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**KINGDOM OF BHUTAN**

# COMMERCIAL AGRICULTURE AND RESILIENT LIVELIHOODS ENHANCEMENT PROGRAMME

# RAPID IMPACT ASSESSMENT REPORT

# FOR

# CLIMATE SMART VILLAGE, NGARPENTANG

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# A
# Report on
# Rapid Impact Assessment
# for
# Climate Smart Village at Ngarpentang

**(February 2021)**

# Commercial Agriculture and Resilient Livelihoods Enhancement Programme

(CARLEP)

Ministry of Agriculture and Forests

Wengkhar, Mongar

**Prepared by**

**Office of the Programme Management**

**&**

**Agriculture Research and Development Center, Wengkhar**

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# Abbreviation

| | |
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| ARDC | Agriculture Research and Development Center |
| CARLEP | Commercial Agriculture and Resilient Livelihoods Enhancement Programme |
| CSA | Climate Smart Agriculture |
| CSV | Climate Smart Village |
| DoA | Department of Agriculture |
| FGD | Focus Group Discussion |
| FY | Financial Year |
| GHG | Greenhouse Gas |
| HH | Household |
| ICIMOD | International Centre for Integrated Mountain Development |
| IFAD | International Fund for Agricultural Development |
| Kg | Kilogram |
| KII | Key Informant Interview |
| KIL | Kufouku International Limited |
| KM | Kilometer |
| LCMP | Land Cover Mapping Project |
| M | Mean |
| Max | Maximum |
| Mdn | Median |
| Min | Minimum |
| MoAF | Ministry of Agriculture and Forests |
| MPU | Milk Processing Units |
| N | Total number of units |
| n | Number of units |
| NEC | National Environment Commission |
| NFE | Non-formal Education |
| Nu | Ngultrum |
| OPM | Office of the Programme Management |
| RAMCO | Regional Agriculture Marketing and Cooperative |
| RLDC | Regional Livestock Development Center |
| SNV | Netherlands Development Organization |
| SPSS | Statistical Package for Social Science |

## Project Background

The Commercial Agriculture and Resilient Livelihoods Enhancement Programme (CARLEP) based at Wengkhar, Mongar is a seven years programme with additional three years (2016-2025) financed by International Fund for Agricultural Development (IFAD). CARLEP operates in the eastern Dzongkhags and aims to facilitate the transformation of a subsistence-based rural agricultural economy into a sustainable value chain and market driven productive sector by promoting climate smart approaches in agriculture and strengthening capacities of communities and local institutions.

The goal of the programme is to reduce poverty through sustainably increasing the income of smallholder farmers through commercial agriculture production. The overall development objective of the programme is to increase returns to smallholder farmers through climate resilient production of crops and livestock in nationally organized value chains and marketing systems.

The main implementing partners are six eastern Dzongkhags & concerned Gewogs, Regional Agricultural Marketing and Cooperatives (RAMCO), Agriculture Research and Development Center (ARDC) Wengkhar, Regional Livestock Development Centre (RLDC) Kanglung and Koufuko International Limited (KIL) Chenary, Trashigang.

# Executive Summary

1. Study covered 29 households from Ngarpentang Climate Smart Village
2. 76% of the respondents were male while 24% were female
3. 66% of the respondents had received Non-formal Education, 24% had attended formal educations, 3% received monastic education, and 7% were illiterate
4. Average landholding in Ngarpentang CSV is 2.4 acres
5. 24% (n=7) of the households have leased-in land for cultivation
6. Survey found 8% increase in land under cultivation after the project intervention
7. Solanaceae cultivation increased by 281% after the project intervention with the annual production increase from 8.25kg to 45.07kg per HH on an average
8. leguminous cultivation increased from 0.07 to 0.18 acre and the production has increased from 24.14 to 57.82 kg per HH on an average
9. Cole crop cultivation increased from 0.01 to 0.20 acre per HH and the mean production per HH has increased from 0.74 to 49 kg.
10. Root crops cultivation increased from 0.03 to 0.19 acre per HH and the mean production per HH has increased from 7.3 to 82.0 kg
11. Maize yield increased by 12% after the project intervention
12. Upland paddy was introduced as a new crop at Ngarpentang CSV in 2017
13. On an average 0.3 acre per HH was used for upland paddy cultivation
14. No. of fruit trees has increased by 211.1% and fruit production by 36%
15. The improved cattle breed has increased by 4% after the intervention.
16. The average number of improved poultry breeds per HHs has increased from 13 to 22 after the intervention
17. Number of poultry inclusive of local and improved breeds has been slightly increased after the project intervention by 54.1%.
18. 3.4% of the respondents had improved sub-tropical pasture, 83% had Napier plantation, and 24% had Guatemala, 31% had pakchong, and 55% had fodder trees.
19. Number of fodder trees increased by 10%.

20. Area under fodder cultivation has increased by 366% after the intervention, i.e., from 0.04 to 0.17 acre per HH on an average
21. Before the project intervention, the farmers did not make any income from vegetables, while 10% of the respondents earned from cereals, and 14% earned from fruits.
22. After intervention, 45% of the respondents earned from selling vegetables, 10% from cereal, and 38% from fruits
23. Off-farm activities remain main source of income for both before and after project intervention.
24. After the intervention, 52% of the respondents reported food self-sufficient for the 10-12 months
25. 100% of the respondents have adopted CSA technologies
26. 100% of the biogas users have reported significant reduction in consumption on firewood and also on LPG consumption
27. 97% of the respondents reported decrease in production losses to wildlife.
28. 7% of the total respondents (n=2) availed loan for agricultural purposes
29. 14% of respondents (n=4) reported to use weather and climate information

# Introduction

Bhutan is an agrarian society with 69% of the population still living in rural areas. Majority of the Bhutanese farmers are smallholders and practice subsistence farming. The arable land area is only 2.93% (LCMP, 2011) and agriculture is largely dominated by rain-fed dryland farming. The domestic food production meets only 64% of the total cereals' requirement making the country still dependent on imported food grains (MoAF, 2018).

Farming in Bhutan is highly challenging due to rugged terrain and steep slopes limiting mechanization, increasing soil erosion and limited access to suitable technologies (SNV and DoA, 2015). Hence, the agro-ecosystem is highly vulnerable to the ensuing impacts of climate change. Smallholder farmers who depend directly on crops and livestock for their livelihood are the most vulnerable (NEC, 2012).

Moreover, the smallholder farmers lack the awareness and understanding of the potential threat of climate change and they do not have assured safety nets and alternative livelihood sources to fall back in the event of crop failures. Hence, there is a growing need for agriculture development options that can contribute to smallholder farmers' food security and ability to adapt to climate change while sequestering carbon dioxide from the atmosphere or otherwise minimizing Greenhouse Gas (GHG) emissions (Bayala *et al*., 2016; FAO, 2013b; ICIMOD, 2015b; Mendelsohn, 2008).

In view of these, Agriculture Research and Development Centre (ARDC), Wengkhar and Regional Livestock Development Centre (RLDC), Kanglung with financial support from Commercial Agriculture and Resilient Livelihoods Enhancement Programme (CARLEP) funded by International Fund for Agricultural Development (IFAD) began promoting Climate Smart Agriculture (CSA) technologies through Climate Smart Village (CSV) approach from 2016-2017 FY onward. A total of 12 CSVs, six in FY 2016-17 and additional six in FY 2019-2020 were identified.

