

Wild Edible Food Plants Diversity and their Utilization Trends in Nepal

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Abstract

Wild Edible Food Plants (WEFPs) are plant species that grow in the wild and are not cultivated or domesticated but are edible and can be consumed by humans. This study aims to explore the diversity, availability, distribution, preference and potential barriers to utilization of (WEFPs) in Nepal. Data was collected through Focus Group Discussions (FGD) and Key Informant Interviews (KII) using semi-structured questionnaires and guidelines. Primary data was obtained from 167 informants, including 94 males and 73 females, while secondary data was collected from various relevant sources. A total of 137 WEFPs belonging to 121 genera and 72 families were documented, with tree species being the most prevalent (41%), followed by herbs (27%) and shrubs (22%). Fruits were the most commonly used plant part (41.30%), followed by leaves and shoots. The majority of the species (37%) had fruiting seasons during summer, followed by spring (27%). The most preferred WEFPs were *Stenochlaena palustris* (Burm.f.) Bedd. (Niuro), *Rubus thomsonii* Focke (Ainselu), *Myrica esculenta* Buch.-Ham. Ex D. Don (Haade kaafal), *Prunus napaulensis* (Ser.) C. K. Schneid and *Aegle marmelos* L. (Bel). However, the consumption of these species has decreased compared to 20 years ago, with potential barriers being time constraints for collection, limited availability in markets, lack of knowledge and no market value for selling. The diversity of WEFPs found in the study area contributes significantly to dietary intake during food scarcity as well as supplementary food. However, conservation and management interventions are necessary to ensure their continued availability to support food security and local livelihoods.

Keywords: Conservation, Diversity, Edible, Neglected, Utilization, Wild

Introduction

Nepal, although occupying only 0.1% of the global land, is a country rich in biodiversity and cultural diversity. It is home to 118 types of ecosystems and 3.2% of the world's floral diversity (Poudel et al., 2012). Additionally, there are 126 ethnic groups in Nepal, each with its native languages, cultures and belief systems (Miya et al., 2021). The country's varied climate and unique geography provide diverse topography, contributing to its ecologically rich environment and multi-ethnic population, which are attractive and unique attributes (Panta et al., 2021). The hub of Nepal is its diverse range of flora and fauna, with biodiversity being its most significant aspect. Wild Edible Food Plants (WEFPs) are plant species growing in the wild, not cultivated or domesticated, but edible and consumable by humans (Bhatia, 2018). They serve as sources of nutrition, medicine, fuel, fodder and spices, making them important components of food security, particularly during times of crop failure or food supply disruptions. Additionally, wild edible food plants (WEFPs) offer economic opportunities for rural communities, as they can be sold in local markets or traded for other goods. Despite modernization, there are still poor and marginalized populations in rural areas that heavily rely on wild edible food plants. Furthermore, the fresh, aromatic taste, pollution-free growing environment and strong vitality of WEFPs make them favorable for utilization (Panta et al., 2021). These neglected food plant groups have the potential to contribute significantly to ensuring food security, increasing agricultural diversification, generating income and reducing poverty (Ashagre et al., 2016). Worldwide, it is estimated that there are about 75,000 species of edible plants (Bhattarai et al., 2009). Consumption of wild edible food plants from both agricultural and non-agricultural ecosystems has been documented in multiple cultural contexts, demonstrating their use and importance among farming households around the world (Cruz et al., 2011). It is estimated that approximately 3,000 plant species have been used as food by human beings throughout history, with about 200 of them domesticated as food crops (Simpson & Ogorzaly, 1995). Nepal is home to about 1,500

useful plant species (Manandhar, 2002), 651 of which are economically useful, including 440 species of wild food plants. Of these, 394 wild plants are recorded to be in use for various purposes (Panta et al., 2021).

Wild edible food plants have played a significant role in ensuring food security, livelihood and income generation for rural, marginalized and ethnic communities in Nepal. These plants are valuable sources of essential vitamins and minerals. However, due to changes in lifestyle, feeding habits and the abandonment of traditions, knowledge about consuming wild edible plants is at risk and traditional knowledge is rapidly eroding. The value of wild edible plants is also decreasing due to poor marketing and habitat degradation. Despite their importance, information and utilization of wild edible food plants remain largely confined to local people. Limited research and documentation have been conducted on wild edible plants in Nepal, with a greater focus on wild edible fruit plants. However, some researchers are interested in understanding and disseminating information about wild edible plants on various platforms and studies have been conducted in various districts of Nepal, such as Rupendehi (Singh et al., 2012), Palpa (Mahato, 2014), Manang (Bhattarai, 2009), Ilam (Tamang & Singh, 2014) and Dhankuta (Shrestha et al., 2021). This study aims to provide information on the diversity of wild edible plant species and their utilization trends in Nepal, covering eight districts that represent all the domains of the country (Terai, Midhill and Mountain).

Materials and Methods

A field survey was conducted in 2022 to study the diversity of wild edible food plants in Nepal. The study sites were chosen to cover the three physiographic zones of Nepal: Lowland, Mid-Hills and High Mountains. These sites included Dhading, Dang, Lalitpur, Pyuthan, Nuwakot, Humla, Okhaldhunga and West Rukum (as shown in Figure 1). Local people were interviewed through Focus Group Discussions (FGD) and Key Informant Interviews (KII) to gather information on wild edible food plants. Semi-structured questionnaires and guidelines were used to facilitate the interviews. A total of 167 informants were interviewed, including 94 males and 73 females. Secondary data were also collected from relevant journals, literature and publications. Local people provided prior informed consent for the study, with assurance that the knowledge they shared would not be used for commercial purposes and that the study was solely for academic purposes.

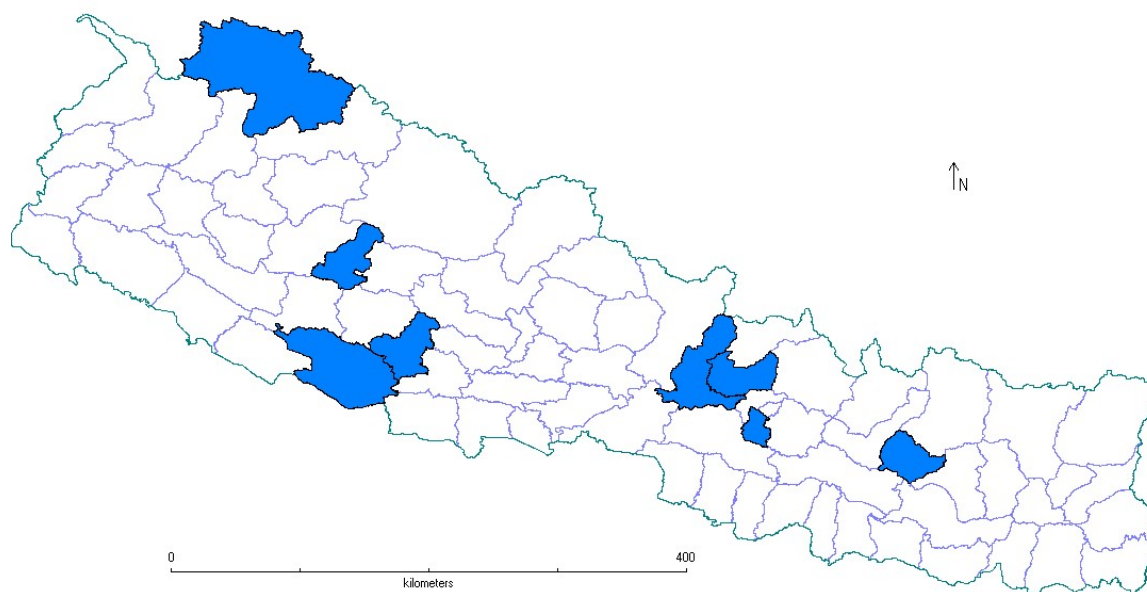


Figure 1. Study sites

Table 1. Study locations in eight districts of Nepal

| S.N. | District | Municipality/Urban Municipality | No of respondents |
|------|-------------|--|-------------------|
| 1 | Dang | Ghorahi | 29 |
| 2 | Dhading | Gajuri, Jwalamukhi, Gangajamuna & Siddhalekh | 45 |
| 3 | Okhaldhunga | Siddhicharan | 15 |
| 4 | Humla | Simikot | 20 |
| 5 | Pyuthan | Pyuthan | 15 |

