Conserving Ikalahan agrobiodiversity and promoting sustainable agriculture in the Philippines

A case study of producer organisation Kalahan Educational Foundation (KEF)

KALAHAN EDUCATIONAL FOUNDATION, INC.
Imugan, Santa Fe, Nueva Vizcaya
Philippines

NTFP-EP

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Cover photos: landscape of the traditional Ikalahan agroforestry production system (top); Imugan waterfall in the Ikalahan ancestral domain (bottom left); demonstration farm of varieties of sweet potato (bottom centre); KEF 51st anniversary and Camote Awareness Day sweet potato carrying competition at Imugan (bottom right). Credit: Duncan Macqueen/IIED

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Abbreviations

CADC-CBFMA	Certificate of ancestral domains claim community based-forest management agreement
CBFM	Community-based forest management
CFSA	Community forest stewardship agreement
DENR	Department of Environment and Natural Resources
IPRA	Indigenous Peoples Rights Act
KEF	Kalahan Educational Foundation
MoU	Memorandum of understanding
NGO	Nongovernmental organisation

Summary

As part of the Nature Nurture project, the Kalahan Educational Foundation (KEF) conducted research with farmers from Indigenous Ikalahan (or Kalanguya) communities of the Cordillera and Caraballo mountain ranges in Northern Luzon, Philippines. The aim was to document local knowledge and its implementation in agrobiodiversity conservation, climate mitigation and prevention of biodiversity loss. The research consisted of interviews with 40 farmers to assess the agrobiodiversity grown by the Ikalahan communities and the strategies used by the farmers to maintain it. The participating farmers included ten women and ten men farmers using traditional farming practises, and ten women and ten men farmers in commercial farming settings.

The historic governance of the Ikalahan people is based on customary laws and practices, including a traditional justice system and community-based rituals that guide relationships with both people and the environment. Their customary laws and practices include sophisticated forest management, wild-food harvesting protocols and agroforestry systems.

Following external pressures on their land and resources, the Ikalahan won a landmark legal victory in 1972 recognising their ancestral land claim to create the Kalahan Forest Reserve. In 1973, the Kalahan Educational Foundation (KEF) was formally established to promote the development of livelihoods, to assist communities in the promotion, protection and improvement of sustainable development; to promote traditions and cultural integrity; to encourage youth to finish basic education; and to strengthen Christian values and relationships among the community. In 1999, KEF succeeded in securing a certificate of ancestral domains claim community based-forest management agreement (CADC-CBFMA). This now covers the total 58,117.75 hectares of the Kalanguya–Ikalahan Ancestral Domain under the Indigenous Peoples Rights Act (IPRA) framework.

KEF's resource utilisation and protection policy (RUPP) covers swidden and agroforestry farming, forest-product harvesting, tree cutting (including chainsaw registration and use), hunting, fishing, quarrying, fire prevention and land encroachment. The overall system manages both wild biodiversity (in natural forests) and agrobiodiversity (in farms in the valleys with <50% slope and flatter mountain ridges). Sweet potato or camote is a particularly important staple food in Ikalahan culture, and KEF has established a demonstration farm with 14 species of camote now cultivated, to share and distribute among farmers from an original 20 varieties documented in a 1997 research study in the area.

The pressures of modernisation and the need for cash income have introduced a shift from purely subsistence models to more commercial farming models. But as the research in this paper shows, agrobiodiversity is still high in both traditional and more commercial farming models used by Ikalahan farmers. Agrobiodiversity managed by Ikalahan farmers, both men and women, involves more than 88 plant species — including 27 main cultivated species of crop, 31 other cultivated fruit trees, palms, vines or shrubs, and an additional 30-plus species collected from forest areas. Those same farmers also rear eight main commercial livestock species while collecting 27 species of wild animals from the forest for food. For more traditional farmers, alongside staples such as sweet potatoes, beans and ginger, they also grow more traditional crops such as chayote (*Sechium edule*), and pihing/taro (*Colocasia sp*.). For commercial farmers, alongside the same staples, crops such as tomato, cucumber and squash take slightly more prominence. Men and women farmers alike perform many duties but men have a particular role in selecting and scouting land for clearance, and women in the selection of seed and also the cultivation of subsistence crops for family nutrition. The system of management blends products from farming and products collected from areas of forest management.

The biocultural heritage managed with the support of KEF informs traditional practices of crop selection, fallow management, composting and soil fertility maintenance. Farmers manage their own seed stocks, but augment this by purchasing seeds, including seeds for commercial crops such as tomatoes and peppers. KEF also has a government agreement on tree seedling production for forest restoration and management activities. To incentivise agrobiodiverse production, KEF has also helped to develop businesses around Indigenous fruit jams and jellies, wild forest honey and coffee. In the future, they plan to develop processing for camote flour, chips and cookies — developing their brand to highlight beneficial elements of the production system — such as organic or Fairtrade certification and single-origin labelling. They also plan to advance barangay (local authority)

ordinances on agrobiodiversity conservation, documenting and promoting the more beneficial elements of local seed management, and traditional agronomic practices.

The Ikalahan's journey reflects an ongoing effort to balance the economic benefits of commercial farming with the sustainability of traditional practices. By integrating agroforestry and organic farming methods into commercial agriculture, the community aims to protect their ancestral lands while ensuring food security and economic viability for future generations. This delicate blend of tradition and modernity exemplifies how Indigenous communities can adapt to change without losing their ecological and cultural roots.

To ensure the future sustainability of the agrobiodiversity of the Ikalahan, KEF must:

- Conduct regular monitoring and documentation to refine techniques for enhancing yield and quality of rare camote varieties.
- Establish a community seed bank to preserve and propagate rare camote varieties.
- Promote seed exchanges among farmers to ensure genetic diversity and resilience of camote varieties.
- Engage with NGOs and international organisations for funding and expertise.
- Promote the inclusion of the Ikalahan agrobiodiversity practices in national agricultural sustainability programmes.
- Ensure the active involvement of community members in decision making to maintain project relevance and sustainability.
- Document and teach traditional farming practices, such as swidden farming and foraging, to younger generations to ensure the continuity of Indigenous knowledge.
- Combine traditional knowledge with scientific research to innovate sustainable farming solutions tailored to the Ikalahan community.
- Advocate for policies that support Indigenous land rights, agroforestry programmes and organic farming initiatives.
- Seek government support to subsidise organic farming inputs and provide incentives for sustainable agricultural practices.

1. Introduction

1.1 About this case study

As part of the Nature Nurture project, the Kalahan Educational Foundation (KEF) conducted research with farmers from Indigenous Ikalahan communities of the Cordillera and Caraballo mountain ranges in Northern Luzon, Philippines. The aim was to document local knowledge and its implementation in agrobiodiversity conservation, climate mitigation and prevention of biodiversity loss. The research consisted of interviews with 40 farmers to assess the agrobiodiversity grown by the Ikalahan communities and the strategies used by the farmers to maintain it. The participating farmers included ten women and ten men farmers using traditional farming practises, and ten women and ten men farmers in commercial farming settings.

1.2 Ikalahan heritage and the Kalahan Educational Foundation

The Ikalahan peoples, also known as the Kalanguya in other regions, are an Indigenous cultural community of the Cordillera and Caraballo mountain ranges in Northern Luzon, Philippines (Cordillera School Groups 2003). They are traditionally forest-dependent swidden farmers, known for their deep spiritual and ecological connection to the land. Their worldview is centred on harmonious coexistence with nature, where forests, watersheds and wildlife are not only sources of sustenance but also integral to cultural identity and ancestral beliefs (Pulhin and Tapia 2007; Dulawan 2006).

Historically, the Ikalahan have governed themselves through customary laws and practices, including a traditional justice system and community-based rituals that guide relationships with both people and the environment (Rice 2000). Their knowledge systems include sophisticated methods of forest management, wild-food harvesting and sustainable agroforestry, passed down intergenerationally through oral tradition, apprenticeships and collective practice (Villamor and Lasco 2006; Segundo 2014).

The Ikalahan territory, now legally recognised as part of their ancestral domain, spans rugged highlands, primary and secondary forests, and cultivated valleys (Saklad 2020). In the early 1970s, the community faced the threat of displacement due to state development plans and private land speculation. In a landmark act of collective resistance, the Ikalahan asserted their ancestral rights, eventually winning legal recognition in 1972 through the help of Reverend Delbert Rice and attorney Julian de Vera (Durst et al. 2005).

This success led to the formation of the Kalahan Educational Foundation in 1973, which was established as an Indigenous peoples' organisation to serve both as a legal representative and as a steward of the Ikalahan's cultural, environmental and socioeconomic aspirations (Dahal and Capistrano 2006; Villamor and Pindog 2008). KEF is registered as a nongovernmental organisation (NGO) in the Philippines. KEF envisions a sustainable and effective organisation working for and with Ikalahan communities for sustainable development, with the mission to be a responsible steward to promote the economic, physical, mental, social, political, moral and spiritual development of the Indigenous peoples within the Kalanguya–Ikalahan Ancestral Domain. The goals of the foundation are:

- To promote the development of livelihoods for the community
- To assist communities in the promotion, protection and improvement of sustainable development
- To promote good traditions and cultural integrity
- To encourage youth to finish basic education, and
- To strengthen Christian values and relationships among the community.

1.3 Origins of the Kalahan Educational Foundation

Land security has been a perennial dilemma for the Ikalahan tribe. Stories from the elders showed how Ikalahan lands were eyed by land speculators for personal use and some were titled in the name of a few lowlanders. In fact, in 1970, the Philippine government planned to convert about 6,300 hectares of ancestral lands into a vacation centre. Fake titles were used by relatives of high-level government officials in efforts to grab land from the Ikalahan. The Ikalahan decided to file a case in court. With the help of the late Reverend Delbert Rice and the late attorney Julian de Vera, they finally

won and achieved legal victory in 1972 by having the government recognise their ancestral land claims. They also revoked some of the lowlanders' titles, and eventually forced the government to abandon plans to develop the area as a vacation centre.

In response to the Ikalahan legal battle in the 1970s, the Ikalahan elders, Delbert Rice and Julian de Vera collaborated to establish the Kalahan Educational Foundation, which was officially registered on 26 November 1973. It has become the legal personality of the Ikalahan people in these areas.

The victory of the Ikalahan paved the way for the establishment of the 14,730 hectare Kalahan Forest Reserve and the issuance of a memorandum of understanding (MoU 1) between the government and KEF that legitimised the prior and vested rights of the Ikalahan tribe over their ancestral lands. It recognised their claim and assured that they would not be driven away from their ancestral lands and that they were given the complete control and authority to manage and utilise the land and its resources. The Ikalahan took on the responsibility of protecting the watershed as part of the agreement.

The MOU signed in 1974 was a pioneering community forest stewardship agreement (CFSA) between the Philippine government and the Ikalahan people facilitated by KEF. The CFSA granted management and stewardship rights over those 14,730 hectares of the Kalahan Forest Reserve, with KEF representing the Ikalahan tribe. It was the first official recognition of Indigenous ancestral land tenure by the Philippine government in the post-colonial period (Saklad 2020). Thus, the MoU was a foundational step that helped pave way for later comprehensive recognition under IPRA (Republic Act 8371 of 1997 Philippines).