Ngarpentang is one of the CSV sites comprising of 50 households identified by the respective district to promote CSA technologies. For the Ngarpentang farmers, agriculture and livestock play a very important role in their livelihoods. However, scarcity of water has greatly affected their livelihoods for ages. In the past, Ngarpentang people trekked for hours to the nearest reliable source of water. The water was barely enough for drinking, let alone for other purposes such as agriculture and livestock. Therefore, the people depended on rainfed cultivation of maize, the staple crop, even though the agro-climatic conditions are suitable for cultivation.

The Agriculture Research and Development Centre (ARDC) Wengkhar recognized that the water system was an important part of building climate resilience in this village. In this regard, ARDC and CARLEP worked together to design, construct and implement a climate-resilient system for spring water harvesting.

Ngarpentang village now have adequate water supply for vegetable and fruit crops. The new water-saving technologies such as sprinklers are also introduced in the community. As a result, people have started growing enough vegetables and fruits to feed their families and sell in local markets.

The climate change adaptation involves putting up required infrastructure and capacity development of farmers which necessitates collaboration among different stakeholders. The implementation of activities is on-going in most of these villages and takes longer to create visible impact, it might be too early to assess impacts across all the villages.

However, as IFAD is currently developing a case study to take stock of the climate change adaptation activities being implemented in different project areas, a rapid impact assessment of CSV Ngarpenteng village is carried out.

## 1.1 Objectives

The objective of the study is to carry out a rapid assessment of Ngarpentang CSV and document the impact of climate change adaptation activities.

# Methodology

## 2.1 Sample Size

The Ngarpentang CSV has 50 households, out of which 33 households were randomly selected for the survey using Yamane's formula: $n=N/1+Ne^2$ (Formula 1). This formula has a 90% confidence interval and 10% error level (Israel, 1992). The sampling will be done based on simple random sampling technique. However, four households were missing during the survey, due to which only 29 households were interviewed.

The household survey was conducted with a sample size of 33 respondents determined

$$n = \frac{N}{1+Ne^2}$$

(Where, n= required responses; $e^2$ = error limit; N= sample size

$$n = \frac{\overset{\text{N= 50}}{50}}{1+50(0.1)^2} = \mathbf{33\ respondents}$$

Table 1: Sample size

| Dzongkhag | Gewog | Village | Households | Sample size |
|---|---|---|---|---|
| Mongar | Thangrong | Ngarpentang | 50 | 33 (29 interviewed) |

## 2.2 Data Collection

The baseline information such as livelihood sources, production system, crops and natural resource base on which the communities subsist including any existing local coping and adaptation strategies have been recorded through Focused Group Discussion (FGD), key informant interview (KII) and household survey using the KOBO toolbox- a free and open-source suite of tools for field data collection and analysis provided by the Harvard Humanitarian Initiative

A comprehensive general and familiarization training on the KoBoToolbox app was provided to the enumerators. KoBoToolbox app was installed in the android tablets issue to enumerators for data collection.

Considering the limited time for conducting the assessment, the survey has been conducted by respective Gewog Agriculture Extension Officers, OPM and ARDC Wengkhar staff.

Before the actual household survey, the overall questionnaire was reviewed and each question was discussed among the enumerators to fully understand the objectives of each question and built a common understanding. Standard quantitative interviewing techniques and field protocols were also discussed in detail.

## 2.3 Data processing and analysis

The data has been analyzed through appropriate Microsoft Excel and SPSS Version 25. The data were analyzed using descriptive statistics.

## 2.4 Questionnaire Development

A set of questionnaires was developed to collect quantitative data through households' interviews. The draft questionnaire was reviewed and finalized by Programme Directors, OPM and ARDC staff.

## 2.5 Pre-testing Questionnaire

Pre-testing was carried out at Wengkhar, Mongar. Pre-testing of the survey questionnaires enabled the survey team to touch base with all the areas of inquiry and also allowed the team to add on new areas of inquiry to the study. After the pre-test, the questionnaire was revised and finalized.

# Results and Discussion

## 3.1 Demographic Profile and Land Holding

### 3.1.1 Gender and Age

The study covered 29 households from Ngarpentang Climate-Smart Village. The majority of the respondents were male (76%, n=22), while 24% (n=7) were female. The age of respondents ranges between 20 and 51 years old, with a mean age of 37 years old.

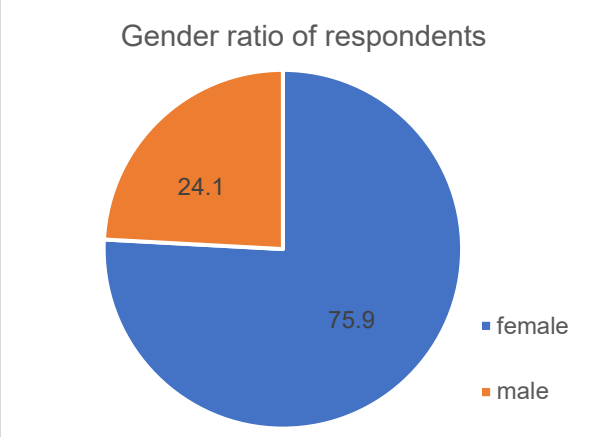


Figure 3.1 Pie chart showing gender ratio of respondents

### 3.1.2 Literacy rate

The study found out that 66% of the respondents had received Non-formal Education, 24% had attended formal educations, 3% received monastic education, and 7% were illiterate. The majority of the respondents (17%) who had formal education were primary school pass out.

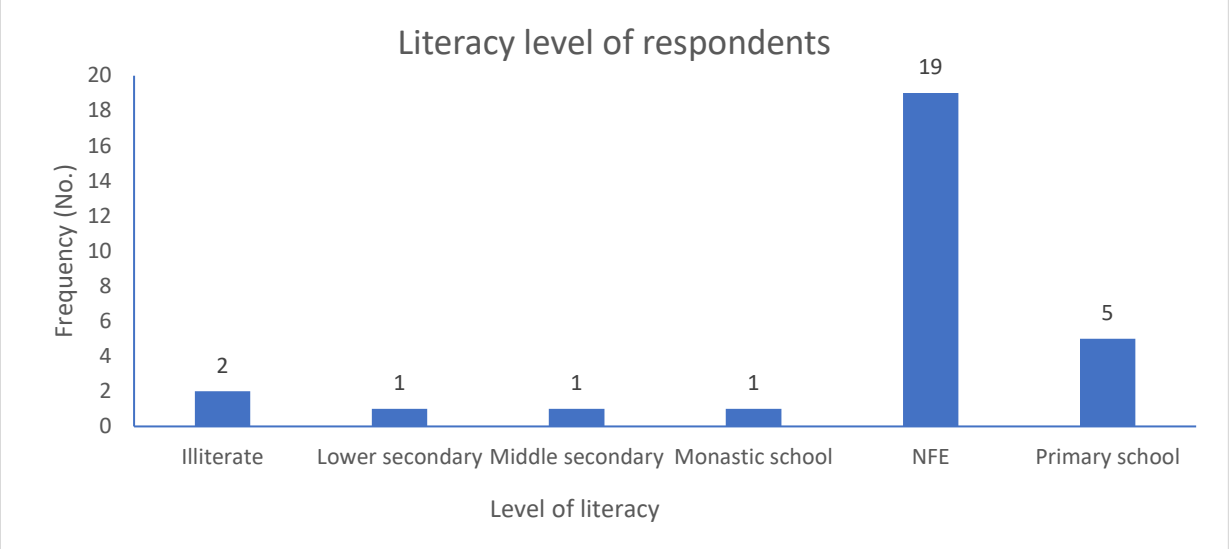


Figure 3.2 Bar graph showing literacy level of respondents

## 3.2 Land Holding

The survey found that the average landholding in Ngarpentang CSV is 2.4 acres (1.6 Mdn, 1.4 Mod), while on average 0.9 acre of land is left fallow. The study also reveals

that the people of Ngarpentang solely depend on dryland agriculture, as the village does not have any wetland.