| S.N. | District | Municipality/Urban Municipality | No of respondents |
|------|------------|--------------------------------------|-------------------|
| 6 | Lalitpur | Bagmati | 10 |
| 7 | West rukum | Sanibheri | 16 |
| 8 | Nuwakot | Suryagadhi | 17 |
| | Total | 11 (Municipality/Urban municipality) | 167 |

Results and Discussion

Diversity of wild edible food plants species in study area

The study area has documentation of 137 wild edible food plant species from 121 genera across 72 families (Table 2). Of these families, 26 have more than one wild edible food plant species, with Moraceae being the most dominant with 11 plant species, followed by Rosaceae (8 spp.), Fabaceae (7 spp.) and Anacardiaceae (5 spp.) (Figure 2). Further details on the plant species, including their respective families, growth habit, edible parts, fruiting seasons and market values, can be found in Table 2. Figure 2 shows the distribution of wild edible food plants based on their growth habit, with tree species accounting for 41% of the plants, followed by herbs (27%), shrubs (22%), climbers (7%) and fungi (3%).

Previous studies have reported a diverse range of wild edible food plant species and their uses in various parts of the country. Miya et al., (2021) discovered that 23 ethnic groups in Nepal consume a total of 261 wild edible plant species from 101 families. In the western himalayas of Nepal, Aryal et al., (2018) documented 99 wild and non-cultivated plant species, while Shrestha et al., (2021) identified 132 wild edible plant species from Dhankuta district belonging to 63 families and 103 genera. As per Shrestha's study, fruits are the most commonly consumed edible part of wild plants, followed by leaves and shoots.

In a study by Ghimire et al., (2010), it was discovered that the ilam district of Nepal had 93 species of wild edible angiosperm plants, with dioscoriaceae being the dominant family. Panta et al., (2021) conducted a survey in the pyuthan district of Nepal and identified 37 distinct species, with trees being the most common. The study also found that 54% of respondents used wild edible plant species as vegetables. Gautam et al., (2020) documented 199 wild edible fruit plant species from west to east Nepal, belonging to 139 different genera and 67 families. Trees accounted for 49% of the total and 145 species were used for their fruits. Khakurel et al., (2021) conducted a study in the western region of Nepal and identified 72 wild food species from 46 families and 61 genera. Fruits were found to be the most commonly used plant part, with 34 species identified, followed by young shoots with 16 species. Shah et al., (2017) documented the utilization of 55 plant species by the Tamang community, belonging to 51 genera and 38 families. The study found that leaves were the most commonly used plant part. Pawera et al., (2020) conducted research on traditional knowledge associated with 106 species of wild food plants in Indonesia, which belonged to 65 genera and 37 botanical families. In a study by Mahato et al., (2014) in the Palpa district of Nepal, 37 wild fruit plant species were identified from 17 different families. Trees and shrubs accounted for 86% of the species, totaling 32 species, with the Moraceae family having the highest representation of 9 species. According to Ghimire et al., (2018), a total of 70 wild medicinal plant species were identified from the far-western region of Nepal, belonging to 36 different botanical families. Malla et al., (2014) documented total of 61 wild plant species belonging to 59 genera and 43 families used in medicinal purpose.

Table 2. List of wild edible food plants species

| SN | Local Name | English Name | Scientific Name | Family | Habit | Parts used | Uses | Fruiting season | Market Value |
|----|---------------|------------------|---|-----------------|-------|------------|--|-----------------|--------------|
| 1 | Amaaro | Hog Plum | <i>Spondias pinnata</i> (L.f) Kurz | Anacardiaceae | T | F & B | Raw fruit is used to make pickle and bark is used in stomach pain and diarrhoea | May-Jun | 40/kg |
| 2 | Mayal | Wild pear | <i>Pyrus pashia</i> Buch. -Ham. ex D.Don | Rosaceae | T | F | Raw fruit is eaten and leaves used for fodder purpose | Dec-Jan | 150/kg |
| 3 | Ban karelo | Striped cucumber | <i>Diplocyclos palmatus</i> (L.) C. Jeffery | Cucurbitaceae | C | F | Immature fruits are used as vegetable | Jun-Jul | 100/kg |
| 4 | Ketukee | Century plant | <i>Agave americana</i> L. | Asparagaceae | S | L&FL | Flowers are used to make pickle and vegetable, leaves are used for wound healing, wormicide and fish poisoning | Mar-Apr | 200/kg |
| 5 | Bako | Cobra Lily | <i>Arisaema utile</i> Hook.f.ex Engl. | Araceae | H | L & T | Boiled tubers are eaten as vegetable and leaves used for making sinki | Feb-Mar | 800-900/kg |
| 6 | Gulaab Jamun | Rose Apple | <i>Syzygium jambos</i> (L.) Alston | Myrtaceae | T | F | Consume fruit and good source of firewood | Apr-May | 350/kg |
| 7 | Sitalchinee | Drum stick | <i>Moringa oleifera</i> Lam. | Moringaceae | T | F | Fruit is eaten | Jan-Feb | 700-800/kg |
| 8 | Kundurk | Ivy Gourd | <i>Coccinia grandis</i> (L.) Voigt | Cucurbitaceae | C | WP | Used as vegetable | Aug-Sep | |
| 9 | Chiuree | Butter Tree | <i>Aesandra butyracea</i> (Roxb.) Bachni. | Sapotaceae | T | F | Ripen fruits are taken as sources of vitamin, seeds are used to make alcoholic beverage | Apr-Jun | 150-160/kg |
| 10 | Paanee amalaa | Sword Fern | <i>Nephrolepis cordifolia</i> (L.) C. Prest | Dryopteridaceae | S | T | Tubers are consumed raw and in form of juice to treat indigestion, cold, cough and fever | Jan-Mar | 100-200/kg |
| 11 | Nimaro | Nimarro | <i>Ficus roxburghii</i> steud. | Moraceae | T | F | Fruit eaten and leaves are used for fodder | Aug-Sep | 20-25/kg |
| 12 | Khanayo | Khanaayo | <i>Ficus cunia</i> Buch.-Ham. ex Roxb. | Moraceae | T | F | Fruit eaten and leaves used for fodder | Jun-Sep | 50-60/kg |
| 13 | Chutro | Barberry | <i>Berberis aristata</i> Roxb.ex. DC. | Berberidaceae | T | F & B | Fruit eaten, bark used as a dye and to treat diarrhoea, piles and malaria | Mar-Apr | 80-90/kg |
| 14 | Titri (Emli) | Tamarind | <i>Tamarindus indicus</i> L. | Fabaceae | T | F | Fruit is used in making jam, pickles and sauce | Jan-Mar | 100/kg |
| 15 | Sisnu | Stinging nettle | <i>Urtica dioica</i> L. | Urticaceae | H | L & Sh | Young leaves and shoots eaten, fiber extracted from stems used to make clothes and bags | All season | 250/kg |
| 16 | Vakimlo | Chinese sumac | <i>Rhus chinensis</i> Mill. | Anacardiaceae | T | F | Fruit is eaten as raw | Nov-Dec | 150/kg |

