

Wild and non-cultivated edible plants and their contribution to local livelihoods in Putao, Myanmar



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Wild and non-cultivated edible plants and their contribution to local livelihoods in Putao, Myanmar

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This study records all plant species used by locals – as part of their diet (curries, vegetables, and spices), as medicine, as crops that generate income, and as plants of special cultural and religious significance. We explore the contributions of WNEPs to human wellbeing: food and nutritional security, social security, income security, and health security among other things.

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Materials and methods

The study was conducted in nine villages in the vicinity of Hponkanrazi Wildlife Sanctuary, Putao. The total number of households at the study site was 201. The population numbered 1,125, and comprised of individuals belonging to the Rawang and Lisu ethnic communities.

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Public awareness levels must be raised and effective community-based management practices need to be encouraged in order to understand the diverse use value of WNEPs and their importance in the conservation of the traditional knowledge of the indigenous communities.

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Abbreviations and acronyms

FD	Forest Department
FGD	Focus group discussion
HH	Household
HI-LIFE	Landscape Initiative for the Far Eastern Himalaya
ICIMOD	International Centre for Integrated Mountain Development
MMK	Myanmar kyat
NTFP	Non-timber forest product
PRA	Participatory rural appraisal
WCS	Wildlife Conservation Society
WNEPs	Wild and non-cultivated edible plants

Acknowledgement

We wish to thank all the respondents and community members of Wa Sab Dam, NamruHtu, Namro, Sawlawdi, wang Hlaing Dam, Longna Dam, Awa Dam, Khalan and Ziya Dam villages, in the vicinity of Hponkanrazi Wildlife Sanctuary, Putao, Myanmar who patiently shared their time, insights and views about wild and non-cultivated edible plants and its status in the area. Our special thanks to Aung Maung, Park Warden, Hkakaborazi National Park and WCS Putao cluster coordinator for their logistic support and guidance. We also wish to thank SEABRI for technical support for field survey. Special thanks to taxonomists Yang Jun and Zhang YU from Kunming Institute of Botany for the identification of plant specimens. Last but not least, we would like to thank Sweden HI-LIFE programme for their financial support for conducting this study.

Executive summary

The Landscape Initiative for the Far Eastern Himalaya (HI-LIFE) is a transboundary landscape initiative jointly implemented by ICIMOD and its partners in three member countries (China, India, and Myanmar) in the Far Eastern Himalayan Landscape. This landscape is rich in both ethnic and indigenous communities, and in plant diversity. The local communities rely heavily on the rich and diverse wild and non-cultivated edible plants (WNEPs) for their livelihood. These WNEPs are source of food, medicine, and spice for the people in the mountain areas, especially the villagers; they also have cultural and ritual significance. The local communities collect a number of WNEPs in the form of roots, leaves, fruits, nuts, tender shoots, etc. However, so far, very few studies have documented the contribution of these resources to the livelihood of the local communities. In this paper, wild and non-cultivated edible plants represent plant resources which are

harvested or collected for the purpose of human use from natural and semi-natural environments. The main objective of this study was to understand the extent of the plant species used by the local people and the associated knowledge and management practices.

The study was conducted in nine villages on the outskirts of Hponkanrazi Wildlife Sanctuary in Putao district, Kachin State, Myanmar. A total of 95 households (HHs) were surveyed, representing almost 50 per cent of the total HHs in the villages. All the nine villages were included in the survey, and sample populations were drawn from each village using the stratified random sampling technique. The selected HHs were interviewed using semi-structured questionnaires. The survey mainly focused on identifying key plant resources that HHs avail of, their use patterns, the degree of dependence on them for livelihood, their role in the management of these species, and the potential drivers of change. In all, 9 focus group discussions (FGDs), one in each village and involving 7–11 participants, were organized. The key topics that were discussed and documented were: information on farming systems; major sources of livelihood and income for the local communities; the number and type of wild and non-cultivated edible plant species and their use; and the conservation and management practices pertaining to these species. Firstly, quantitative and qualitative primary data were collected using a range of participatory tools; this was followed by a household survey and rapid diversity assessments through a collection and display of the plant species available in the villages. A rapid market assessment in Putao was carried out to explore the diversity of the plant species that are brought into the local market from the wild and non-cultivated sector. Those species which could not be identified during the visit were photographed. Their herbarium specimens were taken to the Forest Research Institute for taxonomic identification and validation. For the field exercises, the key participatory rural appraisal (PRA) tools and techniques, specifically FGDs, resource mapping, mobility map, seasonal calendar, four-quadrant analysis, and pair-wise rankings, were discussed. Overall, agriculture was ranked as the most important primary occupation by the majority of the respondents (92 per cent), while non-timber forest product (NTFP) collection was rated as the major secondary occupation by 48 per cent of the HHs. Sachi (*Paris polyphylla*), Ling-zhi mould (*Ganoderma* spp.), and shee pa di (*Ophiocordyceps sinensis*) are some of the species that the local people depend on highly for cash income.

A total of 103 wild and non-cultivated plant species have been documented from the study villages. The greatest richness of these species is found in forest environments. Among these species, 58 per cent are source of food, while 30 per cent are medicinal. And even amongst this 58 per cent, several are used in multiple ways. As for those with a sole function, 16 species are used to make soup alone, while 10 are used only for salad. And, 16 species are used in fish curry. But only three species are part of the staple diet, while four species are used as spices. All respondents reported that they regularly used WNEPs as vegetables. The most frequently collected species are: *Dryopteris cochleata* D. Don; *Dioscorea bulbifera* L.; *Celastrus paniculatus* Willd.; *Polygonum perfoliatum* L.; and *Houttuynia cordata* Thunb. A total of 31 plant species are used in household-level healthcare.

The FGDs and HH survey suggested that the availability of WNEPs in the area has declined during the last two decades. The analyses of the use of both vegetable and medicinal plant species show that there is a growing pressure on these species, and an integrated research and development programme is required in this area. During the FGDs, 36 per cent of the participants were of the opinion that the local community authority and the Forest Department (FD) ought to place restrictions on the use of these plant resources; while 17 per cent of the HHs urged for increasing the awareness levels of the local communities regarding sustainable harvesting techniques. Our study reported that on an average, people depend on wild vegetables for three months in a year during the season of their availability. However, the current trend in the use and demand of some of these species is putting pressure on their sustainable management, and in the long run, this might negatively impact the availability of the species in the future. Among some of the key challenges in the conservation and management of these species include the illegal harvesting of sachi and other important medicinal plants, and the excess harvesting of these plants due to their high demand in the market. For the sustainable management of WNEPs, in situ conservation ought to be accorded high priority, and this should be supported by domestication and coordinated effort from all the relevant sectors. Furthermore, alternative livelihood options also need to be explored so that people can diversify their source of income.

KEY MESSAGES

Very few studies have documented the contribution of plant resources to the sustenance of the livelihoods of local communities. Moreover, this sector has not been given due priority by the government and research institutions. The need to prepare an inventory of key biodiversity resources that are used by the local community was identified during the HI-LIFE regional consultation in Nay Pyi Taw, Myanmar in 2018.

SECTION I

Background

The Far Eastern Himalayan landscape, home to multi-ethnic communities, is rich in diverse WNEP populations, and the local communities rely heavily on these plant species for their livelihoods.

HI-LIFE aims at fostering regional cooperation among China, India, and Myanmar for conservation and development in a biologically rich landscape that stretches from Northeast India through North Myanmar to Northwest Yunnan of China. HI-LIFE is a transboundary landscape initiative jointly implemented by ICIMOD and its three member countries (China, India, and Myanmar) in the Far Eastern Himalayan landscape. This landscape, home to multi-ethnic communities, is rich in diverse WNEP population and the local communities rely heavily on these plant species for their livelihood. A wide range of these species are used by the villagers in various ways. The interactions between the indigenous communities and the diverse plant resources over millennia have resulted in the creation of unique and resilient socioecological systems. In recent years, the Myanmar government, while enhancing its efforts to conserve the rich biodiversity and cultures of its northern-most territory (called the Northern Forest Complex for protection purposes), has been facing challenges in terms of the use of the biodiversity resources by the indigenous communities. The Myanmar government has been developing national policies to provide more scope for community participation in the management of the protected area. In this regard, it is important to understand the traditional interactions between the local communities and their environment – specifically, to know what type and amount of plant resources the local communities have been traditionally using for their subsistence. However, very few studies have documented the contribution of these resources to the sustenance of the livelihood of the local communities. Moreover, this sector has not been given due priority by the government and research institutions. The need to prepare an inventory of key biodiversity resources that are used by the

local community was identified during the HI-LIFE regional consultation in Nay Pyi Taw, Myanmar, in 2018. Accordingly, ICIMOD and its HI-LIFE Myanmar partners – FD and the Wildlife Conservation Society (WCS) – organized an ethnobotanical survey in nine villages on the outskirts of Hponkanrazi Wildlife Sanctuary in Kachin state to understand the extent of plant species used by the local people, and the associated knowledge and management practices.