The survey found that approximately 24% (n=7) of the households have leased-in land for cultivation. 0.64 acre was leased-in on an average, with a maximum of 1.32 acres and a minimum of 0.22 acre.

### 3.3 Land-use Change

The survey found a slight increase (8%) in the area under cultivation after the project intervention. Before the intervention, the average area under cultivation (cereal and vegetable) was 1.19 acres which have increased to 1.3 acres after the intervention.

The survey found that the area under orchard was negligible, i.e., 0.03 acre per HH on average, before the project intervention. After the intervention, the area under orchard has been increased to 0.32 acre per HH on average.

### 3.4 Vegetable Production

As per focus group discussion (FGD) and key informant interview (KII), farmers used to travel to neighboring villages in exchange of pine resin and maize for vegetables. But now, farmers maintain nutrition gardens due to availability of adequate water and dry out surplus for the lean season.

Through the rapid assessment of area coverage and production of vegetables, the survey found a drastic increase in area under cultivation, simultaneously increase in production. The survey mainly focused on the crops which are grown in the selected area and the results as follows;

The area coverage under Solanaceae cultivation i.e., eggplant, chili, tomato and potato increased by 281% after the project intervention with the annual production increase from 8.25kg to 45.07kg per HH on average.

The area coverage under leguminous cultivation increased from 0.07 to 0.18 acre and the production has increased from 24.14 to 57.82 kg per HH on average. The survey included beans and peas under leguminous crops.

The mean area under Cole crops cultivation which includes broccoli, cauliflower and cabbage increased from 0.01 to 0.20 acre per HH and the mean production per HH has increased from 0.74 to 49 kg.

The mean area under root crops cultivation increased from 0.03 to 0.19 acre per HH and the mean production per HH has increased from 7.3 to 82.0 kg. The survey included carrot and radish under root crops.

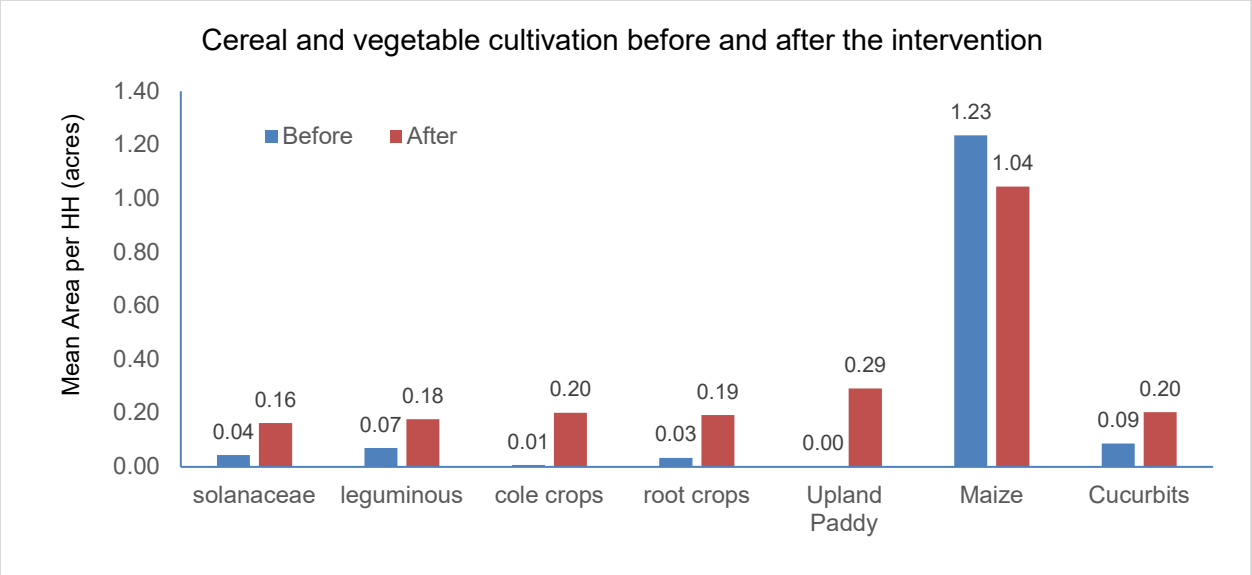


Figure 3.3: Bar graph showing Area Coverage under cereal and vegetable cultivation BEFORE and AFTER the intervention

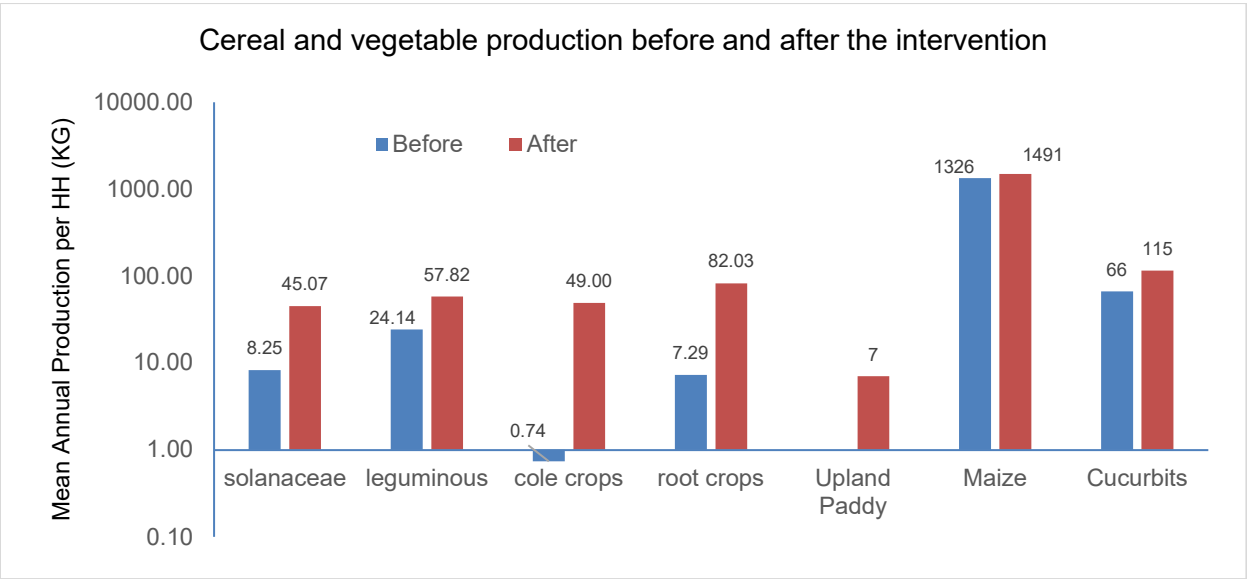


Figure 3.4:Bar graph showing cereal and vegetable production BEFORE and AFTER the project intervention

## 3.5 Cereal Production

Although maize remains one of the staple crops, people have shifted to rice as the main staple due to increase accessibility to the farm road network and market. The survey found that people of Ngarpentang bought 549 kg of rice per HHs annually on an average (Mdn-600, Max-1200, Min-20).