| SN | Local Name | English Name | Scientific Name | Family | Habit | Parts used | Uses | Fruiting season | Market Value |
|----|---------------|---------------------|--|-----------------|-------|------------|---|-----------------|--------------|
| 17 | Haade Kaafal | Wild Bay berry | <i>Myrica esculenta</i> Buch. - Ham. Ex D. Don | Myricaceae | T | F& B | Ripe fruit is eaten with salt | Mar-Apr | 60/kg |
| 18 | Ainselu | Himalayan raspberry | <i>Rubus ellipticus</i> | Rosaceae | S | F | Ripe fruit is very popular among children | Mar-Apr | 100-150/Mana |
| 19 | Aaru bhakhada | Plum | <i>Prunus domestica</i> L. | Rosaceae | T | F | Fruit is eaten and leaves used for fodder | Jun-July | 60/kg |
| 20 | Kimbu | Mulberry | <i>Morus alba</i> L. | Moraceae | T | F | Fruit eaten and leaves used as fodder | Mar-May | 50-60/kg |
| 21 | Paiyun | Paiyu | <i>Prunus serasoides</i> | Rosaceae | T | F | Ripe fruit is eaten and leaves used as fodder | Mar-Apr | 25-30/kg |
| 22 | Tiju | Gaun Persimmon | <i>Diospyros malabarica</i> (Desr.) Kostel. | Ebenaceae | T | F | Ripe fruit is eaten and leaves used as fodder | Mar-Apr | 100/kg |
| 23 | Satuwa | Himalayan paris | <i>Paris polyphylla</i> | Melanthiaceae | H | L & Rh | Tender leaves eaten as a vegetable, rhizome made into paste and applied to snake bite to control the poison | All season | 4000-5000/kg |
| 24 | Jibre Saag | Adder's tongue fern | <i>Ophioglossum nudicaule</i> L. f. | Ophioglossaceae | H | L | Used as vegetable | Jul-Aug | 500/kg |
| 25 | Niuro | Fiddle head Fern | <i>Dryopteris cochleata</i> (D. Don) C. Chr. | Blechnaceae | H | L & Sh | Young leaves and shoots cooked and eaten as a vegetable | May-Jun | 30/Mutha |
| 26 | Koiraalo fool | Orchid Tree | <i>Bauhinia variegata</i> L. | Fabaceae | T | L & FL | Leaves and flowers used as a vegetable and in pickle, flowers used to make soup | Mar-Apr | 200/kg |
| 27 | Sakina | Himalayan Indigo | <i>Indigofera heterantha</i> | Fabaceae | S | L&FL | Flower is used as vegetables and pickle making and leaves used for livestock feeding | Feb-Mar | 300/kg |
| 28 | Laliguransh | Rhododendron | <i>Rhododendron arborium</i> | Ericaceae | T | FL | Flowers used to make wine, nectar used to treat diarrhoea and dysentery | Mar-Apr | 50-60/kg |
| 29 | Bel | Wood apple | <i>Aegle marmelos</i> L. | Rutaceae | T | F | Fruit consumption and leaves used for religious purpose | Feb-Mar | 400-500/kg |
| 30 | Tarul | Five leaf yam | <i>Dioscorea esculenta</i> (Lour.) Brukill | Dioscoreaceae | C | T | Tubers boiled and eaten as a vegetable | Jan-Feb | 300-350/kg |
| 31 | Bethe | Lamb's quarter | <i>Chenopodium album</i> L. | Amaranthaceae | H | L | Leaves and young shoots eaten as a green vegetable | Feb-Mar | 30/Mutha |
| 32 | Jhari chyaau | Waxy laccaria | <i>Laccaria Laccata</i> | Pinaceae | H | F | Eaten as a vegetable | Jun-Jul | 350/kg |

| SN | Local Name | English Name | Scientific Name | Family | Habit | Parts used | Uses | Fruiting season | Market Value |
|----|----------------|------------------------|--|------------------|-------|------------|--|-----------------|--------------|
| 33 | Bagale Chyau | Split gill | <i>Schizophyllum commune</i> | Schizophyllaceae | F | F | Eaten as a vegetable | Jun-Jul | 250-300 |
| 34 | Taamaa | Solid bamboo | <i>Dendrocalamus strictus</i> Roxb. Nees | Poaceae | H | S | Young shoots eaten as a vegetable and used for making pickle | Jun-Jul | 50-60/kg |
| 35 | Armale | Scarlet pimpernel | <i>Anagallis arvensis</i> L. | Myrsinaceae | H | L | Used as vegetable | Jan-Feb | 20-30/kg |
| 36 | Rato chyau | Crab of the woods | <i>Laetiporus sulphureus</i> (Bull.) Murrill | Polyporaceae | F | F | Used as vegetable | Jan-Feb | |
| 37 | Thaakal | Date sugar palm | <i>Phoenix sylvestris</i> (L.) Roxb. | Arecaceae | T | F | Fruit and pith from stem eaten | Apr-May | 50-60/kg |
| 38 | Ban Tarul | Wild edible yam | <i>Dioscorea hamiltonii</i> Hook. f. | Dioscoreaceae | C | T | Tubers boiled and eaten as a vegetable | Jan-Feb | 250-300/kg |
| 39 | Timur | Nepal pepper | <i>Zanthoxylum armatum</i> DC. | Rutaceae | T | F | Fruit is eaten raw and mainly used as pickle and spices. | Jun-Jul | 300/kg |
| 40 | Pyaaulee | Yellow flax | <i>Reinwardtia indica</i> Dumor t. | Linaceae | S | L&FL | Flower is eaten and leaves used for fodder | Feb-Mar | 20-25/kg |
| 41 | Pahenlo Chyaau | Mushroom | <i>Lentinellus ursinus</i> (Fr.) Kuhner | Auriscalpiaceae | F | F | Eaten as vegetable | Aug-Sep | 150-200/kg |
| 42 | Deuli Chyaau | Mushroom | <i>Termitomyces eurhizus</i> | Lyophyllaceae | F | F | Eaten as vegetable | Jun-Jul | 600-700/kg |
| 43 | Bhalayo | Nepal bhalayo | <i>Toxicodendron wallichii</i> (Hook. f.)Kuntze | Anacardiaceae | T | F | Fruit is eaten | Jun-Jul | 20-30/kg |
| 44 | Amalaa | Indian gooseberry | <i>Emblica officinalis</i> Gaertn. | Phyllanthaceae | T | F | Its fruit is used in sweets, sauce and pickles preparation. Dried fruit is used in the preparation of ayurvedic medicine | Feb-Mar | 90-100/kg |
| 45 | Kadam | Purple neo cheese-wood | <i>Neonauclea purpurea</i> (Roxb.) Merr. | Rubiaceae | T | F | Fruit is eaten | Nov-Dec | 50-60/kg |
| 46 | Gitthaa | Wild Yam | <i>Dioscorea oppositifolia</i> L. | Dioscoreaceae | C | T | Tubers boiled and eaten as a vegetable | Jan-Feb | 200/kg |
| 47 | Ghiu kumaree | Indian aloe | <i>Aloe vera</i> (L.) Burm.f. | Xanthorrhoeaceae | H | L | It is useful for rashes, burns, wounds and other skin conditions. | All Season | 80-100/kg |
| 48 | Chuli | Wild Apricot | <i>Prunus armeniaca</i> L. | Rosaseae | T | S | Seed is used for oil extraction | Jun-Jul | 350/L |