KEY MESSAGES

Wild and non-cultivated edible plants (WNEPs) – collected from natural and seminatural environments for the purpose of human consumption – have received little attention despite their significant contributions to the sustenance and livelihoods of mountain communities. This paper explores the use of these plant species by local communities in Putao, Myanmar and the associated knowledge and management practices, including the various socio-economic factors that influence their use.

SECTION II

Introduction

Millions of people, particularly the tribal and rural communities living in the mountain regions, collect and consume a wide range of plant resources to meet their food requirements and livelihood needs.

A wide range of WNEPs is used by the local communities in the mountainous rural areas for food, medicine, and spices, as well as for cultural and ritual purposes (Aryal et al. 2018; Kumar et al. 2017; Singh et al. 2016). In this study, we use the term “wild and non-cultivated edible plants” to describe those plant species which are collected from natural and semi-natural environments for the purpose of human use. A 2000 study by Burlingame shows that at least a billion people around the world use WNEPs in various forms. Millions of people, particularly the tribal and rural communities living in the mountain regions, collect and consume a wide range of plant resources to meet their food requirements and livelihood needs (Aryal et al. 2018; Aryal et al. 2013; Dorji 2012; Piya et al. 2011). The local communities collect a number of WNEPs in the form of roots, leaves, fruits, nuts, tender shoots, etc. These collected WNEPs cater to different aspects of rural life: they are a source of food and nutrition; they help in maintenance of health; and they are also a source of income. By way of food, these resources are used in different forms; they are eaten both raw and fried, and are also part of mixed salads, curries, soups, and various other means depending upon people’s preferences and tastes (Akhtar 2001). Further, these plants are important source of energy and micronutrients; they also add to the diversification of human diet (Shin et al. 2018; Powell et al. 2015; Pieroni et al. 2005). They have cultural values too – some are considered sacred and used during religious and cultural events.

In the case of Myanmar, while there are publications on medicinal plants, very few studies have documented and emphasized the importance of traditional medicinal knowledge and its diverse use (DeFilipps and Krupnick 2018; Ong et al. 2017;



Thein Swe and Sein Win 2005). The rapid economic development of Myanmar is likely to have negative implications for the already threatened biodiversity and the human communities that are dependent on such natural resources (Rao et al. 2013). Moreover, WNEPs have received little attention all over the world despite their significant contribution to the sustenance of the livelihoods of mountain communities. Indeed, there have been hardly any studies on WNEPs and their use, and also on traditional knowledge and management practices. And the studies that have been done mostly focused on the inventory of WNEPs and their use for medicinal purposes (Adnan et al. 2012). These plants species have also been neglected in country programmes and policies (Aryal et al. 2018). Hence, this study is designed to understand the extent of use of these plant species by the local communities and to learn more about the associated knowledge and management practices, including understanding the various socio-economic factors that are directly and indirectly influencing the use of such diverse plant species in the study area.

KEY MESSAGES

This study records all plant species used by locals – as part of their diet (curries, vegetables, and spices), as medicine, as crops that generate income, and as plants of special cultural and religious significance. We explore the contributions of WNEPs to human wellbeing: food and nutritional security, social security, income security, and health security among other things.

SECTION III

Theoretical framework of the study

The Myanmar part of the Far Eastern Himalayan landscape is rich in plant resources, and about 200,000 people use WNEPs in various forms for their well-being.

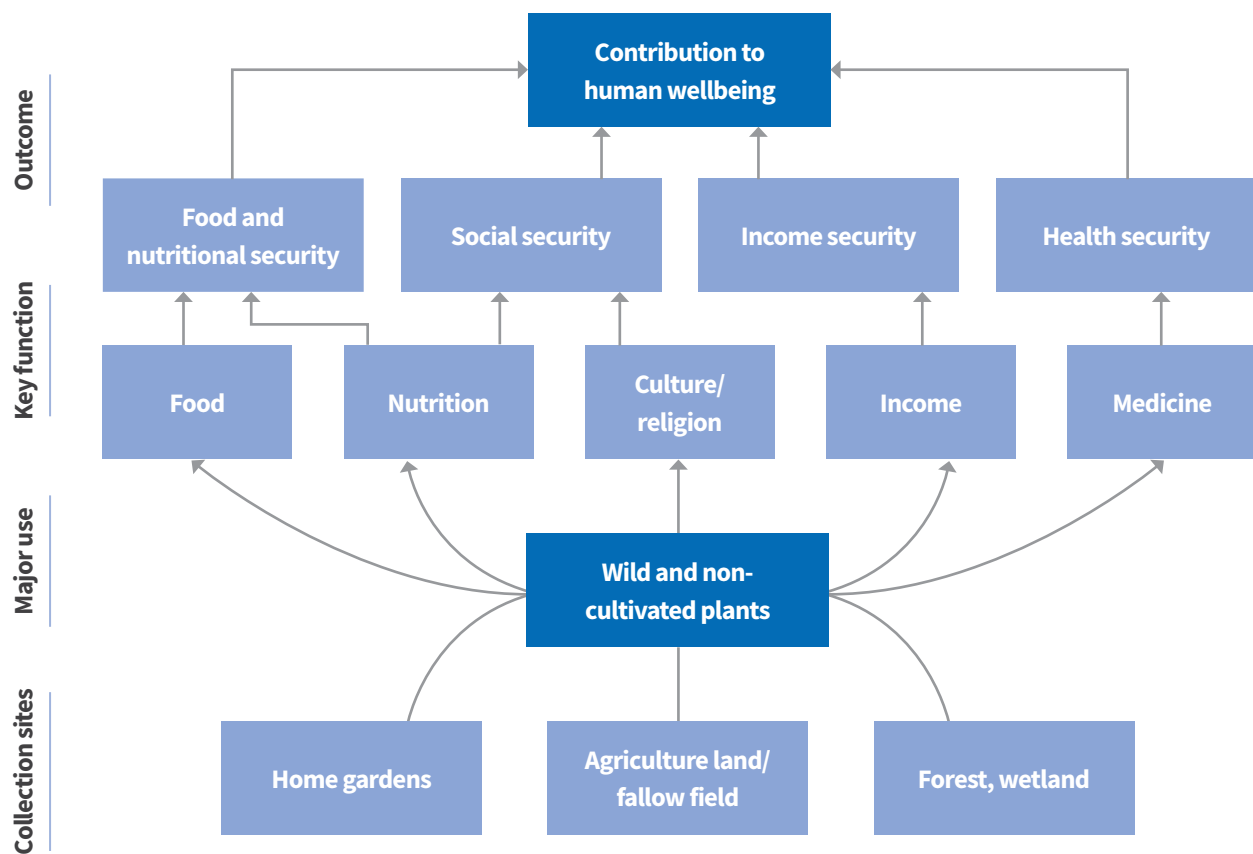
This study is based on the framework presented in Figure 1 and the findings were analysed using this framework. In this paper, wild and non-cultivated edible plants represent plant resources which are harvested or collected for the purpose of human use from natural and semi-natural environments. These resources are crucial for the people of the study area as it has been their tradition to use them for subsistence. During our study, we recorded all those species that are used by the local people for various purposes; these species are part of the local communities' diet (curries, vegetables, and spices); they also have medicinal value; income too is generated from them; moreover, they have a significant role in cultural and religious rituals. These resources are collected from forests, wetlands, agriculture fallows, shifting cultivation areas, and home gardens. The Myanmar part of the Far Eastern Himalayan landscape is rich in these plant resources and about 200,000 people use WNEPs in various forms for their well-being.