To ensure the continuity of land security and the improvement, protection and conservation of natural resources, KEF established the Kalahan Academy, an educational and livelihood facility for the Ikalahan. Health services were provided as part of KEF's educational extension programme during its first 20 years. The KEF agroforestry office was also established and charged with the implementation of environment-related policies made by the KEF board of trustees, of reforestation projects funded in partnership with different funding agencies, and the mapping, drafting and implementation of land-use plans for the whole Kalahan Forest Reserve. The continuity and preservation of Ikalahan cultural traditions and values was made possible with the teaching of culture as part of the curriculum at Kalahan Academy. Basic ecology was also a required subject for all graduates. These three institutions — the Kalahan Academy, health services, and the agroforestry office — represent the core programmes and service arms established by KEF to fulfil its mission of holistic Indigenous community development, wherein each serves a distinct yet interconnected function.

The Kalahan Academy has a mandate to:

- Provide basic and secondary education for Ikalahan youth
- Integrate Indigenous knowledge, culture and values into the formal curriculum, and
- Include unique subjects such as basic ecology and cultural studies, ensuring environmental awareness and identity preservation.

Health services (now reduced; primarily offered in the first 20 years of KEF's existence) provide:

- Basic medical care and health outreach for Ikalahan communities in remote mountain areas.
- Preventive health education and nutrition programmes, especially for mothers and children.
- Health services are sometimes integrated with KEF's environmental programmes (such as water and sanitation, herbal medicine).

The agroforestry office — the environmental and land-use arm of KEF — is tasked with:

- Implementing KEF's resource utilisation and protection policy (RUPP)
- Leading reforestation, land-use planning and watershed protection programmes
- Supporting sustainable farming, soil conservation and agrobiodiversity promotion.

In 1989, the Philippine government conceptualised a community-based forest management programme. This concept was based on the success of KEF's implementation of the community forest stewardship agreement MoU. This became the basis for the delineation of ancestral lands and domain claims in 1993 through Administrative Order No. 2 Series of 1993, and later became the basis of Republic Act No. 8371 or the Indigenous People's Rights Act (IPRA) in 1997.

Again, KEF pioneered securing a CADC-CBFMA with the Philippine government in June 1999. The total extent of the Kalanguya–Ikalahan Ancestral Domain is 58,117.75 ha, as delineated under the Indigenous People's Rights Act (IPRA) framework. This full area was recognised later, following the issuance of a certificate of ancestral domain claim (CADC) in the 1990s and the eventual granting of a certificate of ancestral domain title (CADT). KEF is often presented as a very successful example of collective management of natural resources. It was selected as a case of excellence by the Department of Environment and Natural Resources (DENR) of the government of Philippines and was later successfully selected as an exemplary case of forest management and featured in the book *In search of excellence: exemplary forest management in Asia and the Pacific* (Durst et al. 2005).

In 2023, KEF celebrated its 50th anniversary. This golden celebration highlighted the people behind KEF and recognised its founders for their meritorious efforts in establishing the foundation, which was instrumental in improving the standard of life in the Kalahan Forest Reserve. KEF will continue to fulfil its mission amidst challenges. The foundation is a living testament to faith, determination, perseverance, exemplary leadership and selfless commitment and cooperation. It proves that both old and young can create a vibrant and progressive community.

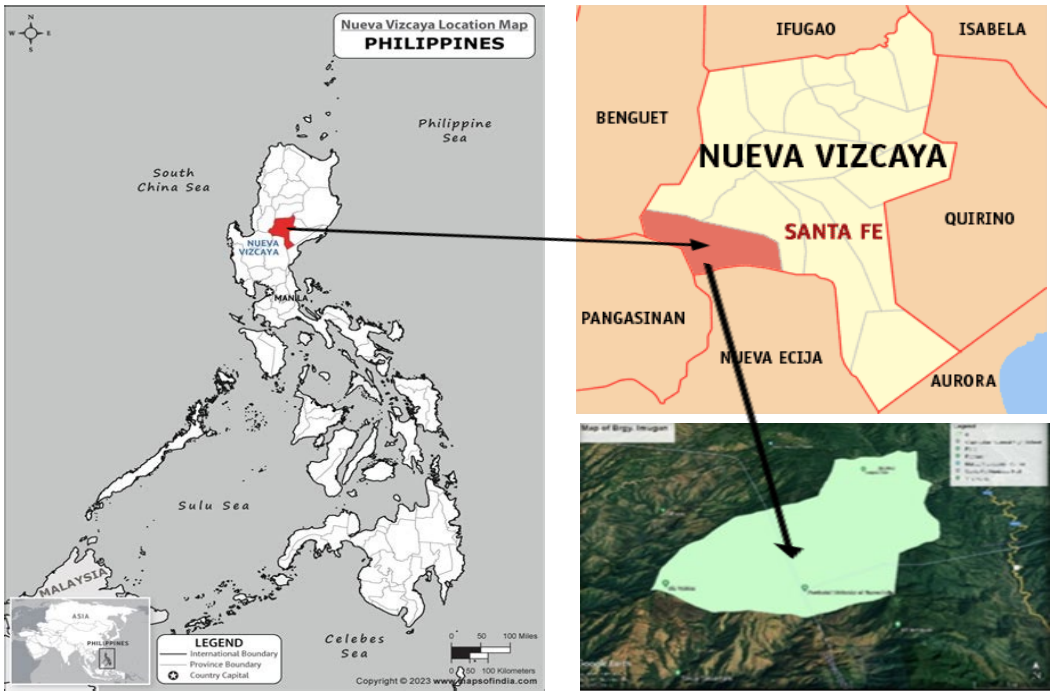
1.4 Location

KEF is located in Imugan barangay (local government unit) in the municipality of Santa Fe, in the province of Nueva Vizcaya in the Cagayan Valley Region (Region II) of the Philippines. The Philippines is under tropical rainforest since it is located near the equator. Imugan is composed of primary tropical rainforest (wildlife sanctuaries and watershed areas) and secondary forest. The secondary forest is interspersed with agroforestry farms where people farm the land for planting different crops, either for commercial or subsistence use.

Nestled in the mountains, Imugan is surrounded by lush forests, waterfalls and streams. It is home to the Ikalahan people who have preserved their traditional practices and unique way of life. It is a small, peaceful rural community, known for its natural beauty, community-based ecotourism and cultural heritage, as well as for its sustainable agriculture initiatives and Ikalahan justice system. Imugan is accessible from the town proper of Santa Fe, which lies along Dalton Pass, and from the town proper of San Nicolas, Pangasinan using the Nueva Vizcaya–Pangasinan National Highway.

The Kalanguya–Ikalahan Ancestral Domain has an area of 58,117.75 ha and has an elevation range of 900–1,312.8m above sea level. Based on the climate map of the Philippines prepared by the Philippine Atmospheric, Geophysical and Astronomical Services Administration Department of Science and Technology, the area belongs to Type III with no very pronounced maximum rain period and with a dry season lasting only for three months; either from December to February or from March to May. Due to the mountainous landscape, the Ikalahan villages experience a cool climate and heavy rainfall. The mossy mountains are forested by pine trees and deciduous trees known locally as *kalahan* (Cordillera School Groups 2003: 53).

Figure 1. Location of the Kalanguya–Ikalahan Ancestral Domain



Note: the map on the left shows the location of Nueva Vizcaya, Northern Luzon, where the Kalanguya–Ikalahan Ancestral Domain is situated; map on the lower right shows the location of Imugan barangay, the seat of the Kalahan Educational Foundation (Lat -16° 9' 21.25" N, Long -120° 54'16.28" E).

1.5 Membership

KEF initially received formal recognition from the Philippine government to manage a 14,730-hectare area, known today as the Kalahan Forest Reserve. Over time, KEF has evolved into the principal organisation managing and representing the broader 58,117.75-hectare Kalanguya–Ikalahan Ancestral Domain, which is comprised of seven barangays (see Table 1). The people residing in these areas are considered members of KEF.

Table 1. Kalanguya-Ikalahan Ancestral Domain: population per barangay

Barangay	Population
Imugan	828
Unib	422
Baracbac	778
Bacneng	1,855
Santa Rosa	306
Malico, Santa Fe	234
Malico, Pangasinan	348
TOTAL	**4,771**

Source: Philippine Statistics Authority (2020)

1.6 Patterns of land use

The Ikalahan community practices a traditional agroforestry and swidden farming system, cultivating land primarily in the lower- to mid-mountain areas and along ridge tops where farming is still viable. Cultivation is generally limited to areas with less than 50% slope, in line with both customary land-use knowledge and soil conservation principles. Each household typically cultivates around one hectare of land, with 270 titled lots recorded as of 1997, which represents the average size of individual family-managed farms at that time.

By the late 1970s and early 1980s, community elders, led by Reverend Delbert Rice, along with the KEF board of trustees and staff, recognised the need for more structured land-use governance. In response, they initiated a participatory process to classify areas suitable for cultivation and to protect ecologically sensitive zones. This led to the identification of three watershed areas or wildlife sanctuaries, which were to be managed under a community-agreed framework.

In the 1980s, the KEF board formulated its resource utilisation and protection policy (RUPP), a set of customary and adaptive rules that remain central to the management of the Kalahan Forest Reserve. Violations of RUPP carry specific penalties, reflecting the community's commitment to the long-term sustainability of their ancestral domain (Cosep et al. 2022).These policies cover swidden farming, forest-product harvesting, tree cutting (including chainsaw registration and use), hunting, fishing, quarrying, fire prevention and land encroachment. Though the chainsaw permit system was temporarily suspended due to jurisdictional overlap with DENR, other provisions continue to be implemented. In particular, KEF’s delineation of at least ten hectares of watershed sanctuary per barangay has significantly influenced local government policy. In the early 2000s, the municipality of Santa Fe adopted these community-led delineation and hunting regulations into a formal municipal ordinance, strengthening the legal recognition of Indigenous conservation practices.

2. Agrobiodiversity in the landscape

2.1 Agrobiodiversity in the forest and farm landscape

The farming practices of the Ikalahan have undergone significant changes over time, reflecting their adaptability to environmental, social and economic conditions. Traditionally, the Ikalahan practiced *kaingin* (swidden) farming, a system of slash-and-burn agriculture that allowed them to grow crops in forested areas. This method was sustainable in the past due to their small population and their deep understanding of forest regeneration cycles. They cultivated root crops, rice and vegetables, complemented by foraging for wild food sources.

However, with the pressures of modernisation, population growth and external influences, the Ikalahan gradually shifted towards more sustainable agroforestry and agrobiodiversity practices. A key turning point came in the 1970s when the community secured land tenure under the MoU with the Philippine government. This formalised their rights to manage their ancestral lands and led to the establishment of the Kalahan Forest Reserve.

