Integrating agrobiodiversity for livelihood options in Bhimphedi municipality, Nepal

Producer organisation: Chabeli Farmers Group within the National Farmers Group Federation (NFGF) of Nepal

Agrobiodiversity Case Study 4: Nepal

Ankita Nepal and Kedar Koirala

Forest and Farm Facility

Sweden Sverige · Finnish Government · Federal Ministry of Food and Agriculture · giz · Government of the Netherlands · Norad · IKEA

Acknowledgements
This case study was commissioned using a template prepared by the International Institute for Environment and Development (IIED) for the Forest and Farm Facility (FFF), a co-management partnership between the Food and Agriculture Organization of the United Nations (FAO), the International Union for Conservation of Nature (IUCN), IIED and AgriCord. The FFF is supported by the governments of Sweden, Finland, Germany, Norway, the Netherlands and the United States of America, and the European Union.

The author extends gratitude to all members of the Chabeli Farmers Group of the National Farmers Group Federation (NFGF) of Nepal who have been practicing mixed agroecosystem approaches, using various crop varieties, livestock species, seed and animal progeny, soil-management techniques, biocontrol agents for crops, and cultural knowledge of diversity in the community. We would like to thank IIED for providing the opportunity to present this case study and to share our learning with others. We would like to express our appreciation for the contribution, kindness and support of the NFGF field team and local government officials. We express our thanks fully to the different levels of the NFGF structure for their efforts to bring the issues and voice of FFPOs to the centre of this initiative. The case study has been reviewed by Duncan Macqueen of IIED and revised by the author, edited by Holly Ashley, and laid out by Ali Logan Pang of IIED.

Disclaimer
The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the International Institute for Environment and Development (IIED) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether these have been patented, does not imply that these have been endorsed or recommended by IIED in preference to others of a similar nature that are not mentioned. The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of IIED.

IIED publications may be shared and republished in accordance with the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International Public License (CC BY-NC-ND 4.0). IIED is happy to discuss any aspect of further usage.

Cover photo: Photo of the landscape in which the Chabeli Farmers Group operates © NFGF

International Institute for Environment and Development
1 Boroughloch, Newington, Edinburgh, EH8 9NJ, UK
www.iied.org
@iied
www.facebook.com/theIIED
Download more publications at http://pubs.iied.org

IIED is a charity registered in England, Charity No.800066 and in Scotland, OSCR Reg No.SC039864 and a company limited by guarantee registered in England No.2188452.

Nepal, A. and Koirala, K. (2023) Integrating agrobiodiversity for livelihood options in Bhimphedi municipality, Nepal. National Farmers Group Federation, Nepal and IIED, Edinburgh.

Corresponding author: Ankita Nepal
Email: ankita.nfgf2022@gmail.com

Contents

List of figures and tables 3
Acronyms 3
Summary 4
1. Introduction to the Chabeli Farmers Group and its land use 5
1.1 Name and vision 5
1.2 Foundation 5
1.3 Location 5
1.4 Membership 6
1.5 Pattern of land use 7
2. Agro-biodiversity across the landscape 8
2.1 Commercial crops grown by men 10
2.2 Commercial crops grown by women 10
2.3 Subsistence crops and Livestock grown by men 10
2.4 Subsistence crops and Livestock grown by women 10
2.5 Wild harvested crops collected by men 10
2.6. Wild harvested crops grown by women 11
2.7 Agro-Biodiversity Documentation 11
3. Knowledge sources for crop and animal cultivation management 14
3.1 Biocultural heritage 14
3.2 Within the household generational transfer 16
3.3 Neighbor knowledge transfer 17
3.4 Chabeli knowledge network 18
3.5 FFPOs knowledge networks ..... **Error! Bookmark not defined.**
4. Seed / animal sources for the crops or animals that are cultivated and managed 19
4.1 Self-provisioning and multiplication 19
4.2 Neighbor barter or purchase 21
4.3 Formal System of a community seed bank 21
5. Enterprise strategies and agrobiodiversity 22
5.1 Cash crops 22
5.2 Changing patterns of cash cropping 23
5.3 The Role of the Chabeli Farmers Group in shaping what is sold 23
5.4 Future enterprise plans 23
6. Conclusions and recommendations 24
6.1 Conclusions 24
6.2 Recommendations 24
References 24

List of figures and tables

Box 1. Farmer livestock preferences
Box 2. Traditional food preparation methods
Box 3. Locally produced manure and compost
Box 4. Seed selection practices
Box 5. An example of how neighbours share knowledge

Figure 1. Land-use map of Bhimphedi municipality
Figure 2. Land-use revenues from planned agriculture and associated forest ecosystems

Table 1. Gender composition of the Chabeli Farmers Group
Table 2. Age composition of the Chabeli Farmers Group
Table 3 Farmer categories in the Chabeli Farmers Group
Table 4. Use of formal agricultural land by land-use categories
Table 5. Crops produced by men and women with estimates of percentages sold
Table 6. Main crop varieties cultivated by the community
Table 7. Additional species used by the community
Table 8. Traditionally used biopesticides

Acronyms

FFF	Forest and Farm Facility
FFPOs	Forest and farm producer organisations
IPM	Integrated pest management
NFGF	National Farmers Group Federation
PGS	Participatory guarantee system

Summary

This case study documents agrobiodiversity managed by the Chabeli Farmers Group in Bhimphedi rural municipality 5 of Makawanpur District in the Middle Hills of Nepal. The Chabeli Farmers Group is comprised of 40 smallholder farmers who each aim to sustain their production system and make it more resilient. In total, 20 smallholder farmers were interviewed for this case study.

The Chabeli Farmers Group is affiliated to the National Farmers Group Federation (NFGF) of Nepal. NFGF has focused its efforts on economic empowerment through the production of healthy and agroecological products to bring transformative changes to the lives and livelihoods of farmer producers. This balances contributions to the local economy with contributions to the maintenance of high levels of agrobiodiversity.

Farmers within the Chabeli Farmers Group are engaged in the agricultural production cycle throughout the year, growing 56 species of cereals, vegetables, fruit, forage and fodder, with as many as 99 different varieties across those main species. Livestock reared includes chickens, cows, buffalo, and goats as well as other species. A significant integration of agrobiodiversity into livelihood strategies has been maintained in the farming system, with both male and female farmers growing crops and livestock for both commercial sales and household subsistence needs.

Agrobiodiversity is the result of the interaction between these commercial and household needs, the natural environment, the available genetic resources, and the management systems and practices used by culturally diverse peoples. The resultant agrobiodiversity encompasses a variety of animals, plants and microorganisms that are necessary for sustaining key functions of the agroecosystem, including its structure and processes for, and in support of, food production and food security (FAO 1999).

Smallholder farmers have retained the knowledge passed on to them by their ancestors. This knowledge is related to an integrated and self-reliant farm, forest and livestock-management system. Traditional and local knowledge includes land preparation, soil fertility management (by using local biological resources extracted from the forest and *khar bari* or grasslands), pest and disease management, post-harvest and storage practices, seed selection, agroforestry practices.

Currently, with external intervention and support, the farmers of the Chabeli Farmers Group can also incorporate modern knowledge resulting in an integrated approach focused on the integration of crops for subsistence, rearing livestock, agroforestry/forage/tree production, and commercial vegetable production. The Chabeli Farmers Group helps to manage seeds from diverse crops and trees through group nurseries.

The emerging system is more resilient, withstanding different challenges such as climate change impacts and COVID-19. The farm-management system has proved that it contributes to the enhancement of the sustainable use of resources through water-management and soil restoration practices, organic pest management, and using local materials (especially biological resources) that they traditionally rely on. These farm-management practices now focus on producing a basket of assorted agriculture and agroforestry products.