3.1 Objective of the study

The main objective of this study was to understand the extent of plant species used by the local communities and to learn more about the associated knowledge and management practices, including understanding the various socio-economic factors that are directly and indirectly influencing the use of WNEPs.



FIGURE 1 THE MULTIFUNCTIONAL ROLE OF WILD AND NON-CULTIVATED PLANTS



Source: adapted and modified from (Ogle et al. 2001)

KEY MESSAGES

The study was conducted in nine villages in the vicinity of Hponkanrazi Wildlife Sanctuary, Putao. The total number of households at the study site was 201. The population numbered 1,125, and comprised of individuals belonging to the Rawang and Lisu ethnic communities.

SECTION IV

Materials and methods

Our survey mainly focused on identifying the key plant resources used, their use patterns, and the degree of dependence on them for livelihood.

4.1 Study area

The study was conducted in nine villages in the vicinity of Hponkanrazi Wildlife Sanctuary, Putao (Figure 2). The villages are accessible by vehicles only during winter, summer and spring season except the monsoons. During the monsoon season the muddy road is blocked in several places due to landslides and sleeper road due to heavy rainfall. The total number of HHs at the study site was 201. It hosts a small population of 1,125 people belonging to the Rawang and Lisu ethnic communities. A brief information on each village is presented in Table 1.

4.2 Methodology

Quantitative and qualitative primary data were collected using a range of participatory tools; this was followed by a household survey and rapid diversity assessments through collection and display of the plant species available in the villages. A concept note had been prepared, involving research methodology, HH survey questionnaire, and checklist for FDGs and key informant interviews. This was shared with the partners in advance. A two-day orientation training programme was also held, followed by field exercises on participatory tools and techniques for the research team. These were organized in collaboration with the FD and the WCS of Myanmar. The training aimed at a standard, comparable, and consistent methodology to ensure common understanding and harmonization among the partners and the participants. It helped the participants to understand the importance of an ethnobotanical survey and about the use of various tools and techniques in PRA. The theory sessions focused on the conceptual framework of WNEPs and their contribution to sustenance of livelihood; they dealt with the management of these resources for

FIGURE 2

LOCATION MAP OF THE STUDY SITE

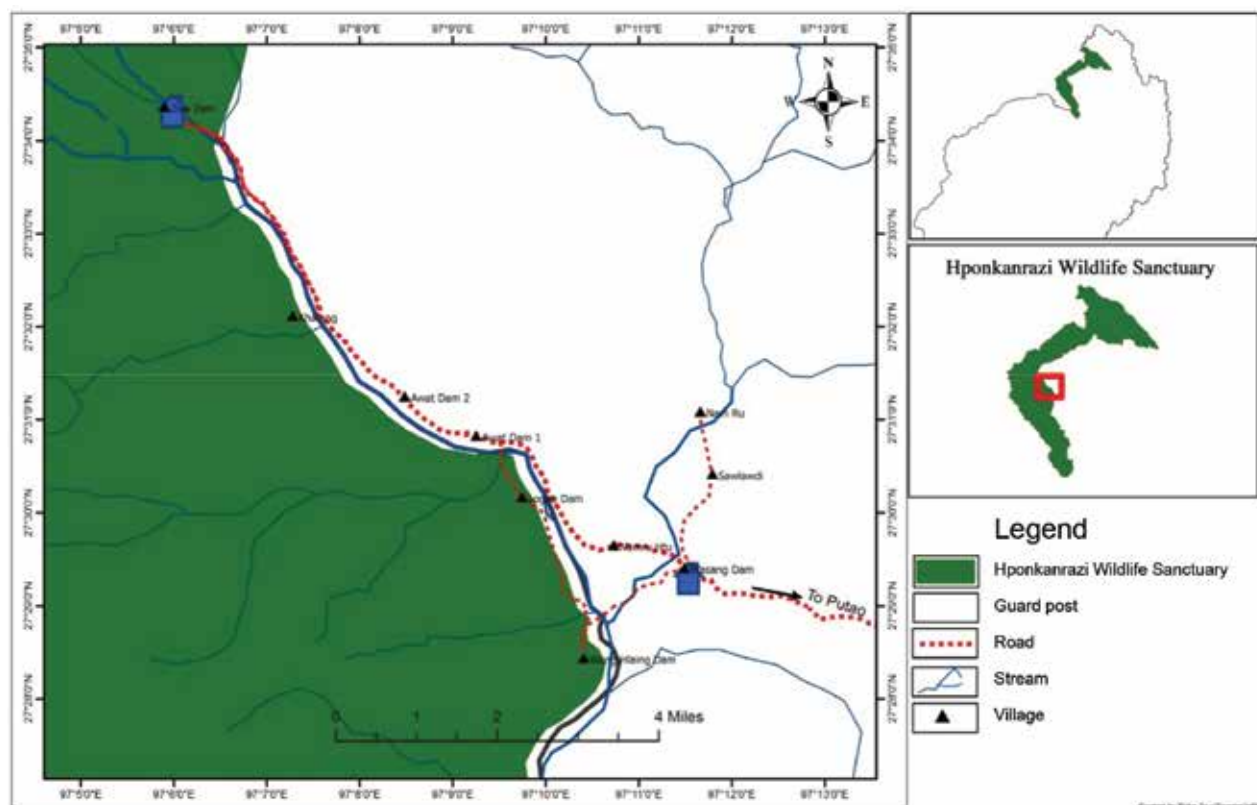


TABLE 1

SOCIO-ECONOMIC PROFILE OF THE STUDY VILLAGES

SN	Village	Total HHs	Population	Main ethnic group	Key occupations	Remarks
1	Wa San Dam	21	114	Rawang	Agriculture	Entry point to Hponkanrazi
2	NamruHtu	8	48	Lisu and Rawang	Agriculture, NTFP collection, and fishing	Village located between two streams, Namro and Mular
3	Namro	8	41	Rawang	Agriculture, NTFP collection	One of the oldest villages
4	Sawlawdi	8	49	Lisu	Agriculture, NTFP collection	Village located between Wa San Dam and Namro
5	Wang Hlaing Dam	18	95	Rawang	Agriculture, NTFP collection, fishing, hunting, and handicraft	Community people are highly dependent on natural resources for their livelihood
6	Longna Dam	25	148	Rawang and Lisu	Agriculture, NTFP collection, and walnut farming and collection	Walnut is cultivated as a commercial crop
7	Awa Dam	59	300	Rawang and Lisu	Agriculture and NTFP collection	Most populated village among the nine
8	Khalan	33	180	Rawang and Lisu	Walnut collection and agriculture	One of the oldest village and mixed ethnic representation
9	Ziya Dam	21	150	Rawang and Lisu	Agriculture, NTFP collection, and tourism	Last village on the track and located at the entrance to Hponkanrazi Wildlife Sanctuary
10	Total	201	1,125			



sustainable services; they also dwelt on why and how to extract useful data. Further, the theory sessions also shed light on the importance of quantitative data in assessing plant resources. As for the session on community-based PRA, the following topics were discussed: concept, opportunities, and challenges; as well as the enumerators' role in effective data collection. For the field exercises, the key PRA tools and techniques, specifically FGDs, resource mapping, mobility map, seasonal calendar, four-quadrant analysis, and pair-wise ranking were discussed.

Furthermore, the team discussed in detail each and every question in the questionnaire as well as the contents of the checklist, and revised them accordingly. The revised questionnaire was then tested, reviewed, and translated into Burmese language for the field survey. Besides, checklists for group discussions and inventory formats were discussed and finalized. A rapid market assessment in Putao was also carried out to explore the diversity of the plant species that are brought into the local market from the wild and non-cultivated sector.

Following the training, various participatory tools were used to identify the plant species used at the HH level as well as those having diverse uses, in each of the nine villages. The team, along with the resource persons, visited each village to identify the plant resources that are being used by the communities; they went around the study villages and nearby wetlands, forests, and agricultural fields to make a detailed inventory. Those species which could not be identified during the visit were photographed. Their

herbarium specimens were then taken to the Forest Research Institute for taxonomic identification and validation.