Maize remains as the main cereal crop cultivated at Ngarpentang, mainly for food and animal feed. The average productivity of maize increased from 1326 to 1490 kg per acre due to the introduction of hybrid and stress tolerant maize variety. However, the area under maize cultivation has decreased by 15% due to a shift in cultivation practices and increased cultivation of vegetables and fruits. And also due to the introduction of upland paddy as a new crop at Ngarpentang CSV in 2017 on a trial basis. The survey found that 65% of the respondents cultivated upland paddy. On average, 0.3 acre per HH was used for upland paddy cultivation.

## 3.6 Fruits Production

The community of Ngarpentang grew fewer citrus, mango, and pineapple fruits in their backyard due to scarce water resources in the past. In comparison, the survey found a drastic increase in the fruit tree plantation attributing to the implementation of a climate-resilient system for spring water harvesting. Since the intervention, the plantation of fruit trees such as mango, dragon fruit, avocado, mandarin, pineapple, and cassava has increased by 211.1%. Concurrent to the increase in the no. of fruit trees plantation, the survey also found an increase in fruit production by 36%.

The mango trees per HHs increased from 2 trees before the intervention to 15 trees after the intervention with the mean production from 44 kg to 90 kg per HHs on average respectively. The survey also found an increase in mandarin trees from 1.7 to 1.9 trees per HHs on average. In comparison, the number of pineapple trees per HHs on average has increased from 8 trees with a mean production of 9 kg before the intervention to 22 trees with a mean production of 13 kg after the intervention. On average, the number of avocado trees per HHs increased from 1 tress before the intervention to 8 trees after the intervention with the mean production increase from 1 kg to 2kg per HHs. The survey also found a slight increase in cassava tree plantation per HHs from 5 to 8 trees on average with the mean production per HHs from 14kg before the intervention to 18 kg after the intervention.

Besides pineapple, mango, cassava, and mandarin, the survey found that the community has adopted dragon fruit plantation for the first time after the intervention. On average, each HHs have 2 dragon fruit trees.

During the survey period, it has been observed that most of the trees are at a young stage and will require a few years to begin producing fruits.

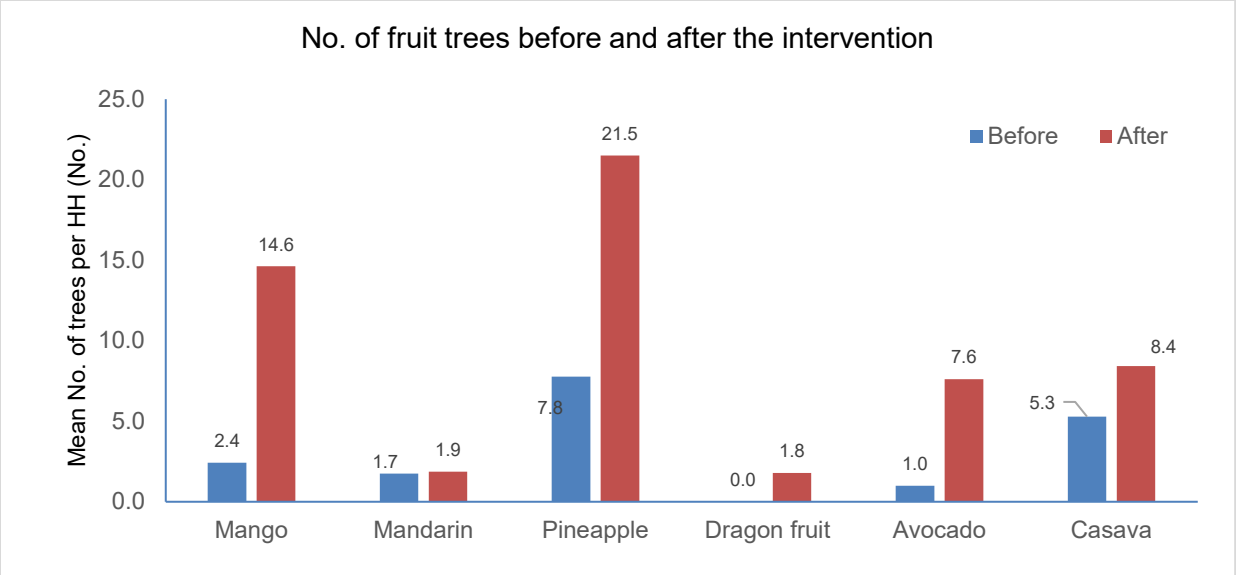


Figure 3.5: Graph showing number of fruit trees BEFORE and AFTER the intervention

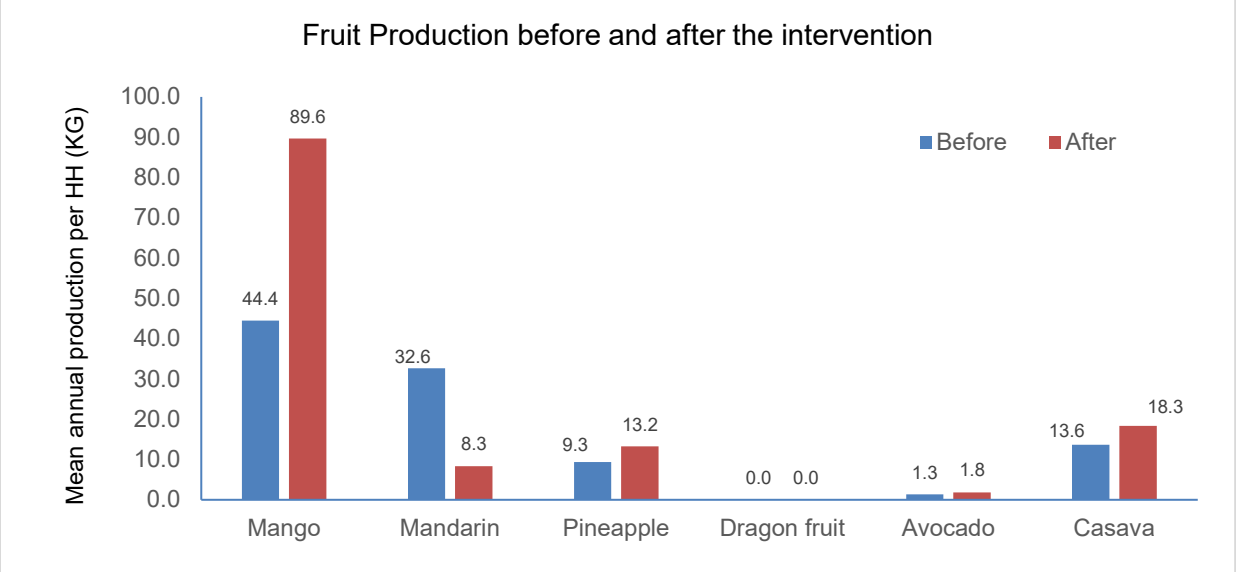


Figure 3.6: Graph showing fruit production BEFORE and AFTER the intervention

## 3.7 Cattle

The survey found that the rearing of improved cattle breed has increased from 93% to 97% after the intervention. The mean annual milk production per HHs has also increased from 624 to 698 liters after the project intervention.

