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ROYAL SOCIETY FOR PROTECTION OF NATURE

ORGANIC DENMARK.

BASELINE REPORT ON FARM YIELDS AND FOOD SECURITY OF PROJECT AREAS IN CHHUKHA AND ZHEMGANG DZONGKHAGS

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December 2018

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Published by:

Royal Society for Protection of Nature
P.O.Box 325, Thimphu, Bhutan
www.rspnbhutan.org
&
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Photo Credits: Front and back cover: Jesper Saxgren

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ACKNOWLEDGEMENT

Civil Society in Development (CISU), Denmark for financial support for this project and Organic Denmark for technical support.

Communities of Bayul-kuenzang and Gidaphu in Bongo Gewog under Chhukha Dzongkhag; Buli, Kikhar and Tali under Nangkor Gewog, and Dakpey and Berti under Trong Gewog in Zhemgang Dzongkhag, the local government officials and Agriculture Extension Officers of Gewog Administrations of Bongo, Nangkor and Trong, and officials of Dzongkhag Administrations of Chhukha and Zhemgang for extending cooperation and assistance during the survey. Without their support, the survey could not have been successful.

I. INTRODUCTION

Chhukha and Zhemgang Dzongkhags are one of the important areas of Royal Society for Protection of Nature's (RSPN) involvement. Since 2012, RSPN started working in Zhemgang and from mid of 2016 in Chhukha aiming to conserve biodiversity through sustainable livelihoods development. Chhukha Dzongkhag in the South West covers an area of 1,882.38 sq. km with elevations ranging from 200 to 3500m above sea level. It has a total arable land of 4.63 percent of the total land. The average landholding is 5.6 acres per household. Majority of the people are dependent on livestock and subsistence agricultural farming. Mandarin, potato and cardamom are the principal cash crops in the Dzongkhag. Despite favourable climatic conditions, farmers are poor and agricultural productivity is low due to lack of agricultural knowledge, rugged terrain, water shortage, human-wildlife conflicts and limited infrastructure for market access.

Zhemgang Dzongkhag in the Central has a total land area of 2421.74 sq. km. Zhemgang is considered as one of the least developed Dzongkhags in the country and is divided into three ecological zones namely Upper Kheng, Middle Kheng and Lower Kheng. The livelihood for the people of Khengrin-Namsum depends on agriculture and livestock farming. In recent years, mandarin cultivation in Lower Kheng as a source of cash income has been quite encouraging. However, the existing problems includes wide spread poverty and food insecurity causing high levels of illiteracy, infant and maternal mortality. Shortage of skilled and unskilled manpower, limited arable land, limited accessibility to market and out-migration of young and educated population exacerbate the situation.

Project sites in both the Dzongkhags are located in warm broadleaf forest zone with potentially high diversity of faunal and floral species. Most of the villagers (if not all) are self-sufficient through agricultural practices combined with livestock raring and small kitchen garden. The villagers significantly depends on forest resources especially for their own livelihoods. Most of the villages in two project areas are scattered amidst forest areas and lack sufficient modern infrastructural facilities. The increasing aspirations of the inhabitants of two project areas for economic development and expanding access to market will potentially lead to degradation of the farm land and natural resources. There is however opportunity for interventions that will open prospects for enhancing both conservation and socio-economic welfare of the local communities. With the findings from the 2016 and 2017 Preliminary Report of 2016 RSPN and Organic Denmark, RSPN has initiated a project on agro-ecological/organic farming in two Districts since early 2018. Major problems addressed in this intervention includes food insecurity, agricultural extension, lack of infrastructure and civil society organizations for small scale farmers. In this context, baseline information has been considered important to enable long-term planning and formulating interventions that are appropriate and relevant to the areas.

The baseline survey was conducted in the month of April 2018 by Chief and Project Officer of RSPN with backstopping from concerned Agriculture Extension Officers of the two project areas (refer Figure 1) as part of the project: 'Empower Small Scale Bhutanese Farmers to Increase Food Security and Sustainable Livelihoods through Agro-Ecological Farming and Food Systems Development'. The project aims to contribute towards Bhutan's vision of going 100% organic by fostering environmentally, socially and economically sound, resilient and sustainable livelihood strategies by integrating the principles of agro-ecological farming and ecosystem management. The project is expected mainly to address the problem of how to secure food security and create climate resilient, sustainable livelihood strategies among small scale Bhutanese farmers by developing and implementing a participatory agro-ecological extension model, building the capacities of individual farmer and families in their communities by joining the expertise of Royal Society for Protection of Nature (RSPN) in natural systems ecology, conservation of nature and biodiversity with Organic Denmark's (OD) experiences in participatory organic farming system methods.

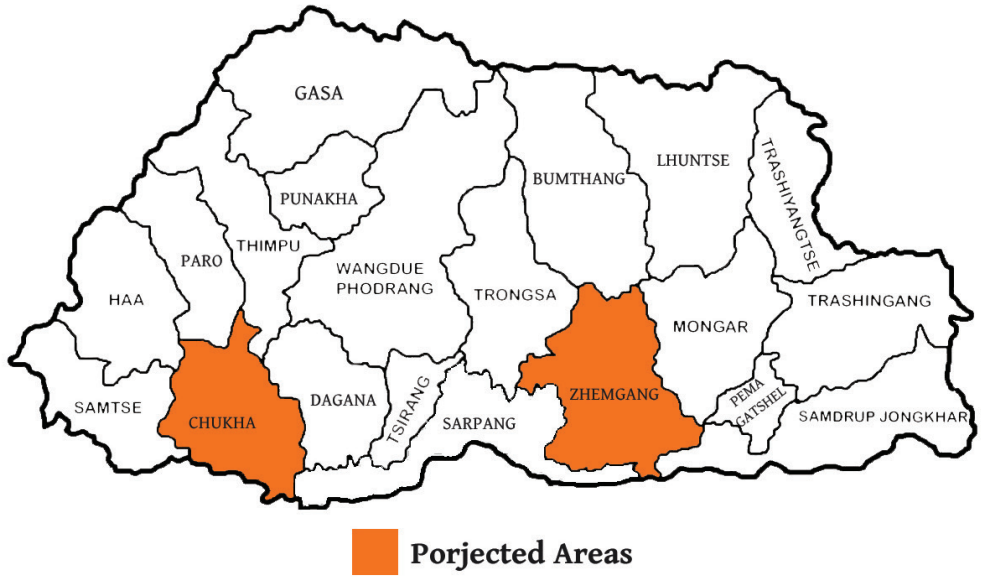
II. OBJECTIVE

Understand the local situation on social, economic and resource management for developing a long term plan to assist local communities in agro-ecological/organic farming program and sustainable natural resources management.

III. METHODS

The baseline survey was conducted using two tools: Participatory Rural Appraisal (PRA) and household survey. RRA was applied to collect information as well as to get the view of key community members and local leaders on socio-economic situation. PRA exercises and household interview were conducted to get detail information of the villages. The quantitative data were recorded and analyzed using SPSS version-21 and Microsoft Excel spreadsheet including graphical illustrations. And qualitative data were recorded through reading, clustering, grouping facts, ideas, perceptions, opinions, patterns, associations and relationships into similar categories.

Figure 1: *Map of Project Areas*



Key informants representatives

Selection of key informant representatives were based on these criteria:

- Gender balance;
- Experienced/elderly representative;
- Youth representative;
- Group key informants consists of representatives from different locations of a village.

PRA exercises:

The PRA tools consists of Village History and population, Village Resource Mapping, Seasonal Calendar, Infrastructures and development, Livelihood and land use patterns, Forest Cover and Forest Product Use, (water, timber and NTFPs exploitation and wildlife), SWOT Analysis and Problems and Solutions and Activity Development (refer Table 1). The PRA is done within a day and household interview took 3 days or more in one location depending on number of households.

Table 1: PRA Tools

Sl.	Tools	Time required in minutes
1	Introduction	5
2	Village History and population	30
3	Village Resource Map (in groups)	120
	TEA BREAK	20
4	Sessional Calendar	40
5	Infrastructures and development	20
6	Livelihoods and land use patterns	50
	LUNCK BREAK	60
7	Forest Product Use	40
8	SWORT Analysis	60
	TEA BREAK	20
9	Problem & Solutions/Activity Development	60
10	Household Survey/Interview	3 or more days in one location

IV. BASELINE SURVEY RESULTS

4.1. Bayul-kuenzang, Bongo Gewog, Chhukha

4.1.1. General Information

Bayul-kuenzang is one of the Chiwogs (sub-block) under Bongo gewog (administrative block) in Chhukha Dzongkhag. Bayul-kuenzang Chiwog consists of five villages with seventy households and is located at an altitude of 610 to 800 meters above the sea level. Bayul-kuenzang currently has 56 households (including Jigme-chhu) while Gidaphu has 14 households of which around 4 households are empty/abandoned (refer Table 2). The area has estimated population of more than 1000 and average land holding is 2 to 3 acres per household. All villages have scattered pattern of settlements. The statistical data on population, land use, economic wealth ranking, crop production, crop productivity, livestock production, forest cover, use of natural resources and water resources are not available at the Chiwog level.

Table 2: ***Details of Households***

Name of villages	Households joined FFLGs	Households not interested to join FFLGs	Empty/Abandoned households	Total households
Gidaphu	13	0	1	14
Khamshing-Lakha	13	4	3	44
Tseshing-Lakha	12			
Yulumpa	12			
Jigme-Chhu	0	12	0	12

History about how the village got its name

The old woman from Bayul-kuenzang narrates that Tsendra Tulku (incarnated lama) from Tsanda Goempa in Paga Gewog under Chhukha Dzongkhag used to visits the areas (present Gidaphu & Bayul-kuenzang) annually to perform annual religious ritual. The lama found the place a heavenly and peaceful as it is located away from rest of the villages and townships, and he named the place Bayul-kuenzang, literally meaning 'hidden land of happiness'. Later the name got fragmented and now commonly known as Baikinza).

Another story says: there is a pilgrimage site on a rock at Jigme-Chhu and local people and people from nearby villages often used to visit the pilgrimage site. And there is a story that people get trapped (Bazha in Dzongkha) in the rock if individual has collected sin or perform indecent acts. Thus, it was derived the name Bayul-kuenzang.

4.1.2. Population by age and gender

Bayul-kuenzang Chiwog has three villages with 70 households and estimated population of more than 1000 as per the village/ Chiwog record. However, only 50 households have joined the FFLG (Farmers Family Learning Groups) with the population of 201, who are agriculture dependent and stays either in the villages throughout or for more than six months. Of the total population, 110 are female and 91 are male. The survey indicates that there is more female than male population in the village (refer Annexure 1)

Table 3: ***Interviewed farmers by age and gender***

Age Range	Female	Male	Total Interviewed FFLG Farmers
15-44	12	11	23
45-54	10	2	12
55-60	4	3	7
61+	6	2	8
Total	**32**	**18**	**50**

The above Table 3 and Figure 2 indicates that of the total 50 respondents, 32 were female and 18 male. An active age group is just 23 respondents falling in the age group of 15 to 44 years followed by 12 respondents in the age group of 45 to 54 years. While 7 respondents and 8 respondents fall in the age groups of 55 to 60 years, and 60+ respectively. Only 46% of the respondent falls in the age group of 15 to 44 years, indicating that there is a shortage of productive age group or labour force in the village for farming.

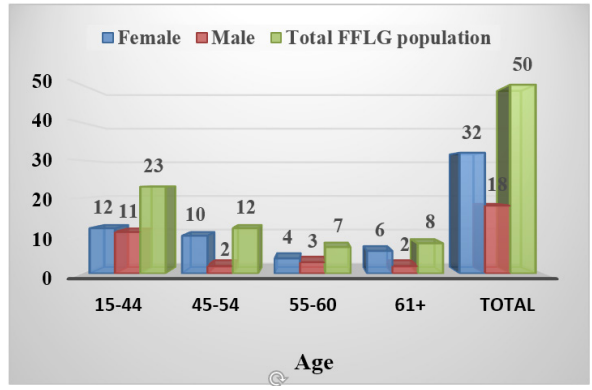


Figure 2: ***FFLG population by age and gender***

4.1.3. Livelihoods

4.1.3.1. Agriculture

Most of the villagers of Bayul-kuenzang Chiwog are self-sufficient and dry land based cultivation is the most dominant farming system in all the villages. It was reported by people that 9 cereal crops and varieties of vegetables are cultivable throughout the year having sufficient water. Cultivation ranges from gentle to steep slopes and the farmers practice mixed cropping. There is no paddy field/wetland other than a small natural lake above Gidaphu village. The households are widely scattered and many of the farming parcels are close to the forest, making the crops vulnerable to wildlife damage. Another important land use system is the previously practiced slash and burn system which has now been reduced as the legislation requires such land to be regularized into permanent dry land. However, in most cases these lands have not been cultivated and have evolved into scrub forest bringing the permanently cultivated parcels close to the forest. Most farmers are of the view that this has enhanced the habitat for the wildlife and the damage on crops.

Food Crops

The staple crop cultivated for food is maize. In addition, farmers also cultivate both finger and fox-tail millets, mustard, buckwheat, barley, dryland/upland rice. Orange, cardamom, mango, sugarcane, banana and chili are the main cash crops grown by the communities.

Table 4: ***Major food crops grown by households in last 3 years (2015 - 2017)***

Major food crops grown by Households (hhs)	Size of cultivated land by Households (hhs)	Annual crop yield of Households (hhs) in Kilograms
Maize	Less than 1 acre: 14 hhs	Don't know the quantity: 6 hhs
Dryland paddy/upland rice	1 acre: 9 hhs	100 to 150: 5 hhs
Finger Millet	More than 1 cares: 11 hhs	150 to 200: 3 hhs
Fox-tail Millet	2 acres: 1 hh	200 to 250: 4 hhs
Mustard	More than 2 cares: 2 hhs	250 to 300: 4 hhs
Buckwheat	3 acres: 1 hhs	300 to 350: 6 hhs
Barley	More than 3 acres: 9 hhs	350 to 450: 2 hhs
Lentils	Runs a shop: 1 hh	More than 500: 18 hhs
Quinoa	Don't cultivate: 2 hhs	Don't cultivate: 2 hhs

The above Table 4 illustrates that all the 50 households cultivate maize, dryland/upland rice, both finger and fox-tail millets, mustard, buckwheat, barley, lentils and quinoa as their staple food crops. Of the total 50 households, 36 households have the record of sizes of their cultivated land and 39 households also have the record of quantity of crops they harvested. On the other hand, it indicates that 1 household runs a shop in the village, 2 households do not cultivate any food crops while 6 households do not know how much quantity they harvested. None of the households market their food crops and for detail information (refer annexure 3).

Fruit/Cash Crops

Horticulture is least developed in Bayul-kenzang; yet, orange (Citrus) was grown abundantly and was the major source of cash income in the past. However, due to Citrus greening disease it was completely wiped out, and farmers have started mass replantation few years ago through the support of Yosipang Research Development Center (RDC) of the Ministry of Agriculture.

Table 5: ***Major fruit/cash crops grown by households in last 3 years (2015 - 2017)***

Major cash crops grown by HHs	HHs earned income from the sale of cash crops
Orange	Grow crops: 45 hhs
Areca Nut/Betel Nut	
Cardamom	Do not grow the crops: 5 hhs
Mango	**Sold the fruit crops: 10 hhs**
Sugarcane	
Banana	Did not sale crops: 35 hhs
Chili	

The above Table 5 shows that of the total 50 households, only 45 households cultivate major fruit/cash crops such as orange, areca nut, cardamom, mango, sugarcane, banana and chili while 5 households do not grow any of the fruit/cash crops. On the other hand, 10 households sold the fruit/cash crops in local market at Jigme-chhu while 35 households do not sale the crops. Therefore, it indicates that either the fruit trees are still small and only bear meager quantities of fruits or the farmers consumed themselves due to lack of road access to market their products. For detail information (refer annexure 4).

Vegetables

Table 6: Major vegetables grown by households in last 3 years (2015 - 2017)

Major vegetables grown by HHs	Size of the vegetable garden owned by HHs	Vegetables consumed by HHs	Time spend in gardening
Chili	Don't know the size: 13 hhs	Chili	
Potato	3 decimal: 1 hh	Potato	
Ginger	5 decimal: 9 hhs	Ginger	
Tomato	6 decimal: 2 hhs	Tomato	Women: 27 hhs
Onion	7 decimal: 1 hh	Onion	
Cauliflower	10 decimal: 11 hhs	Cauliflower	Men: 2 hhs
Cabbage	15 decimal: 1 hh	Cabbage	
Broccoli	20 decimal: 4 hhs	Broccoli	Both woman & man: 18 hhs
Beans	25 decimal: 0 hhs	Beans	
Carrot	30 decimal: 3 hhs	Carrot	Don't have garden: 3 hhs
Radish	35 decimal: 0 hhs	Radish	
Pumpkin	40 decimal: 0 hhs	Pumpkin	Sales vegetables: 7 hhs
Spanish	45 decimal: 0 hhs	Spanish	
Brinjal	50 decimal: 2 hhs	Brinjal	
Squash	Don't have garden: 3 hhs	Squash	

The above table 6 explains that varieties of vegetables are grown by the farmers. Of the total 50 households, 47 households grows vegetables such as chili, potato, ginger, tomato, onion, cauliflower, cabbage, broccoli, beans, carrot, radish, pumpkin, spanish, brinjal and squash, and they consumed all the vegetables they grow. On the other hand, 7 households sold vegetables in nearby market at Jigme-chhu while 3 households do not own vegetable garden. It also indicates that 2 respondents said that men spends more time in gardening, 18 respondents mentioned that both women and men spends equal time in gardening while 27 respondents stated that women spends more time in gardening. This indicates that women shares more work burden than men at the household level. For detail (refer annexure 5).