Overall, nine FGDs – one in each village with 7–11 participants – were organized. The FGDs were conducted in small groups and the participants were split based on their profession, education, age group, and sex; in this regard, well-being and social status were also part of the criteria. Some of the key topics that were discussed and documented were: information on farming system; major sources of livelihoods and income for the local communities; the number and types of wild and non-cultivated edible plant species and their use; and the conservation and management practices pertaining to these species. Every evening, the team sat and discussed and summarized the key achievements of the day and a summary note was prepared. Before leaving each village, the team members also cross-checked each other's work for missing information as well as to render the information clearer.

The HH survey was conducted in about 50 per cent of the HHs in the villages (96 HHs out of 201). All the nine villages were part of the HH survey and sample populations were drawn from each village using a stratified random sampling technique; and these HHs were interviewed via semi-structured questionnaires. The survey mainly focused on identifying the key plant resources that the HHs used, their use patterns, and the degree of dependence on them for livelihood. It also looked at the potential drivers of change and their role in the management of these species.

KEY MESSAGES

Public awareness levels must be raised and effective community-based management practices need to be encouraged in order to understand the diverse use value of WNEPs and their importance in the conservation of the traditional knowledge of the indigenous communities.

SECTION V

Results

A diverse range of wild vegetables contributes significantly to enhancing the food security and nutritional needs of the local communities.

5.1 An overview of the socio-economic features

Table 2 presents information on the educational status, family size, food sufficiency level, occupation, and income sources of the surveyed HHs. The mean age of the respondents was 31 years – the youngest 15 and the oldest 100. The average HH size is 5.6 persons per HH. In general, the literacy rate is very low in all the villages. There are only four primary schools and two middle schools in these nine villages, and only two public clinics. For higher education, the students

TABLE 2

OVERVIEW OF THE SOCIO-ECONOMIC FEATURES OF THE SURVEYED HHS

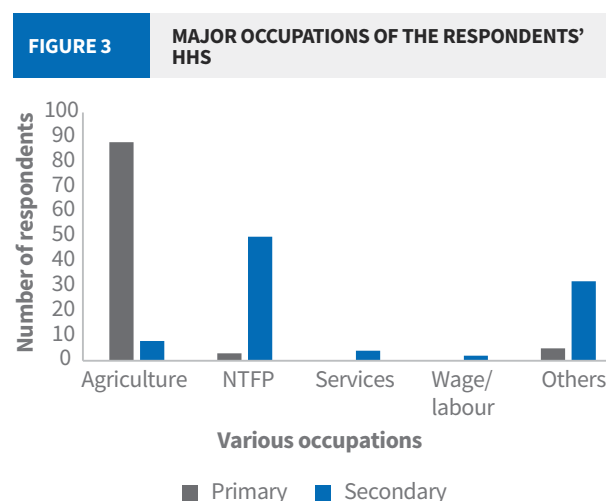
Key features	Number of respondents
Sex	
Male	37 (39%)
Female	59 (61%)
Age Group	
15–35 years	46 (48%)
36–55 years	32 (33%)
56–75 years	14 (15%)
76–100 years	4 (4%)
Average HH size	5.6
Schools	
Primary school	4
Middle school	2
Public clinic	2
Food sufficiency (self-grown food)	
Sufficient	59 (61%)
Not sufficient	37 (39%)

go to Putao and Myitkyina. As for routine medical care, the people go to Awa Dam or Khalan villages, while for bigger medical procedures, they have to go to the hospitals in Putao or Myitkyina.

The people of these nine villages migrate seasonally several times a year for the cash income in the town and to take up seasonal jobs. Mostly, they collect NTFPs from the adjoining state forest, the ice-capped Hponkanrazi Mountain, and even reach up to the border area, and then sell these products in Putao. They also depend on the Mu Lar River for fishing. As for grocery, they get it from Wa San Dam or Awa Dam villages, and sometimes even procure it from Putao. As regards job opportunities, the villagers go to places such as Myitkyina, Phar Kant, and Tanai. They also leave their villages for meetings, trainings, business purposes, and to pursue non-farming careers; for these, they go to places like Putao, Myitkyina, and Yangon, and even abroad, to Chiang Mai (Thailand) and Canada. As the Upper Shan Gaung villages are tourist areas with their ice-capped peaks, these villagers also work there as porters. Then there are some villagers who travel to Putao and Myitkyina to sell walnuts.

5.2 Occupation and income

Agriculture is the main source of livelihood for the majority of the households in all the study areas – 92 per cent of the respondents stated that agriculture is the most important primary occupation, while 48 per cent said that NTFP collection is the largest secondary occupation (Figure 3). Even so, their



agricultural produce is only sufficient for 61 per cent of the HHs throughout the year. The rest of the HHs have to depend on NTFP collection and other income-generating options such as selling walnuts and local handicrafts; they also engage in tourism-related services (porter, chef, tourist guide) as well as fishing and hunting during the food-deficit months.

For cash income, the local communities depend mainly on the sale of species such as sachi (*Paris polyphylla*), Ling-zhi mould (*Ganoderma* spp.), and shee pa di (*Ophiocordyceps sinensis*). Respondents from eight out of the nine villages mentioned that sachi is the major NTFP which is collected and traded for cash (Table 3). Besides, livestock, *Ophiocordyceps*, and paddy are the other sources of income for the local communities. Interestingly, Ziya Dam villagers informed that *Ophiocordyceps sinensis* is the primary source of income, followed by walnut and sachi.

TABLE 3

KEY SOURCES OF INCOME IN THE STUDY VILLAGES (1 IS HIGHEST RANKING)

Villages	Paris spp.	Live-stock	Paddy	Ophio-cordyceps	Vege-table	Handi-crafts	Fish-ing	Hunt-ing	Porter	Ganoderma spp.	Pepper	Walnut
War San Dam	1	2	3	4	5	0	0	0	0	0	0	0
NamruHtu	1	2	4	0	5	3	0	0	0	0	0	0
Namro	1	2	3	0	4	0	0	0	0	0	0	0
Sawlawdi	1	2	0	3	4	0	0	0	0	0	0	0
Wang Hlaing Dam	1	3	0	4	0	0	2	5	0	0	0	0
Longna Dam	1	0	0	0	0	0	2	3	4	0	0	0
Awa Dam	1	4	3	5	0	0	0	0	0	2	0	0
Khalan	1	4	0	2	0	0	0	0	0	0	5	3
Ziya Dam	3	0	0	1	0	0	0	0	5	0	4	2

5.3 Brief information about some of the key species that are used as income sources in the villages

Sachi (*Paris polyphylla*): One of the key species collected and traded by over 50 per cent of the HHs in almost all the villages except Ziya Dam. All the HHs in two villages (NamruHtu and Sawlaudi) depend on sachi for their main source of income. It has a high market demand, especially in China. The price of one viss (1.6 kg) dried sachi rhizome is around MMK 300,000. On an average, the majority of the HHs collect at least two visses of sachi a year worth around MMK 600,000. During the FGD, the villagers reported that the population of this species in the wild has been declining over the years. This they attribute to unhealthy competition among the collectors and overharvesting due to the high price. This is an offshoot of lack of knowledge about sustainable harvesting techniques and the prevalence of sachi's illegal trade in China.

Ling zhi mould (*Ganoderma* spp.): This species is used for medicinal purposes and has a high demand in the Chinese market. It is found on the higher branches of trees and is rather difficult to collect. The price of one viss of Ling-zhi mould is MMK 200,000.

Shee pa di (*Ophiocordyceps sinensis*): The *Ophiocordyceps* in this region are found in two diverse geographical terrains: ice-capped mountain and in flat lands. The *Ophiocordyceps* from the mountain fetch more price than those from the lowlands. The mountain ones are collected from May to July, and the lowland ones from January to April. The market for this species is China. One viss of mountain *Ophiocordyceps* can fetch MMK 10 million in the Chinese market, while the same amount of lowland *Ophiocordyceps* fetches only MMK 2.5–3 million.