## 3.8 Poultry

The survey found that 93% of the respondents had improved poultry breed. The average number of improved poultry breeds per HHs has increased from 13 to 22 after the intervention. Similarly, the mean number of local poultry breeds has increased from 5 to 8 local poultry breeds per HHs after the intervention.

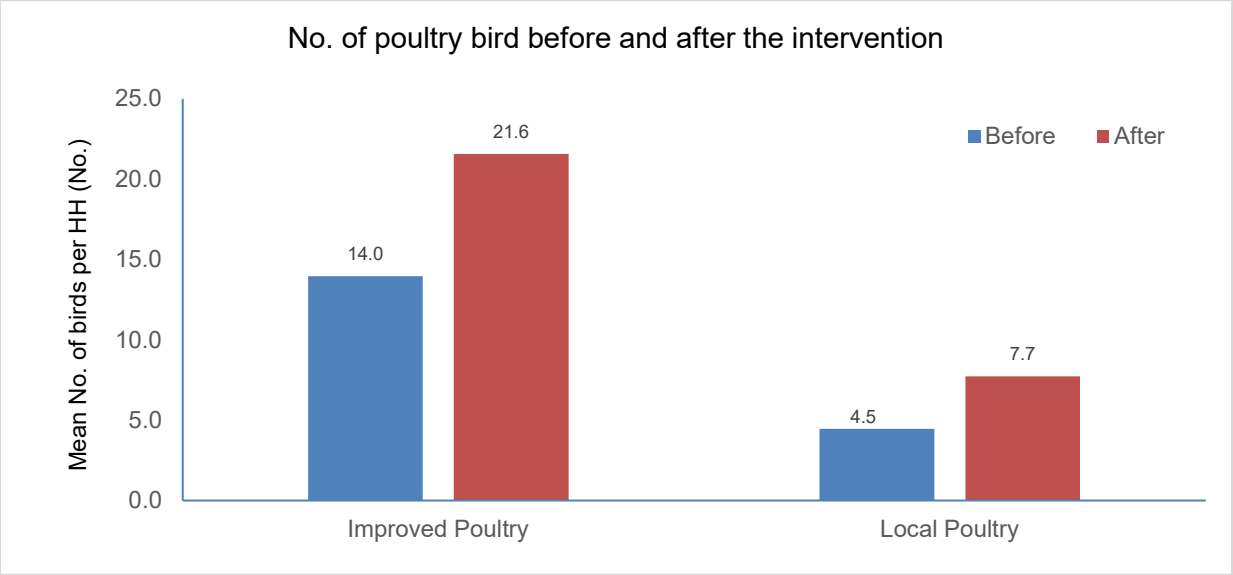


Figure 3.7: Graph showing number of poultry birds BEFORE and AFTER the intervention

Moreover, the survey showed that the number of poultry inclusive of local and improved breeds has been slightly increased after the project intervention by 54.1%.

On average, the annual egg production per HHs has increased from 879 before the intervention to 2023 eggs after the intervention, attributing to 130% growth.

## 3.9 Fodder Resources

The Participatory Vulnerability Assessment Report 2016 showed that there were 1136 fodder trees and 5.98 acres of pasture land at Ngarpentang CSV.

The survey found that 3.4% of the respondents had improved sub-tropical pasture, 83% had Napier plantation, and 24% had Guatemala, 31% had pakchong, and 55% had fodder trees.

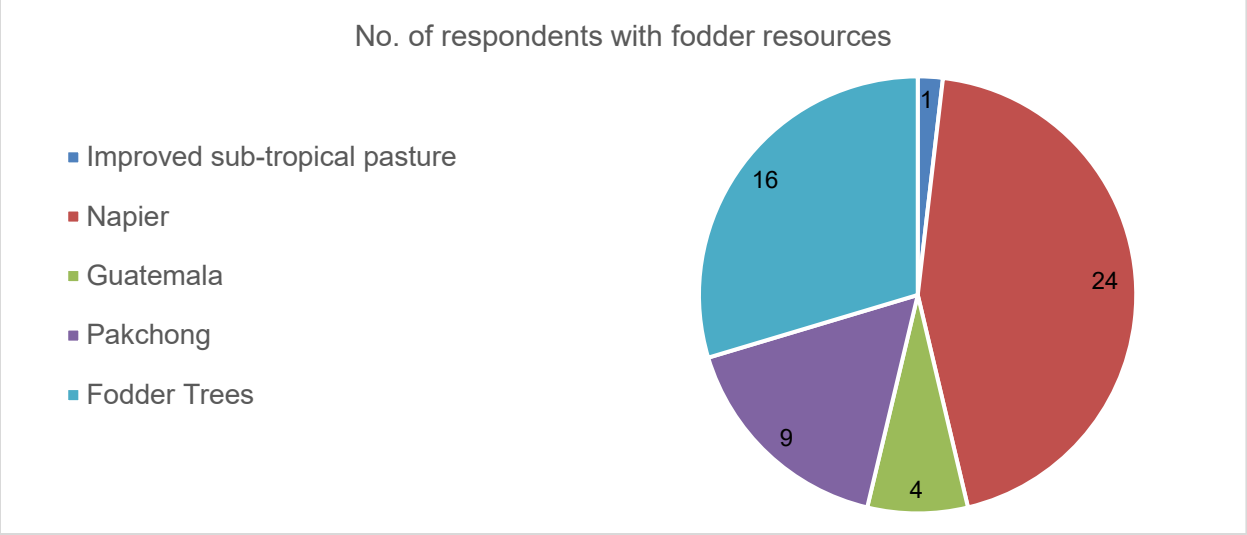


Figure 3.8: Chart showing number of respondents with different fodder resources

According to Focus Group Discussion, there is a gradual shift in cattle rearing pattern in the village from open forest grazing to semi-stall feeding where control grazing in the fields or near-by the field is practiced during the day and stall-fed in morning and evening. This practice of stall feeding has encouraged smallholder dairy farmers to plant more fodder slips and trees.

As per the survey, the number of fodder trees has increased after the project intervention as compared to before the project intervention. The survey found the number of fodder trees increased by 10%.

The survey found that the area under fodder cultivation has increased by 366% after the project intervention, i.e., from 0.04 to 0.17 acre per HH on an average.

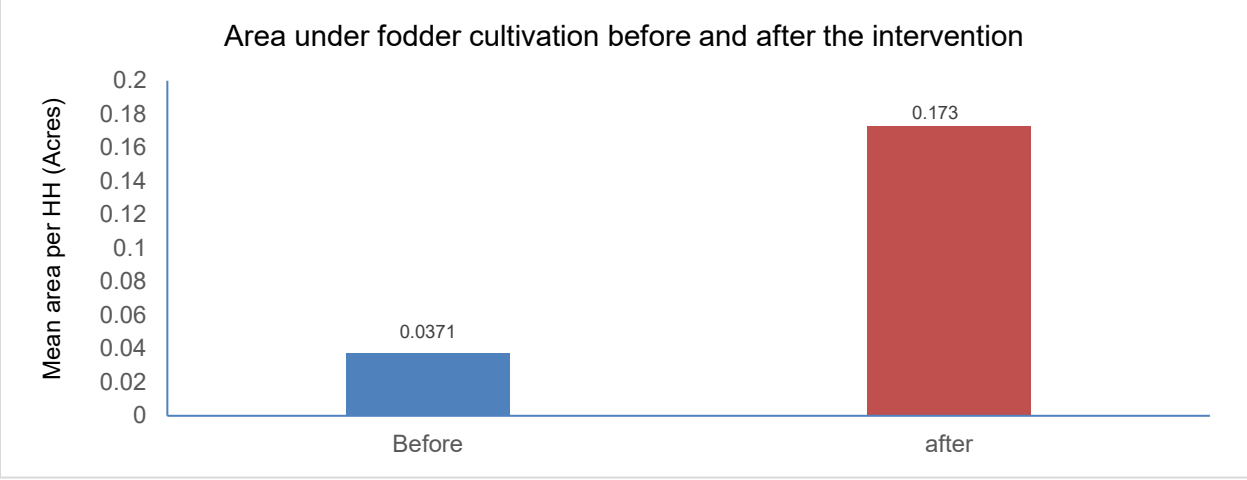


Figure 3.9: Graph showing area under fodder BEFORE and AFTER the intervention

## 3.10 Income

The survey studied four major sources of income. According to the survey, Off-farm activities are the prime source of income for the farmers followed by income earned from fruits, vegetables and cereal crops.