The Chabeli Farmers Group has also consolidated the basket of products that its members produce to collectively approach the market. To certify their products as safe and organic (produced without application of pesticides and agrichemicals), the group has collaborated with the local government to initiate a participatory guarantee system (PGS) to improve the marketing of their organic produce.

1 Introduction to the Chabeli Farmers Group and its land uses

Farmer groups provide a platform to unite and share their expertise, including their knowledge of agrobiodiversity. The benefits include taking joint action and scaling up individual production. The Chabeli Farmers Group was formed in 2012 and consists of smallholder 40 farmers federated within the National Farmers Group Federation (NFGF) of Nepal.

The group's founding members sought a more coordinated and consolidated approach in the production and marketing of commercial organic crops, based on practices that are ecological and environment friendly. NFGF facilitated the Chabeli Farmers Group to formalise and continues to support them to identify, pilot and scale up agrobiodiverse practices based on experience and learning from its other member groups throughout Nepal. NFGF also supports the group in their efforts to retain and update their traditional knowledge and practices, while also updating farming practices using modern tools and techniques. The group's farming practices are based primarily on traditional local knowledge of biological resources in their area.

1.1 About the Chabeli Farmers Group

The Chabeli Farmers Group is a group of smallholder and marginalised farmers that formed a group to help access markets, inputs and finance, to promote entrepreneurship and policy advocacy at the local level, and to improve overall the socioeconomic situation and well-being of its members. As a forest and farm producer organisation (FFPO), the group aims to develop a partnership with the local government. It also plans to broaden its membership and audience to spread knowledge about good practice for sustainable agriculture. The group has been practicing sustainable and resilient farming practices and have worked together to effectively manage high levels of agrobiodiversity locally.

The vision of the group is 'to become a model of sustainable and resilient farming practices that are not only sustainable but also enhance diversified farming systems while preserving Indigenous knowledge and promoting and transferring it to upcoming generations so as to promote the socioeconomic originality of opportunities in agriculture'.

The Chebeli Farmers Group is affiliated with the National Farmers Group Federation (NFGF) which helps to train lead farmers and helps to set up demonstration sites for farmer-to-farmer training.

1.2 Foundation

The Chabeli Farmers Group was established in 2012 (2069 BS). The group is a member of the Shiva Shakti Savings and Credit Cooperative which trades its organic products. It is also aligned with another group of smallholders, the Sundarimai Farmers Group. These farmer groups, together with Shiva Shakti, have started to promote organic production at ward level. This promotion has been initiated in collaboration with the local government of Bhimphedi municipality. The group has collectively adopted sustainable and resilient agricultural practices that have allowed them to better adapt to climate change while conserving the integrity of their land and resources. These practices are based on the traditional knowledge of the biological resources including agrobiodiversity which have been handed down through the generations.

1.3 Location

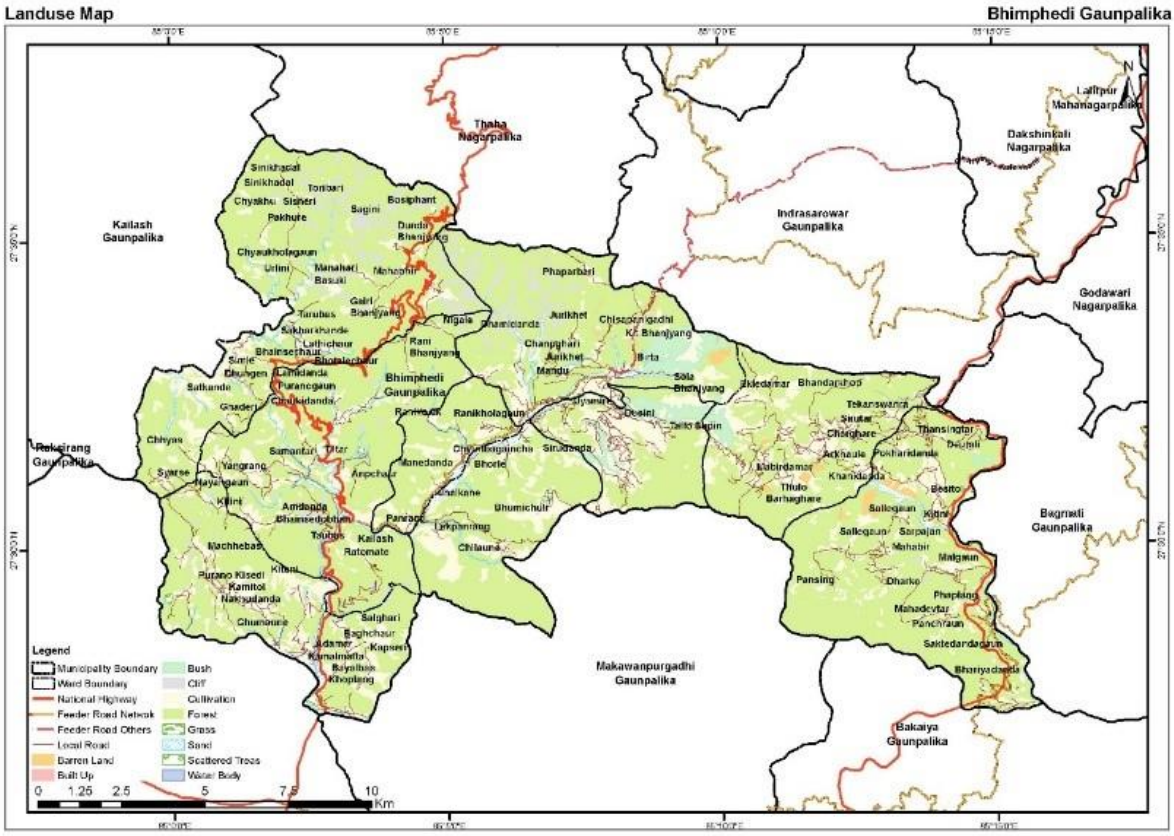
Bhimphedi municipality is situated at an altitude ranging from 300–1,800 metres above sea level with a subtropical to temperate climate.[1] It receives 1,700mm of rainfall during the monsoon season from June to September. The area has loam soil types. Subtropical broadleaf forests are found in lower altitudes, and they are characterised by a diverse range of tree species that include notable species such as sal (*Shorea robusta*), Indian rosewood or sisau (*Dalbergia sissoo*), khayar (*Acacia catechu*) and the chir pine (*Pinus roxburghii*). Temperate broadleaf and mixed forests are found in higher altitudes and are dominated by oak, maple and rhododendron trees. Subtropical pine forests are also found in the drier regions of Bhimphedi municipality and are dominated by the chir pine.

[1] Bhimphedi comes from the Sanskrit words 'bhima' and 'phedi', which translates to 'strong base of hills'.

This hilly area is characterised by steep slopes and river basins. Bhimphedi municipality is predominantly rural and much of the population is dependent on agriculture as a traditional livelihood activity (see Figure 1). Communities rely on agriculture and forest-based resources. Bhimphedi municipality has a mixed economy with both agrarian subsistence and enterprise-based agriculture. Agriculture is characterised by subsistence farming operated by smallholder and marginal farmers.

The region is ethnically diverse with native groups having rich diversity of cultural values, ethnicity, religions and languages (including Nepali, Newar and Tamang). The Brahman and Chhetri people are considered to be the largest groups overall, representing 45% of the population.

Figure 1. Land-use map of Bhimphedi municipality



Source: Department of Forest Research and Survey, 2017.

1.4 Membership

The Chabeli Farmers Group currently involves 40 farmer households. Some 80% of group members are women farmers and the rest are men (Table 1). Only 18% of farmers are youth due to the high rate of youth outmigration in the community (Table 2).