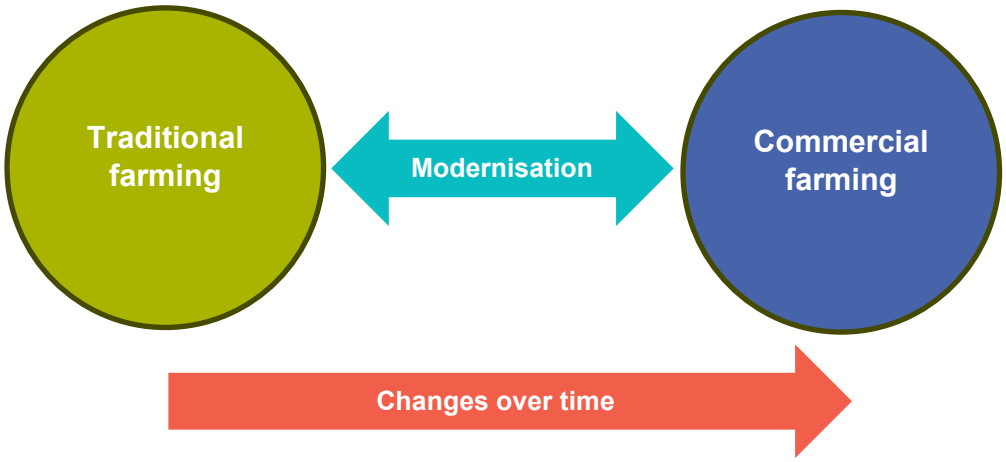
Another aspect in our community that has changed is livelihoods. The function of shifting cultivation was originally for the community's survival. They planted because they needed food and they got their food from their farms. However, the function of swidden farming today is as a source of income. This would explain their shift from multicropping to monocropping. Fewer and fewer young people are also getting involved in the practice of shifting cultivation (Segundo 2014).

Since then, the Ikalahan have diversified their farming systems, integrating fruit-tree farming, organic farming methods and sustainable forest management to enhance both food security and environmental preservation. They have also established a food-processing enterprise utilising local resources such as wild fruits to make jams, jellies and preserves. It is marketed using the Mountain Fresh brand.

These changes reflect the Ikalahan's commitment to preserving their cultural heritage while adapting to modern challenges. Their evolving farming practices demonstrate a delicate balance between traditional knowledge and innovative approaches to ensure the sustainability of their community and ecosystem.

Today, KEF still continues to encourage farmers to balance their practices even despite the introduction of many destructive chemicals that pollute the surroundings. They also promote agrobiodiversity to counteract commercial pressures that have diminished the variety of crops planted over time, which has resulted in the spread of monocultures and chemical fertiliser and pesticide use.

Figure 2. A conceptual framework showing changes in the Ikalahan farming system



Traditionally, Ikalahan farmers of Imugan practice a distinct agrobiodiversity system that blends farming and forest management. The traditional farming system has a very rich species diversity as shown below in Table 2. In addition to conventional crops, the Ikalahan also cultivate a diversity of fruit trees, palms, vines and shrubs (see tables 3 and 4), with a total number of 88 main species.

Table 2. Crops varieties planted and harvested by men and women

Botanical name	Common/Local name	Botanical name	Common/Local name
Phaseolus vulgaris	Beans	*Abelmoschus esculentus*	Okra/lady's fingers
Zingiber sp	Ginger	*Psophocarpus tetragonolobus*	Biligan/winged beans
Solanum sp	Tomato	*Cajanus sp.*	Kapaneh
Capsicum sp	Chilli pepper	*Manihot esculenta*	Cassava
Cucumis sativus	Cucumber/pipino	*Curcuma longa*	Turmeric/kalawag
Sechium edule	Chayote	*Momordica charantia*	Bitter gourd
Cucurbita maxima Cucurbita moschata	Squash	*Lagenaria siceraria*	Bottle gourd/calabash
Ipomoea batatas (L.) Lam.	Sweet potato	*Amaranthus spinosus*	Kalunay/spleen amaranth
Nasturtium officinale	Watercress	*Diplazium esculentum*	Edible fern/pako
Cyrtosperma merkusii	Giant swap taro/galyang	*Brassica oleracea var. botrytis*	Cauliflower
Brassica oleracea var. capitata	Cabbage	*Solanum melongena*	Eggplant
Brassica rapa subsp. pekinensis	Chinese cabbage	*Dioscorea esculenta*	Tugi/lesser yam
Cajanus cajan	Pigeon pea	*Dioscorea alata*	Ube/purple yam
Colocasia esculenta (L.)	Lampakan taro	*Arachis hypogaea*	Peanut
Pisum sativum var. saccharatum	Snow pea	*Solanum lycopersicum var. cerasiforme*	Cherry tomato
Vigna unguiculata	String beans	*Allium cepa*	Onions
Lactuca sativa	Lettuce	*Solanum tuberosum*	Potato
Brassica rapa subsp. chinensis	Pechay (pak choi)	*Daucus carota subsp. sativus*	Carrot
Zea mays	Corn	*Colocasia sp.*	Pitik
Moringa oleifera	Malunggay	*Phaseolus sp.*	Sitting beans
Basella alba	Alugbati/malabar spinach	*Corchorus olitorius*	Saluyot/jute mallow
Ananas comosus	Pineapple	*Capsicum frutescens*	Sili/siling labuyo
Colocasia sp.	Pihing/taro	*Capsicum chinense*	Sili-amki
Vigna unguiculata subsp. sesquipedalis	Agayap/native climbing long beans	*Capsicum sp.*	Sili sultan
Ocimum basilicum	Basil	*Spinacia sp.*	Spinach
Brassica integrifolia	Mustasa/mustard greens	*Allium sativum*	Bawang/garlic

Table 3. Fruit trees harvested by men and women

Botanical name	Common/Local name
Mangifera spp.	Mango
Citrus x microcarpa	Calamansi
Chrysophyllum cainito	Caimito/star apple
Citrus maxima	Pomelo
Saurauia bontocensis	Dagwey
Antidesma bunius	Bignay
Psidium guajava	Guava
Saurauia elegans	Uyok
Dillenia philippinensis	Katmon
Averrhoa sp.	Bilih (cucumber tree)
Garcinia binucao	Batwan
Artocarpus heterophyllus	Jackfruit
Pouteria campechiana	Tiesa/canistel or egg fruit
Flacourtia sp.	Cherry
Sandoricum koetjape	Santol/cotton fruit
Citrus x limon	Lemon
Annona muricata	Guyabano/Soursop

Table 4. Palms, vines, shrubs and grasses harvested by men and women

Botanical name	Common/Local name
Musa spp.	Banana
Carica papaya	Papaya
Calamus rotang	Uway/rattan
Cocos nucifera	Coconut
Areca catechu	Betel nut palm
Arenga pinnata	Kaong/balagnot/sugar palm fruit
Thysanolaena latifolia	Tiger grass
Embelia philippinensis	Dikai vine
Hibiscus sp.	Hibiscus/gumamela
Saccharum officinarum	Sugarcane
Passiflora edulis	Passion fruit
Piper betle	Ikmo/betel vine
Coffea Arabica/robusta	Coffee
Cymbopogon citratus	Lemongrass

On their farms, the Ikalahan grow a wide variety of crops, including commercial and subsistence crops (see Table 5). Commercial crops grown include beans, ginger, sweet potato, coffee, tomato, lettuce and pineapples. Other popular crops include chayote tops, papaya and avocado. In addition to these, they cultivate subsistence crops such as camote, bananas, moringa, chilli, squash and corn.

The Ikalahan also utilise forest areas to grow crops, both for commercial purposes and subsistence (see Table 6). Commercial forest crops include ube (purple yam), calamansi, pineapple and mango, among others. On the subsistence side, the forests provide a wealth of resources, including wild mushrooms, guava, and indigenous plants such as pikaw and samplora. These plants are not only important for daily sustenance but also contribute to the preservation of their traditional knowledge and connection with the environment.

Table 5. Commercial and subsistence crops by men and women from the farm

Main commercial crops	Subsistence crops
Varieties of beans	Sweet potato
Ginger	Kaldeh/Pigeon peas
Giant swap taro/Galyang	Banana
Sweet potato	Papaya
Coffee	Malunggay
Tomato	Chilli
Cassava	Tarong/Eggplant
Pihing/Taro	Corn
Chinese silver grass (pao/*Miscanthus sinensis*)	Squash
Pechay (pak choi)	Danggo (*Allium fistulosum*)
Chayote tops	Utong/string beans
Balat/Banana	Guyabano/Soursop
Chilli	Pihing/Taro
Tiger grass	Galyang
Ube/Purple yam	Chayote
Pipino (cucumber)	Papaya
Cabbage	Calamansi
Lettuce	Avocado
Utong/String beans	Pechay (pak choi)
Onion	Beans
Pineapple	Lettuce
Papaya	Tomato
Guyabano/Soursop	Pineapple
Mango	Mango
Calamansi	-
Avocado	-

Table 6. Commercial and subsistence crops by men and women from the forest

Main commercial crops	Subsistence crops
Littuko/Rattan fruit (*Calamus manillensis*)	Buo/Earthball mushroom (*Scleroderma citrinum*)
Balagnot	Pomelo
Pomelo	Ugob/Breadfruit (*Artocarpus camansi*)
Lemon	Pikaw (*Colocasia sp.*)
Calamansi	Mushrooms
Dagwey	Balagnot
Guava	Dikai
Tiger grass	Samplora (*Blumea sp.* or *Phyllanthus sp.*)
-	Guava
-	Dagwey

2.2 Cash crops grown by men

Traditionally, in the culture of the Ikalahan, it is the men or husbands who scout and select the land for swidden farming. The men in the household also start clearing the land for swidden farming (Cordillera School Groups 2003: 60). They then cultivate the soil ready for planting.

In the figures and tables in the following sections, we contrast the interview results from ten women and ten men farmers who practice traditional agriculture with those of ten women and ten men farmers pursuing more commercial agriculture. Traditional agriculture typically involves smaller areas of crops grown in an integrated manner with many other crops and trees. Commercial agriculture is typified by much larger and more monoculture fields with much higher use of chemical fertilisers and pesticides.

Figure 3. Cash crops grown by Ikalahan men in traditional farming systems

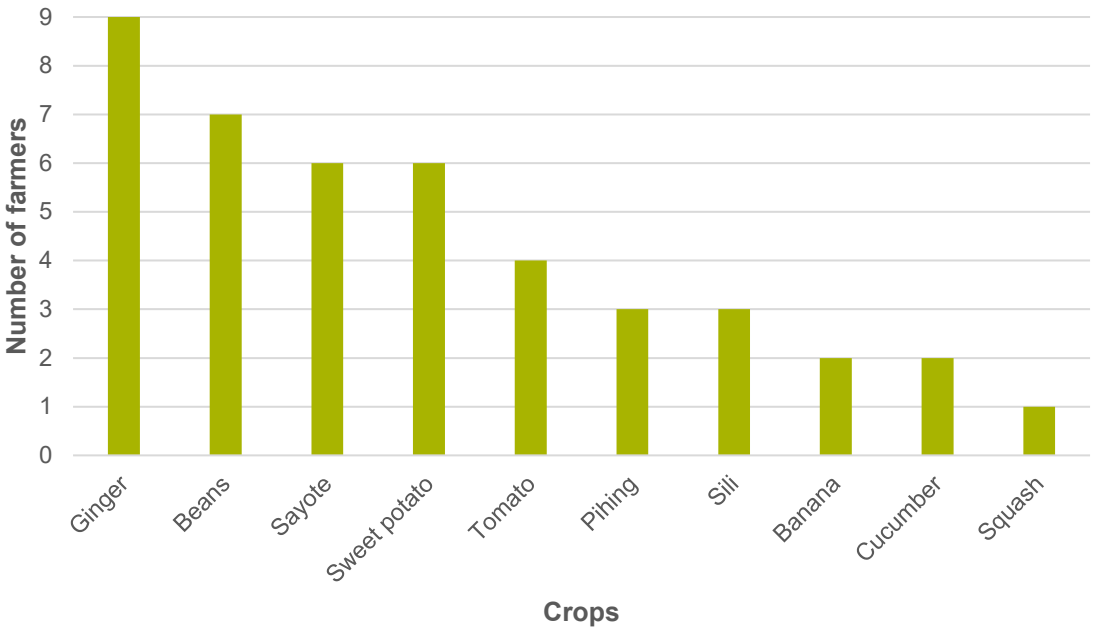


Figure 3 showcases the ten most common cash crops cultivated by the Ikalahan men farmers surveyed, illustrating the contribution of these crops within traditional farming practices. Ginger emerges as the most cultivated crop, indicating its critical role in their farming systems, similar to its importance among women. Beans follow closely, suggesting that legumes are a significant crop, likely valued for their protein content and soil-enriching properties. Sweet potato and chayote are grown by six of the men farmers, and are also important to women, highlighting their role in the daily diet or local economy. Tomatoes, also a major crop among women, are cultivated by four men, reflecting its widespread importance across genders.