Before the project intervention, the farmers have not earned any income from vegetables, while 10% of the respondents have earned from cereals, and 14% earned from fruits.

After the intervention, 45% of the respondents earned from selling vegetables, 10% from cereal, and 38% from fruits.

The mean income earned from vegetables per HHs has drastically increased from zero earning before the project intervention to Nu. 1517 after the intervention. Likewise, the mean income from cereal increased from Nu.63 to Nu 974 per HHs, and the mean income from fruits increased from Nu.672 to Nu 1525 per HHs. The survey found that the income from off-farm activities has also increased from Nu. 37112 to Nu. 50710 after the project intervention. According to the survey, the income generated from off-farm activities was highest for both before and after the project intervention.

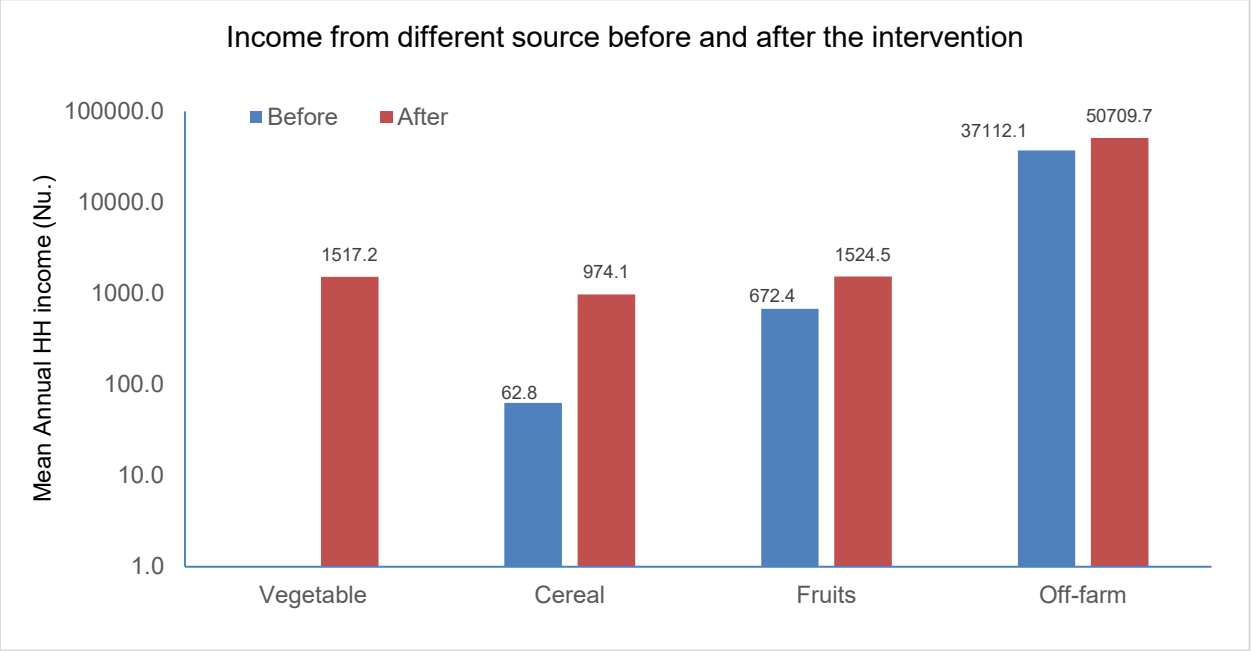


Figure 3.10: Graph showing Income from four sources BEFORE and AFTER the intervention

## 3.11 Household Expenditure

According to the survey, 37% of the respondents have spent their income on the purchase of assets, 7% on the purchase of farm inputs, and 75% on others such as grocery items, rituals, children's education and social events.

As per focus group discussion (FGD) and key informant interview (KII), the main staple food for the region has shifted from maize grains to rice consumption. As the majority of the households do not grow paddy in the region due to multiple climatic factors, farmers have a high dependency on imported rice as their main staple diet. Consequently, increasing the household expenditure on the rice.

## 3.12 Staple crop self-sufficiency

The survey measured the staple crop self-sufficiency of households, whereby maize was the main staple crop for the people of Ngarpentang.

Before the project intervention, 28% of the respondents were self-sufficient for the 10-12 months, 55% for 6 to 9 months, 14% for 3 to 5 months and 3.4% for 0 to 2 months.

After the intervention, 79% of the respondents were self-sufficient for the 10-12 months,14% for 6 to 9 months, 7% for 3 to 5 months and 0% for 0 to 2 months.

The survey found that 3.4% of the respondents were facing food shortages for 10 months before the project intervention while none (0%) reported the shortages after the project intervention.

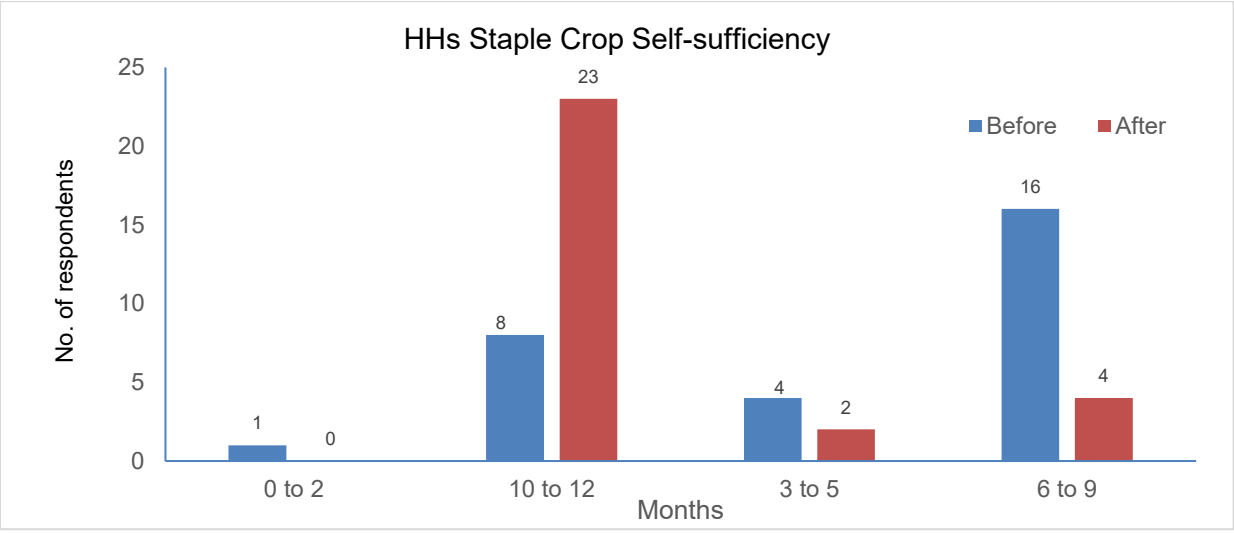


Figure 3.11: Graph showing HHs' staple crop self-sufficiency BEFORE and AFFTER the intervention

The survey reveals that the majority of households do not cultivate paddy despite their heavy consumption of rice. The survey revealed that 100% of the respondents purchase imported rice with an annual average of 549 kg per HHs (Min: 20, Max: 1200).