Farming and Soil Conservation Practices

The farmers practice mixed cropping. Crop rotation is also practiced as a part of farming method. Farmers have initiated number of land management practices such as plantation of fodder grasses (Nippier and Guatemala) and composting through sustainable land management program, and terracing was done in the past but not anymore. Farmers mainly use organic manure such as cow dung and natural compost leaves from forest in their farms as synthetic-chemicals are found to be expensive and also it is not easy to access them. In the past shifting (slash and burn) cultivation was practiced and few households still follow.

Table 7: Farm Management, Soil Conservation and Trainings

Types of farm mgt.	HHs practiced farm mgt.	Types of soil conservation practices	HHs practiced soil conservation	Types of land mgt. training provided	HHs received land mgt. training	Training provided by
Organic Manure (cow dung & natural composed leaves from forest)	49	Terraces	1	Sustainable land management	6	Department of Agriculture (Yosipang RDC) Dzongkhag Agriculture Sector Gewog RNR Agriculture Extension Center
Pesticides	1	Hedgerow	0	Crop management (plantation & harvesting)	20	
Certified seeds	0	Crop rotation	36	Organic farming	6	
Chemical fertilizers	0	Terraces, Hedgerow, Crop rotation & Mixed cropping	11	Water management/ conservation	0	
Others	0	Don't cultivate	2	Didn't receive training	18	

The above table 7 indicates that of the total 50 households, 36 households practices crop rotation, 11 households applies terraces, hedgerow, crop rotation and mixed cropping, while 1 household practices terraces and 2 households do not cultivate. On the other hand, it shows that of the total surveyed household, 49 household used organic manure such as cow dung and natural compost leaves from forest while only 1 household used pesticides in early 2018 indicating there is good potential for opting for organic farming.

Similarly, the table also illustrates that 20 households received land management training on crop management, 6 households on sustainable land management and 6 households on organic farming provided by Yosipang Research Development Center, Dzongkhag Agriculture Sector and Gewog RNR Agriculture Extension Center at different times. However, 18 households did not received above trainings and none of the households received training on water management.

Food Sufficiency

Food insufficiency can be strongly related to the condition of crop yield, mainly maize which is one of the important crops. Most of the farmers of Bayul-kuenzang are self-sufficient as they can grow 9 cereal crops and varieties of vegetables throughout the year having sufficient water. It was informed that people of Gidaphu village is self-sufficient from their own produce (buy only salt) while majority of the households in Bayul-kuenzang buy essentials from Jigme-chhu.

The Figure 3 indicates that of the total 50 households, 38 households recorded enough harvests resulting to sufficient food for throughout the year, while 12 (24%) households experienced a food shortage for 1 to 6 months (refer annexure 9).

Figure 3: Status of food sufficiency

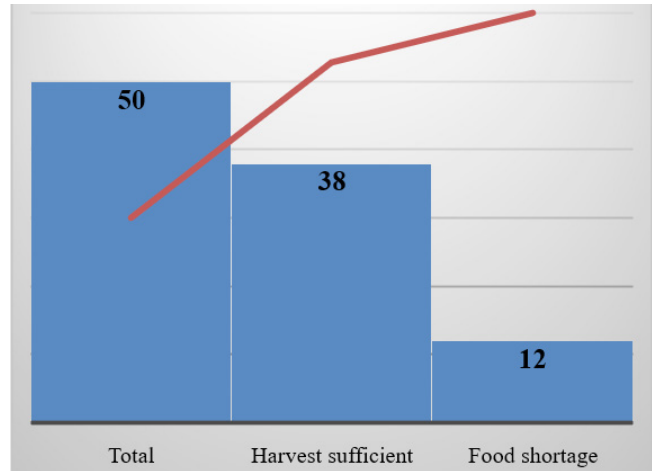
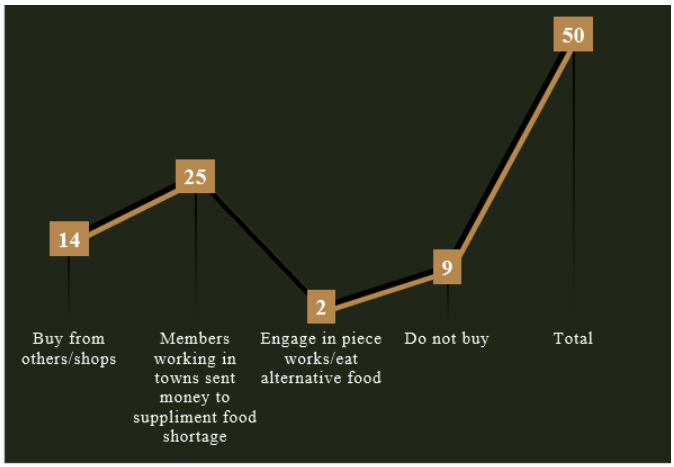


Figure 4: Sources to overcome food shortage



The Figure 4 shows that number of options have been adopted to overcome the food deficit/shortage. Of the total 50 households, 14 households buy from other shops, 2 households either engaged in piece works or eat alternative food while 25 households were sent money by members working in towns to supplement food shortage. Only 9 households (18%) do not buy food items other than just essentials like salt and cooking oil from the nearby town indicating that those household either have enough landholdings and sufficient labour force/productive age group.

4.1.3.2. Livestock

Farmers also engage in number of livestock activities to sustain their livelihood. Livestock particularly cattle is an integral part of the farming system as it is the main source of draught power and manure besides supplementing the household income. Horses are reared for transporting goods from the nearby markets in the absence of farm road. Backyard piggery, poultry and goat are raised by number of farmers to supplement their livelihoods.

The above table 8 shows that of the total 50 households, 23 households raised cattle for supplementing farming system, manure and household income, while 2 households reared both cattle and horse and 2 households owned both cattle and pig. In addition, 4 households raised backyard poultry and goats by 2 households to supplement their livelihoods. 17 households do not owned any animals and none of the households owned bee hive. On the other hand, 6 households sold animal products, 27 households consumed the animal products for themselves while 17 households either buy animal products from neighbours or market. For detail (refer annexure 8).

In addition, the Figure 5 illustrates that of the total 50 surveyed households, 23 households feed the livestock by keeping the in the grazing area during day time and in the stable/shed at night. Similarly 7 households feed the livestock by keeping in the stable/shed and feed throughout while only 3 households feed the livestock by keeping in the grazing area whole time. This graph indicates that majority of the households are aware of negative impacts of uncontrol grazing to the local environment.

Table 8: Types of livestock rear by households

Types of livestock rear by households (hhs)	Households (hhs) owned livestock	Households (hhs) sale livestock products
Cattle	23	Sales: 6 hhs Self-consumption: 27 hhs Buy from others/market: 17 hhs Owned Bee Hive: 0 hh
Horse	0	
Poultry	4	
Goat	2	
Pig	0	
Both Cattle & Horse	2	
Both Cattle & Pig	2	
Do not own any	17	

4.1.3.3. Wealth and sources of income

Difference between the rich and the poor is very insignificant in Bayul-kuenzang. It was reported that about 90% of the households owned television (TV) while 100% households have mobile phones. The average land holding is 2 to 3 acres per household and about 66% households owned livestock to supplement their livelihood. About 88% of the households owned a concrete houses and around 50% households earned income through daily wage labour and meager amount from sales of farm and dairy products in the local market. Three groups of wealth were classified by the local people based on the following criteria (refer table 9).

Figure 5: Types of livestock feeding by households

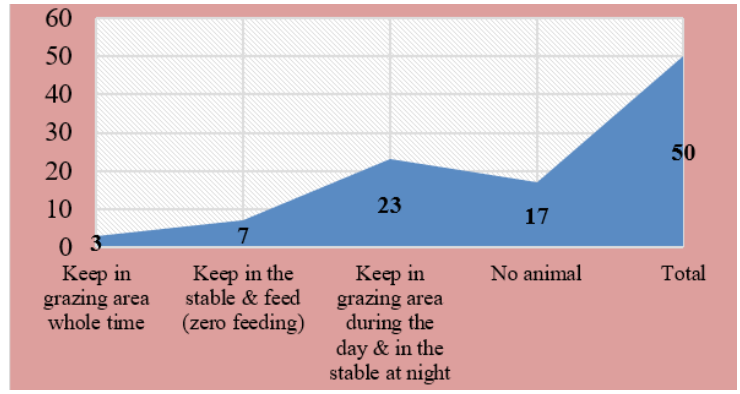


Table 9: Criteria for household wealth ranking in Bayul-kuenzang Chowing

Criteria	Better off	Moderate	Poor
Land holding	> 5 acres	1 acre - 4 acres	< 1 acre
Livestock	Own 10 or more livestock	Own 1 - 10 livestock	< No livestock
Food sufficiency	Surplus	Sufficient	Food shortage
House type	Big/concrete house	Medium/good quality	Small/poor quality house
Income	> Nu. 10,000	> Nu. 1,000 - 9,000	< Nu. 1,000 or no income

The result of the household ranking indicated that (refer figure 6) only 4 (8%) households falling in well-off category and 7 (14%) households as poor. The well-off households owns a very big/concrete house, more than 5 acres of land, own livestock and earns income more than Nu.10,000 annually. The poor households are dependent on daily wage labor and sharing cropping (cultivation of crop on the land of other). On the other hand, about 39 (78%) households falls in moderate group indicating that majority of household in Bayul-kuenza are self sufficient.

Similarly, figure 7 illustrated that of the total 50 households, 44 (88%) households owned a concreted house made of stone and wood, 5 (10%) household owned a house made from wood. This indicates that majority of the people in Bayul-kuenzang owned a good living house.

Figure 6: Household wealth status

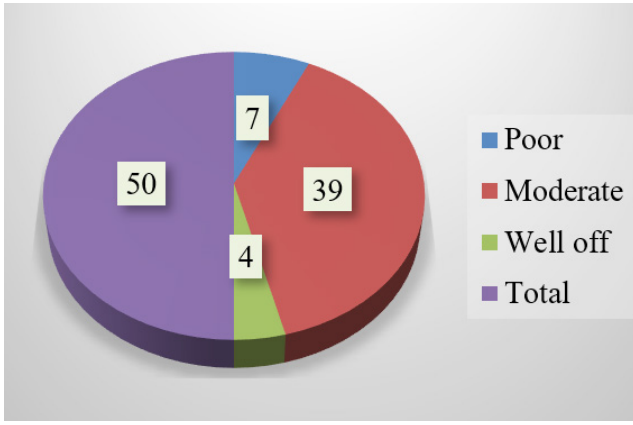
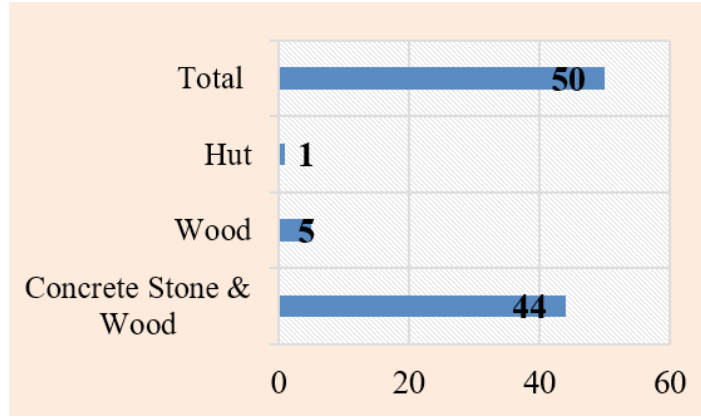


Figure 7: Types of houses



On the other hand, only 1 (2%) household owned hut. The owner of the house is single old woman bears no siblings and do not have any relatives supporting for her livelihood.

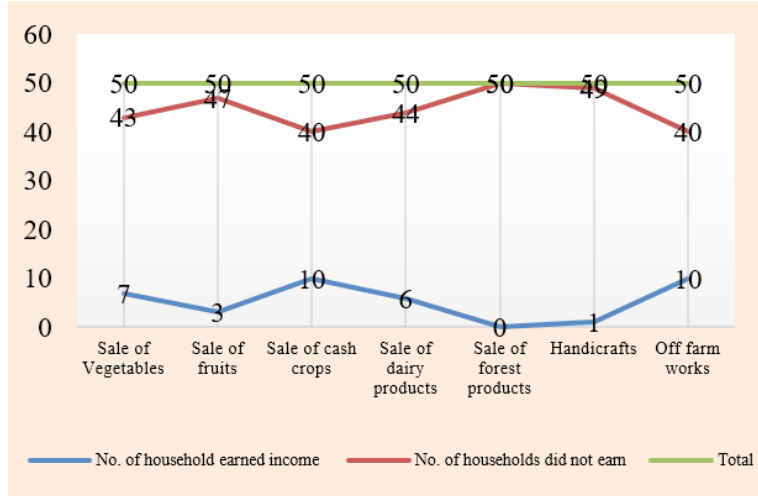
Table 10: Sources of income of the households

Sources of Income	No. of household earned income	No. of households did not earn	Total households
Sale of Vegetables	7	43	50
Sale of fruits	3	47	50
Sale of cash crops	10	40	50
Sale of dairy products	6	44	50
Sale of forest products	0	50	50
Handicrafts	1	49	50
Off farm works	10	40	50

In addition, the above table 10 and figure 8 indicates that of the total 50 households, only 3 households earned income from the sale of fruits, 7 households from sale of vegetables, 6 households from sale of dairy products and 10 households from sale of cash crops.

On the other hand, 10 households earned income from off-farm works (wage labour and salary as school caretaker) while only 1 household earned income from handicraft (carpentry work). None of the households earn income from the sale of forest products. For detail (refer annexure 10).

Figure 8: Sources of income

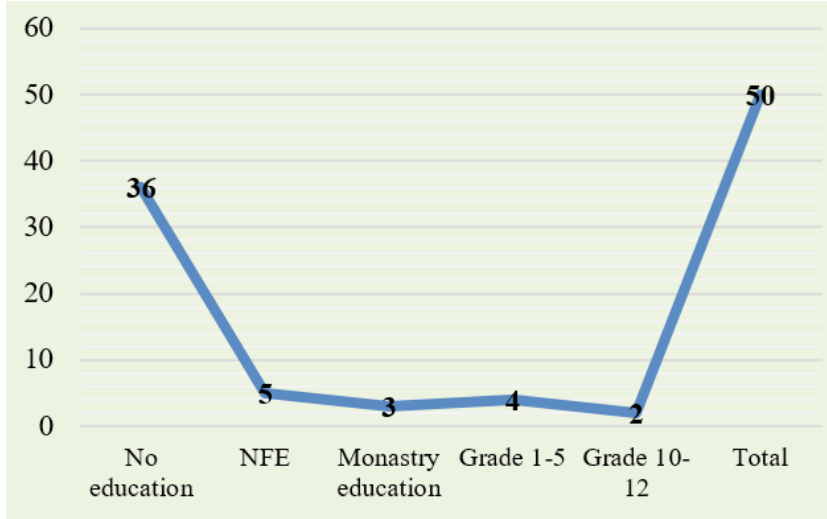


4.1.4. Education and Health

The government has set up educational facilities all over the country. There are formal schools as well as non-formal education (NFE) centers offering learning opportunities at all levels. Bayul-kuenzang has 1 Community Primary School which caters up to class-VI. The school has 3 teachers with 26 students in the academic year 2018. In addition, there was 1 NFE center till end of 2017 but was closed in 2018 due to lack of instructor. The NFE center offers equal learning opportunity to the interested adults and school dropouts in the area. It was reported that of the total population, about 50% population have basics.

Health is another sector where government has tried to maintain balance in all parts of the country. The communities of Bayul-kuenang and Gidaphu have access to health facilities, provided by the Bayul-kuenzang Basic Heath Unit (BHU). The BHU has 1 male Health Assistant (HA), who provides medical assistance especially in immunizing child and routine checkup of the mother. However, the people shared their concern that additional female HA would ease the service delivery of routine checkup of pregnant women and treating other women related diseases.

Figure 9: Level of education of respondents



The figure 9 shows that of the total 50 respondents, only 2 respondents completed grade 10-12, 4 respondents completed grade 1-5 and 3 respondents completed monastic education (ex-monk).

On the other hand, 5 respondents have completed Non-Formal education and the majority of 36 respondents were uneducated. This indicates that illiteracy rate is high in the Bayul-kuenzang. All the school dropout respondents stays in the village and does farm activities.

4.1.5. Infrastructures

Electricity

Bayul-kuenzang Chiwog is located very close to Tala Hydro Power Plant; therefore, all the households have been connected with grid electricity more than decade ago, which made great difference to day to day life of the people. The connection of electricity to the villages not only improved the health and sanitation at the individual household but also led to big reduction on fuel wood consumption.