| SN | Local Name | English Name | Scientific Name | Family | Habit | Parts used | Uses | Fruiting season | Market Value |
|----|---------------|-----------------------|---|----------------|-------|------------|--|-----------------|--------------------------|
| 49 | Jangalee aaru | Nepalese cherry | <i>Prunus nepaulensis</i> (Ser.) C. K. Schneid. | Rosaceae | T | S | Seed is used for oil extraction | Jun-Jul | 350/L |
| 50 | Dhatelo | Cherry prinsepia | <i>Prinsepia utilis</i> Royale | Rosaceae | T | S | Seed is used for oil extraction | Apr-Jun | 450/L |
| 51 | Jimbu | Nepal aromatic garlic | <i>Allium hypsistum</i> Stearn | Amaryllidaceae | H | L & T | Dried plant used in dal and curries | Jun-Jul | 250/kg |
| 52 | Pudinaa | Garden mint | <i>Mentha longifolia</i> (L.) Huds. | Lamiaceae | H | L | Leaves used in pickle and herbal tea | Aug-Sep | 10/mutha |
| 53 | Latte saag | Amaranthus | <i>Amaranthus hypochondriacus</i> L. | Amaranthaceae | H | L & S | Leaves and young shoots eaten as a green vegetable, seed is used for making pudding rice | Jun-Jul | 20/Mutha and 100/kg seed |
| 54 | Gaanjaa | Marijuana | <i>Cannabis indica</i> Lam. | Cannabaceae | S | S | Seeds used in pickle making and oil extraction | Sep-Oct | 300/kg |
| 55 | Padamchaal | Himalayan rhubarb | <i>Rheum australe</i> D.Don. | Polygonaceae | S | L | Leaves are used for wound healing and herbal tea preparation | Jun-Sep | |
| 56 | Buckwheat | Mithe faapar | <i>Fagopyrum esculentum</i> Moench. | Polygonaceae | H | L | Leaves eaten as a green vegetable | May-Jun | 20/Mutha |
| 57 | Daale chuk | Sea buckthorn | <i>Hippophae rhamnoides</i> L. | Elaeagnaceae | S | F | Fruit is eaten | Dec-Jan | 200/kg |
| 58 | Halhale | Spiny sow thistle | <i>Rumex nepalensis</i> Spreng. | Polygonaceae | H | L | Leaves eaten as a green vegetable | Apr-Jun | 30-60/Mutha |
| 59 | Dhayaanro | Fire flame bush | <i>Woodfordia fruticosa</i> (L.) Kurz | Lythraceae | T | FL | Flower is eaten as food | Mar-Apr | |
| 60 | Dudhilo | Willow-leaf fig | <i>Ficus neriifolia</i> L. | Moraceae | T | L & FL | Young leaves eaten as a vegetable and fruit eaten | May-Jun | |
| 61 | Haade Okhar | Walnut | <i>Juglans regia</i> var. kamaonia C | Juglandaceae | T | F | Fruit eaten and offered to gods during festivals | June-Jul | 70/kg |
| 62 | Tejpaat | Indian bay leaf, | <i>Cinnamomum tamala</i> (Buch. -Ham.) | Lauraceae | T | L | Dried leaves used as spice for curries to add flavor and smell | Aug-Sep | |
| 63 | Ban Lasun | Nepal lily | <i>Lilium nepalensis</i> D.Don | Liliaceae | H | L & T | Leaves and tuber used to cure coughs and cold | Jun-Jul | 4000/kg |
| 64 | Gogan | Gogan | <i>Saurauia nepaulensis</i> DC. | Actinidiaceae | T | F | Fruit is eaten and used to relieve fever | Mar-Apr | |

| SN | Local Name | English Name | Scientific Name | Family | Habit | Parts used | Uses | Fruiting season | Market Value |
|----|-----------------|------------------------|--|----------------|-------|------------|---|-----------------|--------------|
| 65 | Golkaankree | Japanese wild cucumber | <i>Zehneria japonica</i> (Thunb.) H.Y. Liu | Cucurbitaceae | S | F | Fruit is eaten | Jun-Jul | |
| 66 | Ban Kurilo | Wild asparagus | <i>Asparagus adscendens</i> Roxb. | Liliaceae | S | Sh | Young shoots used as a vegetable | Jun-Sep | 600/kg |
| 67 | Khole Saag | Water cress | <i>Rorippa nasturtium aquaticum</i> (L.) Hayek | Brassicaceae | H | L | Leaves are eaten as a green vegetable | Apr-May | 20-30/Mutha |
| 68 | Bojho | Sweet flag | <i>Acorus calamus</i> | Acoraceae | H | Rh | Dried rhizome used to treat sore throat, coughs and colds | Mar-Apr | |
| 69 | Sipleegaan | Garlic pear | <i>Crateva unilocularis</i> Buch.-Ham | Capparaceae | S | L | Young twigs are used as vegetable | Apr-Jun | 400/kg |
| 70 | Kaande Dhaniyaa | Culantro | <i>Eryngium foetidum</i> L. | Apiaceae | H | L | Leaves are used in vegetable | Apr-May | 120/kg |
| 71 | Barro | Belliric myrobalan | <i>Terminalia bellirica</i> C.B. Clarke | Combretaceae | T | F | Fleshy part of fruit is eaten raw. It is an important constituent of triphala (ayurvedic medicine). | Aug-Sep | 200-300/kg |
| 72 | Harro | Chebulic myrobalan | <i>Terminalia chebula</i> Retz. | Combretaceae | T | F&B | Fleshy part of fruit is eaten raw. It is an important constituent of triphala (ayurvedic medicine). | Aug-Sep | 1000-1200/kg |
| 73 | Siundee fool | Crown of thorn | <i>Euphorbia milli</i> . des moul | Euphorbiaceae | S | L | Effective molluscicide and a natural alternative to pest control | May-Jun | |
| 74 | Jalkumbhee | Water hyacinth | <i>Pontederia crassipes</i> Mart. | Pontederiaceae | H | FL | Flowers are used as a vegetable | Jun-Jul | |
| 75 | Kuvindo | Ash gourd | <i>Benincasa hispida</i> (Thunb.) Cogn. | Cucurbitaceae | C | F | Fruit eaten as vegetable and offered to gods during festivals | Sep-Oct | 50-100/kg |
| 76 | Tulsi | Holy basil | <i>Ocimum sanctum</i> L. | Lamiaceae | H | L & Sh | Leaves and young shoots are used to make herbal tea | Jul-Aug | |
| 77 | Asuro | Justicia | <i>Justicia adhatoda</i> L. | Acanthaceae | S | L, FL & F | Leaves and flowers used for vegetable and fruit for making pickles | Apr-Jul | |
| 78 | Dumri | Dumri | <i>Ficus racemosa</i> L. | Moraceae | T | F | Ripe fruit is eaten | Apr-May | 80-100/kg |
| 79 | Kuthurke Niuro | Thinleaf brake | <i>Pteris biaurita</i> L. | Pteridaceae | H | L & Sh | Leaves and young shoots eaten as a green vegetable | Apr-May | 100/Mutha |
| 80 | Ban keraa | Seeded banana | <i>Musa bulbisiana</i> Colla | Musaceae | H | F | Ripe fruit eaten and offered to gods during rituals | All season | |