## 3.13 Adoption of Climate Smart Agriculture technologies

One of the main climatic hazards confronting the smallholder farmers are pest and disease outbreaks, and erratic weather patterns. Therefore, stress-tolerant crops such as heat-tolerant maize, stress-tolerant vegetable varieties, low water requiring indigenous crops such as upland paddy and millets, and pest and disease tolerant crop varieties such as blight-resistant potato varieties have been promoted to address these challenges.

According to the focus group discussion (FGD) and key informant interview (KII), it was found that a majority of respondents have not adopted any CSA technologies before the project intervention.

After the project intervention, 100% of the respondents have adopted CSA technologies. 90% of the respondent have adopted integrated fruit and vegetable cultivation, while 35% have adopted stress tolerant crops such as Heat Tolerant Maize, 35% have adopted low water requiring such as upland paddy, 69% have adopted composting, and 79% have adopted water-efficient technologies especially sprinkler irrigation. Four HHs have installed biogas and effectively used bio-slurry in their farm and vegetable garden.

Likewise, 97% of the respondents reported an increase in area under cultivation due to an increase in water availability, water-saving technologies and improved crop varieties adoption. While 100% of the respondents reported an increase in crop yield.

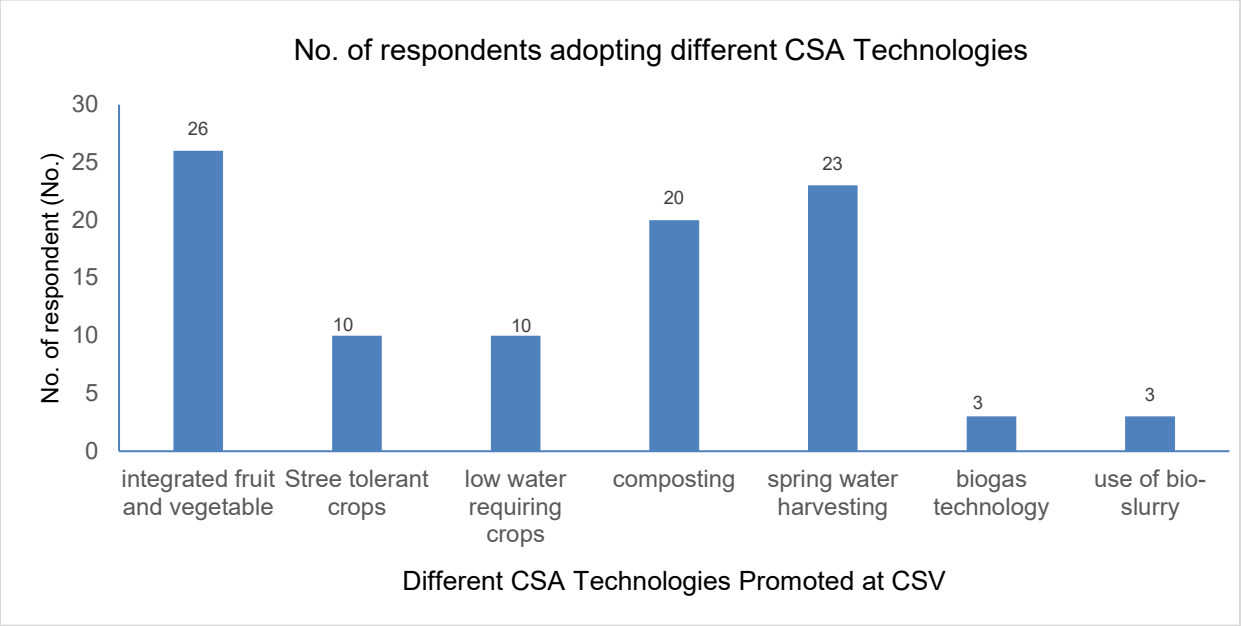


Figure 3.12: Graph showing no. of respondents adopting different CSA Technologies

## 3.14 **Biogas Installation**

Before the biogas installation, the people in the community either used dung directly on the farm or in the form of Farm Yard Manure (FYM). People were found to be unaware of the uses of biogas and the impact of the bio-slurry application on the farmland. Consequently, the people showed reluctance in the adoption of biogas. To date, there are only four HHs, out of 50 HHs who opted for the biogas installation. However, it has been reported that more people are now coming forward for biogas adoption due to its immense benefit. As the survey was carried using random sampling, only three HHs were covered for the rapid survey.

According to the FGD, it has been reported that biogas is mainly used for cooking purposes and has significantly reduced the consumption of firewood and other conventional biomass energy sources. Subsequently, reducing the GHGs emission into the atmosphere. Meanwhile, the Biogas Non-User respondent revealed that the energy needs are met from using electricity, firewood, crop residue, kerosene, and Liquid Petroleum Gas (LPG), etc. Firewood is found to be the most prevalent energy source for cooking, brewing alcohol and preparing livestock feed among others.

The survey revealed that 100% of the biogas users have substantially reduced their consumption on firewood and also on LPG consumption compared to the biogas non-user. Consequently, biogas adoption has significantly played a greater role in drudgery reduction, especially for women and children. As per the key informant interview (KII), it is reported that biogas users no longer worry about LPG bill payment and can utilize the money into buying other household items.

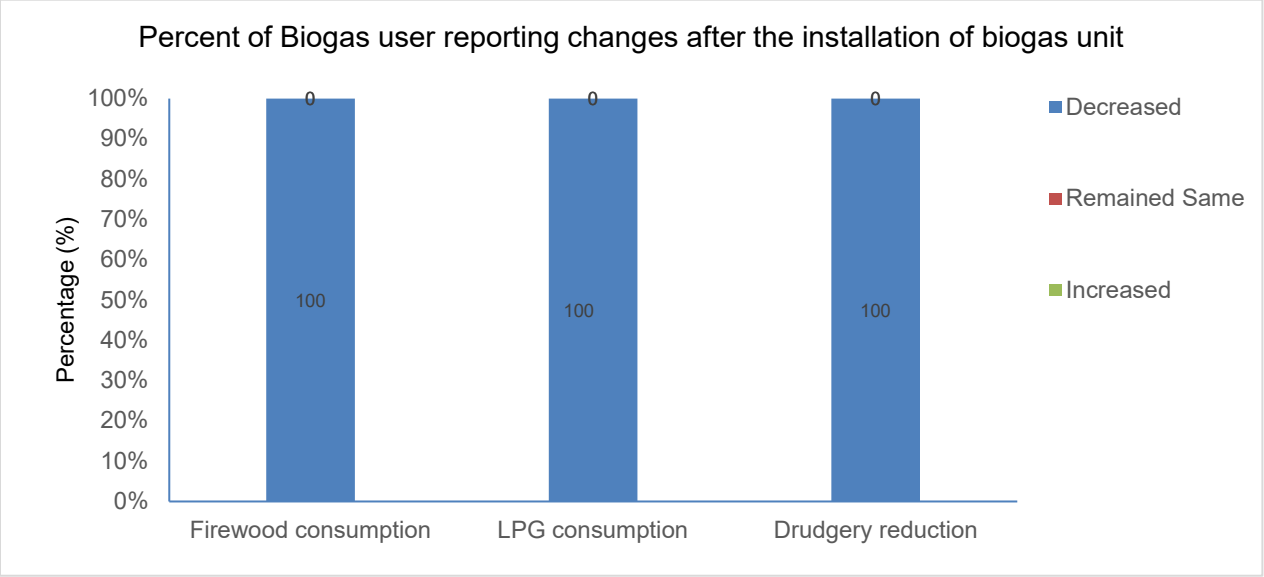


Figure 3.13: Percent of Biogas user reporting changes after the installation of a biogas unit