Road

The farm road is the main concerned of the Gewog (Block) at the moment. At the moment the villages has been connected by age old narrow uphill pathway, which cause difficulties to the communities in transporting household essentials from the local market at Jigme-chhu and marketing their farm products simultaneously. However, construction of farm road from Jigme-chhu is ongoing and soon expecting to complete, whereby it will significantly ease the past difficulties of transporting household essentials and farm products. On the other hand, Bayul-kuenzang used to be connected by Rope-way over mighty Wang-chhu from the road end at Jigme-chhu until end of 2017, which has cause inconveniences in transporting household essentials, marketing farm products and risking the life of commuters. In early 2018, a suspension Baily-bridge over Wang-chhu at Jigme-chhu was constructed by the Dzongkhag and it has greatly benefited the communities. However, village do not have farm product storage infrastructure.

Telecommunication facilities

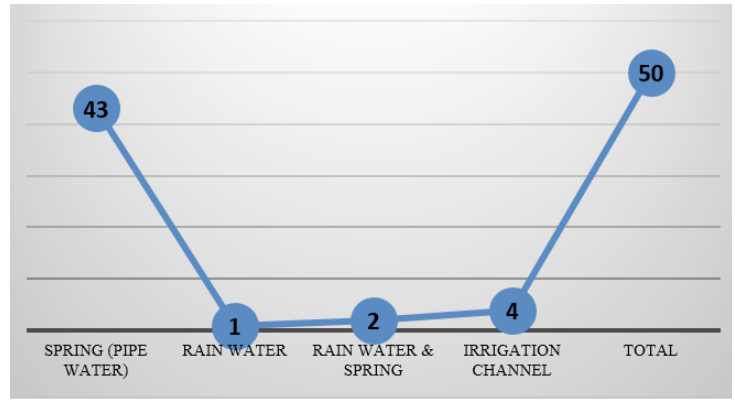
Although no fixed line telephone is owned by any of the households, school and BHU, but 100% of the households owned mobile phone. The people reported that 100% connectivity by both BMobile and TCell networks in Bayul-kuenzang and Jigme-chhu areas. However, Gidaphu village is out of reach from both BMobile and TCell networks because of its location behind the hill.

4.1.6. Water Resources and Wildlife crop damages

Water shortage for both drinking and irrigation was reported as one of the major issues. There are currently 4 water sources existing but it is not adequate and it was informed by the people that one water source at top of the village was dipped in the ground by major earthquake of early 1990s. The government has supported with rural water supply scheme (RWSS) in early 2000s and was repaired in early 2018 to overcome the long awaited drinking water shortage. In addition, government has constructed the irrigation facility early; however, it did not benefited the upper households in the village as the current irrigation channel pass through lower part of the village.

The figure 10 indicates that of the total 50 households, 43 households drink water from pipe connected from nearby spring, 4 households from recently constructed irrigation channel, 1 household depends on rain water from drinking and 2 households used both spring and rain water for drinking. It indicates that about 7 (14%) households either do not have pipe water (RWSS) facilities or sufficient water from pipeline connection.

Figure 10: Sources of drinking water



In addition, the table 11 in the following page indicates that the causes of water shortage is associated with various man-made and natural factors. Of the total 50 households, 5 households reported that cause of water shortage is due to lack of proper water sources management, 6 household said that water source is degraded and sunken the source by earthquake and 3 households mentioned that water source is degraded and demand increased by increasing population. Similarly, 2 households mentioned that water source is degraded and poor water source management, 2 households reported that water source is seasonal, and 10 households said that water source is degraded, while 16 household said that water source dries up during dry season. Only 6 households reported that water is sufficient indicating that the village experienced an acute drinking water shortage.

On the other hand, to overcome the drinking water shortage in the village, various measures have been initiated to conserve water. Likewise, of the total 50 households, 29 households initiated the water conservation through protection of watershed and water source, while 13 households initiated through fencing of watershed and water source. 8 households did not initiated any measures signifying either the households do not experience the water shortage or are not aware of importance of conservation of watersheds and sources.

Table 11: Causes of water shortage and measures initiated to conserve water

Causes of water shortage	HHs experienced water shortage	Measures initiated to conserve water
Water is sufficient	6	• 29 households initiated protection of watershed and water source. • 13 households initiated fencing of watershed and water source. • 8 households did not initiated any measures.
Water source is seasonal	2	
Water source is degraded	10	
Water dries up during dry season	16	
Water source degraded & poor water source management	2	
Water source degraded and demand increased by increasing population	3	
Water source degraded and sunken the water source by earthquake	6	
Lack of proper water source management	5	
Total	50	

On other hand, human wildlife conflict is another major issue in the village. Among various other factors, destruction of crop by wildlife seems to be one of the significant attributers for food insufficiency in Bayul-kuenzang. Almost all the households in the village reported crop damage by wild animals such as wild boar, monkey, barking deer, rat, squirrel, porcupine, Himalayan black bear and yellow-bellied magpie.

Maize is the most destroyed crop followed by other crops although they do not have records of quantity lost to wildlife annually, said the people. Simultaneous to the loss of crop, loss of livestock to wildlife is another dilemma faced by the people in the village, though the extent of damage is not as big. The people reported loss of livestock to wild animals with poultry being the most predated livestock. Eagle was reported as the top predator for poultry. Eagle, Marten, wildcat, and wild dog all reported to be predating on poultry while only wild dog predating on cattle.

People shared that protection of crops through electric fencing will not be possible due to scattered pattern of settlements, existence of forest patches within the villages and due to less numbers of households to undertake the installation, repair and maintenance of electric fencing. Therefore, formation of group compensation scheme is expected to overcome the challenge.

4.1.7. Forest resource use and threats

A number of forest resources are used by the communities including timber and non-wood forest products (fern, mushroom, came and leafy vegetables). Seven different products were identified by the people (refer table 12). Timber for construction, firewood, non-wood forest products like wild leafy vegetables and mushrooms are used extensively for self-consumption. Of these, leaf litter for manure, fodder for cattle and firewood are collected more frequently and by most households. Both men and women, almost equally share the workload of collecting forest resources except timber which is considered a job for the masculine. In terms of quantity exploited annually, timber and bamboo does not feature in the information base, since no new constructions or renovation occurred during the last ten years. Meanwhile almost 100 percent of the total households have tin roofing; therefore cutting down the resources was entirely for housing purposes.

In terms of importance ranking to the communities, timber, firewood and fodder ranked the highest indicating the priority accorded to each, while leaf litter, mushroom, ferns and dambru are less essential denoting that the people do not rely on food supplements from the forests. Although firewood and fodder are important for livelihood of the communities, they are still fairly stable or abundant. However, there is a chances of exploitation of forest resources by outsiders with the connection farm road, if Gewog and Forest do not strongly enforce the regulations. Formation of Community Forest Management Group (CFMG) is expected to help in sustainable management of local resources.

Table 12: Forest product use by the local people

Products	Area exploited from	Percentage men or women	Average amount exploited per year/ household	Restriction by Law	Status of Resources	Home use (%)	Rank
Firewood	Copta Na	50% M & W	30 BL	Yes	A	100%	1
Timber	Apshing	100% M	7 trees in 25 years	Yes	A	100%	1
Mushroom	Copta Na	50% M & W	5 kg	Yes	A	100%	3
Fern	Copta Na	50% W & M	10 B	Yes	A	100%	3
Damru	Copta Na	50% M & W	8 B	Yes	A	100%	3
Fodder	Copta Na	60% M	15 BL	Yes	A	100%	1
Leaf litter	Copta Na	50% M	10 BL	Yes	A	100%	3

Note:

BL= backload, 1 backload is about 30 – 40 Kg	1 = Very important
B = bundle	2 = Important
A = abundant	3 = Less important
Me = Medium	W = women
S = Scare	M= Men

Threats

The major threats to natural resources identified by the people are deforestation, depletion of soil fertility, soil erosion/landslides and degradation of water sources. These threats are caused due to lack of regulations and guidelines on forest management, and lack of knowledge on soil conservation. Deforestation, degradation of watersheds/sources and soil erosion/landslides are mostly caused by shifting cultivation in the past and exploitation of forest resources by people. Though the number of cattle reared by the local people are not huge but there is no designated grazing area. Released cattle in forest are main cause for destruction of young regeneration vegetation and destruction of soil structure. In addition, 40% of the population shared the depletion of soil fertility is due to lack of knowledge on soil conservation, poor farming skills (refer table 13). The peopled recommended that regulating harvesting of forest resources, initiate afforestation, introduce hybrid cattle, control overgrazing through establishment of CFMG and train farmers on sustainable land management will overcome the threats.

Table 13. Threats to natural resources in Bayul-kuenzang

Threats	Causes	Solutions
Deforestation	Shifting cultivation in the past and unsustainable forest resource exploited (timber) by people.	Regulate sustainable harvesting of forest resources and initiate afforestation in degraded areas.
Depletion of Soil fertility	Poor farming skills and lack of knowledge on soil conservation.	Train farmers on sustainable land management techniques.
Soil erosion/landslides	Uncontrolled harvesting of forest resources and uncontrol grazing.	Regulate sustainable harvesting of forest resources and introduce hybrid cattle.
Degradation of watersheds/sources	Inconsistent rainfall, deforestation and overgrazing.	Fencing, prevent deforestation and control overgrazing.

4.1.8. Existence of Community Groups, supports and Gender Rights

Bauyl-kuenzang has no functional community groups other than the Cardamom Group. About 62% of the households are beneficiary members of Cardamom Group, which was informally established by Yosipang Research Development Center of the Department of Agriculture to coordinate and manage the cardamom plantation and promote marketing of cardamom. The village has also informally formed a drinking water group but currently it is not functioning.

The village did not received any support either from NGOs or international donors until 2017 other than the support from Yosipang Research Development Center, Dzongkag and Gewog Agriculture sectors. The Yosipang Research Development Center has supported cardamom plantation and horticulture to all the interested households to boost their income and livelihood. And about 99% of the respondent shared that there is no gender discrimination over resource sharing and decision making in the community. However, 1 respondent mentioned that most of the decisions are taken by men as women cannot raise voice and actively participates as men does.

4.1.9. Threats to livelihoods and SWOT Analysis

The major threats to livelihood identified by the people are wildlife crop damage, lack of market to sale the products, water shortage both for drinking and irrigation, pest infection of crops and poor health services. These threats are caused due to increase wildlife, lack for market and farm road, degradation of watersheds, poor water management and increase water demand by increasing population. The key informant group has identified number of solutions to overcome the threats, and also the group has outlined SWOT analysis for future planning and mitigations (refer table 14 & 15).

Table 14. Threats to livelihood in Bayul-kuenzang

Threats	Causes	Solutions/Activities	Responsibilities
Wildlife crop damage	• Number of wildlife increased due to stop poaching due to restriction by law and religious belief. • Human settlement encroached towards forested areas.	• Initiate fencing using locally available materials. • Propose electric fencing or barbed wire fencing. • Establish crop insurance scheme.	• Community • Government • NGOs
Lack of market to sale the products	• Remote location of villages. • No or lack of market nearby. • No farm road and bridge in the past over Wang-chhu.	• Connection with buys either through middle-man or direct contact over phone calls. • Sell the farm products in group. • Farm road and bridge construction.	• Community • Government • NGOs
Water shortage for drinking and irrigation	• Water source dipped/sink by earthquake of early 1990s (22 years ago). • More demand by increasing population. • Old RWSS system/scheme. • Poor management. • Degradation of watersheds.	• Timely maintenance and operation of RWSS and irrigation infrastructure. • Propose for new RWSSS and irrigation infrastructure. • Protection of watersheds and sources through fencing and plantation.	• Community • Government • NGOs
Pest infection of crops	• Lack of knowledge on cropping practices and pest control methods. • Dominant practice of mono cropping.	• Practice mixed cropping and crop rotation. • Practice organic farming and SLMP. • Plant high yielding variety crops.	• Community • Government • NGOs
Poor health services	• Shortage of female health staff.	• Proposed for one female Health Assistant	• Community • Government

Table 15: SWOT Analysis

Strength	Weakness
• Willingness to undertake farming activities; • Cooperation amongst the communities; • Sufficient land holding owned by farmers; • All 9 cereal crops can be cultivated; • Existence of indigenous farming skills and other incoming earning skills (carpentry & masonry skills); • Intake natural resources.	• Lack of transportation/road network; • Lack of market access to sale the products; • Wildlife crop damage; • Oranges and cardamom infested by pest; • Crops infested by pest due to lack of cold storage; • Water shortage for drinking and irrigation; • Shortage of productive labour force.
Opportunity	**Threat**
• Road construction in progress; • Potentials for organic farming due to less or no use of agro-chemical fertilizers; • Suspension baily bridge constructed; • Sale of farm products through connection of farm road. • Additional support for organic or agro-ecological farming.	• Rural unban migration; • Degradation of natural resources by outsiders with the connection of road network; • Sale of land and other properties to outsiders • Cultural delusions; • Outbreak of diseases; • Shift farming occupation.

4.1.10. Seasonal calendar (Bhutanese/lunar calendar)

The key informant group framed a seasonal calendar based on 5 components (refer table 16). As the results of seasonal calendars in all the villages are similar; therefore, this seasonal calendar is representative for all the villages. The seasonal calendar will be used guidance while planning and implementation of project activities.

- Rain fall: mostly occurs in the 6th and 7th months
- Peak/busy months: Busiest months are 2nd, 3rd, 4th, 7th and 8th corresponding to plantation and harvesting of the three major crops
- Income month: The highest income is generated in the 7th month corresponding to export of potatoes.
- Cash demands: People spend most of their cash in January corresponding to sending children to school; and in the month of September and October during the time of crop harvesting.
- Annual Festivals: Summer festival is conducted on 4th, 5th & 6th day of the 6th month while winter festival is conducted on 9th, 10th & 11th day of the 1st month. The annual festivals are conducted for peace, harmony and prosperity in the village. However, there is no mask dance festival in the areas.

Table 16: Seasonal calendar of Bayul-kuenzang Chiwog

Activities and month	1	2	3	4	5	6	7	8	9	10	11	12
Rainfall				X	X	X	X	X	X	X		
Cash demand	X	X	X	X	X	X	X	X	X	X	X	X
Cash income	X	X				X	X	X	X	X		
Amount of work	X	X	X	X	X	X	X	X	X	X	X	X
Gather resources from forest	X	X	X	X	X	X	X	X	X	X	X	X
Tending domestic animals	X	X	X	X	X	X	X	X	X	X	X	X
Planting Season		X	X	X				X	X			
Harvesting Season							X	X	X	X		
Important Festivals	X					X						

4.1.11. Conclusion and Recommendations

The overall review of the results from the baseline survey indicates that the issues and problem in the four villages of Bayul-kuenzang and Gidaphu are not very different. Some of the common problems or issues relates to insufficient water for drinking and irrigation, deforestation, depletion of soil fertility and pest infection of crops, wildlife crop damage and livestock predation, and lack of market and farm road to sale the surplus farm products. Most of the farmers in these villages seem to be well aware of the issues in their area, however, lack of resources and technical support seems to be the main setback in addressing the problem.

Among the issues, forest degradation or deforestation seems to have a very high implication on the overall livelihood of the people. The issue can be associated to other related problems like degrading water sources and water quality, depletion of soil fertility and landslides, and wildlife crop damage and livestock prediction. In view of the problems and issues described, following measures could be adopted to address the problems:

- Community watershed management
- Community forest management
- Sustainable land management
- Introducing hybrid, high yielding crops to increase crop yield
- Introduce Agro-food-Value Chain program
- Introducing hybrid, high yielding breeds to reduce the number of cattle population to decrease overgrazing
- Afforestation program
- Rain water harvesting

The baseline survey reveals that collection of forest resource is a common phenomenon in Bayul-kuenzang village which require management or restriction to some extent. Some of the measures that could be followed are:

- Enforcement of strict monitoring and regulations
- Improve food production or agriculture
- Promote alternative income generating activities

Low food productivity due to pest infection and wildlife crop damage, and lack of market to sale surplus farm products is another common problem in the study village. Though the problems are not alarming at present, timely intervention is necessary to prevent the problem from escalating further. Integrating organic farming and watershed management would be one measure that could be adopted for addressing the problem.

The most important learning from this survey is that there can be no better solution than to educate the rural communities in order to reduce the vulnerability of the rural poor to the whims of nature. Rural livelihoods are sustainable only when there are enough resources in reserve for the future generations.

V. BASELINE SURVEY RESULTS FOR PILOT HOUSEHOLDS OF ZHEMGANG

5.1. General Information of the Project Areas

5.1.1. General Information

Zhemgang Dzongkhag has 5 pilot villages under two Gewogs. The villages are further divided into 6 Farmers Family Learning Group (FFLGs): Buli, Tali, Dakpay, Berti, Kikhar and Khengrig Namsum, which is a youth cooperative of Zhemgang. Buli, Tali, Kikhar and Dakpay falls under Nangkhor Gewog and Berti under Trong Gewog (refer Table 17). The altitude of Nangkhor Gewog ranges from 500-1700m above sea level, while Trong Gewog ranges from 1200-3000m above sea level. Agriculture is the main source of income for the farmers of Zhemgang.