| SN | Local Name | English Name | Scientific Name | Family | Habit | Parts used | Uses | Fruiting season | Market Value |
|----|------------------------|---------------------------|--|------------------|-------|------------|--|-----------------|--------------|
| 81 | Kaalo bhuin Ainselu | Black ground raspberry | <i>Robus griffithii</i> Hook. f. | Rubiaceae | S | F | Ripe fruit is eaten as raw. | Apr-May | 100/Mana |
| 82 | Taankee | Pink ebony | <i>Bauhinia purpurea</i> L. | Fabaceae | T | L & FL | Flowers are used for pickles and young leaves are consumed as a vegetable | Apr-May | 200-250/kg |
| 83 | Angeree | Nepal Pink Osbeckia | <i>Osbeckia nepalensis</i> | Melastomataceae | S | L&B | Bark is used to treat dysentery and toothache, A decoction of the leaves is used to treat diarrhoea, dysentery & indigestion | Apr-May | |
| 84 | Vyaakur | Nepal yam | <i>Dioscorea deltoidea</i> Wall. ex Griseb | Dioscoreaceae | C | F | Fruit is used for vegetable | Nov-Dec | 300/kg |
| 85 | Khasreto | Khasreto | <i>Ficus hispida</i> L.f. | Moraceae | T | F | Ripe fruit is eaten | Mar-Apr | |
| 86 | Agastee | Vegetable humming bird | <i>Sesbania grandiflora</i> (L.) Poir | Fabaceae | T | FL | Flowers are used for vegetable. | Apr-May | |
| 87 | Dhaturo | Thorn apple | <i>Datura metel</i> L. | Solanaceae | S | F & L | Used for treating asthma, to induce sleep, oil made from datura seeds are used to regrow hair | Jul-Aug | |
| 88 | Ritthaa | Soap berry | <i>Sapindus mukorossi</i> Gaertn. | Sapindaceae | T | F | Fruit is used for oil extraction | Jan-Feb | 40/kg |
| 89 | Nun dhikee | Purslane | <i>Portulaca oleracea</i> L. | Portulacaceae | H | L | Leaves are used as vegetable and salads | Apr-May | |
| 90 | Badahar | Monkey jack | <i>Artocarpus lakoocha</i> Wall. ex Roxb. | Moraceae | T | F & B | Fruit is eaten and bark powder is used to heal wound | Jun-Jul | |
| 91 | Bhimsenpaatee | Butterfly bush | <i>Buddleja paniculata</i> Wall. | Scrophulariaceae | S | L | Leaves are used for making yeast | All season | 100/kg |
| 92 | Pindaalu | Taro | <i>Colacasia esculentus</i> | Araceae | H | WP | Rhizome boiled and eaten as a vegetable, young stem and leaves used as a vegetable | Jan-Feb | 80/kg |
| 93 | Tusaa | Himalayan bamboo | <i>Thamnocalamus spathiflorus</i> (Trin) Munro | Poaceae | S | Sh | Young shoots are used as vegetables | Jun-July | 140/kg |
| 94 | Gabha | Wild taro | <i>Colocasia fallax</i> Schott | Araceae | H | WP | Used as a vegetable | Jun-Sep | 120/kg |
| 95 | Jhuse karelaa | Spiny gourd | <i>Momordica dioica</i> Roxb. | Cucurbitaceae | C | F | Used as a vegetable | Oct-Nov | 80/kg |
| 96 | Sakharkhanda | Sweet potato | <i>Ipomoea batatas</i> (L.) Lam. | Convolvulaceae | S | T | Used as a vegetable | Jan-Feb | 70/kg |
| 97 | Banmaaraa | Catweed | <i>Eupatorium adenophorum</i> Spreng. | Asteraceae | H | L | Used for wound healing, antiseptic, antimicrobial and antifungal | All Season | |

| SN | Local Name | English Name | Scientific Name | Family | Habit | Parts used | Uses | Fruiting season | Market Value |
|-----|--------------|-------------------|--|----------------|-------|------------|---|-----------------|--------------|
| 98 | Bankaankree | Creeping cucumber | <i>Solena amplexicaulis</i> (Lam.) Gandhi | Cucurbitaceae | C | F | Used to treat snake bites, wounds and burns | Feb-Mar | |
| 99 | Chiraaaito | Felwort | <i>Swertia chirata</i> Roxb. | Gentianaceae | H | WP | Used as anathematic, appetizer, bitter tonic in medicine preparation and also used in bitter flavoring agent in alcoholic preparation | Oct-Nov | 4000/kg |
| 100 | Bhui Syaau | Ground apple | <i>Smalanthus sonchifolius</i> (Poepp.) H. Rob. | Asteraceae | S | T | Eaten either raw or fruit salads | Feb-Mar | 100/kg |
| 101 | Titepatee | Common wormwood | <i>Artemisia vulgaris</i> L. | Asteraceae | T | L | Leaves are used as an offering to the gods and for cleansing the environment | All season | |
| 102 | Ghodtaapre | Water pennywort | <i>Centella asiatica</i> (L.) Urban | Apiaceae | H | L | The juice of the plant is used in the treatment of fevers and paste is applied externally to wounds | Jul-Aug | |
| 103 | Lapsi | Nepalese hog plum | <i>Choerospondias axillaris</i> (Roxb.) B.L. | Anacardiaceae | T | F & B | Fruit is eaten as raw and pulp is used to make candy, barks are used to relieve swelling | Sep-Nov | 100/kg |
| 104 | Lahare Aaanp | Passion fruit | <i>Passiflora edulis</i> Sims | Passifloraceae | S | F | Fruit eaten as raw which support digestion, treat gastrointestinal disorder and reduces bad cholesterol. | Oct-Nov | 150-250/kg |
| 105 | Guyenlo | Beauty berry | <i>Callicarpa arborea</i> Roxb. | Verbenaceae | T | F | Tasty fruit eaten as raw | Oct-Nov | 100-200/kg |
| 106 | Berulo | Wild fig | <i>Ficus subincisa</i> Buch.-Ham. ex Sm. | Moraceae | T | F | Fig fruit is eaten, used as laxative to relieve constipation, | Mar-Apr | 100-200/kg |
| 107 | Nigalo | Nigaalo | <i>Phyllostachys nigra</i> (Lodd. ex Lindl.) Munro | Poaceae | S | Sh | Young shoots are used as a vegetable | May-Jun | 150-200/kg |
| 108 | Siltimur | Spicewood | <i>Lindera neesiana</i> (Wall. ex Nees) Kurz | Lauraceae | T | S | Seeds are used for stomachache, gastroenteritis, diabetes and traumatic injury | Oct-Nov | 1000/kg |
| 109 | Kusum | Kusum tree | <i>Schleichera oleosa</i> (Lour.) Oken | Sapindaceae | T | L & S | Seeds are used to extract oil and leaves are used to treat diarrhea | Jun-Jul | 50-100/kg |
| 110 | Pipal | Bodhi tree | <i>Ficus religiosa</i> L. | Moraceae | T | F | Ripe fruits are eaten and leaves used for religious purpose | All Season | |
| 111 | Bar | Bar | <i>Ficus benghalensis</i> L. | Moraceae | T | F | Ripe fruits are eaten and leaves used for religious purpose | All Season | |