Table 1. Gender composition of the Chabeli Farmers Group

Gender	**Number of members**
Male	8
Female	32
Total	**40**

Table 2. Age composition of the Chabeli Farmers Group

Age	**Number of members**
Youth (aged 16–40)	7
Adult (aged 40–59)	32
Elders (aged 60 and above)	1
Total	**40**

The group is diversified and socially inclusive. Its members are from four different castes and ethnicities: eight Brahman and Chhetri members, 22 Adivasi Janjati Indigenous members, seven Dalit members and three members from other castes and ethnicities. The group consists of marginal and smallholder farmers. The average land holding capacity of marginal and smallholder farmers are shown in Table 3.

Table 3. Farmer categories in the Chabeli Farmers Group

Type of farmer	Landholding capacity
Marginal farmer	0.01–0.5 hectares
Smallholder farmer	0.5-0–8 hectares

In terms of income from productive land, farmers use three main production systems:

- **Agroforestry (11%):** Chabeli Farmers Group members are also members of the community forest user group Batuk Bhairab. Marginalised farmers produce fodder and forage grass (berseem) along with a nursery of vegetable and tuber crops, and spices (cardamom, turmeric and ginger).
- **Agriculture (78%):** This includes subsistence and commercial production.
- **Livestock production and poultry management (11%):** This involves keeping and rearing different types of livestock.

1.5 Land-use patterns

About 43% of Nepal is covered with forest and 24% (3.56 million ha) is agricultural land. However, most farmers cultivate less than a hectare in total (Koirala 2022). The land distribution per person is varied across districts and also depends on the ecological region.

As Bhimphedi municipality is situated in a hilly region (where 95% of the land is structured as terraced land and 5% is plain slope) the total land area designated as forest is as high as 48%. Some of the common forest types found in this region include subtropical forests, temperate broadleaf and mixed forests, and subtropical pine forests.

Agriculture accounts for 70% of productive agricultural land use. Agroforestry, poultry and livestock share a smaller proportion of land and there is also some forest on agricultural land. Agricultural crop production is the predominant economic activity in the community. Agroforestry includes the production of wild varieties of trees and crops in the agricultural landscape. The specific area of land used by different agricultural sectors in Bhimphedi municipality are provided in Table 4.

Table 4. Use of formal agricultural land by land-use categories

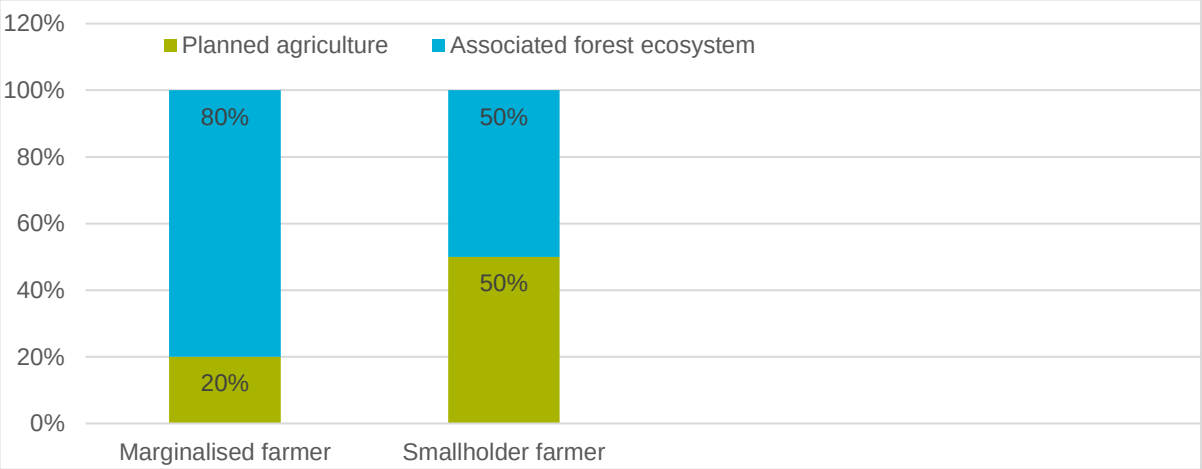
Agriculture land-use type	Percentage
Agriculture	70%
Agroforestry	5%
Livestock	8%
Forestry	10%
Fisheries	2%
Poultry	5%
Total	**100%**

In Bhimphedi municipality, 80% of land is privately controlled by individuals. The remaining 20% is used for commercial agriproduction including poultry and cash crops. Members of the Chabeli Farmers Group access land via different tenure systems, including:

- **Lease-based land tenure:** Leases for private commercial agricultural use are common and are usually for a year. In the Chabeli Farmers Group, 20% of member farmers lease land to grow additional commercial production of vegetable crops and fruits.
- **Forest user group:** Batuk Bhairab community forest user group has been granted the right to use forest land covering 498 hectares and benefiting 400 households. Commercial fodder crops are also grown by the group within that zone.

Marginal farmers earn 20% of their revenues from planned agriculture including crop production and 80% from the associated forest ecosystem. In contrast, smallholder farmers earn 50% of revenues from planned agriculture and 50% from the associated forest ecosystem (Figure 2).

Figure 2. Land-use revenues from planned agriculture and associated forest ecosystems



2 Agrobiodiversity across the landscape

To better understand the Chabeli Farmers Group's agrobiodiversity practices for this case study, a survey was conducted to assess the agrobiodiversity managed by both men and women including youth members. The discussions identified the general patterns of crop production and sales, wild harvests and livestock preferences. Interviews were conducted with 10 men and 10 women farmer members focusing on the types of commercial and subsistence crops grown. The volunteer farmers were classified into three distinct respondent categories based on age and gender: women aged 30–65, men aged 30–70, and youth aged 16–35.

The survey found that the Chabeli Farmers Group utilises many varieties of crops and other plants for different purposes including food and livestock production as well as for medicinal, cultural and religious purposes. Most are cash crops (see Table 5). An immediate observation from this table is that in addition to raising livestock, members are managing a large variety of plant species (56 different species). Many of these species include a range of varieties.

Table 5. Crops produced by men and women with estimates of percentages sold

Commercial and subsistence production by both men and women						
Crop name	**Cash crops (men)**	**Sales % (men)**	**Cash crops (women)**	**Sales % (women)**	**Subsistence crops (men)**	**Subsistence crops (women)**
Cereals						
Maize	✓	90%	✓	90%	✓	✓
Wheat	✓	90%	✓	90%	✓	✓
Buckwheat	✓	80%	✓	80%	✓	✓
Rice	✓	80%	✓	80%	✓	✓
Finger millet	✓	90%	✓	90%	✓	✓
Barley	✓	90%	✓	80%	✓	✓
Legumes, lentils and pulses						
Pigeon peas	✓	90%	✓	80%	✓	✓
Chickpeas	✓	90%	✓	90%	✓	✓
Green peas	✓	95%	✓	90%	✓	✓
Yellow peas	✓	95%	✓	90%	✓	✓
Kidney beans	✓	95%	✓	80%	✓	✓
Butter beans	✓	95%	✓	80%	✓	✓
Fava beans	✓	95%	✓	80%	✓	✓

