as reported in PRA done by Caritas Nepal.

3.9 FOOD SECURITY SITUATION

Due to changing climate, farmers face problems such as drought, lack of timely rainfall during monsoon and critical plant growth stages leading to crop failure and increasing food insecurity. Table 13 presents the information about food availability situation, adverse conditions contributing to crop failure and food sufficiency situation of the Surkhet clusters. It is observed that majority of households have food insecurity for more than 6 months. In Gadhi and Ramghat clusters, 90.18% and 86.57% of households respectively face food insufficiency situation for more than 6 months.

Table 13: Adversities and food availability and deficiency situation in Surkhet clusters

SAF-BIN clusters - Surkhet	Gadhi	Latikoili	Lekhgaun	Ramghat
No. of times key food crops failed in last 5 years				
Occurrence of drought over past 5 years	3	3	2	4
Food security situation among various groups in Surkhet clusters				
Disadvantaged caste group (Dalit and Janajati)				
12 months secure	0	0	0	0
>6 months insecure	56 (90.33%)	3 (42.86%)	22 (38.6%)	95 (84.07%)
4-6months insecure	5 (8.06%)	2 (28.57%)	20 (35.09%)	13 (11.5%)
2-4months insecure	1 (1.61%)	2 (28.57%)	15 (26.31%)	5 (4.42%)
0-2 months insecure	0	0	0	0
Subtotal	62 (100%)	7 (100%)	57 (100%)	113 (100%)
Others (Advantaged caste group)				

12 months secure	1 (0.99%)	0	0	0
>6 months insecure	91 (90.1%)	28 (23.93%)	24 (35.3%)	21 (100%)
4-6months insecure	5 (4.95%)	84 (71.8%)	18 (26.47%)	0
2-4months insecure	2 (1.98%)	5 (4.27%)	20 (29.41%)	0
0-2 months insecure	2 (1.98%)	0	6 (8.82%)	0
Subtotal	**101 (100%)**	**117 (100%)**	**68 (100%)**	**21 (100%)**
<u>**Total households in %**</u>				
12 months secure	1 (0.61%)	0	0	0
>6 months insecure	147 (90.18%)	31 (25%)	46 (37.1%)	116 (86.57%)
4-6months insecure	10 (6.13%)	86 (69.35%)	38 (30.4%)	13 (9.7%)
2-4months insecure	3 (1.84%)	7 (5.65%)	35 (28%)	5 (3.73%)
0-2 months insecure	2 (1.23%)	0	6 (48%)	0
Overall	**163 (100%)**	**124 (100%)**	**125 (100%)**	**134 (100%)**

Figures in parentheses are in percentage

Source: Village data sheet 2011/2012, SAF-BIN

3.10 FOOD HANDLING AND MANAGEMENT

The food handling and post harvest management of food are important. Good practices undertaken during harvesting, processing, storage ensures food loss is less after production. Hence, more food is available for consumption by the households. Table 14 below presents the post harvest handling and management practices followed by the cluster population.

Table 14: Food storage and processing technologies used in four clusters of Surkhet

Storage techniques	**Clusters using the techniques**
Rice stored in bamboo bins	-
Metal drum or bins	-
Plastic drums for wheat	-
Wood bins	-
Plastic sacs	Gadhi, Latikoili, Lekhgaun, Ramghat
Mudbins(Deheri)*	Gadhi, Latikoili, Lekhgaun
Bamboo bins	Gadhi, Latikoili, Lekhgaun
Jute sacs	Gadhi, Latikoili, Lekhgaun, Ramghat
Suli (raised str. with thatched roof for maize storage)	-
Harvesting techniques	
Manual	Gadhi, Latikoili, Lekhgaun, Ramghat

Thresher (used sp. for rice)	-
Processing	
In mills	Gadhi, Latikoili, Lekhgaun
Traditional cereal pounder	Gadhi, Latikoili, Lekhgaun, Ramghat

Source: Village data sheet 2011/2012, SAF-BIN

Bamboo bins, mud bins, jute and plastic sacs are commonly used for storage. Though might be expensive, use of closed mouth metal bins are recommended for maintaining better quality during storage of seed. Harvesting is done manually in all the clusters. In all clusters except Ramghat, cereals are processed in mills. In general, traditional storage methods are followed to store key cereal crops.