| SN | Local Name | English Name | Scientific Name | Family | Habit | Parts used | Uses | Fruiting season | Market Value |
|-----|--------------|-----------------------|--|----------------|-------|------------|--|-----------------|---------------|
| 112 | Filingo | Niger | <i>Guizotia abyssinica</i> (L.f.) Cass. | Asteraceae | H | S | Seeds are used for oil extraction which is used for birth control and treatment of syphilis | May-Jun | |
| 113 | Kutil kosaa | Garden vetch | <i>Vicia sativa</i> L. | Fabaceae | H | F | Fruit is eaten | Oct-Nov | 60/Mutha |
| 114 | Charee amilo | Creeping woodsorell | <i>Oxalis corniculata</i> L. | Oxalidaceae | H | L | Leaves used in preparing pickle | Jun-Jul | |
| 115 | Kaalo Niuro | Silverysplun wort | <i>Daperia boryana</i> (Willd.) M. Kato | Athyriaceae | H | L & Sh | Leaves and young shoots eaten as a green vegetable | Jun-Jul | 100-200/Mutha |
| 116 | Jaluko | Moonwort | <i>Remusatia vivipara</i> (Roxb.) Schott | Araceae | H | L & Sh | Leaves and young shoots are used as a green vegetable | All season | 100-200/kg |
| 117 | Faledo | Corky coral tree | <i>Erythrina stricta</i> Roxb. | Fabaceae | T | L | Leaves are used as a vegetable | Oct-Nov | |
| 118 | Bhogate | Pumelo | <i>Citrus grandis</i> Osbeck | Rutaceae | T | F | Eaten as a raw fruit | Oct-Nov | 100/kg |
| 119 | Bayar | Jugube | <i>Ziziphus incurva</i> Roxb. | Rhamnaceae | S | F | Eaten as a raw fruit | Oct-Mar | 70-80/kg |
| 120 | Bhuin kaafal | Strawberry | <i>Fragaria vesca</i> L. | Rosaceae | S | F | Eaten as a raw fruit | June-Aug | |
| 121 | Dabdabe | Garuga | <i>Lannea coromandelica</i> (Houtt.) Merr. | Anacardiaceae | T | F | Ripe fruit is eaten. | Feb-April | |
| 122 | Archal | Mountain currant tree | <i>Antidesma montanum</i> Blume | Phyllanthaceae | T | F & R | The roots are used in the treatment of stomachache and fruits are used as a tonic for mothers after giving birth | Aug-Sep | |
| 123 | Ghangaaru | Nepal firethorn | <i>Pyracantha crenulata</i> (Roxb. ex D.Don), .Roem. | Rosaceae | S | L | Leaves are used for herbal tea preparation | All season | |
| 124 | Ginderee | Headache tree | <i>Premna integrifolia</i> Willd. | Lamiaceae | S | L& B | Leaves and the bark are used in a herbal steam bath to relieve the pain of headaches and bad backs | Aug-Sep | |
| 125 | Ban Bhindi | Wild okra | <i>Abelmoschus esculentus</i> (L.) Moench. | Malvaceae | H | F | Fruit is eaten as a vegetable | Oct-Nov | |
| 126 | Ban pyaaj | Chlorophytum | <i>Chlorophytum nepalense</i> (Lindl.) Baker | Liliaceae | H | L&T | Leaves and tuber are used for medicinal purpose | Apr-May | |
| 127 | Shyal phorso | Bhimal | <i>Grewia optiva</i> J.R.Drumm. ex Burret | Malvaceae | T | F | Ripe fruit is eaten | Nov-Dec | |

| SN | Local Name | English Name | Scientific Name | Family | Habit | Parts used | Uses | Fruiting season | Market Value |
|-----|------------|----------------------|--|---------------|-------|------------|---|-----------------|--------------|
| 128 | Datiwan | Ox knee | <i>Achyranthes aspera</i> L. | Amaranthaceae | H | L & Sh | Shoots are used to treat tooth pain. Root juice is recommended for hypertension and rheumatism. | Jul-Aug | |
| 129 | Pakhanbed | Rock foil | <i>Bergenia ciliate</i> (Haw.) Sternb. | Saxifragaceae | H | Rh | Rhizome used to make medicine to treat kidney stones | Mar-Apr | 1000/kg |
| 130 | Katahar | Jack Fruit | <i>Artocarpus heterophyllus</i> Lam. | Moraceae | T | F | Ripe fleshy part of fruit is eaten. Raw fruits are eaten as vegetable and pickles. | Jun-Jul | 150-200/kg |
| 131 | Sankhetro | Grape Fruit | <i>Citrus paradisi</i> Macfad. | Rutaceae | T | F | Fruits are eaten as a raw which are used for management of diabetes mellitus and obesity | Oct-Nov | |
| 132 | Bilauni | Bilauni | <i>Maesa chisia</i> | Primulaceae | S | R | Roots are used in treatment of syphilis and anthelmintic | Jun-Jul | 50-70/kg |
| 133 | Kukurdaine | Kukurdaaine | <i>Smilax perfoliata</i> Lour. | Smilacaceae | S | Sh & T | Fruit eaten, young shoots and tubers are eaten as a vegetable | May-Jun | 200-300/kg |
| 134 | Mallido | Bastard oleaster | <i>Elaeagnus latifolia</i> L. | Proteaceae | T | F | Fruit is eaten as raw or cooked | Jun-Jul | |
| 135 | Haluwaabed | Persimmon | <i>Dyospyros virginiana</i> L. | Ebnaceae | T | F | Fruit is eaten as raw | Jun-Jul | 50-100/kg |
| 136 | Ban Angur | Himalayan wild grape | <i>Vitis parviflora</i> | Verbenaceae | C | F | Fruit is eaten | Oct-Nov | |
| 137 | Unyu | Interrupted fern | <i>Osmunda claytoniana</i> L. | Osmundaceae | H | L & Sh | Leaves and young shoots eaten as a green vegetable | May-Jun | 50-100/Mutha |

Source: Field survey, 2022

Notation:

Habit: H=Herb, S=Shrub, T=Tree, C=Climber, F=Fungus

Parts used: F=Fruit, FL= Flower, Sh=Shoot, Rh=Rhizome, R=Root, T=Tuber

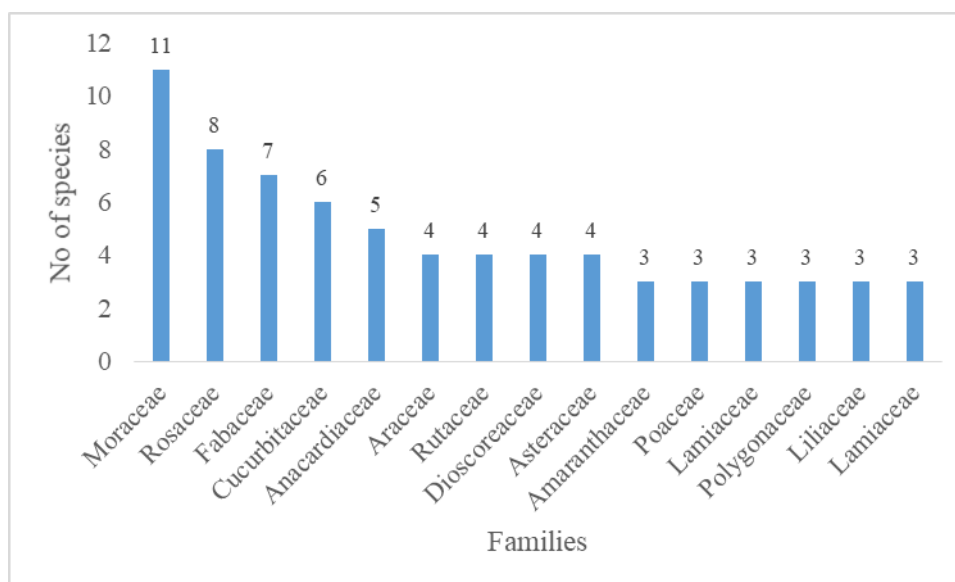


Figure 2. Family wise distribution of wild edible food plant species in study area