Other crops such as taro (pihing) (grown by three men) also play a role in the agricultural diversity of the Ikalahan. Chilli (sili) is grown by three men, possibly reflecting its use in traditional cuisine or as a supplementary crop for flavour and trade. Banana, cucumber (pipino) and squash are cultivated by fewer men, suggesting they are grown on a smaller scale. Overall, Figure 3 reflects a diverse crop base among Ikalahan men in traditional farming systems, with ginger, beans and tomatoes being the key crops. This diversity helps maintain the ecological balance of their traditional farming system while ensuring food security and sustainability. The overlap with crops grown by women, such as ginger and sweet potato, also suggests a shared responsibility in cultivating essential crops for both consumption and livelihood.

Figure 4. Livestock raised by Ikalahan men in traditional farming systems

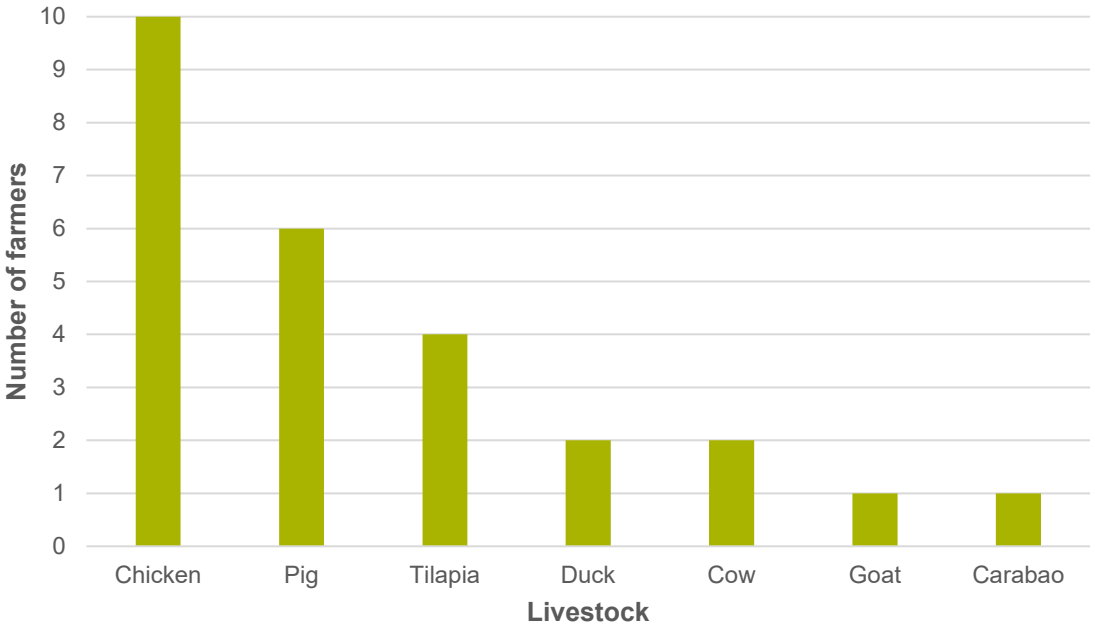


Figure 4 illustrates the seven varieties of livestock raised by the Ikalahan men farmers practising traditional agriculture that we surveyed, highlighting the significance of animal husbandry in their traditional farming practices. Chickens are the most commonly raised livestock. This suggests that chickens play a crucial role, likely for both eggs and meat, contributing to both subsistence and possibly local markets. Pigs are the second most prominent livestock, indicating their importance in food production and perhaps as a source of income, particularly for ceremonial or festive occasions. Chickens and pigs are the animals most used in Ikalahan celebrations; in small celebrations such as the *laga* a chicken is butchered for the rituals, while pigs are used for larger celebrations such as *keleng* or *padit*. Traditionally, these animals were free grazed; however, due to the emergence of agroforestry farms and the increase of population, these animals are confined to a small area for feeding.

Farming tilapia fish, a form of aquaculture, reflects the community's use of local water resources for fish farming, likely providing a source of protein. Ducks are also raised by three of the men; although less common than chickens, they likely serve similar purposes for meat and eggs. Cows and carabaos (a species of water buffalo) are also raised. While fewer farmers are involved in raising these animals, their role is critical in terms of draft power for farming, particularly for ploughing and transportation.

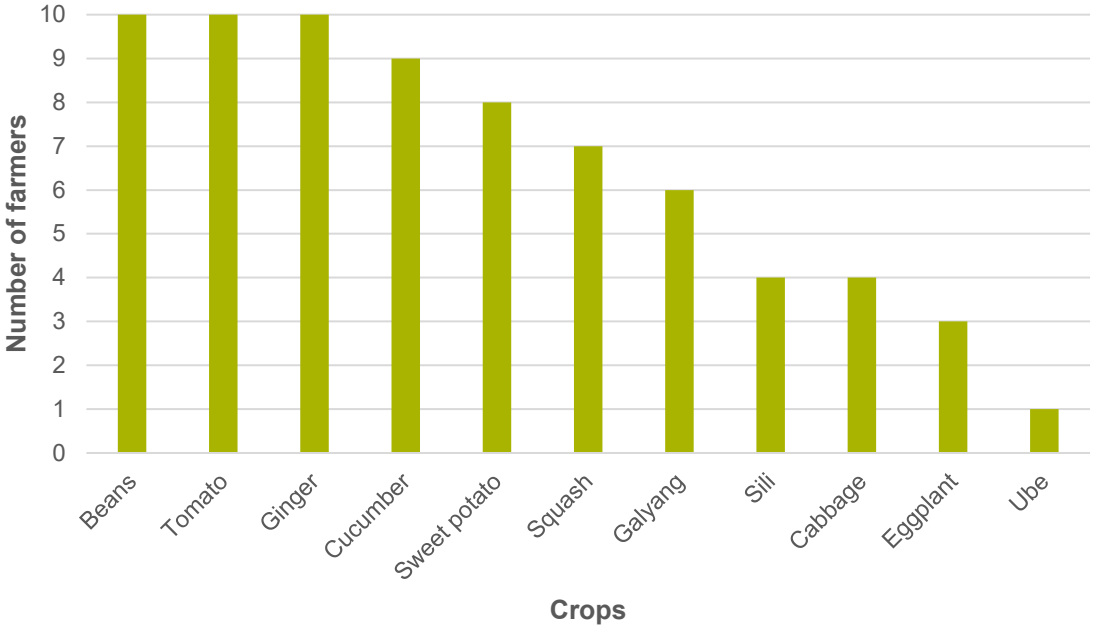
Goats are the least common livestock, suggesting they are less integral to the traditional farming system, possibly due to the landscape, the community's specific needs and the prolonged wet season. Overall, Figure 4 reflects a diversified approach to livestock farming, with poultry (chickens and ducks) being the most common, while larger animals such as cows and carabaos are raised by fewer farmers but are likely important for farm labour and long-term sustenance. This mix of livestock indicates the Ikalahan men's adaptive strategies in managing animal resources for both subsistence and economic purposes.

Figure 5. Some of the livestock raised by Ikalahan men farmers

Photo credits: © KEF

In contrast with the ten men farmers maintaining traditional systems, Figure 6 shows the variety and extent of crops grown by the ten men farmers we surveyed in more commercial farming settings. The most prominent crops appear to be beans, tomato and ginger, with each being grown by all ten of the interviewed men farmers who practice commercial agriculture. These crops likely have a strong market demand, indicating their value as staple commodities in the broader economy. Cucumber and sweet potato follow closely, underscoring their importance as commercial crops, possibly because of their adaptability to the region's farming conditions and consistent demand. Squash and galyang (a local crop) are also popular, reflecting their role in diversified vegetable production for the market. Chilli, cabbage (of different sorts), eggplant and ube (purple yam) are grown by fewer commercial farmers, suggesting they may be a more niche crops, catering to specific markets or seasons.

Figure 6. Cash crops grown by Ikalahan men in commercial farm settings



The presence of such a wide array of crops indicates that commercial farmers in the area are engaged in a diversified farming system. This diversification likely helps mitigate risks from crop failures and fluctuating market prices, while also catering to different market demands. It reflects the adaptive strategies of these farmers, balancing high-demand staples with more niche products to optimise their earnings in the commercial agricultural space.

Figure 7. Livestock raised by Ikalahan men in commercial farm settings

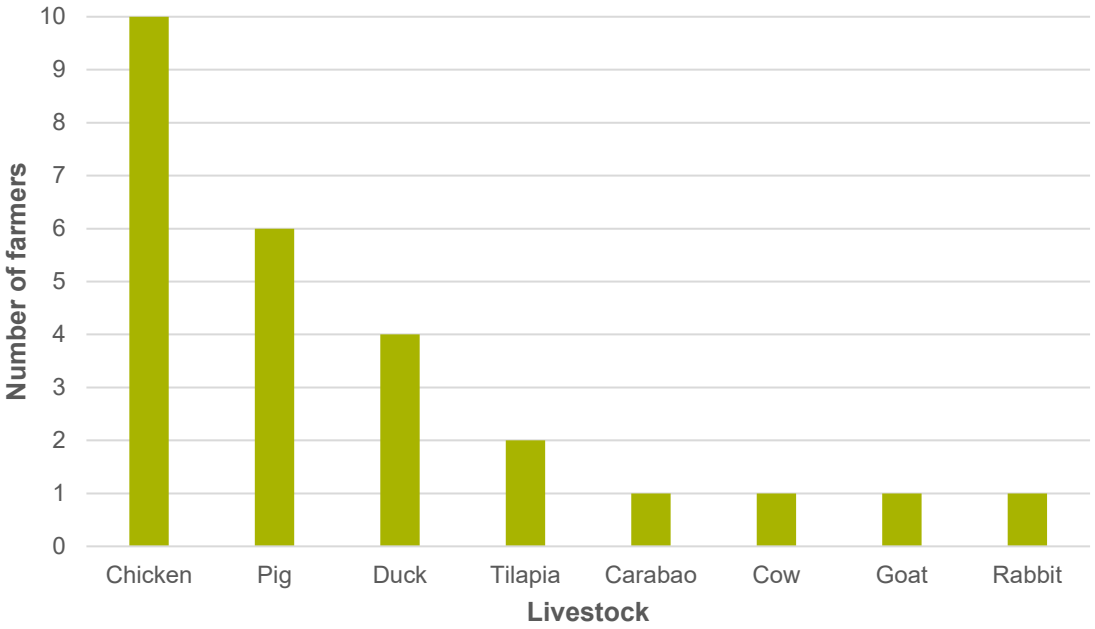


Figure 7 presents livestock raised by the ten male commercial farmers surveyed and typically reflects the animals that are most profitable or suitable for market purposes. Similar to traditional farms, in commercial farming, livestock such as chicken and pigs predominant. Chickens are raised both for meat and eggs, and their relatively low cost of upkeep combined with the steady market for poultry products makes them a top choice among commercial farmers. Pigs are especially popular because of their fast growth rates and the demand for pork, making them a staple in commercial meat production. Cows are also popular for dairy products, and ducks are kept both for meat and eggs. In some areas, goats are raised for both meat and dairy, appealing to niche markets that prefer goat milk or goat meat.