Walnut: Around 25 per cent of the HHs depend on walnut for their major source of income. But in the Khar Lang villages, over 65 per cent of the HHs depend on walnut. In Putao, 10 walnuts can generate MMK 1,500. One walnut tree can generate around MMK 150,000 in a year.

5.4 Major cultivated crops

A wide range of cereals, vegetables, pulses, and fruits is grown in the study villages (Figure 4). Paddy and maize are the major cereal crops grown by 90 per cent of the HHs. Paddy is grown in all the nine villages in irrigated as well as upland fields (i.e. in shifting cultivation plots). The survey revealed that about 30 varieties of paddy are cultivated in the study villages. In the case of upland paddy, as many as 10 varieties are grown via the slash-and-burn method. However, only a few varieties are cultivated in individual farms; mostly, these varieties are khaw ma yo, am yan, moe zay, hti none, and am hal (local names), and they are cultivated in a large area. Some of the households produce surplus paddy, but due to the difficulty in transporting it to Putao, they sell or exchange it at the local level.

The figure of 30 varieties being grown in the study villages, however, has been showing a decline in recent times due to low yield and sparse availability of irrigated land. During the survey, the highest diversity of irrigated paddy was reported in NamruHtu and Longna Dam villages (eight), followed by Khalan and Wang Hlaing Dam villages (six varieties each, Figure 5). Apart from the irrigated paddy, the farmers of six villages, except of Awa Dam, Khalan and Sawlawdi, grow up to four varieties of upland paddy, particularly in shifting cultivation fields (Figure 5).

In the case of vegetables, a diverse variety is grown in these villages. NamruHtu reported the highest variety (18 species), followed by Ziya Dam (17 species, Figure 6). The major vegetables cultivated are: cauliflower, cabbage, brinjal, pumpkin, pea, tomato, radish, bitter gourd, and taro.

FIGURE 4

MAJOR CROPS GROWN IN THE STUDY VILLAGES
(TOTAL NO. OF HHS SURVEYED: 96)

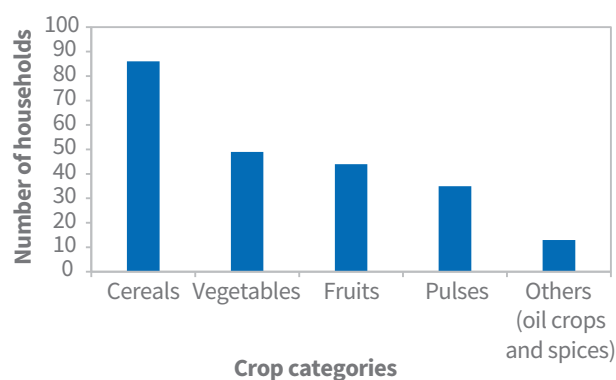


FIGURE 5

NUMBER OF RICE VARIETIES GROWN IN THE STUDY VILLAGES

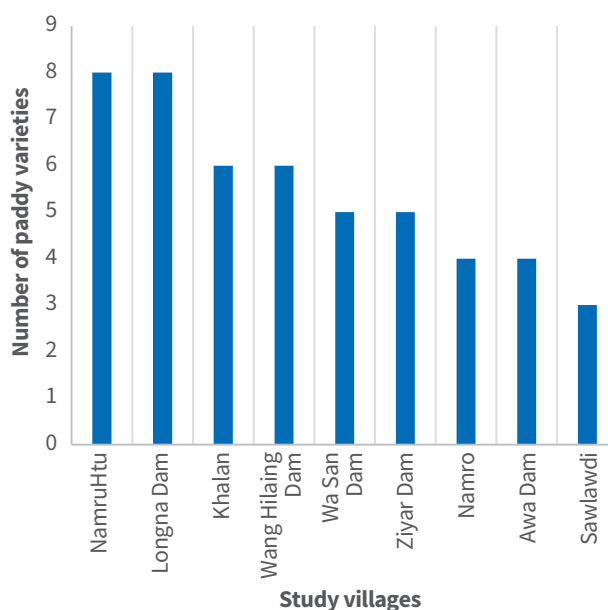


FIGURE 6

NUMBER OF CULTIVATED VEGETABLES IN THE STUDY VILLAGES

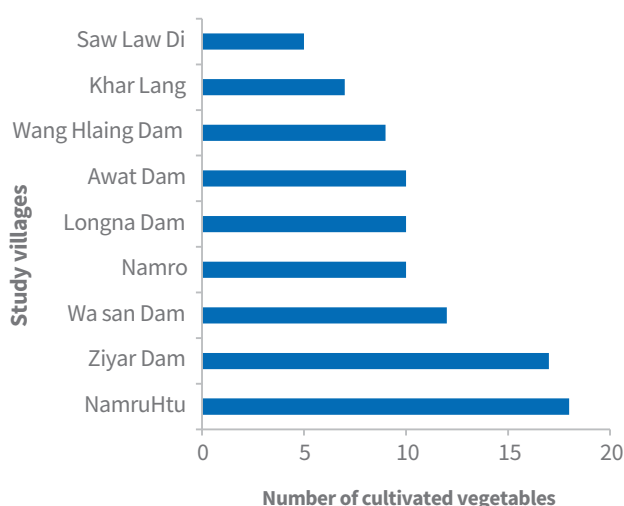
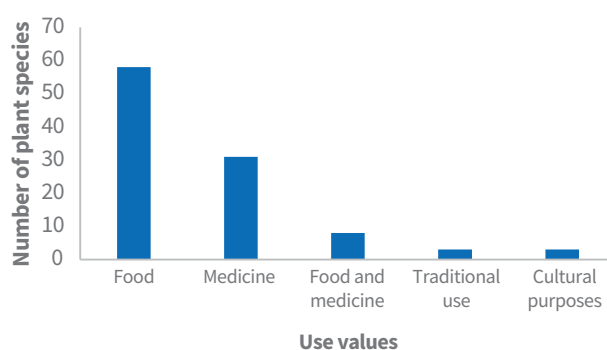


FIGURE 7

RICHNESS OF WNEPs AND THE MAJOR USE CATEGORIES



5.5 Richness of wild and non-cultivated edible plants

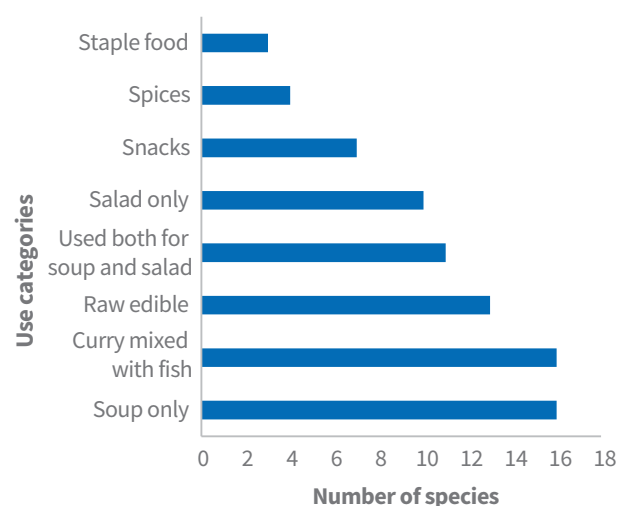
A total of 103 wild and non-cultivated edible plant species have been documented from the study villages (Annex 1). The greatest richness of these species is found in the state forest and Hponkanrazi Wildlife Sanctuary. For generations, these resources have been food and medicine for the local communities, not to mention the cultural and income value of these plants. Largely (58 per cent), these plants serve as food sources, while their use as medicines and for medicinal sale come to around 30 per cent (Figure 7).