Soybeans	✓	95%	✓	90%	✓	✓
Black gram	✓	95%	✓	80%	✓	✓
Green gram	✓	95%	✓	90%	✓	✓
Red lentil	✓	90%	✓	80%	✓	✓
Horticulture fruits						
Banana	✓	90%	✓	75%	✓	✓
Jackfruit	✓	90%	✓	75%	✓	✓
Peach	✓	90%	✓	80%	✓	✓
Persimmons	✓	90%	✓	80%	✓	✓
Raspberries	✓	95%	✓	80%	✓	✓
Strawberries	✓	95%	✓	80%	✓	✓
Pears	✓	90%	✓	90%	✓	✓
Plums	✓	90%	✓	90%	✓	✓
Kiwi	✓	95%	✓	95%	✓	✓
Avocado	✓	95%	✓	95%	✓	✓
Horticulture vegetables						
Potato	✓	85%	✓	80%	✓	✓
Cabbage	✓	85%	✓	80%	✓	✓
Radish	✓	85%	✓	80%	✓	✓
Carrot	✓	85%	✓	80%	✓	✓
Turnip	✓	85%	✓	85%	✓	✓
Tomato	✓	90%	✓	80%	✓	✓
Chilli	✓	90%	✓	75%	✓	✓
Cucumber	✓	90%	✓	90%	✓	✓
Pumpkin	✓	90%	✓	90%	✓	✓
Bottle gourd	✓	90%	✓	90%	✓	✓
Okra	✓	90%	✓	90%	✓	✓
Chayote	✓	100%	✓	80%	✓	✓
Cauliflower	✓	90%	✓	80%	✓	✓
Bamboo shoots	✓	95%	✓	85%	✓	✓
Mushroom	✓	95%	✓	90%	✓	✓
Oilseeds						
Black mustard	✓	95%	✓	80%	✓	✓
Sesame	✓	95%	✓	80%	✓	✓
Flaxseed	✓	95%	✓	80%	✓	✓
Soybean	✓	95%	✓	80%	✓	✓
Livestock/poultry						
Cows	✓	40%	✓	30%	✓	✓
Buffalo	✓	30%	✓	25%	✓	✓
Goats	✓	70%	✓	85%	✓	✓
Pigs	✓	60%	✓	55%	✓	✓
Ducks, geese, quail, pigeons	×	×	×	×	✓	✓
Wild harvests						
Indian gooseberry	✓	95%	✓	90%	✓	✓
Malabar nut	✓	90%	✓	95%	✓	✓
Red silk cotton	✓	100%	✓	100%	×	×
Stinging nettle	×	×	✓	95%	✓	✓
Fiddlehead fern	×	×	✓	90%	✓	✓
Medicinal herbs						
Ginger	✓	95%	✓	80%	✓	✓
Garlic	✓	95%	✓	80%	✓	✓
Holy basils	✓	95%	✓	95%	✓	✓
Chirata	✓	95%	✓	95%	✓	✓

Key: (✓) represents production by either men and women (×) represents no production

2.1 Cash crops grown by men

The assessment shows that both men and women are almost equally involved in agriculture and agrobiodiversity management. The study indicated that of the identified crops cultivated by men, most are grown for commercial production, with often more than 80% being sold. Regarding livestock production, the result indicated that men are slightly more involved in the commercial production of livestock than women.

Box 1. Farmer livestock preferences

Deepak Pudasaini is a member of Chabeli Farmers Group. According to Deepak, animals such as cows and buffalo are raised for dairy production, while both men and women widely prefer to raise chickens and goats for household subsistence consumption. In contrast, men often prefer to keep livestock for commercial purposes and every week, the men take livestock to sell at the local market.

2.2 Cash crops grown by women

The assessment results and discussions indicated that while women also sell much of their agricultural products, they are also more responsible for and concerned with caring for their family's subsistence needs and maintaining nutritional values in household diets. They too prefer selling products that are produced in high quantities specifically for the market (often more than 70%) but perhaps hold back a slightly greater proportion for household nutrition than men.

Livestock production by women was found to be more focused on small animals such as goats and chickens, grown both for subsistence and to sell. Women are found to sell more of their livestock within the community rather than at the local markets. Women also expressed that they prefer selling dairy products as it generates an immediate cash income.

2.3 Subsistence crops grown and livestock managed by men

Based on the interviews, the men farmers are involved seasonally in growing crops for household purposes, especially cereal crops (maize and wheat) which are labour intensive. These crops are also often intercropped to maximise the use of land. Men are found to be less involved in the management of the kitchen and home garden for the production of different types of vegetables, spices and fruits. Their major inputs are land preparation and fertiliser management. The men respondents said that for subsistence production, they are more involved in livestock management, as it is very time consuming.

2.4 Subsistence crops grown and livestock managed by women

The interviews with the farmers indicated that women take responsibility for intercropping operations and other activities linked to the production of subsistence crops, including planting crops in home gardens. Similarly, women raise livestock such as cows and buffaloes (mainly for dairy) and goats and chickens to sell locally. Women are also responsible for harvesting and post-harvest management of crops, as well as selecting and storing seed to plant in the next season. They are also responsible for soil fertility management and associated tasks such as preparing biogas and managing manure from livestock.

Box 2. Traditional food preparation methods

Dil Maya explained how she had learnt from her mother the process of drying surplus vegetables and fermenting green vegetables to eat during leaner seasons. These practices are usually performed by women in most households. Maya says that local Indigenous women have a tradition of preparing a local alcoholic drink for festivals and celebrations using different cereals.

2.5 Wild crops harvested by men

The men harvest and use at least six different wild plants to prepare organic manure. Examples include:

- Malabar nut, mulberry (for medicinal purposes, fodder and forage)
- Stinging nettles (for food and medicine)
- Chinaberry (for preparing *jholmal*, a type of liquid manure)

Box 3. Locally produced manure and compost
Farmers produce tricoderma-enriched vermicompost, a liquid manure known locally as *jholmal*. It is made using a mixture of locally available herbs and shrubs such as neem (*Azadirachta indica*), asuro (Justicia adhatoda), turmeric, onion, ginger, cloves, animal urine, jaggery (cane sugar), sweet flag (*Acorus calamus*) and bojo mint. The plants are sourced from the forest and shrublands.

2.6. Wild crops harvested by women

Women harvest different types of berries such as raspberries, blueberries and blackberries for household consumption, especially by children. Plants such wild ferns are collected for household consumption and also sold at the local market. These leafy green ferns are a rich source of nutrition and are locally found in forests near springs and streams. Other plants include:

- Stinging nettles (food and medicine)
- Mushrooms (food)
- Bamboo (food)

2.7 Agrobiodiversity: crop varieties used

Table 6 shows the main varieties of crops cultivated by members of the Chabeli Farmers Group. Additional useful species are shown in Table 7. A total of 99 plant varieties are listed in the two tables.

Table 6. Main crop varieties cultivated by the community

Agrobiodiversity	Characteristics	Variety	Scientific name
Cereal crops			
Maize (makai)	Hybrid	Arun-2	*Zea mays*
		Manakamana-4	
		Rampur Composite	
		Shikhar-1	
Wheat (gahu)	Improved/semi-dwarf varieties/high yield	Gautam (improved)	*Triticum aestivum*
		NL-971 (semi-dwarf)	
		WK 1204 (semi-dwarf)	
		NL 1110 (high-yield)	
Buckwheat (fapar)	Early grown/cold resistant	Jyoti	*Fagopyrum esculentum*
		Manang local variety	
		Rangli	
		Madhupati	
Paddy rice (dhan)	Resistant varieties	Dhan	*Oryza sativa*
		Khumal-4	
		Radha-4	
		Mansuli	
		Sukha-4	
		Chandanath-1	
Millet		Finger millet (kodo)	*Eleusine coracana*
		Foxtail millet (kaguno)	*Setaria italica*
		Pearl millet (moti kodo)	*Pennisetum glaucum*
		Proso millet (chino)	*Panicum miliaceum*
Barley (jau)	Improved/local varieties	Himalayan-4 (improved)	*Hordeum vulgare*
		Goutum (local)	
		Harsha (local)	
Sorghum (jowar)	Improved varieties	Lalit	*Sorghum bicolor*
Legumes, lentils and pulses			
Pigeon pea (rahar ko daal)	Local varieties	Dhan maya	*Cajanus arietinum*
		Madhukanya	
Chickpea (chana)	High yield	Iccv-10	*Cicer arietinum*
		V-4	
Green pea (hariyo matar)	High yield/disease resistant	Green Arrow	*Pisum sativum*
		Lincoln	