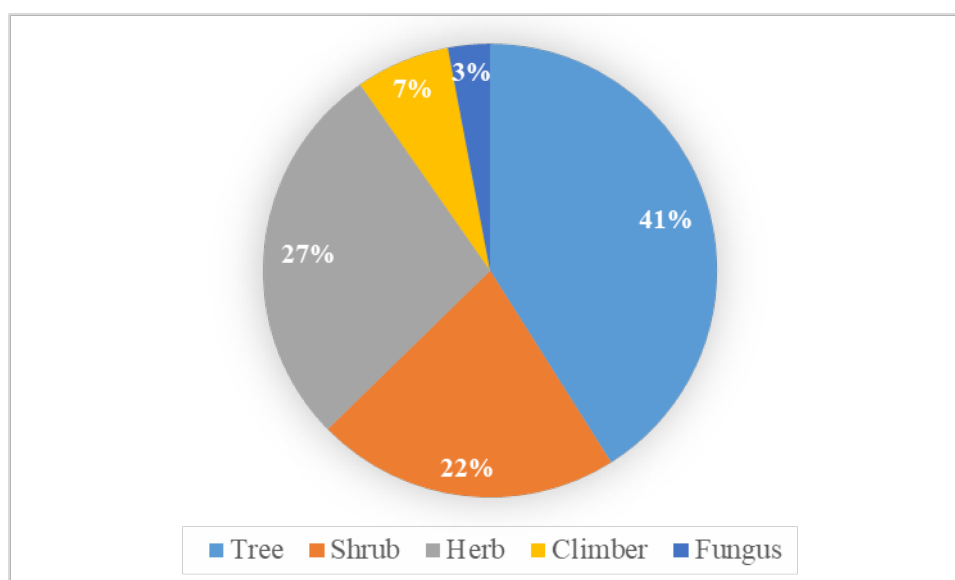


Figure 3. Habit wise distribution of wild edible food plants species in study area

Utilization trends of wild edible food plant species in study area

Out of the plant species listed, 57 species (41.30%) have edible fruits, while 21 species are utilized for their leaves and 6 species have edible tubers and seeds. Additionally, the flowers and shoots of 4 species are consumed as an edible part, while the rhizomes of 2 plant species are also consumed as edible. One species has roots that are considered an edible part, as shown in Figure 3. Among the listed species, four species have all edible parts and some have more than one edible part.

Several wild fruits and nuts are commonly consumed as fresh fruits, including *Myrica esculenta* (Kaafal), *Spondias pinnata* (L.f) Kurz (Amaaro), *Aesandra butyracea* (Roxb.) Bachni. (Chiuree), *Prunus serasoides* (Paiyun) and *Diospyros malabarica* (Desr.) Kostel. The ripe pulp of these fruits is consumed fresh or prepared as juice. *Berberis aristata* Roxb.ex. DC. (Chutro), *Rubus thomsonii* Focke (Ainselu) and *Morus alba* L. (Kimbu) are mostly harvested by children and consumed fresh. The fruit of *Choerospondias axillaris* (Roxb.) B.L. (Lapsi) has multiple uses, where the ripe fruit is eaten raw and the pulp is used to make candy. Additionally, the bark is used to relieve swelling. According to Luitel et al.'s (2014) study, people commonly used leaves and fruits because they were readily accessible. Similarly, in the present study, the majority of the plants listed had their fruits, leaves and shoots utilized for food. The entire plant of four species, namely *Coccinia grandis* (L.) Voigt (Kundruk), *Colacasia*

esculentus (Pidaalu), *Colocasia fallax* Schott (Gaba) and *Swertia chirata* Roxb. (Chiraito), is edible. Among the listed plant species, leaves and shoots are the most commonly consumed parts. The community members in the study area consume leaves and shoots of eight plant species. *Justicia adhatoda* L. (Asuro) is a plant species with three edible parts, namely leaves, flowers and fruit, while the remaining species have two edible parts (Figure 4).

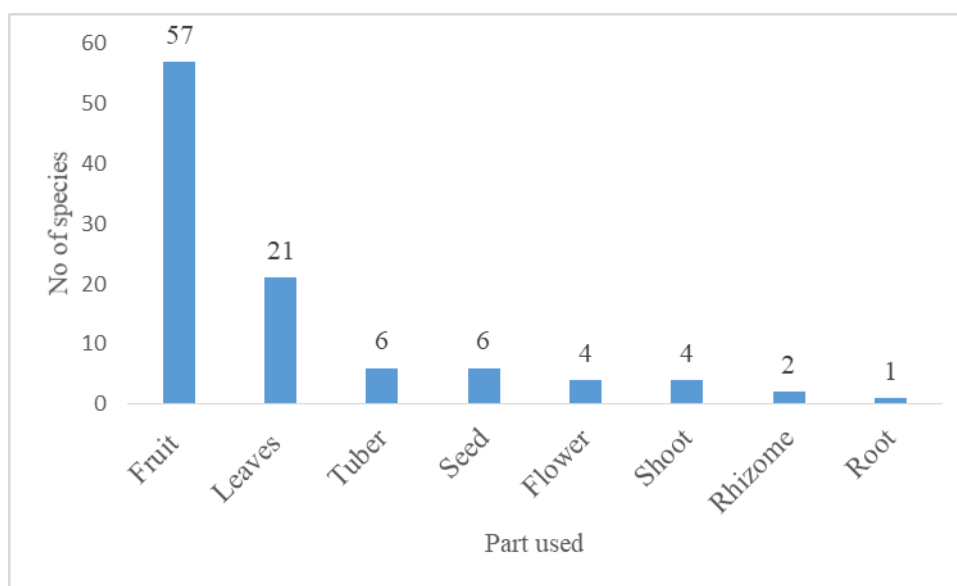


Figure 4. Edible part of wild food plant species used in study area

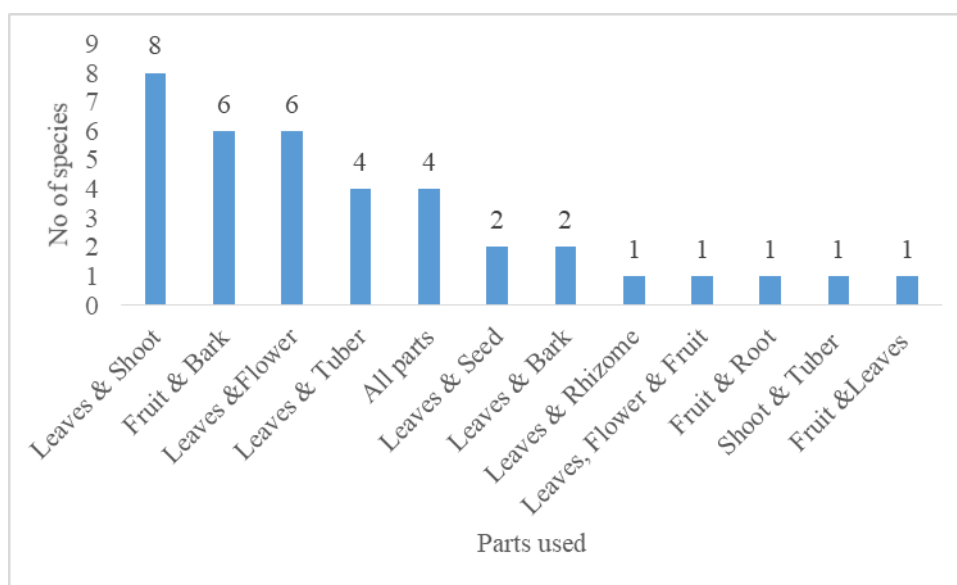


Figure 5. Edible Parts of wild food plant species used in study area

Seasonal availability and market value of wild edible food plant species in study area