Indigenous/Traditional food storage and processing practices of the cluster:

The information below is based upon the information collected during Focus Group Discussion held by Caritas Nepal in the respective project locations during the year 2013.

Kuniyo method: paddy stacked in circular heaps

Farmers in Surkhet clusters spread the harvested paddy in the field and leave them for 3-5 days for drying. After few days of sun drying, for storing the paddy without threshing, harvested and sundried paddy are stacked in circular heaps on the threshing floor so that it can be threshed whenever farmers are free. The heap of paddy is locally called as Kuniyo.

Seed storage by mixing with Kati **(semi-solid extracts yielded during milling of mustard seeds for oil)**

The grain for seed purpose is stored by mixing the seeds with semi-solids extracts generated after milling mustard seeds for soil. At first, grain is sun-dried and mixed with Kati (semi solid extracts after separating mustard oil). In general, the ratio of Kati to grains is maintained approximately at 5:100 for mixing before storage. These grains are filled in a plastic container and sealed tightly. This technique of storing seeds is considered to be very effective against storage grain pests. Farmers of Surkhet clusters reported that all grain legumes seeds (chick pea, pigeon pea, pea, black gram etc) can be stored in this manner. This practice of storing the lentil is believed to be of their traditional methods and its history goes back to decades.

Threshing techniques:

Both traditional method of using bullocks for threshing and modern threshing machines are used for threshing purposes. However, farmers in Latikoili consider that threshing technique using bullocks produce good quality straw that is used for feeding livestock. So, farmers owning bullocks and having large family size use bullocks for threshing. Farmers of Surkhet also reported that thresher machine causes more grain lose.

3.11 MAJOR CROP VARIETIES AND SEED SOURCE

Rice is the major crop with farmers followed by wheat and maize. Besides rice, upland paddy is also cultivated in clusters of Gadhi and Ramghat. Farmers used both improved and local varieties of the major crops in the clusters. Table 15 below provides varietal information of seed of major crops used in the clusters.

Table 15: Major crops varieties grown in Surkhet clusters

SAF-BIN clusters Surkhet	Varieties cultivated in the clusters (L=local, I=improved, H=hybrid)		
	Rice	Wheat	Maize
Gadhi	L: Ghaiya 1,	L: Tunde, Amrikane (Mungaley local)	L: Seto sano, I: Deuti (half of the farmers used it), Manakamana (used by few)
Latikoili	L:…., I: Bindeshwori, Radha-7, Hardinath, Chandina Sarju-52	L: Raato thulo, I: Gautam	L: Local, I: Deuti
Lekhgaun	L: Gopal, Guane, Darmali Dangali, Tudhe, , Thapa Chini, Bijani, Kanchi mansuli; I: Bindeshwori, 60 days, Taichung, Loktantra, Kanchan, IR-21, Khumal-4, Makawanpur-1	L: Americane, Jhuse	L: local black maize, Manakamana kaude (planted many years back till last year), I: Deuti, Manakamana, Sarlahi seto
Ramghat	L: Damaare, Rato dhan, I: Ghaiya-1, Bindeshwori, Radha		L: Seto sano, H: used

Source: Village data sheet 2011/2012, SAF-BIN

3.12 SEED SOURCE

In every cluster, farmers perceived low yield of crops as one of the key problems. Among the causes attributed to low yield, key cause has been termed as lack of quality seed. Table 16 below provides information about the source of seed farmers depends upon.

Table 16: Seed source of major crops grown in Surkhet clusters

SAF-BIN clusters Surkhet	Seed Source (L=local source, E=external source)			Major vegetables consumed and produced
	Rice	Wheat	Maize	
Gadhi	No data (ND)	ND	L: 60, E: 40	Cucumber, pumpkin, cauliflower, garlic, leafy vegetables, chilies
Latikoili	L: 50, I: 50	L: 40, E: 60	L: 80, E: 20	Tomato, potato, cabbage, garlic, leafy vegetables, chilli
Lekhgaun	ND	ND	L: 90, E: 10	Cucumber, pumpkin, cauliflower, garlic, leafy vegetables, chilies
Ramghat	L: 90, E: 10	L: 50, E: 50	L: 60, E: 40	Cauliflower, Cabbage, garlic, leafy vegetables, chilies, Gram (kharif), ground nut, bean, cowpea, okra, snake gourd, tomato, cucumber, bottle gourd, sponge gourd, pumpkin, bitter gourd (rainy season only), broad leaf mustard, mustard (sown in Bhadra), Mango (3ha area and yield: 6.84 ton/ha)