Yellow pea (pahelo matar)	High yield	Arkel	*Pisum sativum*
Cow pea (bodhi)	High yield	It-83e-49	*Vigna unguiculata*
Kidney bean (rajma)	High yield	Red kidney	*Phaseolus vulgaris*
		White kidney	
Butterbeans (ghiu simi)	High yield	Fordhook 242	*Phaseolus lunatus*
Fava beans (bacula)	High yield	Windsor	*Vicia faba*
Soybeans (bhatmas)			*Glycine max*
Black gram (maas ko daal)	High yield	T9	*Vigna mungo*
Green gram/mung bean (hariyo chana)	Early maturity	Nm-92	*Vigna radiata*
Red lentil (masoor daal)	High yield potential	Dhaulagiri	*Lens culinaris*
Horticulture: fruit			
Banana (kera)	Large size	Rajapuri	*Musa sapientum*
	Medium size	Basrai	
	Small size	Rasthali	
Jackfruit (katahar)	Large size	Katahar	*Artocarpus heterophyllus*
Peach (aru)	Large size	Elberta	*Prunus persica*
Apricot (khubani)	Taste (sweet)	Goldcot	*Prunus armeniaca*
Persimmons / Nepal hog plum (lapsi)	Astringency	Hachiya	*Diospyros kaki*
Raspberries (aiselu)	Taste		*Rubus idaeus*
Blackberries (kalo aiselu)	Taste		*Rubus fruitcosus*
Strawberries (chino)	Taste		*Fragaria ananassa*
Pears (naspati)	Popular variety	Barlett	*Pyrus communis*
Plums (aloo bukhara)	Popular variety	Methley	*Prunus domestica*
Horticulture: vegetables			
Potato (aloo)	Popular variety	Khumal rato	*Solanum tuberosum*
Cabbage (banda)	Popular variety	Green cabbage	*Brassica oleracea*
Radish (mula)	Popular variety	Red radish	*Raphanus sativus*
	Popular variety	White radish	
Carrot (gajar)	Hybrid	Nepa-dhim	*Daucus carota*
Turnip (shalgum)	Size/popular variety	Purple top turnip	*Brassica rapa subsp.*
		White globe turnip	
		Golden ball turnip	
Tomato (tamatar)	Popular variety	Cherry tomato	*Solanum lycopersicum*
		Surakhsya	
Chilli (khursani)	Popular variety	Chilli pepper	*Capsicum annuum*
	Popular variety	Habanero chilli	*Capsicum chinense habanero*
Cucumber (kakro)	Popular variety	Dynasty	*Cucumis sativus*
Pumpkin (farsi)	Popular variety	Chhanga	*Cucurbita moschata*
Bottle gourd (lauka)	Popular variety	Pandhera	*Lagenaria siceraria*
Okra (bhindi)	Popular variety	Dharane bhindi	*Abelmoschus esculentus*
Chayote (iskush)	Popular variety	Iskus	*Sechium edule*
Cauliflower (kauli)	Popular variety	Phoolkobi	*Brassica oleracea var. botrytis*
Bamboo shoot (tama)	Popular variety	Bans	-
Mushroom (chiyau)	Popular variety	Oyster mushroom	*Pleurotus ostreatus*
Stinging nettle (sisno)	Wild variety	-	*Urtica dioica*
Fiddlehead fern (ningro)	Wild variety	-	*Matteuccia struthiopteris*

Table 7. Additional plant species used by the community

English name	Local name	Scientific name
Oilseeds		
Black mustard	Kalo tori	*Brassica nigra*
Sesame	Til	*Sesamum indicum*
Flaxseed	Aalas	*Linum usitatissimum*
Soybean	Bhatmas	*Glycine max*
Safflower	Kusum	*Carthamus tinctorius*
Fodder and forage		
Berseem clover	Berseem	*Trifolium alexandrinum*
Malabar nut	Asuro	*Justicia adhatoda*
Mulberry	Kimbu	*Morus nigra*
Stinging nettle	Sisno	*Urtica dioica*
Napier grass	Banmara	*Pennisetum purpureum*
Lucerne	Khaira	*Medicago sativa*
Species used for plant protection		
Red silk cotton	Semal	*Bombax ceiba*
Rhododendron	Gurans	*Rhododendron arboreum*
Malabur nut	Asuro	*Justicia adhatoda*
Neem	Neem	*Azadirachta indica*
Wormwood	Titepati	*Artemisia vulgaris*
Chinaberry	Bakaino	*Melia azedarach*
Indian gooseberry	Amla	*Phyllanthus emblica*
Holy basil	Tulsi	*Ocimum tenuiflorum*
Gokshura	Gokhru	*Tribulus terrestris*
Indian snakeroot	Sarpagandha	*Rauvolfia serpentina*
Medicinal herbs		
Ginger	Aduwa	*Zingiber officinale*
Garlic	Lehsun ka jhol	*Allium sativum*
Asparagus	Shatavari	*Asparagus racemosus*
Spikenard	Jatamansi	*Nardostachys jatamansi*
Holy basils	Tulsi	*Ocimum tenuiflorum*
Swertia	Chirata	*Swertia chirayita*

3 Crop cultivation and rearing livestock: knowledge sources

Local ways of maintaining and protecting agrobiodiversity are based on centuries-long traditional practices related to food cultivation, production and value addition. According to farmers surveyed, these practices are also guided by cultural practices associated with caste and religion. Key traditional and local cultural as well as religious practices have been passed down to them from their ancestors.

The Adivasi Janjati community's knowledge of wild edibles, for example, and their dependence on forests for these forest foods, are also part of the traditional and cultural practices of this Indigenous community. They rely on wild mushrooms, bamboo shoots, wild ferns, berries and medicinal herbs for different purposes such as food, medicine, fodder and forage, and insect and pest repellents.

Newari communities have cultural and religious practices associated with the cropping cycle and food aligned with different seasons of the year. They celebrate different rituals and festivals in line with agricultural production practices. They are also well known for the preparation of popular local wine made of cereals (rice, millet, sorghum) called Chhyang.

There are age-old practices for preparing medicine and pesticides from wild plants including:

- Nutritional supplements include using wild edible herbs and fruits such as cardamom, chirata, bamboo shoots, berries, chilis and turmeric. These are popular spices and herbs also used in every household to add taste to food and maintain dietary requirements.
- Natural pest management includes using cow urine and plants such as bakaino/Chinaberry (*Melia azedarach*) and titepati/wormwood (*Artemisia vulgaris*) for pest management.
- Herbal medicines include the use of plants such as bozo (*Acorus calamus*) for sore throats, holy basil for coughs and fevers, and ginger for inflammation.
- Soil fertility management includes using different types of wild tanki (*Bauhinia purpurea*) and cultivated legumes to maintain soil fertility and fodder.
- Preparation of liquid manure (jholmal) includes using asuro, Chinaberry, and neem with livestock dung and urine to control pests and manage diseases.

3.1 Biocultural heritage

The main staple crops are grown for food security and food nutrition, which has always been a priority for farming households. Farmers also have continued the process of maintaining a significant proportion of agrobiodiversity through the conservation and cultivation of traditional varieties of crops that are based on cultural and nutritional preferences and are passed down from generation to generation. These farmer varieties include a range of crops such as rice, maize, millet, beans, vegetables and fruits, as well as livestock breeds. These varieties have evolved through a process of selection, adaptation and improvement by local farmers. About 80% of crops such as cereal crops (paddy, maize, millet, barley) are sold whereas 20% are stored for food for their families or to feed livestock (see also Box 1).

Box 4. Seed selection practices

The chairperson of Chabeli Farmers Group, Madit Lama, shared that their ancestors used to collect and sort mature and healthy seeds, by selecting them based on physical appearance and then storing them in a dry place for the next plantation. To identify the best seeds, Madit Lama has modified this practice by soaking bunches of seedheads in water while adding a pinch of salt to the bowl. If the seed sinks, then it is good to store for future use. Any seeds that float are used as fodder instead.