Farmers involved in livestock raising usually operate with an eye toward both local and regional markets, adjusting the type and number of animals they raise based on market trends, consumer preferences and environmental conditions. Their choice of livestock often complements the overall farming strategy, where crops and animals are integrated to maximise land-use efficiency and profitability.

2.3 Cash crops grown by women

Traditionally, Ikalahan women are the ones in charge of planting and propagating "*ube*", which they propagate using cuttings (Barker 1984; Segundo 2014).

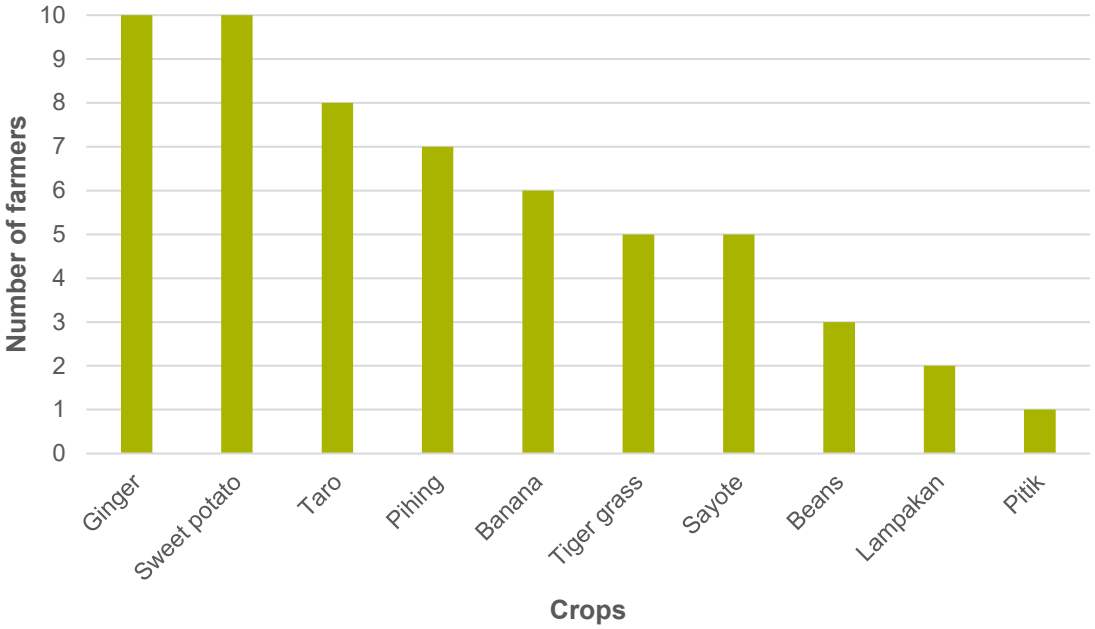
An Ikalahan woman is responsible for a variety of essential tasks throughout the agricultural cycle. Women participate in the clearing and burning of land, seed selection, planting, weeding and harvesting. They also handle post-harvest activities such as food processing and storage, ensuring the sustenance of their families and the community. Women are crucial in preserving agrobiodiversity by maintaining diverse crop varieties, particularly root crops and vegetables. Furthermore, they pass on traditional ecological knowledge to younger generations, ensuring the continuity of sustainable farming practices (Rice 2000).

Figure 8. A group of women harvesting galyang (left); an Ikalahan woman and her niece planting their crops (right)

Photo credits: © KEF

Once again, the research survey distinguished between ten women interviewees working on more traditional farms, and ten women working on more commercial farms. As before, traditional agriculture typically involves smaller areas of crops grown in an integrated manner with many other crops and trees. Commercial agriculture is typified by much larger and more monoculture fields with much higher use of chemical fertilisers and pesticides.

Figure 9. Cash crops grown by Ikalahan women in traditional farming systems



In the traditional farms of the Ikalahan community, women are central to the farming practices and are responsible for growing a variety of crops, with common ones including ginger, sweet potato, and taro. These crops are significant in their agrobiodiversity system and are valued for their resilience and adaptability to the mountainous terrain. Ginger is often grown for its medicinal and culinary uses, while sweet potato and taro serve as staple root crops that contribute to food security.

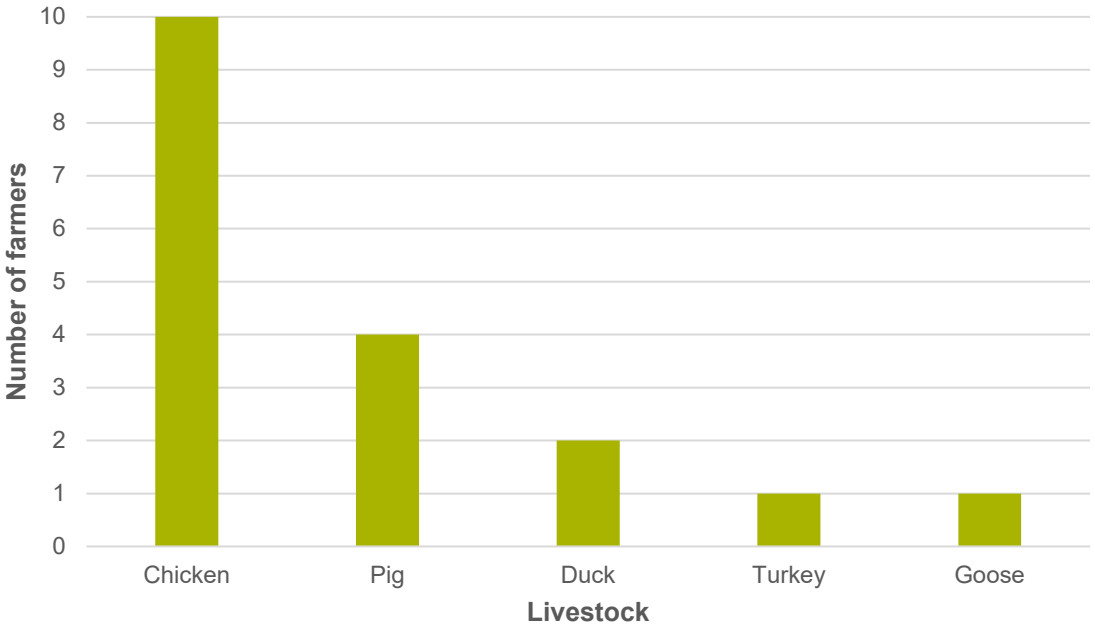
The Ikalahan planting practices are deeply rooted in traditional ecological knowledge, where they utilise swidden farming and shifting cultivation to maintain soil fertility. The cycle involves clearing small patches of forested land for farming, allowing the land to regenerate after a few years. This approach supports biodiversity and prevents soil degradation. Women play a crucial role in managing

these crops, selecting seeds and determining which plants are best suited to specific plots based on environmental factors such as soil type and climate.

Among the crops cultivated by the Ikalahan women farmers practising traditional agriculture that we surveyed, pitik (a less common crop) is the least planted (see Figure 9). Its lower cultivation is likely due to it being either less adapted to the environment or because it is less in demand compared to more common crops. Nevertheless, the diversity of plants grown by the Ikalahan women surveyed reflects their commitment to sustainable agriculture and the preservation of traditional farming practices, ensuring the resilience of their food systems.

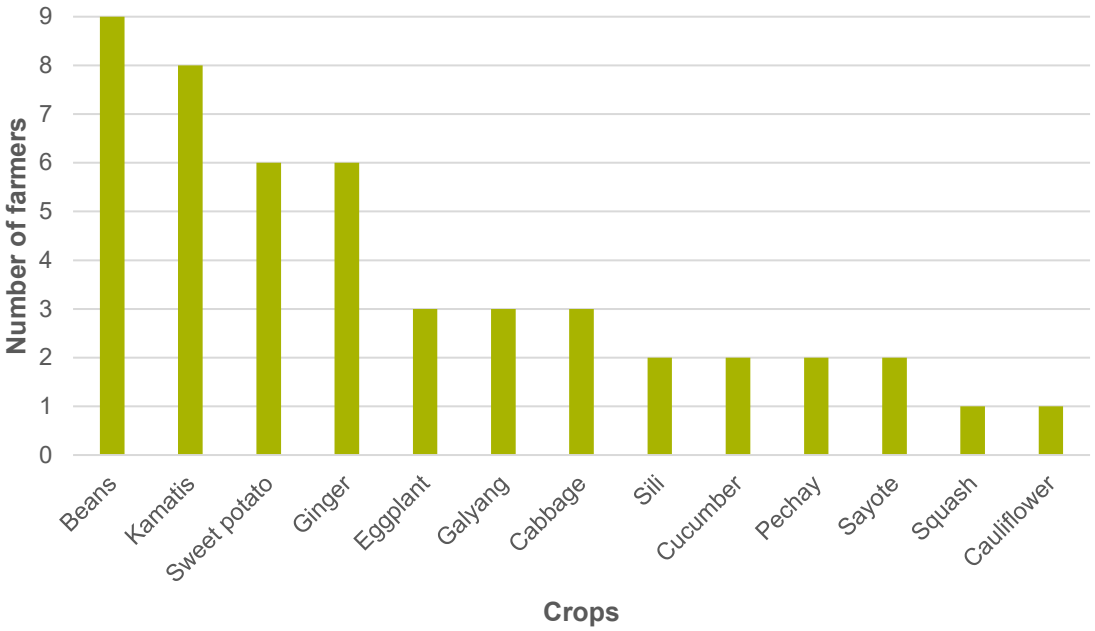
Figure 10 illustrates the types and numbers of livestock raised by Ikalahan women. Chickens are the most commonly raised livestock by all of the Ikalahan women farmers practising traditional agriculture that we surveyed (ten), indicating they are a significant part of the community's livestock production. Pigs come next, followed by ducks. Both turkeys and geese are the animals least raised. This suggests that Ikalahan women prioritise raising chickens, likely due to their versatility and usefulness for both meat and eggs. Pigs also play a key role in their livestock management, while turkeys and geese are less commonly raised, perhaps due to different dietary or cultural preferences.

Figure 10. Livestock reared by Ikalahan women in traditional farming systems



For the ten women we interviewed from more commercial farm settings, Figure 11 illustrates 13 commercial crops grown by women farmers of the Ikalahan community. Beans are the most commonly grown crop, with nine of the women farmers cultivating them, followed by tomatoes (kamatis) and sweet potato and ginger. Eggplant, galyang and cabbage come next, followed by a range of other commercial crops for more niche markets such chili, cucumber, pechay, chayote, squash and cauliflower.