Source: Village data sheet 2011/2012, SAF-BIN

It has been observed that Nepal's seed replacement rate is nominal and not at all, leading to degradation in quality and production of crops. The table above confirms the same that farmers' do not replace their old seeds with fresh ones. Lack of seed replacement can also be the reason for low yield of the crops. Only in Latikoili and Ramghat clusters, 60% and 50% farmers respectively sought seeds from external sources such as agro-vet, research centers, etc.

3.13 FARMING PRACTICES

A farm's agriculture productivity and sustainability depends on seeds, soil, climate as well as the capacity of farmers to pursue suitable farming practices. Table 17 gives information on farming practices followed in the clusters of Surkhet.

Table 17: Farming practices followed in the Surkhet SAF-BIN clusters

Cultivation practices	Clusters following	No. of followers	Area in ha	Crops/system
Organic farming	Latikoili	5	ND	ND
Integrated Pest Management	Latikoili Gadhi	No data (ND)	ND	Vegetable crops
Integrated Nutrient Management	Gadhi, Latikoili	17 +ND	ND	Vegetable crops

Source: Village data sheet 2011/2012, SAF-BIN

In Surkhet clusters, organic farming, Integrated Pest Management (IPM) and Integrated Nutrient Management are the three cultivation practices worth mentioning. However, these practices are adopted in vegetable crops in the limited area of Latikoili and Gadhi clusters only out of four clusters from Surkhet.

3.14 LIVESTOCK INFORMATION

Livestock are an important part of small integrated farming systems present in Nepal. Small and large livestock are raised for income generation. Milk and milk products, egg and meat are consumed and also sold by the small farmer households to raise much needed cash. At times of household emergency such as illness of family member, small or large livestock may be sold to raise the funds needed for medication. In addition to this, animal waste are used as farm yard manure, compost, and for preparing organic concoctions used in farming such as bio-spray. There are various levels of mechanization in the rural areas; however, significant numbers of the households are still noted to keep large animals for use as draught force. The following table 18 is the status of different types of local and improved livestock per household in the location.

Table 18: Livestock status in four Surkhet clusters of SAF-BIN

Status of the local livestock and birds

Surkhet clusters	Cow	Buffalo	Bullocks	Goat	Sheep	Pig	Poultry/birds
Gadhi	13	143	238	413	0	0	0
Latikoili	98	70	107	300	60	40	100
Lekhgaun	10	123	174	456	0	0	100
Ramghat	46	20	267	140	60	25	285
Total	*167*	*356*	*786*	*1309*	*120*	*65*	*485*

Status of the improved livestock and birds

Surkhet clusters	Cow	Buffalo	Bullocks	Goat	Sheep	Pig	Poultry/birds
Gadhi	0	0	27	31	0	0	0
Latikoili	0	0	0	125	4	0	5000
Lekhgaun	0	0	0	7	0	0	7
Ramghat	0	0	0	35	0	0	0
Total	*0*	*0*	*27*	*198*	*4*	*0*	*5007*

Status of Local and improved livestock and poultry combined

Surkhet clusters	Cow	Buffalo	Bullocks	Goat	Sheep	Pig	Poultry/birds
Gadhi	13	143	265	444	0	0	0
Latikoili	98	70	107	425	64	40	5100
Lekhgaun	10	123	174	463	0	0	107
Ramghat	46	20	267	175	60	25	285
Total	**167**	**356**	**813**	**1507**	**124**	**65**	**5492**

Average livestock per HH

Surkhet clusters	Total HH size	*Cow*	*Buffalo*	*Bullocks*	*Goat*	*Sheep*	*Pig*
Gadhi	163	0.08	0.88	1.63	2.72	0.00	0.00
Latikoili	124	0.79	0.56	0.86	3.43	0.52	0.32

Lekhgaun	125	0.08	0.98	1.39	3.70	0.00	0.00
Ramghat	134	0.34	0.15	1.99	1.31	0.45	0.19
Summary	**546**	0.31	0.65	1.49	2.76	0.23	0.12

(N.B.: While collecting information on poultry, the poultries reared for commercial purpose was left out from data because of which average poultry per HH has not been calculated.)