However, with the increasing commercial production and introduction of improved high-yielding varieties, farmers are also attracted to different production systems such as vegetable production. Most of the vegetables and greens produced by the farmers are modern varieties targeting market demand and higher market prices. The farmers in the Chabeli Farmers Group also incorporate a large number of fodder and forage species to boost dairy production.

3.1.1 Crops grown for nutritional security

Some neglected and underutilised crops such as Amaranthus spp, naked barley and sesame are sown for their micronutrients. These supplement staple crops such as wheat, paddy, maize and millet that are specially grown and are consumed daily in every household kitchen as a source of carbohydrates. Only the surplus is sold.

A variety of vegetables and fruit provide good sources of vitamins, minerals and dietary fibre, including root vegetables such potatoes and yams and other vegetables such as tomatoes, onions, chilis, cauliflower and cabbage. Livestock is raised for nutritional security. Chickens, goats, and pigs are raised for meat and eggs, while cows and buffaloes are kept for dairy production (milk, ghee, butter, curd). However, livestock are increasingly being raised for market purposes.

3.1.2 Crops grown for cultural and religious practices

A number of crops are grown due to cultural or religious preferences:

- Paddy rice is known as a sacred grain and is often used in religious ceremonies such as funerals, weddings and auspicious ceremonies. The traditional rice-feeding ceremony is to initiate the intake of solid food in infants.
- Wheat is believed to represent the power of the sun and is often used in rituals related to the god sun.
- In Hinduism, holy basil is considered a sacred plant and is often used in religious ceremonies. It is also known for its medicinal properties, which include reducing inflammation and promoting digestive health.
- In Hinduism, asparagus is used in Ayurvedic medicine to treat a range of ailments including digestive issues, respiratory problems and female reproductive disorders.
- Indian gooseberry is another herb used in Ayurvedic medicine to boost the immune system and improve digestive health. It is also considered to be a sacred plant in Hinduism and is often used in religious ceremonies.
- Ginger is used as a Nepali traditional medicine to treat a range of ailments such as digestive issues, respiratory problems and inflammation. It is also used in Hindu religious practices and is believed to have spiritual properties.

3.1.3 Crops grown to target particular markets

Horticultural fruits such as kiwi, avocado and strawberry are now an emerging interest for the group and in Bhimphedi municipality as a source of cash income. The municipality has also introduced these fruits and agricultural extension officers support farmers and farmer groups to grow these fruits. In addition, the local government also supports farmer groups by providing capacity-building training and consultation on organic manure preparation, organic production practices and mushroom production for commercial purposes. Local government is also focusing on youth with these interventions to decrease the rate of outmigration. Also, everyday spices such as ginger, garlic, turmeric and chillis are popular spices and herbs cultivated, processed and sold by microenterprises.

3.1.4 Crop grown for different farm functions

There are traditional practices where farmers use different local plants such as fodder in traditional canals to control water seepage and they are dependent on the forest to produce fodder for this purpose. Farmers plant different fodder and foraged species in terrace risers to maintain the terracing and prevent soil erosion. Farmers also utilises several biopesticides and biocontrol agents derived from plants traditionally available on their land (Table 8).

Table 8. Traditionally used biopesticides

Common name	Scientific name	Uses
Neem	*Azadirachta Indica*	Neem oil is a natural pesticide extracted from the seeds of the neem tree. It is effective against a wide range of pests and is commonly used in Nepal to control aphids, thrips, whiteflies and caterpillars.
Wormwood (titepati)	*Artemisia vulgaris*	Among other uses, titepati extract is a biocontrol agent and is commonly used as an insecticide to control pests for a wide range of crops including cereals and grains.
Garlic (lehsun ka jhol)	*Allium sativum*	Garlic is known for its antifungal and antibacterial properties, which make it an effective natural pesticide. Garlic extract is used in Nepal to control fungal diseases in crops such as potatoes and tomatoes.
Liquid manure (jholmal)		Jholmal is a homemade biofertiliser and biopesticide made using locally available resources such as animal urine, water, beneficial microbes, farmyard manure, and the leaves of plants such as asuro, titepati, neem and bakaino. It is effective against insect pests such as aphids, whiteflies and mealybugs on a wide range of crops.

Controlling seepage in an irrigation channel using both traditional and modern techniques © CEN (Clean Energy Nepal)

3.2 Intergenerational knowledge transfer within households

Farmers protect different plant species on their land and in the forest to fulfil their needs for food, forage and fodder, medicines and spices. Sociocultural farming practices are based on local and traditional knowledge and farming households have handed down this knowledge through the generations, for example during daily interactions with younger family members while working together on the farm.

3.2.1 Crop-management practices

Farmers in this region follow traditional cultural practices for planting, harvesting, seed storage and sowing. However, farmers are also upgrading their traditional practices, in response to changing contexts and behaviour. They have done this by incorporating other scientific practices to create a diverse and sustainable ecosystem. Smallholder farmers contribute to the protection, maintenance, and continuous production of agrobiodiversity using multiple approaches.

3.2.2 Crop rotation and integrated cropping systems

Rotating different crops over time improves soil fertility, reduces pests and diseases, and prevents soil erosion. For example, during a three-year cycle, farmers will plant maize one year, beans the next, and potatoes the year after that. Other crop rotations include:

- Maize, paddy, wheat and finger millet: This crop rotation is a common practice followed by most farming households. Maize is generally grown in the summer season followed by paddy in the rainy season, and wheat and finger millet in the winter season.
- Maize, beans, vegetables: Maize is produced in summer and beans in winter. The practice helps maintain moisture/fertility and reduces labour costs.
- Paddy rice and wheat: As rice and wheat are widely used for daily consumption and also have market demand, these crops are always a priority for farmers. Rice is produced during the rainy season followed by wheat in winter, then rice again in the spring season (using cold-resistant varieties). Farmers in the community also sow varieties such as Sukha-4, Chandanath-1 and Khumal-4 that also consume less water.
- Root crops followed by fruit and legume crops: Root crops such as ginger, carrot and root vegetables are planted and intercropped with fruit species. The smallholders prefer these patterns to increase productivity and enhance their basket of products. They believe that root crops deplete the soil of nitrogen while fruit and legume crops replenish it.

Intercropping involves planting two or more crops in the same field at the same time. This technique helps to reduce soil erosion, enhance soil fertility and increase biodiversity.

- Farmers plant maize and beans together and as complementary crops.

- Vegetables such as cucumber and pumpkin are planted in a row of maize and millet crops to maximise the use of space and time. This ensures that their household and commercial production both benefit from diversity.

3.2.4 Cover cropping and nursery preparation

This involves planting a crop that is not intended for harvest. For example, alfalfa is grown between maize or potato crops to prevent soil erosion, reduce weed growth, and increase soil fertility by adding organic matter. Legumes such as peas, beans and lentils are commonly used by smallholder farmers as cover crops to reduce their reliance on synthetic fertiliser and also to provide food for farmers and livestock.

For mulching, farmers uses maple and banana leaves which are found locally, as well as animal dung to protect plants. The farmers also said that the traditional method for preparing a seedling nursery is to use wild tree leaves. This helps to keep the nursery bed weed free. These practice is cost-efficient because it uses locally available materials to create a healthy nursery. This method is especially food for the seedlings of plants that are climbers and creepers.

Traditional method of nursery preparation © NFGF

3.3 Knowledge transfer between neighbours

There are ample opportunities for farmers to exchange knowledge with their neighbours on a regular basis. More formal opportunities come from local events, fairs and festivals. The formation of farmer groups (such as the Chabeli Farmers Group and Mai Farmers Group) has also facilitated a process of learning through the transfer of knowledge between lead farmers and neighbouring farmers through the demonstration of best practices. These events have also become relevant for sharing experiences on modern practices, and new varieties and breeds, such as the black tomato (Box 5).