Figure 11. Cash crops grown by Ikalahan women in commercial farm settings



This distribution highlights the preferences of women farmers for certain crops, possibly reflecting factors such as market demand, ease of cultivation or suitability to local growing conditions. It also indicates a diverse range of crops being cultivated commercially within the community.

Figure 12. Livestock raised by Ikalahan women in commercial farm settings

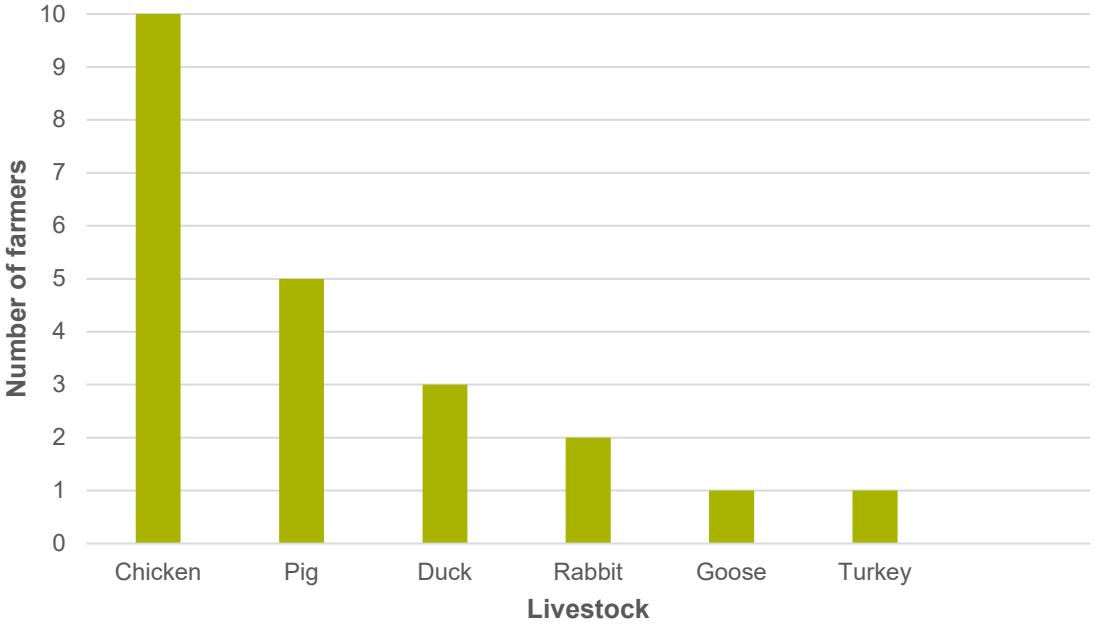


Figure 12 displays the types of livestock raised by more commercial women farmers in the Ikalahan community. The pattern is quite similar to those raised in more traditional farms. Chickens are the most commonly raised livestock, with all ten farmers engaged in their production, followed by pigs and ducks. Rabbits, geese and turkeys are less commonly raised. This trend suggests that chickens, likely due to their versatility and low maintenance, are the preferred livestock. The raising of pigs and ducks indicates diversification, while the lower numbers for rabbits, geese, and turkeys suggest niche or less common practices within the community.

2.4 Subsistence crops grown by men

The diversity of crops grown reflects the importance of agrobiodiversity in Ikalahan farming, ensuring that food, medicine and fibre are all derived from the land. While most farmers prioritise food crops, the inclusion of fibre and medicinal plants emphasises a holistic approach to subsistence farming, meeting the various needs of the community. Each farmer appears to specialise in different crop combinations, ensuring resilience and food security within the community.

Table 7 showcases the 25 different subsistence crops grown by the ten Ikalahan men farmers practising traditional farming surveyed for this research, categorised into three primary uses: food, fibre and medicine. Each row corresponds to an individual farmer (numbered 1–10) and the crops they cultivate (marked with an 'X'). The table reveals a strong focus on food crops, with a wide range of plants being grown, including staples such as banana, beans, corn (maize), ginger (laya), sweet potato (ube), taro (galyang), and vegetables such as tomato (kamatis), pepper (chilli), cucumber (pipino), and leafy greens such as lettuce and alugbati/malabar spinach. Some farmers grow fruits such as mango, papaya and pineapple (pinya), contributing to a diversified diet.

Fibre crops, mainly represented by banana, are less commonly cultivated, with only a few farmers engaged in growing crops for fibre. Medicinal crops such as malunggay, guyabano and calamansi are grown by select farmers, highlighting their role in traditional healthcare practices.

Table 7. Subsistence crops grown by the ten men farmers practicing traditional farming

Crops	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Farm 6	Farm 7	Farm 8	Farm 9	Farm 10
Kaldeh	x									
Banana	x						x			x
Malunggay	x									
Beans		x		x						x
Cucumber		x	x							
Tomato		x	x	x						x
Sweet potato		x	x			x	x			
Corn		x	x	x	x					
Galyang		x	x	x	x					
Sili	x	x	x		x		x	x	x	x
Tarong				x						
Ginger					x			x		
Chayote					x			x		
Danggo						x				
Utong						x				x
Alugbati						x				
Papaya						x				x
Pinya						x				x
Guyabano							x			x
Pihing (taro)										x
Lettuce										x
Mango										x
Calamansi										x
Littuko	x									
Danglah (herb)	x									

2.5 Subsistence crops grown by women

Table 8 reveals that Ikalahan women manage a diverse range of crops, ensuring food security and preserving biodiversity in their farming practices. While most farmers grow common staple crops, a few cultivate unique or less common plants, showcasing the individualised nature of their farming. This approach highlights the vital role women play in sustaining the community through their subsistence farming, which is critical for providing food and other essentials, and maintaining ecological balance.

Table 8. Subsistence crops grown by the ten women farmers practicing traditional farming

Crops	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Farm 6	Farm 7	Farm 8	Farm 9	Farm 10
Sweet potato	x			x	x	x	x	x	x	x
Okra	x	x								
Corn	x	x		x				x		x
Agayap beans	x	x								
Pigeon pea	x		x							
Biligan beans	x									
Kapaneh		x								
Cassava			x	x						
Banana			x					x		x
Coffee			x							
Sugarcane			x							
Utong			x							
Ginger							x			x
Beans					x					
Pineapple							x			x
Pihing (taro)							x	x	x	
Chayote tops							x		x	
Water crest								x		
Amti									x	
Kalunay									x	
Pao										x
Tiger grass	x	x	x	x		x	x	x	x	x

The table illustrates the 22 subsistence crops grown by Ikalahan women practicing traditional farming, categorised into two main groups: food crops and other crops. Each row corresponds to a specific farmer (numbered 1–10), showing which crops they grow (marked with an 'X'). Among the food crops, staple crops such as ube (purple yam), okra, corn (mais), cassava (camoteng kahoy), banana and ginger (laya) are commonly cultivated. These crops form the foundation of the community's diet, providing essential nutrition. Beans, chayote tops and tapsoy (leafy greens) are also grown for food, contributing to a varied and balanced diet.

In the other category, some women grow coffee (kape) and pao (a local root crop), along with amti, kalunay and hagid, which might serve as medicinal plants or plants used for traditional purposes. Kaldeh, biligan and kapaneh are less commonly grown crops that may have specific cultural or local significance.

2.6 Wild products harvested by both men and women

According to all of the farmers surveyed for this research, the Ikalahan people, both men and women, harvest a wide range of wild plants with at least 44 species from their forests, utilising them for food, medicine, fibre, construction and other purposes. Many of these plants serve multiple functions,

demonstrating the depth of the Ikalahan's traditional ecological knowledge. For food, they harvest plants such as guava, bamboo shoots, turmeric, guava, and various wild greens such as dagwey, bakhi, uyok and baktal. Some plants, such as balagnot and bili, are used for both food and medicinal purposes, while orchids are harvested for ornamental or ritual use.

Fibre-rich plants such as uway and littuko (types of rattan) are essential for making ropes and other woven items, and they also play a role in construction. For instance, uway and gatilay are vital materials for building homes and other structures. Medicinal plants such as amti and turmeric are used in traditional healing practices, providing remedies for various ailments. Other plants, such as kulibangbang and ngayngay, have unique roles in their culture, possibly related to rituals or specialised uses. This deep knowledge of wild plant harvesting reflects the Ikalahan's harmonious relationship with their environment and their ability to sustainably manage the resources of their ancestral lands.

Table 9. Uses of wild products harvested by both men and women

Botanical name	Common/Local name	Food	Fibre	Construction	Medicine	Other
Orchidaceae	Orchids					x
Solanum nigrum	Amti/Black nightshade	x			x	
Arenga pinnata	Balagnot	x		x	x	
	Talagadaw					
Calamus rotang	Uway/Rattan		x	x		
	Dikay/Bihulak (herb)	x				
Psidium guajava	Guava	x				
Saurauia bontocensis	Dagwey	x				
Nasturtium officinale	Tapsoy/ Watercress	x				
Saurauia sp.	Garlic/ Bawang	x				
-	Bakhi	x				
Saurauia elegans	Uyok	x				
-	Baktal	x				
Antidesma bunius	Bignay	x				
-	Kunday	x				
-	Bayah	x				
Corcoma longa	Turmeric	x			x	
Palm sp.	Gatilay	x		x		
Colocasia sp.	Pikaw	x				
Diplazium esculentum	Pako/Edible fern	x				
-	Tamuyan	x				
Scleroderma citrinum	Buo/Earthball mushroom	x				
Canarium luzonicum	Kagahaka	x				
Garcinia vidalii	Bilih	x				x
Citrus sp.	Lukoh	x				x
-	Apihang	x				
Schizophyllum commune	Kulat/Mushroom	x				
Musa sp.	Pintok/ Seeded banana	x				

Garcinia binucao	Batwan/ balukok	x				
Calamus manillensis	Littuko/Rattan fruit	x	x	x		
-	Kalyo	x				
-	Bakalaw	x				
-	Baloy	x				
-	Alantap	x				
Ficus sp.	Galiwgiwan	x		x		
Fragaria vesca	Buyot/Wild strawberry	x				
Bambusa vulgaris	Bamboo shoot	x				
-	Kulibangbang	x				x
-	Ngayngay	x				
-	Kalyat	x				
Palm shoot	Bitungay	x				
-	Puhlak	x				
Calamus merrillii Becc.	Giwi/Rattan	x				
-	Kokongo	x				

The Ikalahan men and women engage in the sustainable hunting and gathering of a variety of wild animals, with at least 27 species, which play a crucial role in their subsistence and cultural practices (see Table 10). Many of these animals provide both food and medicinal resources, showcasing the Ikalahan's deep knowledge of their environment. For example, putyukan, a type of wild bee, is highly valued not only for its honey, which is used as food, but also for its medicinal properties. Other animals such as liyak (flying termites), abal-abal (beetle larvae), kalakal (mole cricket) and uldinay (wild chicken) are important sources of protein, forming a staple part of their diet.

Certain animal species, such as amki (palm civet) and buwat (cloud rat), are also hunted for food, contributing to the Ikalahan's reliance on wild resources for nutrition. Some animals, such as tadaw (monkeys) and makwah (deer), may serve unique cultural or functional roles, potentially linked to traditional rituals or ecological practices. The diversity of animals hunted include insects, small mammals and amphibians such as tukak (frogs) reflects the Ikalahan's intimate understanding of their ecosystem. These hunting practices are carried out with a deep respect for nature, ensuring that wildlife populations are maintained and the balance of their environment is preserved.