Table 17: Details of Households joined FFLGs

Name of villages	Households joined FFLGs	Total
Buli	13	67 households initially joined the FFLGs
Tali	13	
Kikhar	8	
Dakpay	11	
Berti	11	
KNC	11	

5.1.2. Population by age and sex

Household characteristics: Out of 51 interviewed FFLG members, the survey found out that 47 were female and remaining 4 males (Table 18). The highest number falls under the age range of 35-44 followed by 25-34. The survey also indicates that the villages have highest number of population in active working group.

Education and literacy: Majority of the farmers are illiterate with an approximate figure of 60.8% individual are illiterate amongst surveyed respondents. Only 7 individuals have studied up to grade 5 while 4 individuals are drop outs from grade 10-12, while 5 individuals are enrolled in non-formal education.

Table 18: Population of respondents by age and sex

List of Farmers	Age	Sex of the interviewer		Total interviewed Farmers
		Female	Male	
Interviewed Farmers by Age and Sex	15-24	5	1	6
	25-34	15	1	16
	35-44	17	0	17
	45-54	8	1	9
	55-60	2	1	3
Total		47	4	51

5.2. Livelihood

5.2.1. Agriculture

Agriculture is the main source of livelihood for the people of Zhemgang. Majority of the farmers in Zhemgang are self-sufficient and practices subsistence agriculture. The farmers practice both dry and wet land cultivation with rearing of livestock for their daily sustenance. Out of 51 interviewed respondents, 16 responded cultivate maize, paddy and potatoes as a major crops. 15 respondents cultivate only maize and potatoes while 10 respondents cultivate potatoes, maize and turmeric (refer table 19).

The average land holding of the pilot farmers are calculated keeping in mind the total land holding and the number of households owning agricultural land. Majority of farmers owned land more than 2 acres followed by less than 2 acres. About 20 households owned land more than 2 acres, 9 households owned 2 acres land while 13 households owned 1care or less than 1 acre land. Only 9 households owned 3 acres or more than 3 acres land (refer Table 20).

Table 19: Major crop cultivation and production of crops

Types of crops cultivated	Production of Crops					Total
	Don't know	Don't grow	250-300 kgs	300-350 kgs	+500 kgs	
Maize, potatoes, beans	3	0	0	0	1	**4**
Maize, paddy and water melon	2	0	0	0	0	**2**
Maize, Paddy, Potatoes	14	0	1	0	1	**16**
Maize and mustard	0	0	0	1	0	**1**
Maize, potatoes, turmeric	10	0	0	0	0	**10**
Maize, Millet, Mustard, Buckwheat	2	0	0	0	0	**2**
Maize and paddy	12	0	0	1	2	**15**
Run a shop/business/don't cultivate	0	1	0	0	0	**1**
Total	43	1	1	2	4	**51**

Table 20: Land owned by the pilot farmers

Areas cultivated land	Total Households
less than 1 acre	3
1 acre	5
+1 acres	5
2 acres	9
+2 acres	20
3 acres	3
+3 acres	6
Total	**51**

Cash and Food Crops: The staple crops grown by the farmers of Zhemgang are rice and maize. Farmers also grow vegetables for self-consumption as well as for marketing at the local markets. As per the survey, potato, chili and cabbage are top 3 cash crops grown by the farmers and followed by turmeric and ginger (refer table 21). On other hand, 31 households sale the cash crops and earned plus Nu.10000, 6 household earned Nu.8000-10000 while 6 household earned Nu.6000-8000 from the sale of cash crops. 6 households did not sale any cash crops.

Table 21: Top 3 cash crops and Estimated income per year from sale of cash crops

Types of crops sell	Don't sell	Don't Know	Nu. 2000-4000	Nu. 6000-8000	Nu. 8000-10000	Nu. 10000+	Total
Potatoes, Cabbage, Chili	0	2	0	1	4	7	14
Turmeric, ginger and other vegetables	0	0	0	0	0	7	7
Garlic. cabbage, beans	0	0	0	0	0	1	1
Potato, Beans, cabbage and other vegetables	0	0	0	2	1	8	11
Turmeric and Ginger	0	0	0	3	1	8	12
Maize, potatoes, water melon	6	0	0	0	0	0	6
Maize and Paddy	0	0	0	0	0	0	0
Total	6	2	0	6	6	31	51

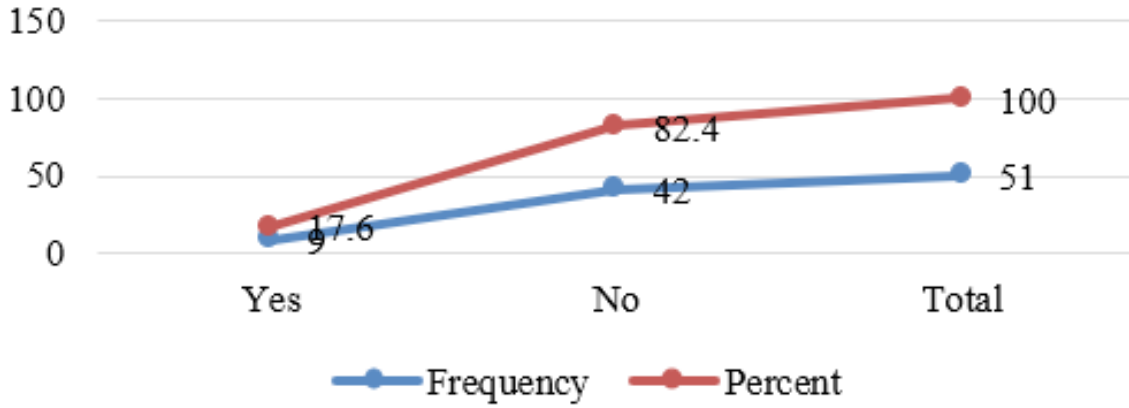
Horticulture: The survey showed that horticulture activities in Zhemgang are minimal for the pilot farmers. Majority of the pilot households does not own fruit trees. Of the 51 surveyed households, 5 households have citrus/orange, 4 households owned avocado, 3 households owned both oranges and citrus and 2 households have hazelnut. 36 households do not owned any fruit trees (refer table 22).

Table 22: Number of farmers who owned different types of fruit trees

Own Fruit Trees	Avocado	Orange	Orange & Peach	Hazelnut	No fruit trees	Mango & Litchi	Total
Yes	4	5	3	2	0	1	15
No	0	0	0	0	36	0	36
Total	4	5	3	1	36	1	51

The figure 11 shows that of the 51 surveyed households, only 9 (17.6%) households market the fruit crops and 42 (82.4%) households does not market their fruit crops. The survey indicates that due to poor access to market, bad road conditions and poor transport system; most of the households either consumed fruits by themselves or feed for their animals.

Figure 11: Households marketing fruits



Self Sufficiency: The pilot households were also surveyed on the food sufficiency. Out of 51 surveyed households, 36 households (70.58%) are self-sufficient and remaining 15 (29.42%) households are insufficient (refer table 23). Farmers of Zhemgang grows different types of cereal crops as well as vegetables, which makes them sufficient for whole year. Except for some essentials needs like cooking oil and salts, they produce crops to last for a year.

Table 23: Details of food self-sufficiency by percentage

Food Sufficiency at household level	Frequency	Percent
Yes	36	70.58
No	15	29.42
Total	**51**	**100**

Types of houses & household wealth: During the survey, the people shared that the living standard of the people of Zhemgang has significantly improved in the last few years though there is still poverty in the Dzongkhag of the 51 interviewed households, 49 responders have concrete stone and wooden house, 2 respondents have wooden house and none of them owns hut like in the past (refer figure 12). On other hand, of the 51 interviewed households, 49 responders consider themselves as moderate while 1 responder consider as poor. Only 1 respondent considered as well-off indicating it is very difficult to get the information on wealth (refer figure 13).

Figure 12: Types of Houses

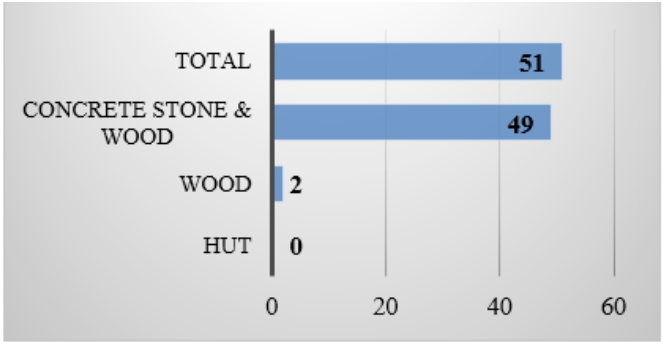
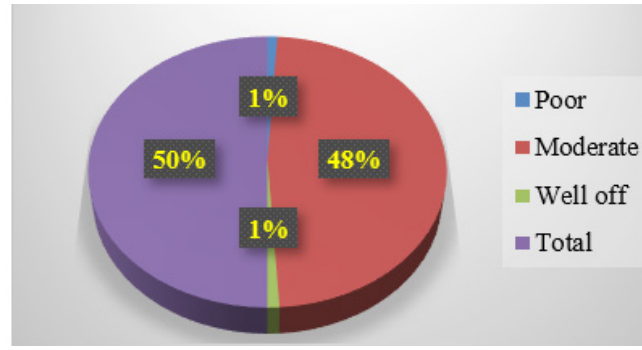


Figure 13: Household wealth status



5.2.2. Vegetables

Majority of pilot households grow vegetables and owned vegetable garden. Of the total 51 surveyed households, 49 households owned vegetable garden and only 2 households do not have vegetable garden (refer table 24 & 25). On the other hand, farmers grow diverse vegetables for self-consumption as well as for marketing both at local and national markets. Potato, chili and cabbage are the top 3 vegetables grown by the farmers. Apart for vegetables, farmers of Dakpay also grows turmeric and ginger, which they process it into a powder and market it to Zhemgang and Thimphu. Farmers of Berti village also grows water melon apart from potatoes and other vegetables. They market the melon to nearby town and Khengrig Namsum Cooperatives.

Table 24: Details of households owned vegetable garden

Households owned vegetable Garden	Frequency	Percent
Yes	49	98
No	2	2
Total	**51**	**100**

Table 25: Top vegetables grown by the pilot Households

Vegetables	Frequency	Percent
Potatoes, Cabbage, Chili	16	31.4
Turmeric, ginger and other vegetables	7	13.7
Garlic. cabbage, beans	1	2
Potato, Beans, cabbage and other vegetables	12	23.5
Turmeric and Ginger	2	3.9
Don't grow	2	2
Maize, potatoes, water melon	6	11.8
Maize and Paddy	4	7.8
Potatoes, beans, chilies	1	2
Total	**51**	**100**

5.3 Farming and Soil Conservation Practices

The majority of the farmers in Zhemgang practices crop rotation. Of the total 51 surveyed households, 30 households practices crop rotation while 17 households practices both crop rotation as well as mixed farming. The farmers also practices land management techniques such as terraces and hedge row whereby at least 3 surveyed households practices above mentioned land management techniques (refer table 26).

Table 27: Number of farmers using organic/chemical fertilizer

Households/ Farmers	Soil conservation practices				Total households
	Crop Rotation & Mixed Cropping	Terraces	Crop Rotation	Terraces, Hedgerow & Crop Rotation	
Farmers applying the techniques	17	1	30	2	51

Farmers were also asked whether they use chemical fertilizer or organic manure. Of the total 51 surveyed households, 50 households does not use any chemical fertilizers for last 5 years and only 1 household used chemical fertilizer in 2017. The farmers of Zhemgang now widely uses organic manure such as compost, prepared by using cow dung and leave litters collected from the forest. This method of preparing compost is traditionally practiced method in Zhemgang. Farmer shared that use of chemical fertilizers and pesticides are strongly not recommended by the government and Agriculture Extension Officers of Gewog. Most of the farmers now know the ill effects of chemical fertilizers in terms of soil management and health (refer table 27).

Table 27: Number of farmers using organic/chemical fertilizer

Farm Management	Number of farmers applying types of manure
Organic manure	50
Chemical fertilizer	1
Total	**51**

5.4. Livestock

Apart from cultivating crops, farmers of Zhemgang also raise livestock and other domestic animals for their sustainable livelihoods. They earn income by selling animal products such as cheese, butter, meat and so on. Out of 51 surveyed households, 42 households owned cattle, 2 households owned poultry, cattle and horse while 9 households does not have any domestic animals. On the other hand, of the 42 farmers who owned cattle, 25 farmers sell butter and cheese while 3 farmers sell meat, cheese and butter in the nearby market and in Zhemgang town. 13 farmers do not sell the products and the products that they get from the animals are used for self-consumption (refer table 28 and Figure 14).

Of the total 51 surveyed households, 35 (68.7%) households feed the livestock by keeping the in the grazing area during day time and in the stable/shed at night. Similarly 4 (7.8%) households feed the livestock by keeping in the stable/shed and feed throughout while only 3 (5.8) households feed the livestock by keeping in the grazing area whole time. This indicates that majority of the households are aware of negative impacts of uncontrol grazing to the local environment (refer table 29).

Figure 14: Frequency and Percent of Product sold

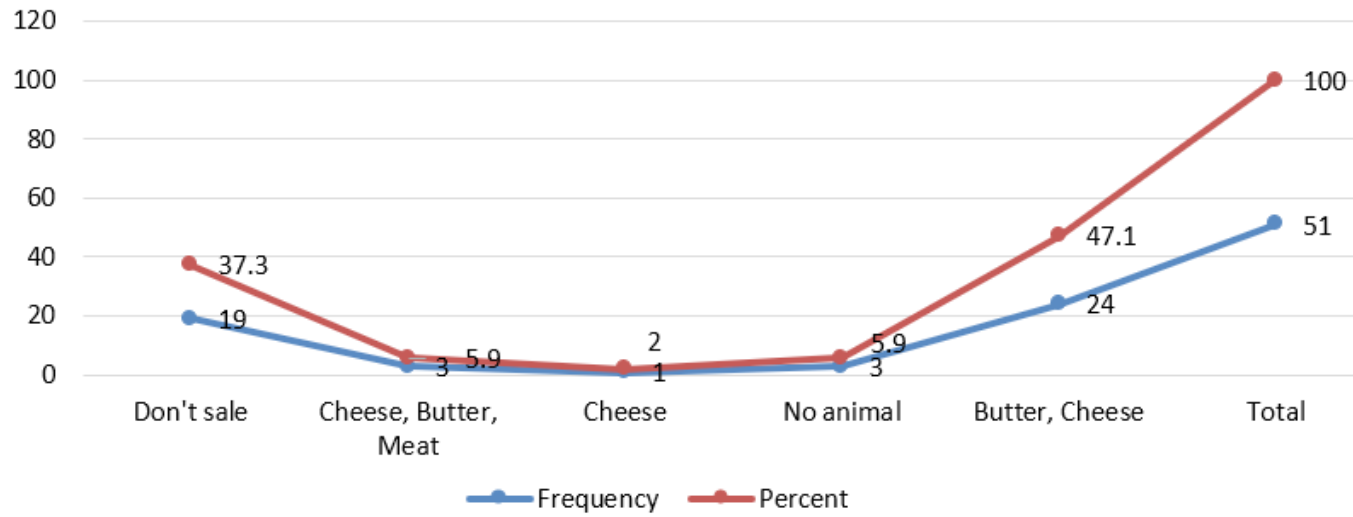


Table 29: Type of grazing for animal

Type of Grazing to Animals	Frequency	Percent
Zero feeding (keep in the stable and feed	4	7.8
Keep in grazing area during the day & in the stable at night	35	68.7
Keep in the grazing area whole time	3	5.8
No animal	9	17.6
Total	**51**	**100**

5.5. Forest Management and Environmental Problems

Majority of land cover in Zhemgang are under forest cover. People of Zhemgang collect varieties of forest products for self-consumption as well as for other livelihood purposes. People collect different kinds of mushrooms and ferns for consumption and sale to earn income, and timber, fodder and leave litters for fuel, animal feeding and manure respectively (refer table 30).

Table 30: Kind of forest and non-forest products collected

Types of Forest Product collected	Purpose for Collection				Total households
	Collect for self-consumption	Don't sale	Timber, Cane, Mushroom	Mushroom	
Don't collect	0	1	0	0	1
leave litters, ferns, fruits, mushroom, etc	6	2	0	2	10
Mushroom and ferns	2	11	1	12	26
Mushroom	0	6	0	8	14

The major threats to local environment identified by the people are waste, flooding, earth warming, deforestation, depletion of soil fertility, soil erosion/landslides and degradation of water sources. These threats are caused due to lack of regulations and guidelines on local environment management, and lack of knowledge on soil conservation. Deforestation, degradation of watersheds/sources and soil erosion/landslides are mostly caused by shifting cultivation in the past and exploitation of forest resources by people. In addition, respondents shared the depletion of soil fertility is due to lack of knowledge on soil conservation, poor farming skills (refer table 31).

Table 31: Environmental problems

Environmental problems	Frequency	Percent
Waste	1	2
Flooding	2	3.9
Earth warming	1	2
Soil erosion	9	17.6
Landslides	14	27.4
Forest clearing/watershed depletion/degradation	4	7.8
Soil fertility/soil depletion	5	9.8
Forest clearing/watershed depletion	14	27.5
Deforestation	1	2
Total	51	100

5.6. Infrastructures

5.6.1. Electricity

Majority of villages in Zhemgang are electrified with grid-electricity. 100 percent of pilot villages have received electricity and use of firewood is drastically reduced as people used firewood only for cooking and preparing animal feeds.