Box 5. An example of how neighbours share knowledge

Giriraj Pudasaini is a community member and entrepreneur from Bhimphedi. Giriraj had gone to Kathmandu for the marriage ceremony of his daughter and took the opportunity to visit the National Agricultural Research Council (NARC), where he found new variety of tomato, the black tomato (*Solanum lycopersicum)*. He thought that the tomato's unique characteristics had good market potential and would grow in his climate zone. Giriraj bought 10 plants to trial on his farm. After successfully farming black tomatoes, he shared what he had learnt with other farmers in his community. This has helped to encourage many other farmers to grow black tomatoes.

The organisations of events like seed fairs, farmer field schools, and integrated pest management (IPM) organised by different supporting institutions in collaboration with farmer's groups provide an opportunity to exchange seeds, plant cuttings, and other planting materials.

A **farmer showing an earthworm taken from her vermicompost ©NFGF**

3.4 Chabeli Farmers Group knowledge networks

The Chabeli Farmers Group plays an active role in encouraging knowledge transfer. For example, the process of creating biofertiliser is demonstrated at a demonstration site – demonstration sites being supported by the NFGF. Farmers quickly realised that biofertiliser production is in effect an updated practice similar to their existing use of local knowledge, and soon replicated the technique on their farms. The group learned to prepare compost with the support of modern techniques such as mixing tricoderma and animal dung to produce vermicompost. The technique is currently widely adopted by farmers in Bhimphedi municipality for organic vegetable production.

The Chabeli Farmers Group has also helped its members to incorporate climate-resilient practices, such as rehabilitating traditional reservoir ponds as well as rainwater harvesting and collecting wastewater. Wastewater from households and farmland is collected in a pond and used to produce algae which is used as a biofertiliser. The incorporation of tree species in degraded, unproductive and abandoned agricultural land is also an important intervention, as it upgrades land use for agroforestry. Farmers also referred to the benefits of domesticating and sustainably managing wild tree species, which is expected to help enrich dietary diversity as well as supply wood for different farm purposes. Some species are also used to enrich livestock feed or are used in medicine or as plant protection measures.

Farmers learning how to prepare vegetable seedlings by sowing them in rows and columns ©NFGF

The Chabeli Farmers Group has also established a demonstration garden showcasing agrobiodiverse organic methods, incorporating various crops and vegetables of both local and improved varieties. Each member of the group is expected to learn at the centre and then replicate the practice on their land.

As a member of the NFGF, the Chabeli Farmers Group is also part of a knowledge network which keeps them informed about farm management and production techniques, including:

- Technical knowledge of organic production, updated practices of soil fertility management, how to establish and run a participatory guarantee system (PGS), and how to make production systems more resilient, and
  Knowledge about market-oriented production systems and processes, which is transferred using farmer field schools, exchange visits, and orientation and coaching on specific subject farming topics.

Additionally, specific knowledge and technologies that are developed include:

- Forming a participatory annual action plan to promote the adoption of resilient practices by prioritising proven techniques, including traditional practices
- Developing capacities to manage pests and diseases through onsite training
- Developing capacities to access and use different sources of information such as publications and broadcasted information from the National Agricultural Research Council (NARC) (including a weekly agri-bulletin, radio programmes), and information disseminated by local government and civil society organisations.
- Linking with facilitating programmes such as the Forest and Farm Facility (FFF) to build capacities in accessing markets
- Building capacities to upgrade farmer's traditional agroforestry practices
- Introducing PGS through a capacity development programme, and
- Developing capacities to adopt climate-friendly techniques to efficiently manage water.

4 Cultivating and managing seed and animal resources

4.1 Self-provisioning and multiplication

Farmers use traditional practices to manage seeds to use on their own farms and to sell at local markets.

- Collecting and storing seeds: These include seeds from locally adapted plants, including traditional and heirloom varieties. Farmers ensure that the seeds are properly dried and stored in a cool, dry place to maintain their viability.
- Labelling and organising seeds: Each seed packet is labelled with the plant name, variety and any other relevant information about its characteristics or growing conditions. Farmers systematically organise their seed packets to make them easy to find and retrieve.
- Record keeping: Farmers maintain detailed records of the seeds collected and stored, including information about the date of collection, location and any relevant notes about the plant. This information can be used to track the performance of the seeds and to identify any potential problems or issues.
- Marketing: Collected seeds are sold at local markets, where farmers also purchase seeds from seed producers.

4.1.1 Traditional seed storage techniques

The Chabeli Farmers Group use a variety of traditional seed storage techniques. For example, grains are stored in containers known as *bhakari* that are made of bamboo and mud. *Bhakaris* are generally one-chambered, although some may have two. Double-chambered *bhakaris* are mostly used in areas that experience flooding. The grains in the lower chamber are used first while grains in the upper chamber are used during monsoon season. These structures can store two tonnes of grain.

A *bhakari* used to store grain ©CEN (Clean Energy Nepal)

Another practice is the use of ghaitas. These are clay pots and are often used to store beans and mustard seeds. Ghaitas are filled with seeds and the lids are sealed with clay. Sometimes a straw layer is added inside the ghaita to maintain the moisture content.

A clay *ghaita* used to store beans and mustard seed ©CEN (Clean Energy Nepal)

Similarly, *chaaitas* are another a grain storage technique. They are made of bamboo and useful to store small quantities of seed grain. *Chaaitas* are often covered with mud to protect them from pests and moths. These practices are commonly observed by the Indigenous Adivasi Janjati communities.

A straw and mud *chaaita* used to store small quantities of seed ©CEN (Clean energy Nepal)

4.2 Bartering for and purchasing seed

As the apex FFPO, NFGF organises regular fairs and exchanges to encourage the exchange of seed between farming communities. The aim is to promote agrobiodiversity and improve local seed stocks.

Community members also participate in a community seed fair organised by seed producers in the Bhimphedi municipality market, where local unique varieties of seeds are demonstrated. The local varieties are well-adopted to soil, climatic and other conditions and thus are important for farmers and breeders. These types of fairs also help in developing the relationship between farmers and market actors and support the process of seed swaps. The Chabeli Farmers Group also runs a demonstration stand showcasing their basket of produce at a nutrition fair organised by schools and local government. The aim is interest young people in agriculture and the importance of nutritional values.

NFGF has also introduced mobile apps called Krishipath app and Krishi Guru app. This is an online platform that provides farmers with a range of features including information on different crops and their varieties, the availability of seeds, market prices, crop production guidelines, crop insurance, and information on government schemes and programmes. The Chabeli Farmers Group also uses the app to connect with other farmers and experts in the field of agriculture. This supports them in sharing their experiences and seeking/providing advice. The apps have empowered farmers in the community with the knowledge and tools they need to identify good seeds.

A nutritious food basket prepared by farmers for the farmer's fair ©NFGF

A lead farmer explaining to members about an agroecology demonstration garden ©NFGF

4.3 Formal purchasing systems

At the local level, smallholder farmers are always practicing on-farm conservation measures. The farming household traditionally preserves seeds of crop landraces for household use and to sell in the market. Farmers have always relied on their traditional and local knowledge to select viable seeds which are preserved for the next cycle. This means that the Chabeli Farmers Group have not had to set up any formal community seed bank.

These traditional practices provide the advantage of easy access to seed and planting materials. NFGF as the apex producer organisation also promotes these practices as they lobby for farmers' rights and food sovereignty.

5 Enterprise strategies and agrobiodiversity

The Chabeli Farmers Group in collaboration with local government operates an integrated pest management learning centre. The centre has enabled the group to work towards more ecologically friendly agricultural practices that will shape their market opportunities. The centre has also capacitated another additional five farmer groups from neighbouring communities and four community lead farmers from each of the new farmer groups. The IPM centre focuses on multiple approaches to promoting organic and climate-friendly production through the better management of soil and pests.