Source: Village data sheet 2011/2012, SAF-BIN

In general, among the large milch breeds, buffalo is preferred more than cow as buffaloes produce more milk with higher fat percentage fetching better price in dairy market. However, numbers of cows outnumber the buffalo population in the clusters of Latikoili and Ramghat. The data showed that in far-off areas, improved breeds are uncommon which may be due to the remoteness of the area and lack of financial resources owing to meager production of crops and lack of good income source where as areas near the cities or areas well connected with road networks are found to adopt improved breeds as well. In case of small livestock, goats are preferred as they can generate fast cash in case of emergency.

3.15 CLIMATE CHANGE PERCEPTION, IMPACTS, AND ADAPTATION

United Nations Panel on Climate Change has reported how humans are contributing to bringing about significant change in climate with their deposition of green house gases in the atmosphere starting with the onset of the industrial age. The change in climate is noted mostly in terms of change in temperature (of soil, water and air) and rainfall pattern (time and period, intensity, frequency, amount). The small farm holders from South Asia had been highly vulnerable to and affected by adverse changing climate scenario such as drought, no rainfall during critical growth stages especially of winter crops and high rainfall during harvesting and vegetative growth stages. Caritas Nepal undertook research using participatory research tools that includes Participatory Rural Appraisal, Screening workshops, stakeholder meetings to name few in the potential project clusters to find out small farmers' understanding of climate change and its impacts in general, its impact on agriculture, and adaptations pursued in agriculture by them. Following are the findings.

Farmer's perception on climate change trend in Surkhet clusters

According to the farmers of the cluster,

- *Changes perceived during monsoon:*

There is a fluctuation in monsoon rainfall pattern in recent years, with more rainfall towards the latter half of the monsoon season. Within monsoon, there are periods of high and low rainfall over the period of time. There are times when onset of monsoon is delayed where as there are periods or years of timely start of monsoon. In some years, there has been high rainfall in latter part of Monsoon. In addition to this, there are periods of no rainfall (or limited) rainfall within the wider Monsoon season. The irregular pattern of rainfall has made it difficult for farmers to predict monsoon and carry on smoothly timely cropping practices. Erratic monsoon rainfall has delayed planting season of maize.

- *Reoccurence of frost in winter*

  Farmers in Surkhet have to face frost damages in wheat during its initial growth stages. Owing to frost, wheat could not maintain its smooth growth leading to low yield or crop failure.

- Before, there used to be enough dew. Hence, soil moisture was retained in winter due to dew and winter rainfall of about ½ months in winter. During recent times, dew is not sufficient to keep the soil moist as winter has become drier owing to lack of winter rainfall.

- Timely plantation of crops has become difficult, so cultivation of monsoon maize has been delayed. Even in rice, farmers shift the transplanting date depending upon the onset of monsoon decreasing the yield potential.

- Outbreak of diseases and pests on plants have been increased in maize and other cereal crops, pests such as termites, beetles infest plants badly.

  Khumal Red variety of potato and True potato seed which were supposed to be somehow resistant against late blight are also infested by the disease. Farmers acknowledge the changes in weather pattern responsible for disease outbreak. As per their observation, since past 3-4 years in winter, nights have become cloudy and blowing of cold winds during winter has been recurrent. In this type of weather, farmers experienced increased outbreak of late blight of potato. Damping off observed in potato and cauliflower.

- Winter crops are affected due to lack of rainfall leading to seasonal drought

- In Chheda, which is the highest hill point (1425 masl) near to Latikoili till 2007 AD, snowing used to fall and melts only after 4-5 days. However, there has not been any snowfall since past five years.

<u>Understanding of Climate Change as recognized by locals of Latikoili, Surkhet cluster</u>

Ms. Ratna Malla, 69, originally hailed from Dailekh and living in Latikoili since past 48 years reported that heavier amount of rainfall at old times. In proverbial tone, she remarked that rainfall was such that mushrooms used to grow on the horns of buffaloes. Now, rainfall seems to have lessened.