5.6.2. Road

All pilot villages are connected with better road facilities. Buli, Tali, Kikhar and Dakpay are connected with blacktopped road. Berti is 7 kilometers away from the nearest Tingtibi town and is connected with the farm road from Trong Gewog Office at Tingtibi.

5.6.3. Telecommunication facilities

Almost 100 percent of surveyed households in Zhemgang owns mobile phone. All the pilot villages were connected with the telecommunication facilities decade ago. Two telecommunication networks: B-mobile and TashiCell are available for the people of Zhemgang.

5.7. Water Resources

The figure 13 indicates that of the total 51 households, 32 households drink water from pipe connected from nearby spring, 17 households from irrigation channel while 2 household depends on rain water from drinking (refer figure 15).

The pilot households were asked whether they have sufficient drinking water. Out of 51 surveyed households, 17 households answered that they have sufficient water while 26 households stated that they face seasonal shortage as their water source is seasonal. 8 households responded that they face shortage due to poor management of water by the households (refer table 32).

Figure 15: Sources of water

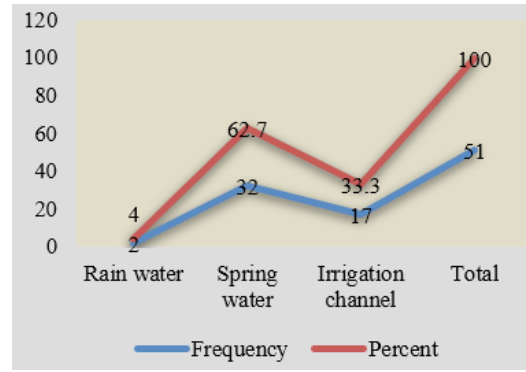


Table 32: Causes of water shortage.

Reasons for water shortage	HHs experiencing shortage
Water source is seasonal	26
Water source is degraded, poor water management, demand increased by increasing population	0
Water sufficient	17
Water source is degraded	0
Polluted water source	0
Lack of proper water source management	8
Water source is degraded & sunken the water source by earthquake	0
Water source is degraded and demand increased by increasing population	0

On the other hand, to overcome the drinking water shortage in the village, various measures have been initiated to conserve water. Likewise, of the total 51 surveyed households, 17 households initiated the conservation and protection of watershed and water sources through fencing of watershed and water source. 34 households did not initiated any measures signifying either the households do not experience the water shortage or are not aware of importance of conservation of watersheds and sources (refer table 33).

Table 33: Types of water conservation measures initiated

Any measures implemented to conserve water	Types of measures initiated to conserve water			Total
	Protection of watersheds & sources	Fencing of watersheds & sources	No measures undertaken	
Yes	6	11	0	17
No	0	0	34	34
Total				**51**

5.8. Seasonal calendar

The key informant group framed a seasonal calendar based on 5 components (refer table 34). As the results of seasonal calendars in all the villages are similar; therefore, this seasonal calendar is representative for all the villages. The seasonal calendar will be used as guidance while planning and implementation of project activities.

- Rain fall: mostly occurs in the 6th and 7th months annually.
- Cash demands: People have highest cash demand in February, September, October, November and December. In February, cash are needed to send their children to school while in later months of the year, cash are needed for annual rituals and harvesting of their crops.
- Cash Income: People earn income in May, October and November. In May, it is the season for harvesting potatoes and in October and November, people harvest paddy and other vegetables.
- Amount of Work: Major chunk of works are being done in January for plantation of potatoes and winter vegetables. In June and July, people harvest potatoes and start with the paddy plantations. People harvest paddy and other vegetables by October and November.
- Annual Festivals: Most of the important festivals and rituals are conducted in December, January, February and March.

Table 33: Seasonal calendar of Zhemgang.

Activities and month	1	2	3	4	5	6	7	8	9	10	11	12
Rainfall						X	X					
				X	X	X	X	X	X			
Cash demand		X							X	X		
	X	X				X			X	X		X
		X	X	X	X	X	X	X	X	X	X	X
Cash income					X				X	X	X	
					X	X	X	X	X	X	X	
	X	X			X	X	X	X	X	X	X	
Amount of work/ planting/ harvesting season	X				X	X				X	X	
	X	X			X	X	X	X	X	X	X	
	X	X	X		X	X	X	X	X	X	X	
Gather resources from forest					X	X	X					X
	X	X			X	X	X	X				X
	X	X	X	X	X	X	X	X	X	X	X	X

References

1. Dzongkhag at Glance of Chhukha and Zhemgang
2. Field Note on Visit to Bayul-kuenzang, Chhukha, RSPN, October, 2016
3. Preliminary Report of two project areas by RSPN and OD

Annexure 1: Details of FFLG Household Members

Sl	Name of FFLGs and Members	Name of FFLG Facilitator
I	**Gedaphu of FFLLG**	
1	Mr. Pema Thinley	**Mr. Pema Thinley**
2	Ms. Shakha Lham	
3	Ms. Laychum	
4	Mr. Sangay Dorji	
5	Ms. Sonam Yuden	
6	Ms. Sithu Dem	
7	Mr. Jamba	
8	Ms. Nima Zangmo	
9	Ms. Dupchem	
10	Mr. Ngawang Dorji	
11	Mr. Penjor	
12	Ms. Chencho Wangmo	
13	Mr. Sonam Dorji	
II	**Khamshing Lakha FFLG**	
1	Mr. Passang Wangdi	**Mr. Rinchen Gyeltshen**
2	Ms. Phub Zangmo	
3	Ms. Nidup Pem	
4	Mr. Chimi Dorji	
5	Ms. Kalam	
6	Ms. Lham	
7	Ms. Pem Dem	
8	Mr. Dawala	
9	Mr. Rinchen Gyeltshen	
10	Mr. Angto	
11	Mr. Chongala	
12	Ms. Nima Dem	
13	Ms. Rinzin Bida	
III	**Tseshing Lakha FFLG**	
1	Ms. Yeshi Bida	**Ms. Yeshi Bida**
2	Ms. Pem Om	
3	Ms. Yangki	
4	Ms. Yuden	
5	Mr. Kaka	
6	Ms. Dawa Zam	
7	Ms. Hotram	
8	Ms. Khazem	
9	Ms. Karma Lhaden	
10	Ms. Sangay Choden	
11	Ms. Tashi Om	
12	Ms. Jangchun Dem	

IV	Yulumpa FFLG	
1	Mr. Dawa Tshering	**Mr. Dawa Tshering**
2	Ms. Luki	
3	Mr. Jochu	
4	Mr. Dorji	
5	Mr. Pema Dorji	
6	Mr. Choki Dorji	
7	Ms. Nidup Pem	
8	Mr. Thukten	
9	Ms. Choden	
10	Mr. Kuenzang Thinley	
11	Mr. Nima Dorji	
12	Ms. Dawa Dem	

Annexure 2: Details of Population in Bayul-kuenza Chiwog (who stays within the villages).

Name of the respondents	Age of respondents	Sex of the respondents	Marital status of respondents	Relationship to household head	Female members	Male members	Name of villages
Rinzin Bida	60+	Female	Single	Head	1	0	Bayul-kuenza
Chazem	60+	Female	Married	Head	1	5	Bayul-kuenza
Nidup Wangmo	25-34	Female	Divorced	Son/Daughter	3	3	Bayul-kuenza
Yuden	55-60	Female	Married	Sister/Brother	2	1	Bayul-kuenza
Namgay Dorji	35-44	Male	Married	Head	1	2	Bayul-kuenza
Nidup Pem	55-60	Female	Married	Head	2	2	Bayul-kuenza
Tashi Phuntsho	15-24	Male	Single	Son/Daughter	3	2	Bayul-kuenza
Kuenzang Thinley	60+	Male	Married	Head	3	1	Bayul-kuenza
Yeshi Bida	45-54	Female	Married	Head	3	3	Bayul-kuenza
Pem Dem	35-44	Female	Married	Wife/Husband	1	3	Bayul-kuenza
Luki	60+	Female	Widowed/Widower	Father/Mother	5	1	Bayul-kuenza
Thinley Wangmo	45-54	Female	Married	Son/Daughter	3	2	Bayul-kuenza
Jangchuk Dem	15-24	Female	Single	Niece/Nephew	3	4	Gedaphu
Sithu Dem	15-24	Female	Single	Head	2	1	Gedaphu
Phub Zam	45-54	Female	Married	Head	2	2	Bayul-kuenza
Penjor	55-60	Male	Married	Head	5	3	Gedaphu
Jamba	35-44	Male	Married	Head	5	1	Gedaphu
Thinley Dorji	55-60	Male	Married	Head	1	3	Bayul-kuenza
Nim Dorji	55-60	Male	Married	Head	2	4	Gedaphu
Chimi Dorji	35-44	Male	Married	Head	1	1	Bayul-kuenza
Sonam Yuden	25-34	Female	Single	Son/Daughter	2	2	Gedaphu
Dawa Zam	45-54	Female	Widowed/Widower	Head	2	0	Bayul-kuenza
Choden	45-54	Female	Married	Head	2	1	Bayul-kuenza
Sangay Choden	25-34	Female	Married	Son/Daughter	1	2	Bayul-kuenza
Choki Dema	35-44	Female	Married	Son/Daughter	2	1	Gedaphu
Dawa Zangmo	25-34	Female	Married	Wife/Husband	3	2	Bayul-kuenza
Dolay	35-44	Male	Married	Father/Mother in law	1	2	Bayul-kuenza
Pema Thinley	35-44	Male	Married	Head	2	2	Gedaphu
Passang Wangdi	35-44	Male	Married	Head	2	2	Bayul-kuenza
Karma	35-44	Male	Married	Son/Daughter in law	3	2	Gedaphu
Nima Dem	35-44	Female	Married	Head	4	3	Bayul-kuenza
Sonam Dorji	35-44	Male	Married	Head	4	3	Bayul-kuenza
Rinchen Gyelthsen	60+	Male	Married	Head	4	1	Bayul-kuenza
Rinchen Lhamo	60+	Female	Married	Head	2	0	Bayul-kuenza
Nidup Mo	45-54	Female	Married	Head	2	1	Bayul-kuenza
Dawa Tshering	35-44	Male	Married	Head	2	3	Bayul-kuenza
Kalaym	45-54	Female	Married	Head	1	2	Bayul-kuenza
Chimi Wangmo	35-44	Female	Married	Wife/Husband	4	2	Bayul-kuenza

Hotem	55-60	Female	Widowed/Widower	Head	1	0	Bayul-kuenza
Rekimo	60+	Female	Widowed/Widower	Head	1	1	Bayul-kuenza
Dawala	45-54	Male	Married	Head	2	2	Bayul-kuenza
Dawa Pem	60+	Female	Widowed/Widower	Head	2	2	Bayul-kuenza
Pema Wangmo	45-54	Female	Married	Head	2	3	Bayul-kuenza
Sonam Tshering	35-44	Male	Married	Head	1	2	Bayul-kuenza
Karma Lhaden	55-60	Female	Married	Head	2	1	Bayul-kuenza
Tshering Mo	25-34	Female	Married	Head	1	2	Bayul-kuenza
Sangay Dema	45-54	Female	Married	Head	2	1	Jigme-chhu
Tashi Wangmo	45-54	Female	Divorced	Head	2	0	Jigme-chhu
Kaka	45-54	Male	Married	Head	2	2	Bayul-kuenza
Sangay Bida	35-44	Female	Married	Head	2	1	Jigme-chhu
Total 50		50		50	110	91	

Annexure 3: Types of food crops grown by area and market

Name of the respondents	Name of the village	Crops cultivated	Areas cultivated	Money earn per year from field crops
Rinzin Bida	Bayul-kuenza	Maize, Buckwheat, Quinoa	Less than 1 acre	Don't sell
Chazem	Bayul-kuenza	Maize, Dry Paddy, Millet, Mustard	1 acre	Don't sell
Nidup Wangmo	Bayul-kuenza	Maize, Millet, Mustard, Buckwheat	+3 acres	Don't sell
Yuden	Bayul-kuenza	Maize, Millet, Mustard, Buckwheat	Less than 1 acre	Don't sell
Namgay Dorji	Bayul-kuenza	Maize	Less than 1 acre	Don't sell
Nidup Pem	Bayul-kuenza	Maize, Dry Paddy, Millet, Mustard	Less than 1 acre	Don't sell
Tashi Phuntsho	Bayul-kuenza	Maize, Buckwheat, Quinoa	Less than 1 acre	Don't sell
Kuenzang Thinley	Bayul-kuenza	Maize, Dry Paddy, Millet, Mustard	+3 acres	Don't sell
Yeshi Bida	Bayul-kuenza	Maize, Millet, Mustard, Buckwheat	+2 acres	Don't sell
Pem Dem	Bayul-kuenza	Maize, Dry Paddy, Millet, Mustard	+1 acres	Don't sell
Luki	Bayul-kuenza	Run a shop/business/don't cultivate	Less than 1 acre	Don't sell
Thinley Wangmo	Bayul-kuenza	Maize	1 acre	Don't sell
Jangchuk Dem	Gedaphu	Maize, Millet, Barley	+3 acres	Don't sell
Sithu Dem	Gedaphu	Maize, Millet, Barley	+2 acres	Don't sell
Phub Zam	Bayul-kuenza	Maize, Dry Paddy, Millet, Mustard	Less than 1 acre	Don't sell
Penjor	Gedaphu	Maize, Millet, Barley	+1 acres	Don't sell
Jamba	Gedaphu	Maize, Millet, Barley	+1 acres	Don't sell
Thinley Dorji	Bayul-kuenza	Maize, Millet, Barley	1 acre	Don't sell
Nim Dorji	Gedaphu	Maize, Millet, Barley	+1 acres	Don't sell
Chimi Dorji	Bayul-kuenza	Maize, Millet, Barley	Less than 1 acre	Don't sell
Sonam Yuden	Gedaphu	Maize, Millet, Barley	+3 acres	Don't sell
Dawa Zam	Bayul-kuenza	Maize, Dry Paddy, Millet, Mustard	Less than 1 acre	Don't sell
Choden	Bayul-kuenza	Maize, Dry Paddy, Millet, Mustard	Less than 1 acre	Don't sell
Sangay Choden	Bayul-kuenza	Maize	Less than 1 acre	Don't sell
Choki Dema	Gedaphu	Maize, Millet, Barley	1 acre	Don't sell
Dawa Zangmo	Bayul-kuenza	Maize, Dry Paddy, Millet, Mustard	+1 acres	Don't sell
Dolay	Bayul-kuenza	Maize, Dry Paddy, Millet, Mustard	+1 acres	Don't sell
Pema Thinley	Gedaphu	Maize, Millet, Barley	+3 acres	Don't sell
Passang Wangdi	Bayul-kuenza	Maize	Less than 1 acre	Don't sell
Karma	Gedaphu	Maize, Millet, Mustard, Buckwheat	+3 acres	Don't sell
Nima Dem	Bayul-kuenza	Maize, Dry Paddy, Millet, Mustard	+3 acres	Don't sell
Sonam Dorji	Bayul-kuenza	Maize, Dry Paddy, Millet, Mustard	+3 acres	Don't sell
Rinchen Gyelthsen	Bayul-kuenza	Maize, Dry Paddy, Millet, Mustard	3 acres	Don't sell
Rinchen Lhamo	Bayul-kuenza	Maize	Less than 1 acre	Don't sell
Nidup Mo	Bayul-kuenza	Maize, Millet, Mustard	1 acre	Don't sell
Dawa Tshering	Bayul-kuenza	Maize, Millet, Mustard	+3 acres	Don't sell
Kalaym	Bayul-kuenza	Don't cultivate	Less than 1 acre	Don't sell
Chimi Wangmo	Bayul-kuenza	Maize, Millet, Mustard, Buckwheat	+1 acres	Don't sell
Hotem	Bayul-kuenza	Don't cultivate	Less than 1 acre	Don't sell
Rekimo	Bayul-kuenza	Maize	1 acre	Don't sell

Dawala	Bayul-kuenza	Maize, Millet, Mustard, Buckwheat	2 acres	Don't sell
Dawa Pem	Bayul-kuenza	Maize, Millet, Mustard, Buckwheat	+1 acres	Don't sell
Pema Wangmo	Bayul-kuenza	Millet	Less than 1 acre	Don't sell
Sonam Tshering	Bayul-kuenza	Maize	Less than 1 acre	Don't sell
Karma Lhaden	Bayul-kuenza	Maize, Millet, Mustard	+1 acres	Don't sell
Tshering Mo	Bayul-kuenza	Maize, Millet, Mustard	+1 acres	Don't sell
Sangay Dema	Jigme-chhu	Maize	1 acre	Don't sell
Tashi Wangmo	Jigme-chhu	Maize	1 acre	Don't sell
Kaka	Bayul-kuenza	Maize, Millet, Mustard	+1 acres	Don't sell
Sangay Bida	Jigme-chhu	Maize	1 acre	Don't sell