5.6 Use of WNEPs

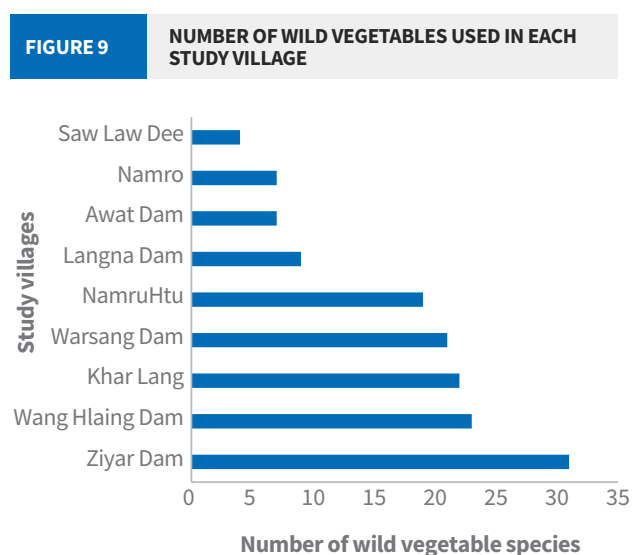
The knowledge that the local communities possess about WNEPs is what makes them put these plants to use in their daily lives. These communities collect various parts of these plants like roots, leaves, fruits, nuts, and flowers, as well as whole plants not only for daily use but also preserve them for the future. The 58 species that are used as food are part of different dishes. In Myanmar, soup is an integral item of cuisine and as many as 16 WNEPs make for different soups, while 10 of these species are used only in salads (Figure 8). In the case of curries too, 16 WNEPs are used, mixed with fish. But very few of these species – only three of them – are part of the staple diet. As for WNEPs as spices, only four of them are part of this category (More details on these spices are presented in Annex 1.)

FIGURE 8

DIFFERENT USE VALUES OF WNEPs UNDER FOOD CATEGORIES



A diverse range of wild vegetables contributes significantly to enhancing the food security and nutritional needs of the local communities. In Ziya Dam, the villagers use as many as 31 species as vegetables, while those in Wang Hlaing Dam, use 23 species to fulfil their vegetable needs (Figure 9). Indeed, these wild plant species are part of the staple diet in all the nine villages. The most frequently collected species are: *Dryopteris cochleata* D. Don; *Dioscorea bulbifera* L.; *Celastrus paniculatus* Willd.; *Polygonum perfoliatum* L.; and *Houttuynia cordata* Thunb.



None of the surveyed households in the nine villages need to buy any vegetables and their daily needs are provided for by the wild species or by the cultivated ones. While the women in these communities mostly collect mushrooms and leafy vegetables from the nearby forest, the men collect vegetables from remote areas.

The WNEPs also play a major role in healthcare (Annex 1). A wide range of health-related problems are first treated in the village itself and only when the traditional care treatment is found inadequate do the villagers go to Putao. The number of medicinal plant species in these villages range from 2 to 16. In Ziya Dam, the villagers use 16 species for medicinal purposes, while only two are used for a similar purpose in in Awa Dam. Some of the species that are commonly used as medicines are listed in Table 4. Usually, these plant-based medicines are prescribed by the local healers. Generally, different plant parts (root, stem, bark, leaf, fruit, seed, etc.) are made into juice, paste, infusion, or powder.

TABLE 4 IMPORTANT MEDICINAL PLANTS USED BY THE LOCAL COMMUNITIES				
Local name	Scientific name	Family	Parts used	Main usage
Sha-maw	<i>Artemisia vulgaris</i> L.	Asteraceae	Leaf	For cough and nosebleed
Ta-chup-pa-zi	<i>Radermachera</i> sp.	Bignoniaceae	Leaf	Used as balm
Cha-ze	<i>Embelia parviflora</i> Wall. ex A. DC.	Myrsinaceae	Leaf	For clearing throat /voice
Zima-sa-yone-see	<i>Lophatherum gracile</i> Brongn.	Gramineae	Tuber	For urinary diseases
Jin-phit	<i>Phoebe nanmu</i> (Oliv.) Gamble	Lauraceae	Leaf and flower	To treat menstrual conditions after childbirth
Sha-zee	<i>Piper semiimmersum</i> C. DC.	Piperaceae	Leaf	Coughing, asthma and sneezing. Administered with boiled water mixed with ginger or directly applied on the body
Phat-kha	<i>Clerodendrum colebrookianum</i> Walp.	Verbenaceae	Flower	To treat dysentery
Kyaung-pyan	<i>Osmanthus suavis</i> King ex C. B. Clarke in Hook. f.	Oleaceae	Aerial root	Used together with honey and alcohol as tonic for men
Chone	<i>Urena lobata</i> Linn.	Malvaceae	Leaf and petiole	To stop bleeding in cut wounds
Lan-dam	<i>Cycas</i> sp.	Cycadaceae	Leaf	For cough, and asthma, and as an astringent



5.7 Rapid market survey

A rapid market assessment was carried out in the local market of Putao. The survey recorded 112 crop/plant varieties in the market. They included leafy vegetables – cultivated (18) and wild and non-cultivated (40) – fruits (14), beans (9), spices (11), root crops (10), and staples (10) such as rice, maize, and buckwheat.

5.8 Conservation and management practices, and key challenges

In terms of food security, the study villages are self-sufficient. However, cash income is the worrying aspect. The villagers need to almost exclusively depend on collection of NTFPs for cash. The FGDs and household survey indicated that the availability of WNEPs has been on the decline over the last two decades. More than 70 per cent of the informants stated that this was largely due to depletion of natural vegetation caused by uncontrolled harvesting as well as the heavy dependence of the local communities on these resources.

It became clear during the study that the farmers are aware about the management and utilization practices of WNEPs. About 75 per cent of the respondents reported that they are involved in managing the important WNEP species population. In this regard, the farmers have generally been adopting in situ techniques to conserve these species. Another approach that they have been taking – as reported

by 12 per cent of the respondents – is domestication. During the discussions related to the facilitation of sustainable use of WNEPs, the participants identified two major factors – 17 per cent of the respondents called for increasing the awareness levels of collectors on sustainable harvesting, while 36 per cent suggested regulated restrictions on the use of these plant resources. A few of them sought technical solutions on this matter as well as better cooperation among HHs. From the key informants interviews and group discussions, it was clear that the government should facilitate participatory natural resources management programmes and draft better management plans.

Among the alternative options that were mooted during the discussions was tourism and the business opportunities that it would bring along. But it was emphasized that this should specifically benefit the local communities. In this regard, it was felt that the promotion of home stay would boost the tourism and business prospects of the region. But as things stand, while international tourism is still at its fledgling state in the area, domestic tourism too has not been really beneficial to the local communities as most domestic tourists bring in their own food and porters. Another opportunity that was discussed was the domestication and commercial cultivation of sachi involving proper techniques. Presently, the participants said, the haphazard and unregulated harvesting of sachi – in order to cater to its high demand, especially in the Chinese market – even in the areas beyond the nine villages is posing a grave threat to this important medicinal plant.

KEY MESSAGES

Public awareness levels must be raised and effective community-based management practices need to be encouraged in order to understand the diverse use value of WNEPs and their importance in the conservation of the traditional knowledge of the indigenous communities.

SECTION VI

Discussions and conclusion

The challenge for both the local communities and the government lies in the conservation and sustainable use of WNEPs, a valuable natural resource.

The communities in the study sites depend on multiple sources to sustain their livelihood. Among them, agriculture is the main source, followed by the collection of WNEPs. Altogether, 103 WNEP species are utilized in these villages and they are put to multiple use. While a number of studies by several authors have documented the diverse range of WNEP species and their use in different parts of the Himalayan region, most of them have not assessed the status, availability, consumption patterns, and local management practices. For example, Aryal et al. (2018) have documented 99 WNEPs used in Nepal's Darchula district, while Shin et al. (2018) have documented 83 WNEPs used in the southern Shan state in Myanmar.

The WNEPs contribute significantly to the local people's livelihood in all the nine study villages, especially in terms of providing food and nutritional security, medicines and healthcare, and generating cash income. For generations, the people in these villages have been using these wild plants for both vegetable and primary healthcare purposes. In the eastern Himalayas, such plant species have been documented for their multiple use values (Aryal et al. 2018; DeFilipps and Krupnick 2018; Dorji 2012; Akhtar 2001). In Myanmar, the production of traditional medicines from plant extracts is widely practiced, particularly in the rural areas as an alternative to modern medicine (Aung et al. 2016; Thein Swe and Sein Win 2005). However, a detailed study on their use and curative power is yet to be conducted properly. Meanwhile, the analyses of the use patterns of these wild plants – both as food and medicine – shows that there is a growing pressure on these species. In the immediate context, the challenge for both the local communities and the government lies in the

conservation and sustainable use of this valuable natural resource.