Similarly, According to Bhadra Malla and Suja Rokaya of Latikoili, at old times after uprooting of rice seedlings, it used to rain a lot in such a way that water from rain used to sweep plough to the river. Now, there is no rainfall, we cannot keep seed bed for rice. Even during transplanting, there is no rainfall. May be rainfall amount is more or less the same. However, now rainfall pattern is such that it does not favor farmers. This year, during booting stage of rice, no rainfall has been observed whereas, due to excessive rainfall in winter, potato cultivation was damaged due to flood resulting from heavy rainfall. In the mean time, potato crops suffered due to severe pest and disease infestation owing to changes in weather pattern.

Now a day, warmer days are observed from early March, whereas at past weather used to get warmer only by mid March.

Negative impacts or problems due to climate change to small farmers

Various sources observed that climate change has profound negative impacts to the small holder farmers of South Asian region. Even farmers concur that they have experienced the change in terms of change in rainfall time, duration, temperature and change in other weather patterns. This section covers the problems perceived by farmers blaming climate change. According to the farmers, yield of crops has decreased where as pest and disease infestation problem has increased. Reservoirs and rivers' water level has decreased in due course of time. Due to out-migration owing to food insecurity, human resources working in agricultural land have decreased.

Besides general problem, crop specific problems (rice, maize, wheat and potato) owing to climate change as perceived by farmers are presented below.

Problems faced by farmers of Surkhet clusters in various crops

Gadhi	Latikoili	Lekhgaun	Ramghat
<u>Problems in maize</u>	**<u>Problems in major</u>**	**<u>Problems in maize</u>**	**<u>Problems in maize</u>**

• Maize stem borer • Yellowing of maize • Lodging of maize - major problem in those areas where heavy wind occurs • Minimum spacing • Black smut, Cutworms, White grubs infestation high in yellow colored soil **Problems in potato:** Red ant and Late blight are major problems in potato though local varieties are found to be resistant to disease. Late planted potato generally suffers from late blight of potato	**food crops**: Rice, wheat, maize, barley • **Pests:** grasshoppers, leaf roller, stink bugs, • **Disease:** Bacterial leaf blight, Blast, Loose smut, Borer, caseworm, termites **Problems in rice cultivations** • Lack of timely onset of monsoon during seed bed preparation and transplanting of rice. • In upland rice – ghaiya, weed is highly problematic. • Heavy rainfall and hailstone at the harvesting time period **Problems in wheat cultivation:** **Disease:** termites, Black rust (rato sindure), smuts	• Pests: White grubs, Maize stem borer, grasshoppers, Sarange, • Diseases: stem rot, white disease (whitish powders appeared on leaves), Black smut • Problems of lodging • Unable to sow and harvest maize on time. **Problems in rice cultivations** • Disease and pests: • rice stem borer, • Leaf roller, Rice stink bugs, rice blight, Raate (Zinc deficiency) • Delayed transplanting due to no rainfall • Rainfall at the time of harvesting **Problems in wheat cultivation:** • **Frost:** Frost (**Mangsir- Falgun**) is a major problems in winter seasons if occurs for longer duration causing damage to most winter season crops. • Heavy rainfall at the later stages is	• Maize stem borer, pod borer, termites, white grubs • Late onset of monsoon leads to delayed cropping; • lodging problems due to wind, • Wild boar damage • Heavy rainfall at harvesting and storage stages causes rotting of cob **Problems in rice (Ghaiya):** • **Diseases**: Black smut, major problem • **Pests:** grasshoppers, leaf roller, stink bugs

		favorable for (wheat rust: brown rust, yellow rust) **Problems in Colocasia and Potato cultivation:** • Red ant - major problem. • Colocasia highly affected by pests, Borer and beetles major problem.	

According to farmers' perception, in many of the crops, disease and pest infestation has intensified and erratic rainfall pattern has been observed as key problems affecting the crop production and productivity negatively. Lack of timely rainfall, rainfall during crop harvesting period, and increased pest infestation are associated with climate change in a sense that rainfall pattern change has been observed affecting traditional agricultural practices. In addition to the problems pertaining to climate change issues, farmers' management practices, such as use of old seeds and lack of technical knowledge is also responsible for low yield, which in itself is a problem. In conclusion, detailed study is needed to identify the causes of the problems - climate related problems and crop management related negative impacts so as to provide effective solution.