Table 10. Uses of wild animals and animal products hunted or collected by Ikalahan men and women

Common name	Common/Local name	Food	Medicine
Wild honey	Putyukan	x	x
Flying termites	Liyak	x	
Asian weaver ant	Ayaka	x	
Beetle larvae	Abal-abal	x	
Mole cricket	Kalakal	x	
Wild chicken	Uldinay	x	
Palm civet	Amki	x	
Wild boar	Ulha	x	
Cloud rat	Buwat	x	
Monkey	Tadaw	x	
Deer	Makwah	x	
Philippine coucal	Talaktak	x	
Birds	Titit	x	
Nymph	Babadi/hahayap	x	
Snake	Ulag	x	
Mud eel	Yoyo	x	

Crab	Ga-lang	x	
Goby fish	Udingan	x	
Freshwater gar fish	Badoy	x	
Frog	Tukak	x	
Beetle larvae	Abatal	x	
Monitor lizard	Tilay	x	
Rat	Utot	x	
Wild cat	Tabaw	x	
Goby sp.	Bunog	x	
Freshwater snail	Lihdog	x	
Freshwater eel	Kiwat	x	

2.7 Important crops varieties conserved

Camote (sweet potato) is a significant staple food for the Ikalahan community. It thrives in the highland environment of Nueva Vizcaya, where the Ikalahan people have traditionally engaged in swidden farming. The Ikalahan cultivate camote alongside other root crops due to its adaptability to the mountainous terrain and its role in providing year-round food security. As a staple, camote serves multiple purposes in the Ikalahan diet, being consumed in various forms, either boiled, roasted or incorporated into traditional dishes.

The cultivation of camote also supports sustainable land-use practices. Because it grows well in nutrient-depleted soil and can be intercropped with other species, it plays a role in preventing soil erosion and maintaining the fertility of the land. Its resilience makes it a reliable crop for the Ikalahan, particularly in times of food scarcity.

However, while camote has brought numerous advantages, it has also introduced a slight shift in the community's farming practices. Some concerns arose over the potential overreliance on camote, which may have led to the gradual displacement of other native root crops that hold cultural and ecological significance. The new varieties introduced by DENR are the most recognised due to the short time period for harvesting that lasts only for three months compared to the old varieties that last for six months, and the high price they can obtain in the market. That is the reason why the demonstration farm was established by KEF: to maintain the diversity of the different camote varieties grown (see Table 11).

Figure 13. Ikalahan women washing camote (sweet potatoes) ready for selling at the market

Photo credit: © KEF

Table 11. Camote (sweet potato) varieties grown by the Ikalahan

Old camote varieties (based on 1997 research on sweet potato day-og (composting) trials in Nueva Vizcaya)	Existing camote varieties planted on the demonstration farm
Tokano-01	Tokano
Motmot-diket	Motmot
Pokopok	Pokopok
Kalbooy	Kalbooy
Kangao	Kangaw
Magaan	Toklong
Badyangao	Gihay-big leaf
Ponpon	Gihay-small leaf
Hakkobo	Belance
Mayoyao	Pacac
Kalumbah	Halpido
Lapihnayan	Dakol
Bayodik-white	Violet*
Red ohalan	Carrot*
Imelda yellow	-
Gayabangan	-
Dangiyan	-
Tugi	-
Bokagan	-
White gihey	-

* New varieties

3. Crop cultivation and rearing livestock: knowledge sources

3.1 Biocultural heritage

The Ikalahan practice hunting, gathering, herding and farming in order to survive. However, their primary source of livelihood is swidden farming. The primary product of traditional shifting cultivation is sweet potato (Ipomoea batatas), known locally as ube (Rice 1974; Segundo 2014).

The Ikalahan harvest plants from their farms and in the wild, and hunt animals during hunting season. Among these wild-harvested plants are the pao (edible fern) that freely grows near riverbanks, balagnot/kaong (sugar palm fruit) and wild mushrooms, among others. These are chemical-free plants that grow naturally in the area. KEF also has a communal forest where people can freely harvest plants, including dagwey (a type of fruit), dikay (a type of herb), and guava to be processed into jams and jellies. Farmers also used black soil from the decayed plants, leaves and fruit of the tibig and balete trees (indigenous types of fig tree) as a fertiliser for plants or seed beds.[1] It is also a tradition of the Ikalahan to store seeds in their kitchens, for they believe that the smoke will ensure the longevity of the seeds, ready for the next planting season.

For the wild animals, the Ikalahan are only allowed to hunt during the hunting season. This is to prevent overhunting in the area and maintain the population of wild animals. Harvesting of honey is also allowed during summer seasons and is a source of income for farmers.

The Ikalahan also have Indigenous farming practices which are considered to be environmentally sustainable (Villamor and Lasco 2006). To prolong cultivation and maintain productivity, the Ikalahan use an ancient Indigenous composting technique known as gen-gen on sloping land to maintain soil fertility and prevent soil erosion (de Luna et al. 2019). ‘Kinebbah’ or the fallow system of the Ikalahan is another indigenous technique for soil conservation, fertility restoration and pest and disease control. When the soil has no longer enough nutrients, farmers leave their fields fallow and plant alnus trees, (a nitrogen fixing tree) for at least 10–15 years. However, this depends on the individual farmers, who may prefer a shorter fallow period to meet production demands, while some may prefer to have no fallow period, especially in this present time with high financial demands. The majority of farmers use chicken manure or commercial fertilisers to maintain soil fertility. ‘Day-og’ is another developed Indigenous technology of composting for sweet potatoes to maintain soil fertility, by burying weeds such as panawel (*Ageratina adenophora*) and other plants on the farm and letting them decompose to become fertiliser. The KEF conducted research in 1997 for soil fertility because soil fertility is important to the plants, especially camote/sweet potatoes.

3.2 Intergenerational knowledge transfer within households

Most Ikalahan farming knowledge is transferred to the younger generations by parents and grandparents. The knowledge is handed down through demonstration, application, experience and observation. However, many farmers surveyed indicated that the knowledge they acquire from their households has been maintained but not applied due to the emergence of more modern techniques and technologies. Another reason is due to climate change, where they have adapted to new farming practices so that their plants will survive.

3.3 Knowledge transfer between neighbours

Farmers rely also on knowledge acquired from their neighbours. They tend to share their experiences with their fellow farmers. Their success stories in farming educate their neighbours on the best strategies and practices for farming. Knowledge is transferred by sharing stories and recommendations, and through demonstrations. In these modern times where there are emerging technologies and machineries, farmers recommend to others the best technologies, machinery and chemicals to use on their farms. They also create associations or groups of farmers in order to acquire assistance or subsidies from the government.

[1] Black soil is highly fertile soil that is enriched with organic matter.

3.4 Organisational knowledge networks

Farmers also gain knowledge through different networks. The majority of this knowledge comes from lectures, seminars and workshops run by DENR as well as by local government units at provincial and municipal levels. NGOs and agricultural schools also offer free training, as do fertiliser or chemical companies who want to introduce their products to the farmers. Since the 1990s, KEF has conducted ecology seminars, discussing the importance of taking care of the environment and its importance to human beings. These days, young farmers also watch YouTube videos to acquire knowledge of modern farming.

4. Cultivating and managing seed and animal resources

4.1 Self-provisioning and multiplication of seed

Based on the interviews with farmers, the majority of seeds planted are from their own stock. However, seeds for tomato, pepper, cucumber, some varieties of sweet potato, eggplant, cabbage, carrots and all commercial crops are acquired from stores, to ensure the quality and viability of seeds since these undergo different tests and experiments. On the other hand, seeds for corn, ginger, chayote, galyang and sweet potatoes come from their own stocks. KEF also encourages farmers to plant fruit trees such as coffee (*Coffea arabica*), alnus trees, narra trees (*Pterocarpus indicus*), and other indigenous trees to maintain biodiversity. According to the farmers, they plant trees such as mahogany as a long-term investment so that they can harvest them in the future.

In 2012, KEF and DENR's Community Environment and Natural Resources Office (CENRO) Aritao made an agreement for seedling production, planting and maintenance, in connection with the nationwide National Greening Program (NGP — a government forest-rehabilitation programme) by the virtue of Executive Order 26 dated 24 February 2011. In the agreement, the KEF established 300 hectares of land for planting trees, with a total number of 68,250 *Dipterocarp* sp, 49,750 Philippine oak, 10,000 coffee, 1,000 narra, 50,000 alnus, 100 banuyo, 100 malanangka, 50 amugis, 1,000 *Syzygium* sp., 300 antipolo, 200 *Sterculia* sp, 5,000 guava, 1,500 cacao and 250 guyabano. This move is a big opportunity to maintain and enhance the agrobiodiversity in the area.

All livestock raised is from the farmers' own stock. For aquaculture, tilapia fish fingerlings are obtained from DENR, so farmers only need to have prepared a readily available fishpond.

Figure 14. Seed reserved from farmers' own stock for multiplication

Photo credit: © KEF

4.2 Bartering for and purchasing seed

The Ikalahan rarely barter for goods. Instead, they give away excess for free, especially crops that have decreased market prices, rather than see it go to waste. Corn, beans, okra, agayap (a type of legume) are given freely to ensure that the seeds are being maintained and multiplied. However, there are also instances where some are sold for cash.

5. Enterprise strategies and agrobiodiversity

5.1 Cash-crop enterprises

The Ikalahan farmers have developed a range of value-added products to increase the profitability of their crops while maintaining their commitment to sustainable forest management. Through the support of KEF, wild and cultivated fruits such as guava, passion fruit and dagwey are processed into premium products such as jams and jellies at KEF's food processing centre. These products are marketed locally and at trade fairs as Indigenous, organic and forest-friendly goods, attracting eco-conscious buyers and generating additional income for the community. Similarly, Arabica coffee grown under agroforestry systems is carefully handpicked, processed and roasted in small batches, allowing the farmers to produce high-quality roasted ground coffee and green beans that cater to local specialty markets.

In addition to fruits and coffee, the collection of wild forest honey by local people has become another important enterprise. The honey is harvested sustainably to protect the bees and processed into clean, premium bottles marketed for their natural, chemical-free qualities. These efforts demonstrate the Ikalahan's ability to combine traditional ecological knowledge with modern techniques to create value-added products that are both profitable and environmentally sustainable.

To scale these enterprises, the community could enhance their processing facilities by investing in modern equipment such as solar dryers, bottling tools and quality-control systems. Strengthening their brand identity to highlight their Indigenous heritage, organic practices and forest-friendly approaches will allow them to tap into premium niche markets, including online platforms and eco-conscious consumers.

Capacity building through training in food safety, financial literacy and processing innovations can further improve their competitiveness. Partnerships with government agencies, NGOs and universities could also provide access to funding, technology and market linkages, while certifications such as organic and Fairtrade could open opportunities in international markets. However, challenges such as limited capital, poor road infrastructure and climate variability must be addressed to ensure long-term success. By focusing on these strategies, the Ikalahan farmers can continue to enhance their cash-crop enterprises while preserving their cultural heritage and protecting their forest ecosystems.

The Ikalahan's management of the forest exemplifies sustainable forest use, incorporating practices such as selective harvesting, agroforestry and reforestation. Their efforts have also led to the development of a community-based forest products enterprise, where the Ikalahan sustainably harvest and process non-timber forest products such as wild berries and tree sap into marketable goods.