Recent and past studies on WNEPs remain inadequate, particularly in the case of Myanmar (Kyaw et al. 2018; DeFilipps and Krupnick, 2018; Ong et al. 2017; Thein Swe and Sein Win, 2005). The present study shows that the people in all the nine villages have been using WNEP resources for generations and that the current trends in the harvesting of some of the species that are in high demand in the market are not sustainable and might impact their availability in the future. In order to conserve and sustainably manage these resources, an integrated approach has to be pursued with focus on both in situ conservation and domestication, and supplemented by coordinated efforts from different sectors – forest, wildlife, tourism, agriculture, culture, defence, commerce, and so on.

The findings suggest that:

- i) Public awareness levels must be raised and effective community-based management practices need to be encouraged in order to understand the diverse use value of WNEPs and their importance in the conservation of the traditional knowledge of the indigenous communities.
- ii) Further investigation is required into population dynamics, distribution, and the economic valuation of key WNEP that are in high demand in the market, such as sachi; this will help in defining strategies for sustainable use.
- iii) Nutritional and pharmacological investigation of wild vegetables and medicinal plants ought to be carried out so that these can be promoted as next-generation food crops and as organic and nutrition-rich crops.
- iv) Participatory community-based conservation and management programmes as well as capacity building packages should be developed for in situ conservation of WNEPs.
- v) The capacity of the communities ought to be strengthened in order to efficiently domesticate the WNEPs that are in high demand in the market; here, the focus should be on sustaining the livelihoods of both communities and stakeholders along the value chain, as well as protecting the species in the wild.
- vi) Alternative conservation-friendly livelihood opportunities and options need to be explored so that those livelihoods that are dependent on natural resources are minimized or complemented. Promoting community-based ecotourism can help in the protection and sustainable use of local resources – both biological and sociocultural – as well as generate income for the communities.
- vii) The respondents stated that there are opportunities to collect and sell WNEPs to neighbouring countries, especially India and China. Therefore, it is essential to strengthen regional cooperation in order to minimize both inequitable sharing of benefits and illegal trade across borders; unregulated collection and harvesting too must be stopped.
- viii) The Government of Myanmar needs to work with communities to define clearly the rules and policies regarding the management of WNEPs and their sustainable use. It has to explain explicitly on the following counts:
 - Whether the collection of (a certain species) is allowed.
 - Whether trade in (certain species) is allowed.
 - If allowed, where can the collection be done? Who can do the collection?
 - How is collection to be monitored? What government-/community-based mechanism is needed to ensure regulated collection?
 - How can harvesting of WNEPs comply with the protected area management plan?
 - What value chain provisions and access and benefit-sharing mechanism are necessary?
 - How can trade between countries be regulated? What transboundary mechanisms or bilateral mechanisms need to be strengthened?
 - What risk mitigation mechanisms have to be ensured – for example, to deal with fluctuation in market price or loss of WNEPs due to a natural disaster?
 - In order to strike a balance between the availability of important WNEPs and their utilization for livelihood and income generation by the communities, what investment, infrastructure, and capacities are needed for possible domestication?

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Annex

Annex 1: List of wild non-cultivated plant species used by the communities

No.	Local name	Other name	Scientific name	Function	Usage/Preparation method	Method of processing	Used part
1	Tashi-ta-chup			Medicine	Tuber crushed and mixed with water to treat persons affected by witchcraft and possession	Fresh	Tuber
2	Taw-chin-baung		<i>Begonia</i> sp.	Food	Soup, mixed with fish	Fresh	Aerial parts
3	Pa-sit			Food	Mixed and cooked with fish	Fresh	Leaf
4	Pann-u		<i>Canna indica</i> L.	Food (Staple)	Traditional diet of boiled tubers	Fresh	Tuber
5	Thway-thee			Food	Eaten raw	Fresh	Fruit
6	Sha-maw		<i>Artemisia vulgaris</i> L. (Asteraceae)	Medicine	For cough and nosebleed	Fresh	Leaf
7	Pan-sout-ntoe		<i>Crassocephalum crepidioides</i> (Benth.) S. Moore	Food	Eaten raw, and in soup and salad	Fresh	Shoot
8	Nga-nyi		<i>Houttuynia cordata</i> Thunb.	Food	Salad; also in curry	Fresh	Leaf
9	Da-yin-kauk			Food	Salad and soup	Fresh	Leaf and shoot
10	Ta-chup-pa-zi			Medicine	Balm	Fresh	Leaf
11	Thapyay-thee			Food	Eaten raw	Fresh	Fruit
12	In-zun	Thin-gan		Food	Salad and soup	Fresh	Shoot
13	Ran-don			Food	Salad and soup	Fresh	Shoot
14	Pu-si-nam	Meant		Food	Ingredient in curry and salad	Fresh	Leaf
15	Phat-kha	Ka-dat-khaing	<i>Clerodendrum</i> sp.	Both food and medicine	Leaf used in soups, and flower for treating dysentery	Both fresh and dried	Leaf and flower
16	Sha-ri		<i>Fagopyrum</i> sp.	Food	Salad and soup	Fresh	Shoot
17	Gyi-lee		<i>Solanum nigrum</i> L. (Solanaceae)	Food	Soup	Fresh	Shoot
18	Sa-nar-ni		<i>Diospyros kaki</i> L.f.	Food	In toast and eaten raw	Fresh	Fruit
19	Kyaung-pyan			Medicine	Used together with honey and alcohol as a tonic for men	Dried	Aerial root

No.	Local name	Other name	Scientific name	Function	Usage/Preparation method	Method of processing	Used part
20	Htan-si		<i>Saurauia</i> sp.	Food	Eaten raw	Fresh	Fruit
21	Taw-nyote-kaung	Wild pepper	<i>Zanthoxylum</i> sp.	Both food and medicine	As spice and to treat flatulence	Both fresh and dried	Seed and leaf
22	Lann-nyit		<i>Polygonum perfoliatum</i> L.	Food	Cooked with fish	Fresh	Whole plant
23	Kan-sin			Food	Soup, salad, and as vegetable	Fresh	Shoot
24	Nga-u-war		<i>Rubus ellipticus</i> var. <i>obcordatus</i> (Franch.) Focke	Food	Snack	Fresh	Fruit
25	Nga-u-ni		<i>Rubus</i> sp.	Food	Snack	Fresh	Fruit
26	Pham-hee-khan-set			Both food and medicine	The leafy parts are used in curry and the heartwood is used to treat diabetes	Both fresh and dried	Shoot and heartwood
27	Sha-phal-kham		<i>Piper</i> sp.	Food	Soup	Fresh	Shoot
28	Hinn-hmwe		<i>Celastrus paniculatus</i> Willd.	Food	Put in meat curry	Fresh	Leaf
29	Tha-di-ya			Food	Soup, salad, and fried	Fresh	Leaf
30	Gon-min			Food	Soup and made into a paste with other ingredients	Fresh	Stem
31	Sha-wel		<i>Curculigo orchiooides</i> Gaertn. (Hypoxidaceae)	Food	Boiled	Fresh	Tuber
32	Sa-mu		<i>Erigeron</i> sp.	Food	Salad and soup	Fresh	Leaf
33	Taw-shout		<i>Cirtus</i> sp.	Both food and medicine	Salad and eaten raw	Fresh	Shoot and fruit
34	Mote-soe-ma-kyein			Food	Soup	Fresh	Bud
35	Dat-pon-set			Medicine	Mineral water from leaf	Fresh	Leaf
36	Ta-chone-shee			Food	Eaten raw	Fresh	Fruit
37	Ma-nu-set			Food	Soup and salad	Fresh	Leaf
38	Pa-hee-ma-nu	Oak-shit-new	<i>Acanthopanax</i> sp.	Food	Salad and eaten raw	Fresh	Leaf
39	Kham-phale-phan-hee			Food	Soup and curry	Fresh	Bud
40	Kat-kyay-kite			Medicine	Tonic, put in alcohol	Both fresh and dried	Root
41	Sha-Pe		<i>Ficus</i> sp.	Food	Salad and soup	Fresh	Leaf
42	War-myt			Food	Soup and eaten in paste form	Fresh	Stem
43	Sha-phi-za			Both food and fodder	Soup and salad	Fresh	Shoot