Scope to deal or cope with adversities in Latikoili

- Potato may give good yield.
- Mustard may be good because it requires less water
- Plastic house cultivation of potato may be unsuccessful because heavy wind damages the structure.
- Timur (Szechwan pepper) harvesting is difficult. If easy harvesting adopted, can become additional source of income.
- Scope of domesticating Madela – wild fruit similar to that of date fruit, and it gives good yield after 3 years of cultivation.

- Thakal – wild fruit can be part to achieve nutritional security. Since, it is found to be drought resistant; locals can resort to thakal during drought or food insecure condition as part of their food intake.

Adaptation and coping strategy for climate change followed (Present and Possible)

- Adjustment in sowing and harvesting time according to availability of rainfall (done by farmers at many places)
- Selection of robust seeds at local level
- Selection of appropriate seed variety such as choosing drought tolerant variety
- Crop replacement: Drought tolerant, crops with minimum water requirement can be adopted for cultivation.

4   CONCLUSION

Caritas Nepal has used this base line information to form small farmer groups. In Surkhet, from 4 clusters, 12 groups are formed. From each clusters, three hamlets are formed. About 15 farmers interested to work on the issue of climate change and agriculture adaptation have been organized to form a group in each hamlet.

Based on this base line information and pursuing workshops held in the villages, Caritas Nepal is identifying areas for further research. The research will be "small farmer group led action research". It will examine agriculture adaptations in farming to improve productivity of food grain crops (rice/wheat/maize) and other nutritious crops. The research will further examine the strengths found in this base line survey and screening outcomes regarding the small farming systems in the face of changing climate.

In this way, this baseline information has been useful to Caritas Nepal to understand the real context of climate change and its impacts in the cluster. We hope this information will be useful to other actors who want to contribute to the sector of climate change research and agriculture adaptation in Nepal and South Asia as a whole.

5   RECOMMENDATION

Local farmers need to follow innovative and alternative strategy rather than following only traditional practices so as to increase the adaptive capacity against climate change. Such as following integrated farming approach, integrated pest and nutrient management approach can increase their ability to fight against the adversities due to climate change. Generally, farmers do not replace old seeds with new ones, affecting yield potential, so awareness and action in this aspect might help them to prevent crop failure. Likewise, farmers should have access to innovative ideas and alternative technologies so that they are able to solve or deal with problems due to climate and pest infestations in effective manner. Meanwhile, innovative ideas used by local farmers should be disseminated to other local farmers.

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ANNEXES

Longitude (deg/min): 84.13

Elevation (m): 0154 masl

Maximum temperature recorded in °C over the last 30 years (1980-2011) in Dumkauli Meteorological Station, Surkhet

Year (AD) /Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1980												
1981												
1982												
1983												
1984												
1985												
1986												
1987												
1988												
1989												
1990												
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1998												
1999												
2000												
2001												
2002												
2003												
2004												
2005												

2006	
2007	
2008	
2009	
2010	
2011	

Source: Raw data from Department of Hydrology and Meteorology, Nepal

Minimum temperature recorded in °C over the last 30 years (1980-2011) in Dumkauli Meteorological Station, Surkhet

Year (AD) /Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1980												
1981												
1982												
1983												
1984												
1985												
1986												
1987												
1988												
1989												
1990												
1991												
1992												
1993												
1994												
1995												
1996												
1997												

1998

1999

2000

2001

2002

2003

2004

2005

2006

2007

2008

2009

2010

2011

Source: Raw data from Department of Hydrology and Meteorology, Nepal

Annual monthly rainfall measured in mm over last 34 years (1976-2011) in Dumkauli
Meteorological Station, Surkhet

Year(AD) /Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976												
1977												
1978												
1979												
1980												
1981												
1982												
1983												
1984												
1985												
1986												
1987												
1988												

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2004

2005

2006

2007

2008

2009

2010

2011

Source: Raw data from Department of Hydrology and Meteorology, Nepal

Annex 2: Farmers' innovative practices

1. Hybrids seeds: The hybrid seeds are not adopted in Surkhet district, they are under adoption in Ramghat, Gadi and Lekhgaun. But in Latikoili hybrid seeds are fully adopted it may be due to the access to hybrid seeds because the Latikoili lies in Birendra Nagar Municipality.