Annexure 4: Types of fruit/cash grown by market and income earned

Name of the respondents	Name of the village	Owned Fruit Trees	Kinds of fruits trees owned	Market of fruit crops	Types of fruits market	Market of the fruit crops	Income from sale of fruits
Rinzin Bida	Bayul-kuenza	Yes	Orange, Sugarcane, Banana	No	Don't sale	Don't sale	Nu. 0
Chazem	Bayul-kuenza	Yes	Orange, Areca Nut, Banana	No	Don't sale	Don't sale	Nu. 0
Nidup Wangmo	Bayul-kuenza	Yes	Orange, Areca Nut, Banana	No	Don't sale	Don't sale	Nu. 0
Yuden	Bayul-kuenza	Yes	Orange, Mango, Guava	No	Don't sale	Don't sale	Nu. 0
Namgay Dorji	Bayul-kuenza	Yes	Orange, Sugarcane, Banana	No	Don't sale	Don't sale	Nu. 0
Nidup Pem	Bayul-kuenza	Yes	Orange, Mango, Guava	No	Don't sale	Don't sale	Nu. 0
Tashi Phuntsho	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	No	Don't sale	Don't sale	Nu. 0
Kuenzang Thinley	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	Yes	Sugarcane	Jigme-chhu	500-1000
Yeshi Bida	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	No	Don't sale	Don't sale	Nu. 0
Pem Dem	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	No	Don't sale	Don't sale	Nu. 0
Luki	Bayul-kuenza	Yes	Orange, Sugar cane, Banana	No	Don't sale	Don't sale	Nu. 0
Thinley Wangmo	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	No	Don't sale	Don't sale	Nu. 0
Jangchuk Dem	Gedaphu	Yes	Peach, walnut	No	Don't sale	Don't sale	Nu. 0
Sithu Dem	Gedaphu	Yes	Peach	No	Don't sale	Don't sale	Nu. 0
Phub Zam	Bayul-kuenza	Yes	Orange, Sugarcane, Banana	No	Don't sale	Don't sale	Nu. 0
Penjor	Gedaphu	No	No fruit trees	No	Don't sale	Don't sale	Nu. 0
Jamba	Gedaphu	No	No fruit trees	No	Don't sale	Don't sale	Nu. 0
Thinley Dorji	Bayul-kuenza	Yes	Peach	No	Don't sale	Don't sale	Nu. 0
Nim Dorji	Gedaphu	No	No fruit trees	No	Don't sale	Don't sale	Nu. 0
Chimi Dorji	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	No	Don't sale	Don't sale	Nu. 0
Sonam Yuden	Gedaphu	Yes	Peach	No	Don't sale	Don't sale	Nu. 0
Dawa Zam	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	Yes	Areca Nut	Within the village	5000-6000
Choden	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	Yes	Sugarcane	Jigme-chhu	2000-3000
Sangay Choden	Bayul-kuenza	Yes	Orange, Sugarcane, Banana	No	Don't sale	Don't sale	Nu. 0
Choki Dema	Gedaphu	Yes	Peach, walnut	No	Don't sale	Don't sale	Nu. 0
Dawa Zangmo	Bayul-kuenza	Yes	Orange, Sugarcane, Banana	No	Don't sale	Don't sale	Nu. 0

Dolay	Bayul-kuenza	Yes	Orange, Sugarcane, Banana	No	Don't sale	Don't sale	Nu. 0
Pema Thinley	Gedaphu	Yes	Peach, Plum	No	Don't sale	Don't sale	Nu. 0
Passang Wangdi	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	No	Don't sale	Don't sale	Nu. 0
Karma	Gedaphu	Yes	Peach	No	Don't sale	Don't sale	Nu. 0
Nima Dem	Bayul-kuenza	Yes	Orange, Sugarcane, Banana	No	Don't sale	Don't sale	Nu. 0
Sonam Dorji	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	No	Don't sale	Don't sale	Nu. 0
Rinchen Gyelthsen	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	No	Don't sale	Don't sale	Nu. 0
Rinchen Lhamo	Bayul-kuenza	Yes	Orange, Mango, Guava	No	Don't sale	Don't sale	Nu. 0
Nidup Mo	Bayul-kuenza	Yes	Orange, Sugarcane, Banana	No	Don't sale	Don't sale	Nu. 0
Dawa Tshering	Bayul-kuenza	Yes	Orange, Mango, Guava	No	Don't sale	Don't sale	Nu. 0
Kalaym	Bayul-kuenza	Yes	Orange, Sugarcane, Banana	No	Don't sale	Don't sale	Nu. 0
Chimi Wangmo	Bayul-kuenza	Yes	Orange, Mango, Guava	No	Don't sale	Don't sale	Nu. 0
Hotem	Bayul-kuenza	Yes	Orange, Mango, Guava	No	Don't sale	Don't sale	Nu. 0
Rekimo	Bayul-kuenza	Yes	Orange, Mango, Guava	No	Don't sale	Don't sale	Nu. 0
Dawala	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	No	Don't sale	Don't sale	Nu. 0
Dawa Pem	Bayul-kuenza	Yes	Orange, Sugarcane, Banana	No	Don't sale	Don't sale	Nu. 0
Pema Wangmo	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	No	Don't sale	Don't sale	Nu. 0
Sonam Tshering	Bayul-kuenza	Yes	Orange, Mango, Guava	No	Don't sale	Don't sale	Nu. 0
Karma Lhaden	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	No	Don't sale	Don't sale	Nu. 0
Tshering Mo	Bayul-kuenza	Yes	Orange, Areca Nut, Banana	No	Don't sale	Don't sale	Nu. 0
Sangay Dema	Jigme-chhu	Yes	Orange, Areca Nut, Banana	No	Don't sale	Don't sale	Nu. 0
Tashi Wangmo	Jigme-chhu	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	No	Don't sale	Don't sale	Nu. 0
Kaka	Bayul-kuenza	Yes	Orange, Areca Nut, Banana, Mango, Guava, Plum, Peach, Sugarcane	No	Don't sale	Don't sale	Nu. 0
Sangay Bida	Jigme-chhu	Yes	Orange, Areca Nut, Banana	No	Don't sale	Don't sale	Nu. 0

Annexure 5: Types of vegetables grown by size of area, market and consume

Name of the respondents	Name of the village	Types of vegetable grown	Size of garden	Time spends in the garden	Marketing of products	Income from sale of vegetable products	Place of marking the prod-ucts	Vegetables Consume
Rinzin Bida	Bayul-kuenza	Chili, Radish, Sag, Onion	Don't know	Women	No	Nu. 0	Don't sale	Chili, Sag, Brinjal
Chazem	Bayul-kuenza	Chili, Radish, Sag, Onion	Don't know	Men	No	Nu. 0	Don't sale	Chili, Sag, Tomato
Nidup Wangmo	Bayul-kuenza	All vegetables	30 deci-mal	Men	No	Nu. 0	Don't sale	Chili, Potato, Sag
Yuden	Bayul-kuenza	Chilli, Brinjal, Onion, Tomato	5 deci-mal	Women	No	Nu. 0	Don't sale	Chili, Sag, Brinjal
Namgay Dorji	Bayul-kuenza	Chilli, Brinjal, Onion, Tomato	Don't know	Women	No	Nu. 0	Don't sale	Chili, Sag, Brinjal
Nidup Pem	Bayul-kuenza	Chilli, Brinjal, Onion, Tomato	Don't know	Women	No	Nu. 0	Don't sale	Chili, Sag, Brinjal
Tashi Phuntsho	Bayul-kuenza	Chilli, Brinjal, Onion, Tomato	Don't know	Both Women & Men	No	Nu. 0	Don't sale	Chili, Potato, Sag
Kuenzang Thinley	Bayul-kuenza	Chilli, Brinjal, Onion, Tomato	Don't know	Both Women & Men	No	Nu. 0	Don't sale	Chili, Sag, Brinjal
Yeshi Bida	Bayul-kuenza	All vegetables	10 deci-mal	Both Women & Men	No	Nu. 0	Don't sale	Chili, Sag, Brinjal
Pem Dem	Bayul-kuenza	Chili, Radish, Sag, Onion	Don't know	Both Women & Men	No	Nu. 0	Don't sale	Chili, Sag, Brinjal
Luki	Bayul-kuenza	Chilli, Potato, On-ion, Tomato	Don't know	Women	No	Nu. 0	Don't sale	Chili, Potato, Sag
Thinley Wangmo	Bayul-kuenza	Chili, Brinjal, On-ion, Tomato	Don't know	Both Women & Men	No	Nu. 0	Don't sale	Chili, Brin-jal, Potato
Jangchuk Dem	Gedaphu	All vegetables	20 deci-mal	Women	Yes	1000-2000	Within the village	Chili, Sag, Brinjal
Sithu Dem	Gedaphu	All vegetables	20 deci-mal	Women	No	Nu. 0	Don't sale	Chili, Potato, Sag
Phub Zam	Bayul-kuenza	All vegetables	10 deci-mal	Women	No	Nu. 0	Don't sale	Chili, Sag, Tomato
Penjor	Gedaphu	All vegetables	10 deci-mal	Both Women & Men	Yes	6000-7000	Jigme-chhu	Chili, Potato, Sag
Jamba	Gedaphu	All vegetables	10 deci-mal	Both Women & Men	Yes	2000-3000	Jigme-chhu	Chili, Potato, Sag

Thinley Dorji	Bayul-kuenza	Chili, Potato, Onion, Tomato	5 decimal	Both Women & Men	No	Nu. 0	Don't sale	Chili, Potato, Sag
Nim Dorji	Gedaphu	Chili, Potato, Onion, Tomato	Don't know	Both Women & Men	Yes	+ 10000	Within the village	Chili, Potato, Sag
Chimi Dorji	Bayul-kuenza	Don't have garden	Don't have garden	Don't have garden	No	Nu. 0	Don't sale	Chili, Potato, Sag
Sonam Yuden	Gedaphu	All vegetables	50 decimal	Women	No	Nu. 0	Don't sale	Chili, Potato, Sag
Dawa Zam	Bayul-kuenza	All vegetables	5 decimal	Women	No	Nu. 0	Don't sale	Chili, Potato, Sag
Choden	Bayul-kuenza	Chili, Brinjal, Onion, Tomato	10 decimal	Women	Yes	Nu. 500-1000	Within the village	Chili, Sag, Tomato
Sangay Choden	Bayul-kuenza	Chili, Brinjal, Onion, Tomato	5 decimal	Women	No	Nu. 0	Don't sale	Chili, Potato, Sag
Choki Dema	Gedaphu	All vegetables	10 decimal	Women	No	Nu. 0	Don't sale	Chili, Potato, Sag
Dawa Zangmo	Bayul-kuenza	All vegetables	5 decimal	Women	No	Nu. 0	Don't sale	Chili, Sag, Brinjal
Dolay	Bayul-kuenza	All vegetables	10 decimal	Women	No	Nu. 0	Don't sale	Chili, Sag, Brinjal
Pema Thinley	Gedaphu	All vegetables	30 decimal	Both Women & Men	Yes	1000-2000	Jigme-chhu	Chili, Sag, Brinjal
Passang Wangdi	Bayul-kuenza	All vegetables	10 decimal	Women	No	Nu. 0	Don't sale	Chili, Sag, Brinjal
Karma	Gedaphu	All vegetables	20 decimal	Women	No	Nu. 0	Don't sale	Chili, Potato, Sag
Nima Dem	Bayul-kuenza	All vegetables	20 decimal	Both Women & Men	No	Nu. 0	Don't sale	Chili, Onion, Tomato
Sonam Dorji	Bayul-kuenza	All vegetables	50 decimal	Both Women & Men	Yes	3000-4000	Jigme-chhu	Chili, Sag, Tomato
Rinchen Gyelthsen	Bayul-kuenza	All vegetables	5 decimal	Women	No	Nu. 0	Don't sale	Chili, Sag, Brinjal
Rinchen Lhamo	Bayul-kuenza	Chili, Brinjal, Onion, Tomato	5 decimal	Women	No	Nu. 0	Don't sale	Chili, Brinjal, Potato
Nidup Mo	Bayul-kuenza	Chili, Radish, Sag, Onion	Don't know	Women	No	Nu. 0	Don't sale	Chili, Potato, Sag
Dawa Tshering	Bayul-kuenza	All vegetables	15 decimal	Both Women & Men	No	Nu. 0	Don't sale	All vegetables
Kalaym	Bayul-kuenza	Chili, Radish, Sag, Onion	Don't know	Women	No	Nu. 0	Don't sale	All vegetables

Chimi Wangmo	Bayul-kuenza	Chili, Radish, Sag, Onion	30 decimal	Both Women & Men	No	Nu. 0	Don't sale	All vegetables
Hotem	Bayul-kuenza	All vegetables	10 decimal	Women	No	Nu. 0	Don't sale	All vegetables
Rekimo	Bayul-kuenza	All vegetables	5 decimal	Women	No	Nu. 0	Don't sale	All vegetables
Dawala	Bayul-kuenza	Don't have garden	Don't have garden	Don't have garden	No	Nu. 0	Don't sale	All vegetables
Dawa Pem	Bayul-kuenza	All vegetables	5 decimal	Women	No	Nu. 0	Don't sale	All vegetables
Pema Wangmo	Bayul-kuenza	All vegetables	7 decimal	Women	No	Nu. 0	Don't sale	All vegetables
Sonam Tshering	Bayul-kuenza	All vegetables	6 decimal	Both Women & Men	No	Nu. 0	Don't sale	All vegetables
Karma Lhaden	Bayul-kuenza	All vegetables	10 decimal	Both Women & Men	No	Nu. 0	Don't sale	All vegetables
Tshering Mo	Bayul-kuenza	All vegetables	6 decimal	Both Women & Men	No	Nu. 0	Don't sale	All vegetables
Sangay Dema	Jigme-chhu	Chili, Radish, Sag, Onion	3 decimal	Women	No	Nu. 0	Don't sale	All vegetables
Tashi Wangmo	Jigme-chhu	Chili, Potato, Onion, Tomato	Don't know	Women	No	Nu. 0	Don't sale	All vegetables
Kaka	Bayul-kuenza	Chili, Potato, Onion, Tomato	10 decimal	Both Women & Men	No	Nu. 0	Don't sale	All vegetables
Sangay Bida	Jigme-chhu	Don't have garden	No garden	Don't have garden	No	Nu. 0	Don't sale	All vegetables

Annexure 6: Soil Conservation Practices and Trainings received

Names of respondents	Types of organic manure	Trainings received	Types of Training received in the village	Provide Training by
Rinzin bida	Cow dung	No	None	None
Chazem	Natural composed leaves from forest	Yes	Sustainable Land Management	Department of Agriculture
Nidup Wangmo	Natural composed leaves from forest	No	None	None
Yuden	Natural composed leaves from forest	Yes	Organic Farming	Department of Agriculture
Namgay Dorji	Cow dung	Yes	Organic Farming	Department of Agriculture
Nidup Pem	Natural composed leaves from forest	Yes	Crop management (plantation & harvest)	Department of Agriculture
Tashi Phuntsho	Cow dung	Yes	Organic Farming	Department of Agriculture
Kuenzang Thinley	Cow dung	Yes	Sustainable Land Management	Department of Agriculture
Yeshi bida	Natural composed leaves from forest	Yes	Sustainable Land Management	Department of Agriculture
Pem Dem	Natural composed leaves from forest	Yes	Crop management (plantation & harvest)	Department of Agriculture
Luki	Natural composed leaves from forest	No	None	None
Thinley Wangmo	Cow dung	Yes	Crop management (plantation & harvest)	Department of Agriculture
Jangchuk Dem	Cow dung	No	None	None
Sithu Dem	Cow dung	No	None	None
Phub Zam	Natural composed leaves from forest	Yes	Crop management (plantation & harvest)	Dzongkhag Agriculture
Penjor	Cow dung	No	None	None
Jamba	Cow dung	No	None	None
Thinley Dorji	Natural composed leaves from forest	No	None	None
Nim Dorji	Cow dung	No	None	None
Chimi Dorji	Natural composed leaves from forest	No	None	None
Sonam Yuden	Cow dung	No	None	None
Dawa Zam	Natural composed leaves from forest	Yes	Crop management (plantation & harvest)	Dzongkhag Agriculture
Choden	Cow dung	Yes	Crop management (plantation & harvest)	Department of Agriculture
Sangay Choden	Cow dung	Yes	Crop management (plantation & harvest)	Department of Agriculture
Choki Dema	Cow dung	Yes	Crop management (plantation & harvest)	Department of Agriculture
Dawa Zangmo	Natural composed leaves from forest	Yes	Crop management (plantation & harvest)	Department of Agriculture