The Chabeli Farmers Group also aims to produce a basket of products based on organic practices. The area is known for producing local varieties of legumes and vegetables. The group prioritises conserving local varieties and producing them organically. Their strategy is to sell vegetables in commercial markets and also produce a diverse local basket of products targeting niche markets. NFGF is facilitating upgrades and adding value to its product by incorporating a PGS. This will allow neighbouring groups of farmers to agree to a set of organic standards and then make a claim of organic origin in the market – using audits from among the neighbouring farmer groups to ensure that everyone is complying with the standard. The groups are facilitated by NFGF and local government as well as the FFF programme to produce enterprise development plans. The plans will support them to create a clear vision and define clear actions for their agribusiness.

5.1 Cash-crop enterprises

The commercial production of vegetable crops that are organically produced and PGS certified are the main commodities that the Chabeli Farmers Group sells in the market. In addition to this, the farmers produce local varieties of cereals and legumes. The crops that are commercially produced are leafy greens, tomatoes, cereal crops and legumes.

However, the adoption of commercial organic vegetable production will potentially diminish on-farm agrobiodiversity in Bhimphedi. The reason is due to the introduction of a range of new and improved varieties of vegetables such as the black tomato and additional fruit species such as strawberries, kiwi, and avocado. The adoption of improved varieties might lead to the replacement of traditional local plants and their varieties in the future, if not already. There are also claims that the improved varieties are susceptible to pests and diseases, and have reduced the resilience of the agricultural system to climate change.

Despite this possible threat to agrobiodiversity, the Chabeli Farmers Group's production practices continue to rely on traditional knowledge and agrobiodiversity to ensure organic production. The knowledge and wild plant materials are used for different organic production practices, for pest and disease management, and management of soil fertility. Additionally, farmers are encouraged to incorporate their own traditional sustainable production management practices such as rotating crops, practicing minimum tillage, using natural materials for mulching, and incorporating beneficial fodder and forage species as well as horticultural species. Farmers are also encouraged to protect and manage beneficial plants from forests by maintaining integrated agroforestry systems.

Commercial production also presents other environmental challenges, such as the practice of using polybag/plastics in tunnels and mulching, the increasing use of machinery and fossil fuels, and the corresponding decrease in sustainable traditional practices such as intercropping, crop rotations, and zero tillage. The impact of these practices and inputs on soil health and soil organisms is still unknown.

However, farmers, local government and NFGF are focusing on aligning the commercial production of crops with traditional practices in the Chabeli Farmers Group, by promoting the adoption of climate-resilient ecological practices that rely on the conservation of natural vegetation, species and varieties.

There is also a push for the adoption of value-added agroforestry, which marginalised farmers can adopt to scale up their production. For example, the local government are encouraging the plantation of fodder (Malabar nut) that has a higher market value as livestock feed alongside horticultural crops such as vegetables and fruits.

5.2 Changing patterns of cash cropping

Farmers originally used to produce local varieties of cereals and legumes. The commodities were sold locally and in nearby cities because of their local characteristics and unique taste. The farmers of Bhimphedi municipality including Chabeli Farmers Groups were originally focused on seasonal vegetable production as well. However, with the increasing demand for their vegetables in the market, the farmers now are switching to commercial production of both seasonal and off-season production.

5.3 Chabeli Farmers Group's role in shaping what is sold

The Chabeli Farmers Group is slowly building its brand identity as a group of safe organic vegetable growers. It has also built and improved its relationship with other market actors. Crops are now grown based on the crop calendar prepared by the members to ensure scale, consistency and quality. Commercial production has also currently increased the number of crops and animal species grown and reared, but if their production dominates in the future might pose a threat to agrobiodiversity.

The group has also trained members in mushroom production with the support and facilitation of municipality officials. Members have begun to grow mushrooms commercially with the introduction of a new production method such as systematic dark house preparation. The mushrooms are packaged and sold to nearby markets in Bhimphedi municipality. Interventions such as this have changed what is being sold.

The group is also supporting the development of value-added enterprises, such as processing and packaging of other crops, which is expected to increase the value of commodities sold and provide additional income.

Farmers learning about mushroom cultivation ©NFGF

5.4 Future enterprise plans

The Chabeli Farmers Group is planning to make their area a pocket of organic production and built their capacity to produce local products that retain local agrobiodiversity. They have started promoting their organic products to local and provincial markets and have developed a marketing strategy to highlight the benefits of organic farming, including its benefits to biodiversity and building climate change resilience. The group has encouraged farmers to participate in local farmers' markets and link with online platforms, establishing a direct link to their consumers.

This has been identified as a major strategy to become more resilient to climate change impacts. By implementing these plans, the group can contribute to the conservation of biodiversity, mitigate the effects of climate change, and promote healthy, sustainable food production. To scale up the production and distribution of commercial products, smallholder farmers are ready to be linked with microfinance institutions. The PGS scheme also enhances the recognition and branding of their local and organic produce.

6 Conclusions and recommendations

6.1 Conclusions

The smallholder producers interviewed for this case study manage high levels of agrobiodiversity including some 56 native species and more than 99 cultivars. These are maintained in all categories of crops including cereals and horticultural, ornamental and wild species. Although traditional practices face challenges due to the introduction of modern technology and hybrid species, these smallholders have retained their traditional knowledge. Local technologies are inexpensive, sustainable and environmentally friendly, and contribute to the revival of Nepal's unique food and agricultural culture.

There has been a progressive improvement in entrepreneurship in this group of agricultural producers. They have demonstrated successful organic production and the adoption of resilient sustainable practices that also facilitate access to profitable markets and provide quality assurance for their products through local-level certification using PGS.

Ecological and organic production has helped these farmers to evolve traditional farming practices to increase resilience. Smallholder engagement with agrobiodiversity has also helped boost self-sufficiency and maintain resilience in the face of various challenges posed by climate change and pandemics. This mechanism has supported the production of a diversified basket of farm products, generating multiple income sources. Farmers are encouragingly shifting towards agroecology-based value chain practices promoting local biodiverse crops/commodities and contributing to agrobiodiversity. They have been using resilient and improved technologies for transforming local, traditional and Indigenous knowledge.

6.2 Recommendations

For the Chabeli Farmers Group to receive recognition for their interventions, it is necessary to document their traditional knowledge and practices. In terms of the sustainable management of farmer landraces and retaining their rights to these resources, community seedbanks should be promoted. Through seed banks, smallholder farmer groups like the Chabeli Farmers Group can conserve and sustainably utilise seed resources and help maintain local agrobiodiversity.

To ensure the sustainable production and distribution of their local produce, the Chabeli Farmers Group should analyse the market and develop a specific strategy for local niche products. As product recognition is a key issue, they need to systematically scale up the branding and labelling of their products.

Documentation and registration of agrobiodiversity and traditional knowledge should be a priority and should be done by local government in collaboration with farmers. This is an urgent need, as the local cultivars and native plants are slowly disappearing. Local government must identify and protect locally and traditionally conserved and utilised agrobiodiversity in collaboration with farmers, to ensure a resilient supply of seeds as well as the conservation of agrobiodiversity. In addition, mechanisms are needed to compensate farmers for using and conserving agrobiodiversity.

References

FAO (1999) Sustaining the multiple functions of agricultural biodiversity. Background Paper 1: agricultural biodiversity. FAO, Rome. www.fao.org/3/x2775e/X2775E02.htm

Koirala, N (2022) Policies and perspectives of food health and safety in Nepal: Is Nepal ready? eFood 4(1): e56. https://onlinelibrary.wiley.com/doi/10.1002/efd2.56