No.	Local name	Other name	Scientific name	Function	Usage/Preparation method	Method of processing	Used part
44	Kar-mee-kar-see			Food	Eaten raw	Fresh	Fruit
45	See-see-si-si			Medicine	Used to treat diabetes	Fresh	Fruit and leaf
46	Cha-mar-gyi		<i>Rhus chinensis</i> Mill.	Food	Fruit is used as a vegetable and in soup	Fresh	Fruit
47	E-gee			Food	Gives a sour taste to curry	Fresh	Leaf
48	Nar-du		<i>Dioscorea</i> spp.	Food	Tuber is boiled and used to make soup	Fresh	Tuber and fruit
49	Ar-ya-ze-kwe			Medicine	Used to treat stomach pain	Fresh	Fruit
50	A-chin-ywet			Food	Cooked with fish	Fresh	Leaf
51	War-per			Both as food and for HH purposes	Used in making mattress; and shoot are used to cook	Both fresh and dried	Shoot and stem
52	Htan-bri			Medicine	Mineral water from dried root powder is used to treat abdominal pain and flatulence	Dried	Root
53	A-rain-kha	Sin-tone -ma-new		Medicine	Sneeze, cough, and diarrhoea	Both fresh and dried	Root and stem
54	Mai-rein-shee		<i>Myrica</i> sp.	Food	Eaten as fruit when ripe; used in soups when sour	Fresh	Fruit
55	Nga-yoe-ywet			Both as medicine and for ornamental purpose	The tuber is eaten raw to reduce hypertension, while the leaf is used for decoration	Fresh	Tuber and leaf
56	Cha-ze		<i>Embelia parviflora</i> Wall. ex A. DC.	Medicine	Used to treat throat problem	Fresh	Leaf
57	Sar-chi		<i>Paris polyphylla</i> (Trilliaceae)	medicine	Collected for selling as medicine	Dried	Tuber
58	U-hlaing		<i>Korthasia laciniosa</i> (Griff.) Mart. (Arecaceae)	Food	Snack	Fresh	Heartwood
59	Zima-sa-yone-see		<i>Lophatherum gracile</i> Brongn.	Medicine	Used to treat urinary disease	Fresh	Tuber
60	Zone-min		<i>Litsea</i> sp.	Food	As spice and mixed with chilli paste	Fresh	Fruit and bark
61	Naing-lun			Food	Eaten raw	Fresh	Fruit
62	Sana-khan-let			Food	Salad and soup	Fresh	Shoot
63	Jin-phit			Medicine	Used to treat menstrual conditions	Fresh	Flower and leaf
64	Mar-phala			Both food and medicine	Salad and soup; and medicine for piles	Fresh	Aerial parts
65	Khar-li-ta-pin-let			Medicine	Heated green leaves placed on the wrist to treat malaria	Fresh	Leaf

No.	Local name	Other name	Scientific name	Function	Usage/Preparation method	Method of processing	Used part
66	Khar-lun-pa-htein		<i>Maesa</i> sp.	Food	Soup and salad	Fresh	Leaf
67	Pha-man			Food	Fermented; used in salad	Fresh	Fruit
68	Ya-naing		<i>Ficus</i> sp.	Food	Salad and soup	Fresh	Shoot
69	Ma-htu-zi			Medicine	Used as antidote for insect sting and snakebite	Fresh	Whole plant
70	Lat-tha-kha/Set-tha-kha			Medicine	Diarrhoea and dysentery	Fresh	Leaf
71	Sa-mu		<i>Eurya acuminata</i>	Food	Curry	Fresh	Shoot
72	Htam-sit			Food	Staple food	Fresh	Tuber
73	Sha-zee	Taw-kun	<i>Piper</i> sp.	Medicine	Cough, asthma, and sneezing; used with ginger in boiled water or directly applied on the body	Fresh	Leaf
74	La-phort		<i>Macaranga</i> sp.	Cultural	To pack the rice for religious and cultural ceremonies	Fresh or a little heated	Leaf
75	Min-baw		<i>Caryota urens</i> L. (Arecaceae)	Food	Traditional snack	Fresh	Heartwood
76	Shin-htaung-shin		<i>Dichroa febrifuga</i>	Food	Snack (nectar)	Fresh	Flower
77	Mei-dawn-hone	Phat-won		Medicine and as wood	The dried leaf powder is used to treat dysentery and diarrhoea	Dried	Leaf and wood
78	Shell		<i>Pandanus</i> sp.	Household	Used in making mattress	Dried	Leaf
79	Lan-dam			Medicine	Used to treat cough, asthma, and astringency	Fresh	Leaf
80	Raw-du			Food	Paste	Fresh	Flower
81	Thin-kaw			Household	Roofing	Dried	Leaf
82	Ma-ni-shee			Food	Snack	Fresh	Fruit
83	Collector's name			Medicine	Used to treat ulcer wounds and joint or bone fracture	Fresh	Whole plant
84	Nam-kwel-set			Food	Cooked and also eaten raw	Fresh	Fruit and leaf
85	Ma-si-swan/Ram-sar-shee			Food	Eaten raw edible	Fresh	Fruit
86	Htan-dein			Food	Paste	Fresh	Tuber and rhizome
87	Chone		<i>Urena</i> sp.	Medicine	Used to stop	Fresh	Leaf and petiole
88	A-htut			Both food and medicine	As traditional food and also as medicine	Fresh	Heartwood
89	Thit-min			Cultural	Traditional vase	Preserved	Stem

No.	Local name	Other name	Scientific name	Function	Usage/Preparation method	Method of processing	Used part
90	Ra-naing-new			Food	Curry	Fresh	Leaf
91	Ei-hort			Both food and medicine	Used to treat flatulence	Fresh	Leaf
92	Ma-set			Food	Cooked	Fresh	Leaf
93	Ma--short-set			Medicine	Used as an antidote to snakebite	Fresh	Leaf
94	Set-tha-hone	Na-lin-kyaw		Medicine	Used to treat flatulence	Fresh	Leaf
95	Ra-gon-chay-han		<i>Schefflera</i> sp.	Medicine	Used to treat flatulence	Fresh	Leaf and bark
96	Pan-nam-set			Medicine	Used to treat astringency	Fresh	Leaf and fruit
97	Kha-li-set			Medicine	Used as an antiseptic and to treat malaria	Fresh	Leaf
98	Ma-gut-Shee			Food	Curry	Fresh	Leaf
99	Nar-pha-la			Medicine	Used to treat astringency and as an antiseptic	Fresh	Leaf and fruit
100	Nam-bom-set		<i>Chloranthus</i> sp.	Medicine	Used to treat flatulence	Fresh	Leaf
101	Bu-zi			Medicine	Used as an antidote to snakebite	Fresh	Root
102	Ma-set			Food	Mixed and cooked with fish	Fresh	Leaf
103	Mu-set		<i>Cyathula</i> sp.	Food	Cooked	Fresh	Leaf

About ICIMOD

The International Centre for Integrated Mountain Development (ICIMOD), is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush Himalaya – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – and based in Kathmandu, Nepal. Globalisation and climate change have an increasing influence on the stability of fragile mountain ecosystems and the livelihoods of mountain people. ICIMOD aims to assist mountain people to understand these changes, adapt to them, and make the most of new opportunities, while addressing upstream-downstream issues. We support regional transboundary programmes through partnership with regional partner institutions, facilitate the exchange of experience, and serve as a regional knowledge hub. We strengthen networking among regional and global centres of excellence. Overall, we are working to develop an economically and environmentally sound mountain ecosystem to improve the living standards of mountain populations and to sustain vital ecosystem services for the billions of people living downstream – now, and for the future.

REGIONAL MEMBER COUNTRIES



AFGHANISTAN



BANGLADESH



BHUTAN



CHINA



INDIA



MYANMAR



NEPAL



PAKISTAN

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