Dolay	Cow dung	Yes	Crop management (plantation & harvest)	Department of Agriculture
Pema Thinley	Cow dung	Yes	Organic Farming	Department of Agriculture
Passang Wangdi	Natural composed leaves from forest	Yes	Crop management (plantation & harvest)	Department of Agriculture
Karma	Cow dung	No	None	None
Nima Dem	Natural composed leaves from forest	Yes	Organic Farming	Department of Agriculture
Sonam Dorji	Natural composed leaves from forest	Yes	Organic Farming	Department of Agriculture
Rinchen Gyelthsen	Natural composed leaves from forest	Yes	Crop management (plantation & harvest)	Department of Agriculture
Rinchen Lhamo	Natural composed leaves from forest	No	None	None
Nidup Mo	Natural composed leaves from forest	Yes	Crop management (plantation & harvest)	Department of Agriculture
Dawa Tshering	Cow dung	Yes	Sustainable Land Management	Gewog Agriculture
Kalaym	Cow dung	Yes	Crop management (plantation & harvest)	Department of Agriculture
Chimi Wangmo	Natural composed leaves from forest	Yes	Crop management (plantation & harvest)	Department of Agriculture
Hotem	Cow dung	Yes	Crop management (plantation & harvest)	Department of Agriculture
Rikemo	Natural composed leaves from forest	No	None	None
Dawala	Natural composed leaves from forest	No	None	None
Dawa Pem	Cow dung	Yes	Crop management (plantation & harvest)	Department of Agriculture
Pema Wangmo	Natural composed leaves from forest	Yes	Sustainable Land Management	Department of Agriculture
Sonam Tshering	Cow dung	Yes	Sustainable Land Management	Department of Agriculture
Karma Lhaden	Cow dung	Yes	Crop management (plantation & harvest)	Department of Agriculture
Tshering Mo	Cow dung	Yes	Crop management (plantation & harvest)	Department of Agriculture
Sangay Dema	Cow dung	No	None	None
Wangmo	Natural composed leaves from forest	No	None	None
Kaka	Cow dung	Yes	Crop management (plantation & harvest)	Department of Agriculture
Sangay Bida	Don't use anything	No	None	None

Annexure 7: Farm management practices applied

Name of the respondents	Farm management practices applied	Soil conservation practices initiated	Pesticide/ chemical fertilizer applied	Types of pesticides used	Use Organic manure
Rinzin bida	Organic manure	None	No	Don't use	Yes
Chazem	Organic manure	Crop Rotation	No	Don't use	Yes
Nidup Wangmo	Organic manure	Crop Rotation	No	Don't use	Yes
Yuden	Organic manure	Crop Rotation	No	Don't use	Yes
Namgay Dorji	Organic manure	Crop Rotation	No	Don't use	Yes
Nidup Pem	Organic manure	Crop Rotation	No	Don't use	Yes
Tashi Phuntsho	Organic manure	Crop Rotation	No	Don't use	Yes
Kuenzang Thinley	Organic manure	Crop Rotation	No	Don't use	Yes
Yeshi bida	Organic manure	Crop Rotation	No	Don't use	Yes
Pem Dem	Chemical fertilizer	Crop Rotation	Yes	Weedicides	Yes (used both)
Luki	Organic manure	Don't cultivate	No	Don't use	Yes
Thinley Wangmo	Organic manure	Crop Rotation	No	Don't use	Yes
Jangchuk Dem	Organic manure	Terraces & Crop Rotation	No	Don't use	Yes
Sithu Dem	Organic manure	Terraces	No	Don't use	Yes
Phub Zam	Organic manure	Terraces & Crop Rotation	No	Don't use	Yes
Penjor	Organic manure	Crop Rotation	No	Don't use	Yes
Jamba	Organic manure	Crop Rotation	No	Don't use	Yes
Thinley Dorji	Organic manure	Crop Rotation	No	Don't use	Yes
Nim Dorji	Organic manure	Crop Rotation	No	Don't use	Yes
Chimi Dorji	Organic manure	Crop Rotation	No	Don't use	Yes
Sonam Yuden	Organic manure	Crop Rotation	No	Don't use	Yes
Dawa Zam	Organic manure	Crop Rotation	No	Don't use	Yes
Choden	Organic manure	Terraces & Crop Rotation	No	Don't use	Yes
Sangay Choden	Organic manure	Crop Rotation	No	Don't use	Yes
Choki Dema	Organic manure	Crop Rotation	No	Don't use	Yes
Dawa Zangmo	Organic manure	Terraces & Crop Rotation	No	Don't use	Yes
Dolay	Organic manure	Terraces & Crop Rotation	No	Don't use	Yes
Pema Thinley	Organic manure	Crop Rotation	No	Don't use	Yes
Passang Wangdi	Organic manure	Crop Rotation	No	Don't use	Yes
Karma	Organic manure	Crop Rotation	No	Don't use	Yes
Nima Dem	Organic manure	Crop Rotation	No	Don't use	Yes
Sonam Dorji	Organic manure	Crop Rotation & Mixed Cropping	No	Don't use	Yes
Rinchen Gyelthsen	Organic manure	Terraces, Hedgerow & Crop Rotation	No	Don't use	Yes
Rinchen Lhamo	Organic manure	Terraces & Crop Rotation	No	Don't use	Yes
Nidup Mo	Organic manure	Crop Rotation & Mixed Cropping	No	Don't use	Yes
Dawa Tshering	Organic manure	Crop Rotation	No	Don't use	Yes
Kalaym	Organic manure	Crop Rotation	No	Don't use	Yes

Chimi Wangmo	Organic manure	Crop Rotation	No	Don't use	Yes
Hotem	Organic manure	Crop Rotation	No	Don't use	Yes
Rikemo	Organic manure	Crop Rotation	No	Don't use	Yes
Dawala	Organic manure	Crop Rotation	No	Don't use	Yes
Dawa Pem	Organic manure	Crop Rotation	No	Don't use	Yes
Pema Wangmo	Organic manure	Crop Rotation & Mixed Cropping	No	Don't use	Yes
Sonam Tshering	Organic manure	Crop Rotation	No	Don't use	Yes
Karma Lhaden	Organic manure	Crop Rotation	No	Don't use	Yes
Tshering Mo	Organic manure	Terraces, Hedgerow & Crop Rotation	No	Don't use	Yes
Sangay Dema	Organic manure	Crop Rotation	No	Don't use	Yes
Wangmo	Organic manure	Crop Rotation	No	Don't use	Yes
Kaka	Organic manure	Crop Rotation	No	Don't use	Yes
Sangay Bida	Organic manure	Crop Rotation	No	Don't use	Yes

Annexure 8: Types of domestic animals owned, feeding and market of products

Name of the respondents	Name of the village	Kind of domestic animal owned	Sale of animal products	Income from sale of animal products	Feeding of livestock	Owned of Bee hives
Rinzin Bida	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Chazem	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Nidup Wangmo	Bayul-kuenza	Cattle, Pig	Don't sale	Nu.0	Keep in the grazing area whole time	No
Yuden	Bayul-kuenza	Goat	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Namgay Dorji	Bayul-kuenza	Cattle, Pig	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Nidup Pem	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Tashi Phuntsho	Bayul-kuenza	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Kuenzang Thinley	Bayul-kuenza	Cattle	Don't sale	Nu.0	Zero feeding (keep in the stable and feed	No
Yeshi Bida	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Pem Dem	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Luki	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Thinley Wangmo	Bayul-kuenza	Cattle	Butter, Cheese	Nu. 500-1000	Keep in grazing area during the day and in the stable at night	No
Jangchuk Dem	Gedaphu	Cattle, Horse	Butter, Cheese	7000-8000	Keep in grazing area during the day and in the stable at night	No
Sithu Dem	Gedaphu	Cattle, Horse	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Phub Zam	Bayul-kuenza	Goat	Don't sale	Nu.0	Zero feeding (keep in the stable and feed	No
Penjor	Gedaphu	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No

Jamba	Gedaphu	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Thinley Dorji	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Nim Dorji	Gedaphu	Cattle	Butter, Cheese	Nu. 3500-4000	Keep in the grazing area whole time	No
Chimi Dorji	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Sonam Yuden	Gedaphu	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Dawa Zam	Bayul-kuenza	Poultry	Don't sale	Nu.0	Zero feeding (keep in the stable and feed	No
Choden	Bayul-kuenza	Cattle	Butter, Cheese	Nu. 3500-4000	Zero feeding (keep in the stable and feed	No
Sangay Choden	Bayul-kuenza	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Choki Dema	Gedaphu	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Dawa Zangmo	Bayul-kuenza	Poultry	Don't sale	Nu.0	Zero feeding (keep in the stable and feed	No
Dolay	Bayul-kuenza	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Pema Thinley	Gedaphu	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Passang Wangdi	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Karma	Gedaphu	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Nima Dem	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Sonam Dorji	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Rinchen Gyelthsen	Bayul-kuenza	Poultry	Don't sale	Nu.0	Zero feeding (keep in the stable and feed	No
Rinchen Lhamo	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No

Nidup Mo	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Dawa Tshering	Bayul-kuenza	Cattle	Butter, Cheese	6000-7000	Keep in grazing area during the day and in the stable at night	No
Kalaym	Bayul-kuenza	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Chimi Wangmo	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Hotem	Bayul-kuenza	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Rekimo	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Dawala	Bayul-kuenza	Don't have any animal	No animal	Nu.0	No animal	No
Dawa Pem	Bayul-kuenza	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Pema Wangmo	Bayul-kuenza	Cattle	Don't sale	Nu.0	Keep in the grazing area whole time	No
Sonam Tshering	Bayul-kuenza	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Karma Lhaden	Bayul-kuenza	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Tshering Mo	Bayul-kuenza	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Sangay Dema	Jigme-chhu	Cattle	Don't sale	Nu.0	Keep in grazing area during the day and in the stable at night	No
Tashi Wangmo	Jigme-chhu	Don't have any animal	No animal	Nu.0	No animal	No
Kaka	Bayul-kuenza	Cattle	Butter, Cheese	Nu. 1500-2000	Keep in grazing area during the day and in the stable at night	No
Sangay Bida	Jigme-chhu	Poultry	Don't sale	Nu.0	Zero feeding (keep in the stable and feed	No

Annexure 9: Food sufficiency and options to overcome food shortage

Name of respondents	Harvest enough food to last whole year	Face food shortage	Options to overcome the food shortage deficit
Rinzin Bida	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Chazem	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Nidup Wangmo	Yes	No shortage	Eat other alternative food
Yuden	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Namgay Dorji	Yes	No shortage	Buy from others/shops
Nudup Pem	Yes	No shortage	Buy from others/shops
Tashi Phuntsho	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Kuenzang Thinley	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Yeshi Bida	Yes	No shortage	Buy from others/shops
Pem Dem	Yes	No shortage	Buy from others/shops
Luki	Yes	No shortage	Buy from others/shops
Thinley Wangmo	Yes	No shortage	Buy from others/shops
Jangchuk Dem	Yes	No shortage	Don't buy
Sithu Dem	Yes	No shortage	Don't buy
Phub Zam	No	5-6 months	Members working in towns/other areas sends money to supplement the food shortage
Penjor	No	1-2 months	Buy from others/shops
Jamba	Yes	No shortage	Don't buy
Thinley Dorji	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Nim Dorji	Yes	1-2 months	Buy from others/shops
Chimi Dorji	No	3-4 months	Buy from others/shops
Sonam Yuden	Yes	No shortage	Don't buy
Dawa Zam	No	3-4 months	Members working in towns/other areas sends money to supplement the food shortage
Choden	No	3-4 months	Members working in towns/other areas sends money to supplement the food shortage
Sangay Choden	No	3-4 months	Members working in towns/other areas sends money to supplement the food shortage
Choki Dema	No	3-4 months	Members working in towns/other areas sends money to supplement the food shortage
Dawa Zangmo	Yes	No shortage	Don't buy
Dolay	No	3-4 months	Members working in towns/other areas sends money to supplement the food shortage
Pema Thinley	Yes	No shortage	Don't buy
Passang Wangdi	No	1-2 months	Buy from others/shops
Karma	Yes	No shortage	Don't buy

Nima Dem	Yes	No shortage	Don't buy
Sonam Dorji	Yes	No shortage	Don't buy
Rinchen Gyelthsen	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Rinchen Lhamo	No	1-2 months	Members working in towns/other areas sends money to supplement the food shortage
Nidup Mo	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Dawa Tshering	No	3-4 months	Engage in piece work
Kalaym	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Chimi Wangmo	Yes	No shortage	Buy from others/shops
Hotem	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Rekimo	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Dawala	No	1-2 months	Buy from others/shops
Dawa Pem	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Pema Wangmo	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Sonam Tshering	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Karma Lhaden	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Tshering Mo	Yes	No shortage	Buy from others/shops
Sangay Dema	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Tashi Wangmo	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage
Kaka	Yes	No shortage	Buy from others/shops
Sangay Bida	Yes	No shortage	Members working in towns/other areas sends money to supplement the food shortage

Annexure 10: Sources of Income

Income earned from sales of cash crops	No. of households earned income	Income earned from sales of vegetables	No. of households earned income	Remarks
Nu. 100 to 2000	2	Nu. 500 to 1000	1	*None of the households sale forest products. * No household raise bee hives * 6 respondent earned income through working as wage labour (off farm activities) in construction of houses in the locality of and transporting of sand for BHU construction. * 1 respondent earned through monthly salary as school caretaker * 1 respondent earned income through carpentry in the locality.
Nu. 2000 to 4000	4	Nu. 1000 to 2000	2	
Nu. 8000 to 10000	1	Nu. 2000 to 3000	1	
Nu. 10000 to 12000	1	Nu. 3000 to 4000	1	
Nu 12000 to 14000	1	Nu 6000 to 7000	1	
Nu. 14000 to 16000	1	Nu. + 10000	1	
Did not sale	40	Did not sale	43	
Total	50	Total	50	
Income earned from sales of dairy products	No. of households earned income	Income earned from Off Farm Activities	No. of households earned income	
Nu. 500 to 1000	1	Nu. 1000 to 5000	1	
Nu. 1500 to 2000	1	Nu. 5000 to 10000	2	
Nu. 3000 to 40000	2	Nu. 15000 to 20000	1	
Nu. 6000 to 7000	1	Nu. 25000 to 50000	1	
Nu. 7000 to 8000	1	Nu 50000 to 10000	1	
Did not sale	44	Did not earn	44	
Total	50	Total	50	
Income earned from sales of fruits	No. of households earned income	Income earned from handicrafts	No. of households earned income	
Nu. 500 to 1000	1	Nu. 1000 to 2000	0	
Nu. 2000 to 3000	1	Nu. 2000 to 30000	0	
Nu. 5000 to 60000	1	Nu. 3000 to 4000	1	
Did not sale	47	Did not sale	49	
Total	50	Total	50	

Annexure 11: Status of fuel wood consumption

Name of the respondents	Consumption of fuel wood by family in a year	Allowed of fuel wood collect from forest per year	Alternatives to deficit fuel wood shortage
Rinzin Bida	1-10 backloads	No enforcement of laws/free to collect	Sufficient
Chazem	10-20 backloads	No enforcement of laws/free to collect	Sufficient
Nidup Wangmo	1-10 backloads	2 trees	Sufficient
Yuden	1-10 backloads	No enforcement of laws/free to collect	Sufficient
Namgay Dorji	1-10 backloads	No enforcement of laws/free to collect	Sufficient
Nidup Pem	20-30 backloads	No enforcement of laws/free to collect	Sufficient
Tashi Phuntsho	1-10 backloads	No enforcement of laws/free to collect	Collect dry wood
Kuenzang Thinley	10-20 backloads	No enforcement of laws/free to collect	Sufficient
Yeshi Bida	20-30 backloads	No enforcement of laws/free to collect	Sufficient
Pem Dem	30-40 backloads	No enforcement of laws/free to collect	Sufficient
Luki	1-10 backloads	No enforcement of laws/free to collect	Use LPG
Thinley Wangmo	30-40 backloads	No enforcement of laws/free to collect	Sufficient
Jangchuk Dem	30-40 backloads	1 tree	Collect dry wood
Sithu Dem	10-20 backloads	1 tree	Collect dry wood
Phub Zam	30-40 backloads	2 trees	Sufficient
Penjor	1-10 backloads	No enforcement of laws/free to collect	Collect dry wood
Jamba	1-10 backloads	No enforcement of laws/free to collect	Sufficient
Thinley Dorji	1-10 backloads	No enforcement of laws/free to collect	Sufficient
Nim Dorji	1-10 backloads	No enforcement of laws/free to collect	Sufficient
Chimi Dorji	20-30 backloads	1 tree	Sufficient
Sonam Yuden	10-20 backloads	2 trees	Sufficient
Dawa Zam	1-10 backloads	1 tree	Sufficient
Choden	1-10 backloads	1 tree	Sufficient
Sangay Choden	10-20 backloads	1 tree	Sufficient
Choki Dema	10-20 backloads	1 tree	Sufficient
Dawa Zangmo	1-10 backloads	1 tree	Sufficient
Dolay	10-20 backloads	1 tree	Sufficient
Pema Thinley	1-10 backloads	1 tree	Sufficient
Passang Wangdi	1-10 backloads	1 tree	Sufficient
Karma	10-20 backloads	1 tree	Sufficient
Nima Dem	10-20 backloads	No enforcement of laws/free to collect	Sufficient
Sonam Dorji	10-20 backloads	1 tree	Sufficient
Rinchen Gyelthsen	1-10 backloads	2 trees	Sufficient
Rinchen Lhamo	1-10 backloads	1 tree	Sufficient
Nidup Mo	20-30 backloads	No enforcement of laws/free to collect	Sufficient
Dawa Tshering	10-20 backloads	1 tree	Use Electricity
Kalaym	10-20 backloads	3 trees	Collect dry wood
Chimi Wangmo	10-20 backloads	No enforcement of laws/free to collect	Sufficient
Hotem	1-10 backloads	1 tree	Sufficient