2. Cultivation: machine is under adopted in Ramghat VDC. Where as in other VDCs its difficult to indicate there may be no adoption.

3. Irrigation technology: canal irrigation is not adopted.

4. Harvesting machine: adopted

5. Seed storage technology: the traditional seed storing boxes are used such as wooden box, bamboo box etc are used.

6. Post harvest technology: drying of grain products on sun is not new practices. But they don't dry up grain in optimum condition. Now farmers dry grains in optimum moisture condition. The scientific drying is well adopted in Bardiya district.

Annex 3: Various crops of Surkhet clusters

Cereal crops: maize, upland rice (ghaiya), millet, barley, sorghum

Legumes: lentil, chickpea, pea, bean, cowpea, soybean, black gram, broad beans

Oil seeds: mustard, linseed, sesame, groundnut

Vegetable crops

- **Leafy vegetables:** Broad Leaf Mustard (BLM), *Chenopodium album* (Bethe), Fenugreek, Cress, Spinach, Amaranthus, Buckwheat, Swiss chard
- **Crucifers:** Cauliflower, Cabbage, Broccoli, Radish, Carrot, Turnip
- **Solanaceous:** Potato, Brinjal, Tomato, Chilli
- **Climbers and vines:** Pumpkin, Cucumbers, Bottle gourd, Sponge gourd, Snake gourd, Bitter gourd, Ash gourd, Cow pea, *Coccinea grandis* (ivy gourd/kundruk)
- **Bulbs:** Onion, Garlic,
- **Root crops:** Colocasia, Sweet potato, Yam (Tarul)
- **Spice crops:** Ginger, Turmeric
- **Others:** Carrot, Beans, Okra

Horticultural crops: Mango, Jackfruit, Banana, Lime, Guava, Lemon, Pomegranate, Plum, Pear, Litchi, Papaya,

Agro forestry: Custard apple, Amala (*Emblica officinalis*), Amaro (golden apple/*Spondias pinnata*), caruda, Bayar (*Jujube ziziphus*), Avrakh, kimbu (Moris alba), Badahar (*Artocarpus lakoocha*), kadam, Imeli (tamarind).

Crops collected from jungle (uncultivated crops)

Wood apple, jamun (*Syzygium jambolanum*), kusum (*Schleichera oleos*), payari (*Ficus arnottiana*), harro (*Terminalia chebula*), barro (*Terminalia bellirica*), pipla (*Piper longum*), thatara, tata (Bholau), Gaurai, phosou, ban tarul (*Dioscorea hemiltoni*), niuro (fiddle head fern), jibre (*Ophioglossum reticulatum*), jaluko (*Remusatia vivipara*), asparagus, pudki, bemata, futko, wild mushroom, asparagus, aiselu (wild raspberries), Farate, Chiuri (Butter plant), Thakal (*Phoenix humilis*), koiralo (*Bauhinia variegata*), Tendu (*Diospyros malabarica*), piyari (*Buchanania latifolia*), bhalayo (*Rhus wallichii*),

Livestock: Buffalo, Cattle, Goat, Sheep, Local Poultry, Swine

saf bin
For Small Farmers Future

Strengthening Adaptive Farming in Bangladesh, India and Nepal (SAF-BIN) is an action research programme under the European Union Global programme on Agriculture Research for Development (ARD). It is a multi-dimensional research that address the agricultural development challenges of developing and emerging countries. It is an initiative to promote local food and nutritional security through adaptive small scale farming in four rainfed Agro Ecosystems (AES) in South Asia. The programme is implemented by the Caritas Organisations in Bangladesh, India & Nepal in partnership with University of Natural Resources and Applied Life Sciences (BOKU), Austria and in association with Action for Food Production (AFPRO), India; Sam Higginbotom Institute of Agriculture, Technology & Sciences (SHIATS), India; Bangladesh Rice Research Institute (BRRI), Bangladesh and Local Initiatives for Biodiversity, Research and Development (LI-BIRD) to address the Food Security and Climate Change Challenges of the Smallholder Farmers living in rainfed areas in South Asia.