As per the past studies, bio-slurry contains 2.07% Phosphorus, 1.76% Nitrogen and 2.3% Potash. As it contains essential elements for the soil nutrients, it was found that the slurry from biogas digester has improved soil quality. According to the survey, 100% of biogas users (n=3) stated that the productivity of farmland has increased after the application of bio-slurry.

## 3.15 **Electric Fence**

The crop depredation by wild animals is seen as the most severe non-climatic hazard confronting this village. Hence, electric fencing has been promoted to reduce crop loss to wildlife. According to the FGD, the intervention has greatly helped farmers in protecting their crops from wildlife damage, while increasing household food self-sufficiency. Thus, it has contributed to an increase in crop cultivation and reducing fallow land apart from reducing the drudgery for farmers.

The survey shows that 97% of the respondents have decreased production losses to wildlife.

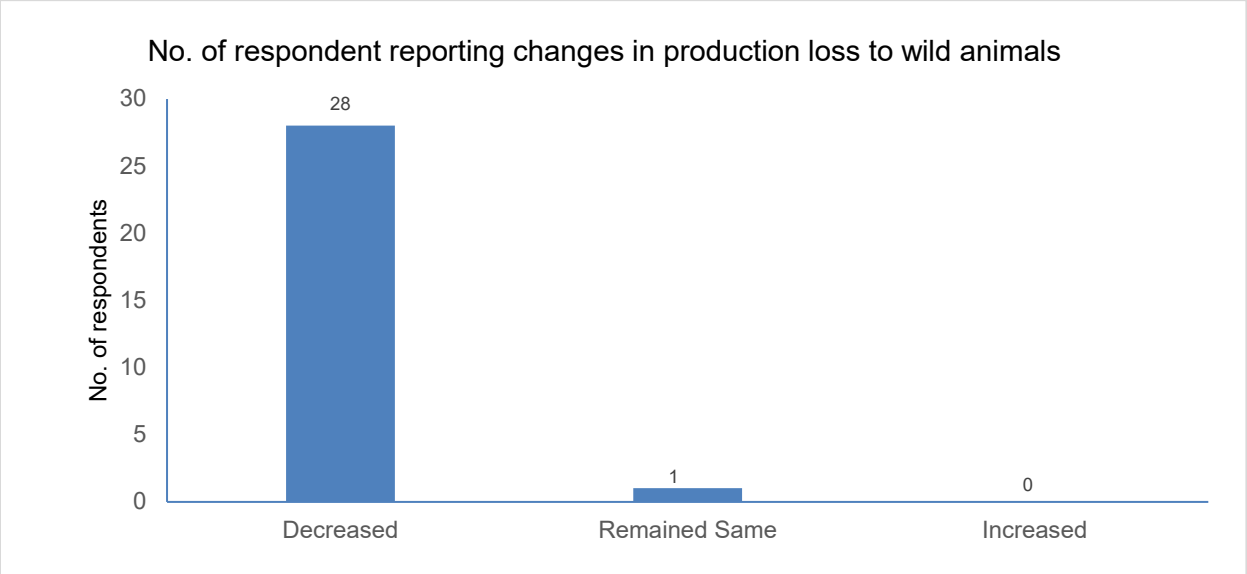


Figure 3.14: Graph showing no. of respondent reporting changes in production loss to wild animals

## 3.16 **Homestead nutrition garden**

Maize is the predominant crop grown in Ngarpentang. To diversify cropping patterns, ensure nutritional security and diversify sources of income, the homestead nutrition garden development has been identified as one of the appropriate interventions to enable smallholders to cope with the impacts of climate change.

Concerning the impact of homestead nutrition gardens on food security, 21% of the respondents reported improvement in food security while 79% reported no changes even after receiving the project intervention.

## 3.17 Loan

The survey found that approximately 7% of the total respondents (n=2) availed loan for agricultural purposes i.e., to purchase seedling and fencing. The respondent attributed the increase in credit service to CSV intervention.

## 3.18 Climate and weather information

The main purpose of weather forecasts is to ensure climate and weather-based farming and protect the economic loss of crops. Hence, timely dissemination of climate and weather information is one of the key strategies to ensure preparedness and adaptation to the impacts of climate change.

According to the survey, 14% of respondents (n=4) reported using weather and climate information whereas 86% (n=25) responded that they do not use such information. The 10% of respondents (n=3) revealed Television/Radio as the main source of information for rainfall weather patterns, while 3% (n=1) uses radio as a climate and weather information source. Likewise, 3% of the respondent(n=1) reported social media as the main source of information.

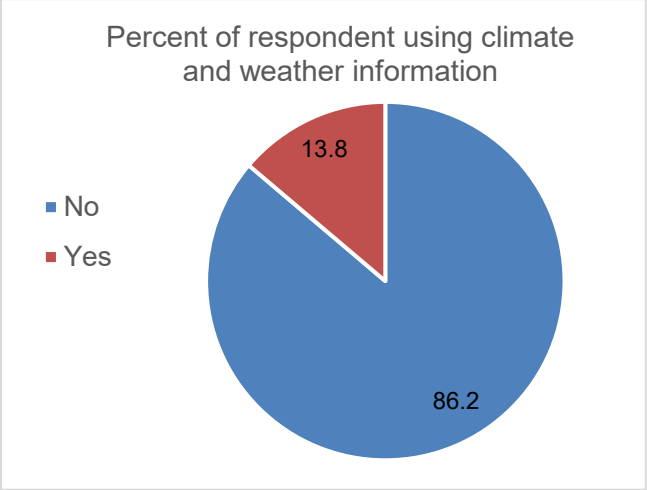


Figure 3.15: Percent of respondent using climate and weather information

Figure 3.16: Percent of respondent using climate and weather information

## 3.19 Technical and Marketing Support

The survey categorizes support provided to the people in two types; Technical and Marketing support. In technical support, it covers non-financial assistance, sharing of information, knowledge and expertise, skills training, and consulting services by local or international specialists. Whereas marketing support includes intervention provided in assuring market accessibility or market reach.

Before the project intervention, 24% (n=7) of the respondents responded having received technical support while 3% (n=1) received marketing support.

After the project intervention, 62% (n=18) of the respondents received technical support while 31% received marketing support.

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**Office of the Programme Management**

**CARLEP_IFAD**

**Wengkhar, Mongar, 43001**

**Post Box no: 146**

**Telephone: 00975 04-641236**

**Email address: carlep2016@gmail.com**

**Website: www.carlep.gov.bt**