Rekimo	1-10 backloads	1 tree	Use Electricity
Dawala	1-10 backloads	1 tree	Sufficient
Dawa Pem	10-20 backloads	1 tree	Use Electricity
Pema Wangmo	10-20 backloads	1 tree	Use Electricity
Sonam Tshering	10-20 backloads	1 tree	Use Electricity
Karma Lhaden	10-20 backloads	1 tree	Collect dry wood
Tshering Mo	10-20 backloads	1 tree	Use Electricity
Sangay Dema	1-10 backloads	1 tree	Use Electricity
Tashi Wangmo	10-20 backloads	1 tree	Use Electricity
Kaka	1-10 backloads	1 tree	Use Electricity
Sangay Bida	10-20 backloads	1 tree	Use Electricity

Annexure 12: Sources of drinking water, causes of water shortage and interventions

Name of the respondents	Name of the village	Sources of drinking water	Causes of water shortage	Measures implemented to conserve water	Types of measures initiated to conserve water
Rinzin Bida	Bayul-kuenza	Spring water	Water Source degraded, poor water source management	Yes	Protection of watersheds and water source
Chazem	Bayul-kuenza	Rain Water, Spring Water	Water source is degraded	Yes	Protection of watersheds and water source
Nidup Wangmo	Bayul-kuenza	Spring water	Water dries up during dry seasons	Yes	Protection of watersheds and water source
Yuden	Bayul-kuenza	Rain Water, Spring Water	Water source is seasonal	Yes	Fencing of watersheds and sources
Namgay Dorji	Bayul-kuenza	Spring water	Water source is degraded and demand increased by increasing population	Yes	Protection of watersheds and water source
Nidup Pem	Bayul-kuenza	Spring water	Water source is degraded, poor water management, demand increased by increasing population	Yes	Protection of watersheds and water source
Tashi Phuntsho	Bayul-kuenza	Spring water	Water source is degraded and demand increased by increasing population	Yes	Fencing of watersheds and sources
Kuenzang Thinley	Bayul-kuenza	Spring water	Water source is degraded and demand increased by increasing population	Yes	Fencing of watersheds and sources
Yeshi Bida	Bayul-kuenza	Spring water	Water source is degraded & sunk the water source by earthquake	Yes	Protection of watersheds and water source
Pem Dem	Bayul-kuenza	Spring water	Water source is degraded & sunk the water source by earthquake	Yes	Protection of watersheds and water source
Luki	Bayul-kuenza	Spring water	Water source is degraded & sunk the water source by earthquake	Yes	Protection of watersheds and water source
Thinley Wangmo	Bayul-kuenza	Spring water	Water source is degraded & sunk the water source by earthquake	Yes	Protection of watersheds and water source
Jangchuk Dem	Gedaphu	Spring water	Water dries up during dry seasons	Yes	Fencing of watersheds and sources
Sithu Dem	Gedaphu	Spring water	Water source is seasonal	Yes	Fencing of watersheds and sources
Phub Zam	Bayul-kuenza	Spring water	Water sufficient	Yes	Fencing of watersheds and sources
Penjor	Gedaphu	Irrigation channel	Lack of proper water source management	Yes	Fencing of watersheds and sources
Jamba	Gedaphu	Irrigation channel	Lack of proper water source management	No	No measures undertaken

Thinley Dorji	Bayul-kuenza	Irrigation channel	Lack of proper water source management	No	No measures undertaken
Nim Dorji	Gedaphu	Irrigation channel	Lack of proper water source management	Yes	Protection of watersheds and water source
Chimi Dorji	Bayul-kuenza	Spring water	Lack of proper water source management	Yes	Protection of watersheds and water source
Sonam Yuden	Gedaphu	Spring water	Water dries up during dry seasons	Yes	Protection of watersheds and water source
Dawa Zam	Bayul-kuenza	Spring water	Water source is degraded	No	No measures undertaken
Choden	Bayul-kuenza	Spring water	Water sufficient	No	No measures undertaken
Sangay Choden	Bayul-kuenza	Spring water	Sunk the water source by earthquake	No	No measures undertaken
Choki Dema	Gedaphu	Spring water	Water sufficient	Yes	Protection of watersheds and water source
Dawa Zangmo	Bayul-kuenza	Spring water	Water source is degraded	No	No measures undertaken
Dolay	Bayul-kuenza	Spring water	Water sufficient	Yes	Protection of watersheds and water source
Pema Thinley	Gedaphu	Spring water	Water dries up during dry seasons	Yes	Protection of watersheds and water source
Passang Wangdi	Bayul-kuenza	Spring water	Water dries up during dry seasons	No	No measures undertaken
Karma	Gedaphu	Spring water	Water dries up during dry seasons	Yes	Protection of watersheds and water source
Nima Dem	Bayul-kuenza	Spring water	Water source is degraded	Yes	Protection of watersheds and water source
Sonam Dorji	Bayul-kuenza	Spring water	Water source is degraded & sunk the water source by earthquake	Yes	Protection of watersheds and water source
Rinchen Gyelthsen	Bayul-kuenza	Spring water	Water dries up during dry seasons	Yes	Protection of watersheds and water source
Rinchen Lhamo	Bayul-kuenza	Rain water	Water dries up during dry seasons	No	No measures undertaken
Nidup Mo	Bayul-kuenza	Spring water	Water sufficient	Yes	Fencing of watersheds and sources
Dawa Tshering	Bayul-kuenza	Spring water	Water sufficient	Yes	Protection of watersheds and water source
Kalaym	Bayul-kuenza	Spring water	Water source is degraded	Yes	Protection of watersheds and water source
Chimi Wangmo	Bayul-kuenza	Spring water	Water source is degraded	Yes	Protection of watersheds and water source
Hotem	Bayul-kuenza	Spring water	Water dries up during dry seasons	Yes	Protection of watersheds and water source
Rekimo	Bayul-kuenza	Spring water	Water dries up during dry seasons	Yes	Protection of watersheds and water source
Dawala	Bayul-kuenza	Spring water	Water source is degraded	Yes	Protection of watersheds and water source

Dawa Pem	Bayul-kuenza	Spring water	Water source is degraded	Yes	Fencing of watersheds and sources
Pema Wangmo	Bayul-kuenza	Spring water	Water dries up during dry seasons	Yes	Fencing of watersheds and sources
Sonam Tshering	Bayul-kuenza	Spring water	Water dries up during dry seasons	Yes	Fencing of watersheds and sources
Karma Lhaden	Bayul-kuenza	Spring water	Water source is degraded	Yes	Fencing of watersheds and sources
Tshering Mo	Bayul-kuenza	Spring water	Water dries up during dry seasons	Yes	Protection of watersheds and water source
Sangay Dema	Jigme-chhu	Spring water	Water dries up during dry seasons	Yes	Fencing of watersheds and sources
Tashi Wangmo	Jigme-chhu	Spring water	Water dries up during dry seasons	Yes	Protection of watersheds and water source
Kaka	Bayul-kuenza	Spring water	Water dries up during dry seasons	Yes	Protection of watersheds and water source
Sangay Bida	Jigme-chhu	Spring water	Water source is degraded	Yes	Protection of watersheds and water source

Annexure 13: Major environmental problems and causes of soil erosion

Name of the respondents	Name of the village	Major environmental problems	Causes of soil erosion
Rinzin Bida	Bayul-kuenza	Forest clearing, watershed depletion, soil depletion	Deforestation
Chazem	Bayul-kuenza	Forest clearing/watershed depletion/degradation	Deforestation, Lack of awareness on importance of soil conservation
Nidup Wangmo	Bayul-kuenza	Soil fertility/soil depletion	Deforestation
Yuden	Bayul-kuenza	Forest clearing, watershed depletion, soil depletion	Lack of awareness on importance of soil conservation
Namgay Dorji	Bayul-kuenza	Forest clearing/watershed depletion/degradation	Deforestation, Lack of awareness on importance of soil conservation
Nidup Pem	Bayul-kuenza	Forest clearing/watershed depletion/degradation	Deforestation, Lack of awareness on importance of soil conservation
Tashi Phuntsho	Bayul-kuenza	Forest clearing, watershed depletion, soil depletion	Deforestation
Kuenzang Thinley	Bayul-kuenza	Forest clearing/watershed depletion/degradation	Deforestation, Lack of awareness on importance of soil conservation
Yeshi Bida	Bayul-kuenza	Forest clearing, watershed depletion, soil depletion	Deforestation
Pem Dem	Bayul-kuenza	Forest clearing, watershed depletion, soil depletion	Deforestation, Lack of awareness on importance of soil conservation
Luki	Bayul-kuenza	Forest clearing/watershed depletion/degradation	Deforestation
Thinley Wangmo	Bayul-kuenza	Forest clearing/watershed depletion/degradation	Deforestation
Jangchuk Dem	Gedaphu	Soil fertility/soil depletion	Lack of awareness on importance of soil conservation
Sithu Dem	Gedaphu	Soil erosion	Lack of knowledge of soil conservation techniques
Phub Zam	Bayul-kuenza	Soil erosion	Lack of knowledge of soil conservation techniques
Penjor	Gedaphu	Soil fertility/soil depletion	Poor farming methods
Jamba	Gedaphu	Landslides	Lack of knowledge of soil conservation techniques
Thinley Dorji	Bayul-kuenza	Forest clearing/watershed depletion/degradation	Poor farming methods
Nim Dorji	Gedaphu	Forest clearing, watershed depletion, soil depletion	Poor farming methods
Chimi Dorji	Bayul-kuenza	Soil fertility/soil depletion	Lack of awareness on importance of soil conservation
Sonam Yuden	Gedaphu	Soil fertility/soil depletion	Lack of awareness on importance of soil conservation
Dawa Zam	Bayul-kuenza	Soil fertility/soil depletion	Lack of awareness on importance of soil conservation
Choden	Bayul-kuenza	Soil fertility/soil depletion	Lack of knowledge of soil conservation techniques

Sangay Choden	Bayul-kuenza	Soil fertility/soil depletion	Lack of knowledge of soil conservation techniques
Choki Dema	Gedaphu	Soil fertility/soil depletion	Lack of knowledge of soil conservation techniques
Dawa Zangmo	Bayul-kuenza	Soil fertility/soil depletion	Lack of knowledge of soil conservation techniques
Dolay	Bayul-kuenza	Soil fertility/soil depletion	Lack of knowledge of soil conservation techniques
Pema Thinley	Gedaphu	Soil fertility/soil depletion	Lack of awareness on importance of soil conservation
Passang Wangdi	Bayul-kuenza	Soil fertility/soil depletion	Lack of awareness on importance of soil conservation
Karma	Gedaphu	Soil fertility/soil depletion	Lack of awareness on importance of soil conservation
Nima Dem	Bayul-kuenza	Forest clearing/watershed depletion/degradation	Deforestation, Lack of awareness on importance of soil conservation
Sonam Dorji	Bayul-kuenza	Forest clearing, watershed depletion, soil depletion	Deforestation, Lack of awareness on importance of soil conservation
Rinchen Gyelthsen	Bayul-kuenza	Soil fertility/soil depletion	Deforestation
Rinchen Lhamo	Bayul-kuenza	Soil fertility/soil depletion	Lack of knowledge of soil conservation techniques
Nidup Mo	Bayul-kuenza	Forest clearing/watershed depletion/degradation	Lack of knowledge of soil conservation techniques
Dawa Tshering	Bayul-kuenza	Soil fertility/soil depletion	Deforestation
Kalaym	Bayul-kuenza	Forest clearing, watershed depletion, soil depletion	Deforestation
Chimi Wangmo	Bayul-kuenza	Forest clearing, watershed depletion, soil depletion	Deforestation
Hotem	Bayul-kuenza	Soil fertility/soil depletion	Lack of knowledge of soil conservation techniques
Rekimo	Bayul-kuenza	Forest clearing, watershed depletion, soil depletion	Deforestation
Dawala	Bayul-kuenza	Soil fertility/soil depletion	Deforestation
Dawa Pem	Bayul-kuenza	Forest clearing, watershed depletion, soil depletion	Lack of knowledge of soil conservation techniques
Pema Wangmo	Bayul-kuenza	Forest clearing, watershed depletion, soil depletion	Deforestation
Sonam Tshering	Bayul-kuenza	Forest clearing/watershed depletion/degradation	Deforestation
Karma Lhaden	Bayul-kuenza	Soil fertility/soil depletion	Lack of knowledge of soil conservation techniques
Tshering Mo	Bayul-kuenza	Forest clearing/watershed depletion/degradation	Deforestation
Sangay Dema	Jigme-chhu	Forest clearing/watershed depletion/degradation	Deforestation

Tashi Wangmo	Jigme-chhu	Forest clearing/watershed depletion/degradation	Deforestation
Kaka	Bayul-kuenza	Forest clearing, watershed depletion, soil depletion	Deforestation
Sangay Bida	Jigme-chhu	Forest clearing/watershed depletion/degradation	Deforestation

Annexure 14: List of interviewees for Zhemgang Dzongkhag

Name	Sex of the interviewer		Total
	Female	Male	
Changki	1	0	1
Choney Pelden	1	0	1
Choney Wangmo	1	0	1
Dawa Chozom	1	0	1
Dema	2	0	2
Kardung	1	0	1
Karma Lhamo	1	0	1
Kelzang Dema	1	0	1
Kezang Choden	1	0	1
Kezang Wangmo	1	0	1
kinley Tenzin	0	1	1
leki Wangmo	1	0	1
Leki Wangmo	2	0	2
Leki Zangmo	1	0	1
Lhamo	1	0	1
Pelden Dema	1	0	1
Pema Choki	3	0	3
Pema Chozom	1	0	1
Pema Lhamo	1	0	1
Pema Tshoki	1	0	1
Pema Zangmo	1	0	1
Pemo	1	0	1
Phurpa Wangmo	1	0	1
Rinchen Wangmo	1	0	1
Rinzin Lhamo	1	0	1
Rinzin Tshoki	1	0	1
Sangay Lhaden	1	0	1
Sherub	1	1	2
Sonam Choden	1	0	1
Tandin Lhamo	1	0	1
Tashi Yangzom	1	0	1
Tenzin Choden	1	0	1
Thsering Lhamo	1	0	1
Tsewang Choden	1	0	1
Tshering Choden	1	0	1
Tshering Chozom	1	0	1
Tshering Dema	2	0	2
Tshering Lhamo	1	0	1
Tshewang Dema	1	0	1

Ugyen Choda	0	1	1
Ugyen Dema	1	0	1
Wangchuk Norbu	0	1	1
Yeshi Lhamo	1	0	1
Yeshi Palden	1	0	1
Yeshi Yangzom	1	0	1
Total	47	4	51

Annexure 15: List of FFLG Members and Facilitators

Sl	Name of FFLGs and Members	Name of FFLG Facilitator
I	Berti	
1	Choney Pelden	Ms. Ugyen Dema
2	Dawa Chozom	
3	Karma Lhamo	
4	leki Wangmo	
5	Pema Zangmo	
6	Pemo	
7	Ugyen Dema	
8	Yeshi Palden	
9	leki Wangmo	
10	Pema Choki	
11	Cheni Pelden	
II	**Dakpay**	
1	Kardung	Ms. Sangay Lhaden
2	Pelden Dema	
3	Pema Choki	
4	Pema Lhamo	
5	Sangay Lhaden	
6	Tenzin Choden	
7	Tsewang Choden	
8	Tshering Lhamo	
9	Yeshi Lhamo	
10	Karma Yangzom	
11	Leki Wangmo	
III	**Kikhar**	
1	Choney Wangmo	Ms Kelzang Dema
2	Dema	
3	Kelzang Dema	
4	Kezang Choden	
5	Kezang Wangmo	
6	Kinley Tenzin	
7	Dema	
8	Pema Tshoki	
9	Phurpa Wangmo	
10	Rinchen Wangmo	
11	Rinzin Lhamo	
12	Tandin Lhamo	
13	Tshewang Dema	
14	Wangchuk Norbu	
15	Rinzin Tshoki	

IV	Tali	
1	Leki Wangmo	Mr. Wangyel
2	Lhamo	
3	Changki	
4	Pema Choki	
5	Sherub	
6	Sonam Choden	
7	Tashi Yangzom	
8	Thsering Lhamo	
9	Tshering Choden	
10	Tshering Chozom	
11	Yeshi Yangzom	
12	Tshering Dema	
13	Sherub	
14	Ugyen Choda	
V	**Buli**	
1	Lham Dorji	Mr. Tashi Tobgay
2	Sonam Gyelmo	
3	Yeshi Lhaden	
4	Tashi Wangmo	
5	Kinley Tobgey	
6	Lili Wangchuk	
7	Singye Wangchuk	
8	Dechen Dorji	
9	Sangay Choden	
10	Tashi Tobgay	
11	Tobgay	
VI	**Khengrig-Namsum Cooperatives**	
1	Thinley Wangdi	Mr. Leki Dorji
2	Dawa Zangpo	
3	Tashi Wangmo	
4	Leki Dorji	
5	Sangay Lungten	
6	Tshering Delker	
7	Pema Tshewang	
8	Pema Wangmo	
9	Jamayang Lhamo	
10	Sangay Wangmo	
11	Sangay Ngazom	