Figure 15. Jam and jellies processed at the Kalahan Educational Foundation

Photo credit: © KEF

5.2 Future plans

Camote/sweet potato production is the expertise of the Ikalahan. It is also abundant in all villages of the Kalanguya-Ikalahan Ancestral Domain with different varieties being cultivated. KEF plans to develop products out of these diverse camote varieties, including the rare varieties, which are superior in taste and believed to be richer in nutrition because of the dark violet colour.

Since KEF plans to make these rare varieties its flagship products, it proposes to try different chemical-free cultivation methods to enhance camote yield and quality, since these are the factors affecting the abundance of these rare varieties. Once the appropriate cultivation method is refined, technology transfer and dissemination shall be carried out for community application on their traditional farms.

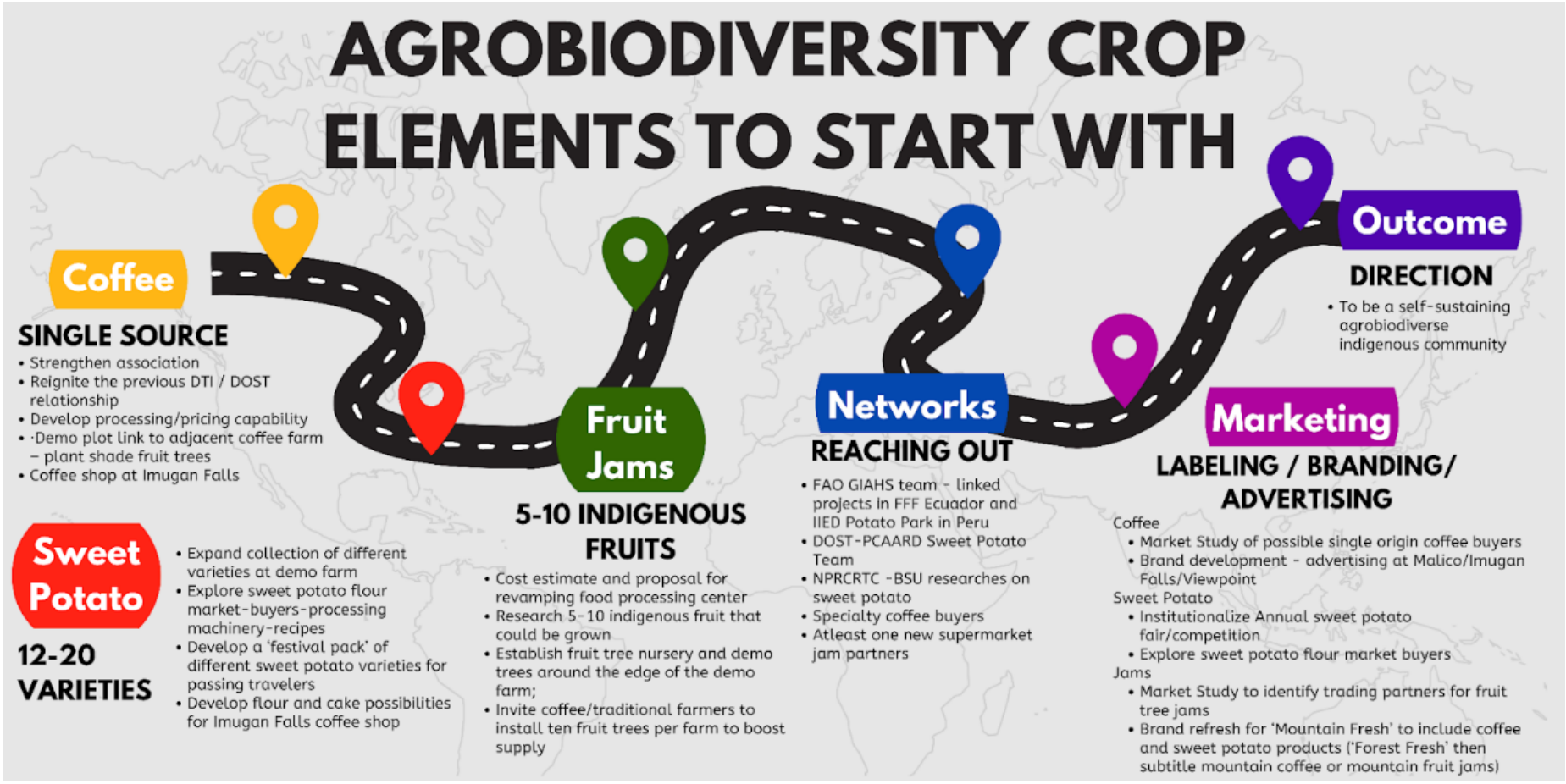
Simultaneous to the cultivation technology development, further research on producing camote-based products such as flour, chips, cookies, jams, jelly, wine, vinegar, sugar and others will be initiated. When successful, the farmer-beneficiaries of the camote cultivation technology will be able to supply the Kalahan food processing centre with camote processing. While the success of these studies may not be 100%, creating one or two new camote products will be a big achievement because it will serve as an encouragement to the project participants and as another step up the ladder of sustainable development.

Before the start of the production of end-user products, strategic plannings shall be carried out with the help of relevant government and NGOs to address financial, marketing, facilities and administrative concerns. Issues on costs, labelling, patenting, product registration, memoranda of agreements between producers and suppliers, target markets and business projections will also be given attention to ensure project sustainability and profitability.

Diversification of product lines will be done through continuing research. This may include diversifying the product base with one or more additional crops or fruit to either enhance colour, flavour and taste according to customer preferences. Once the camote processing technology is advanced, the centre will be able to process other crops such as chayote, ginger and taro, as all thrive well in these communities. This creates more enterprises based on the Ikalahan's agrobiodiversity (see Figure 16 on page 34).

However, KEF has capacity gaps in finance, technology, personnel and facilities. It therefore needs to strengthen its collaboration with national and international organisations, governments, academic institutions and most importantly with its member–beneficiaries and other stakeholders. These partnerships will help the foundation secure funding, technical assistance and policy support for the programme. Additionally, KEF aims to advocate for policies that protect Indigenous rights, promote sustainable agriculture, and support forest conservation at both the local and national levels.

Figure 16. Roadmap for agrobiodiversity businesses in the Kalanguya–Ikalahan Ancestral Domain



6. Finance strategies for diversified production

6.1 Internal financing mechanisms

Concerning the strategies for diversified production of resilient traditional crops, KEF plans to focus more on policies as a more effective approach. The project has already started lobbying with local barangay officials regarding the drafting of a barangay ordinance that will hopefully then be adopted as a municipal ordinance. The ordinance being lobbied is called the Baragangy Agrobiodiversity Conservation and Sustainable Agriculture Ordinance of 2025. This ordinance shall mandate each barangay adopting it to establish a barangay community germplasm bank for the preservation and reproduction of heirloom seeds and resilient native plant varieties. The purpose is to serve as a source of free planting materials for its residents.

Aside from policy lobbying as a strategy in diversified production, the Nature Nurture project and KEF are to conduct research to develop products as discussed in Section 5.2 to add value to identified crops and encourage community production. This strategy has already been tested by KEF in the late 1970s when they produced a brand called Dagwey Preserve (dagwey is a fruit of the endemic Philippine species *Saurauia subglabra*). The population of dagwey trees in the locality was threatened due to upland farming and careless harvesting of its fruit since it had no economic value at that time. When the product was developed, it created demand which encouraged protection and planting, even without financial assistance.

Currently, KEF has no internal financial mechanism for diversified production. Although KEF has funded production, reforestation and conservation activities in the past several years, these were all components of funded projects and most activities were terminated after the projects ended, with the exception of the Organic Farming Project Fund. Although the project was terminated in the early 90s, the financial mechanism established went on for several years. However, some beneficiaries have the mentality that the money they borrowed from the fund was a grant and not a loan. Because of this, they did not pay back their loans, which led to the closure of the fund.

6.2 Financial services that support agrobiodiversity

KEF offers no financial services to members. However, despite the absence of an internal financial mechanism, each of the barangays of this municipality have one, if not more, financial institutions supporting productive activities. Most of these are community cooperatives or small-scale community organisations funded by the government. Most households are members of more than one financial institution (in their own locality and in other localities). Their access to loans for production purposes are in place.

6.3 FFPO role in external finance partnerships

KEF accesses government, NGO and international funding through project proposals in line with KEF's goals. Most of these sources of funds are conservation organisations or donations intended for social services. The Department of Education of the Philippines is also a regular source of some funds but these are intended only for KEF's education programme. DENR has also been a partner in implementing the National Greening Program from 2013 to 2018.

Most of these funds are utilised for the natural resources development programme and for livelihoods, research and the education programmes, which are the main KEF priorities. Through KEF, the generated funds from the project proposals are utilised to meet the objectives of the funding agency. At the same time, the KEF is able to implement its own activities within the Kalanguya–Ikalahan Ancestral Domain.

6.4 Future plans

For KEF's aspirations related to financial strategies and mechanisms, please refer to Section 5.2.

7. Conclusions and recommendations

7.1 Conclusions

The Ikalahan community's farming practices reflect a balance between traditional methods and modern commercial agriculture, shaped by their deep connection to the land and the need to adapt to contemporary demands. Traditionally, the Ikalahan have relied on *kaingin* (swidden) farming and agroforestry, cultivating root crops, rice, vegetables and native fruits, while foraging for wild plants from their communal forest. Their practices emphasise sustainability, biodiversity and minimal disruption to the ecosystem, aligning with their respect for nature and their culture to preserve community harmony.

As the Ikalahan have gradually incorporated commercial farming techniques, they have begun planting crops such as coffee, ginger and fruits for wider markets. However, the introduction of commercial pesticides and fertilisers in some areas poses challenges to the environmental harmony they have long preserved. While these methods can boost yields and meet market demands, they can also threaten soil health, water quality and biodiversity.

In conclusion, the Ikalahan's journey reflects an ongoing effort to balance the economic benefits of commercial farming with the sustainability of traditional practices. By integrating agroforestry and organic farming methods into commercial agriculture, the community aims to protect their ancestral lands while ensuring food security and economic viability for future generations. This delicate blend of tradition and modernity exemplifies how Indigenous communities can adapt to change without losing their ecological and cultural roots.

7.2 Recommendations

To ensure the future sustainability of the agrobiodiversity of the Ikalahan, KEF must:

- Conduct regular monitoring and documentation to refine techniques for enhancing yield and quality of rare camote varieties.
- Establish a community seed bank to preserve and propagate rare camote varieties.
- Promote seed exchanges among farmers to ensure genetic diversity and resilience of camote varieties.
- Engage with NGOs and international organisations for funding and expertise.
- Promote the inclusion of the Ikalahan agrobiodiversity practices in national agricultural sustainability programmes.
- Ensure the active involvement of community members in decision making to maintain project relevance and sustainability.
- Document and teach traditional farming practices, such as swidden farming and foraging, to younger generations to ensure the continuity of Indigenous knowledge.
- Combine traditional knowledge with scientific research to innovate sustainable farming solutions tailored to the Ikalahan community.
- Advocate for policies that support Indigenous land rights, agroforestry programmes and organic farming initiatives.
- Seek government support to subsidise organic farming inputs and provide incentives for sustainable agricultural practices.

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