The fruiting season of the wild edible food plant species identified is illustrated in figure 5. Most of the species have a specific harvesting period and their utilization is limited to that particular time of the year. The fruiting season of 37% of the species falls during the summer season, while 27% of the species bear fruit during spring. Only 11% of the species bear fruit throughout the year. Although most of the plant species are available in the local market year-round, some wild foods are scarce and are consumed locally, without reaching the market. Out of the documented wild food plant species, 80 species have market potential (Figure 5). The majority of the plant species (44 species) have a market value of less than Rs 100, while 32 plant species are sold in nearby markets with prices ranging between Rs. 100-500. *Moringa aleifera* Lam (Sitalchine), *Termitomyces eurhizu* (Deuli chyaau) and *Lindera neesiana* (Wall. Ex Nees) Kurz (Siltimur) are some of the plant species with market value ranging between Rs. 500-

1000. The study also reports two important medicinal plant species found in the studied districts, *Paris polyphylla* (satuwa) and *Terminalia chebula* Retz., which can be sold at a high market price (>1000) (Figure 5). Khakurel et al., 2021 reported that most edible plants were consumed in summer and during rainy seasons.

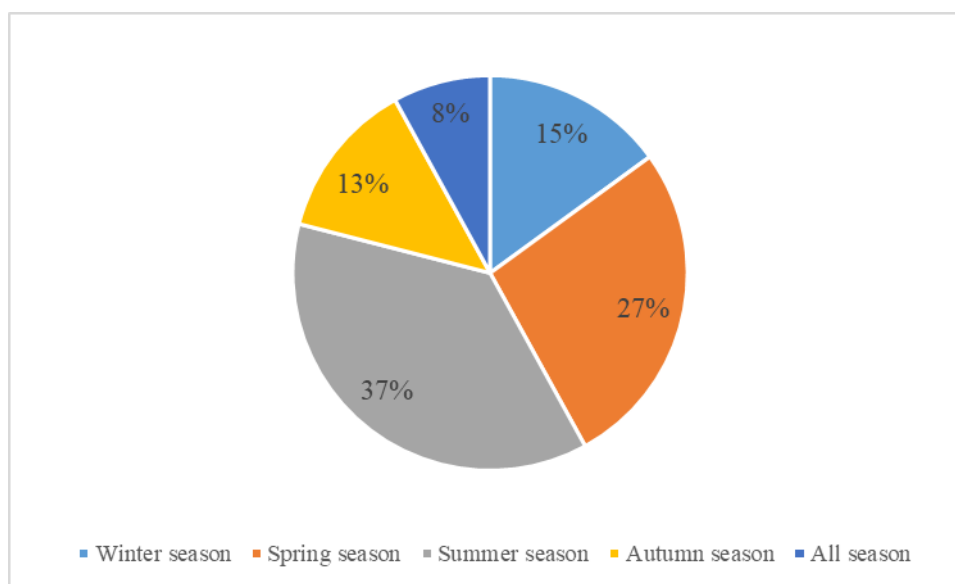


Figure 6. Seasonal availability of wild edible plant species in study area

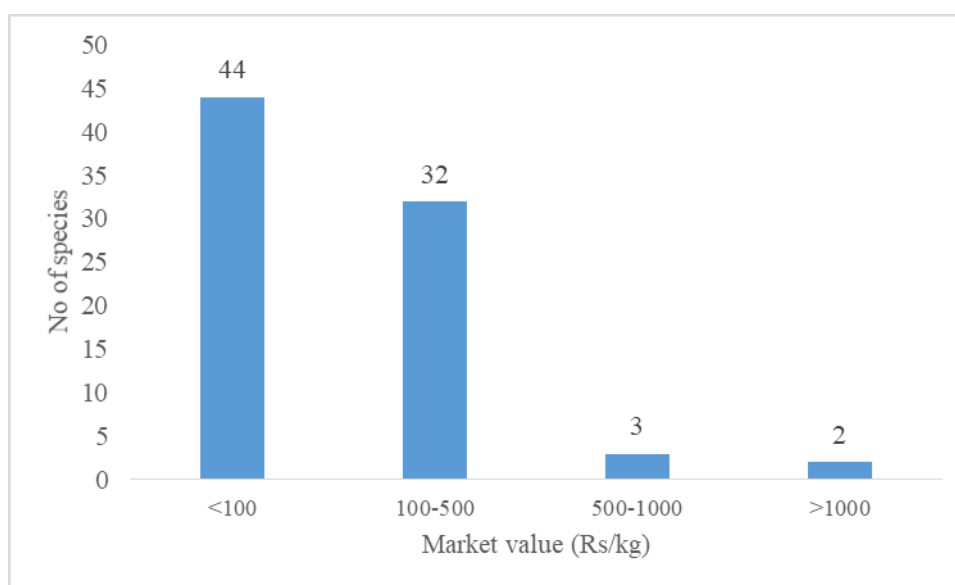


Figure 7. Market value of wild edible plant species in study area

Factors influencing the use of wild edible food plants: Motivators and Barriers

The respondents provided several reasons for using wild edible food plants, as shown in Figure 6. The majority of the respondents (110) reported that they use these plant species because of their taste. Other important reasons for using wild edible food plants include their pesticide-free nature, freshness and higher nutritional value. According to Pawera et al. (2021), the use of wild edible food plants is motivated by their natural, unpolluted and free availability (Chhetri et al., 2005). However, in our study area, the use of wild edible food plants is decreasing, as reported by 91.01% of the respondents (Figure 7). The main barrier to the use of these plants is the time constraint for collection, which was reported by 63 respondents. Additionally, the lack of availability in the market, insufficient knowledge and the absence of market value for selling are potential barriers to the use of wild edible plant species (Figure 8). Miya et al. (2021) noted that traditional knowledge about wild edible food plant species is declining due to modernization and socio-cultural changes. Therefore, it is important to document ethnobotanical

knowledge about wild edible plants properly. Changing food habits, taste preferences and lifestyles, as well as the availability of ready-made foods in the market, are contributing to an increasing neglect of traditional foods in rural diets.

The loss of wild edible food plants can be attributed to various factors such as habitat degradation, rapid urbanization, over-exploitation and changes in food habits (Ashagre et al., 2016). The collection and utilization of wild edible food plants (WEFPs) are considered risky and time-consuming and younger generations are becoming less familiar with these species. The sustainability of harvesting practices for WEFPs is poorly understood (Aryal et al., 2018). Aryal et al. (2018) identified premature and unsustainable harvesting, inadequate labor resources within families and the time required for collection as primary issues contributing to the decreasing availability of wild edible plant species. The loss and overharvesting of forests and other wild plant habitats have caused the decrease in these plant populations (Hong et al., 2022). Species with a high use value are often subject to greater extraction rates, which can lead to unsustainable practices. To ensure sustainable management, it is crucial to control overexploitation and illegal harvesting. A concerted effort from all sectors is necessary to develop and implement conservation strategies such as in situ conservation and domestication for the long-term management of wild edible food plant species. These strategies, along with other conservation and management measures, need to be coordinated and implemented effectively (Aryal et al., 2018). It is essential to make concerted efforts to conserve the diversity of wild edible plant species and promote their sustainable use. Community-based conservation programs, sustainable harvesting practices and the documentation and sharing of traditional knowledge associated with these plants are all potential initiatives to achieve this goal. However, despite these efforts, the sustainable use and management of these resources remain crucial for the millions of people living in mountainous areas, as their livelihoods still rely on these plants (Miya et al., 2021).

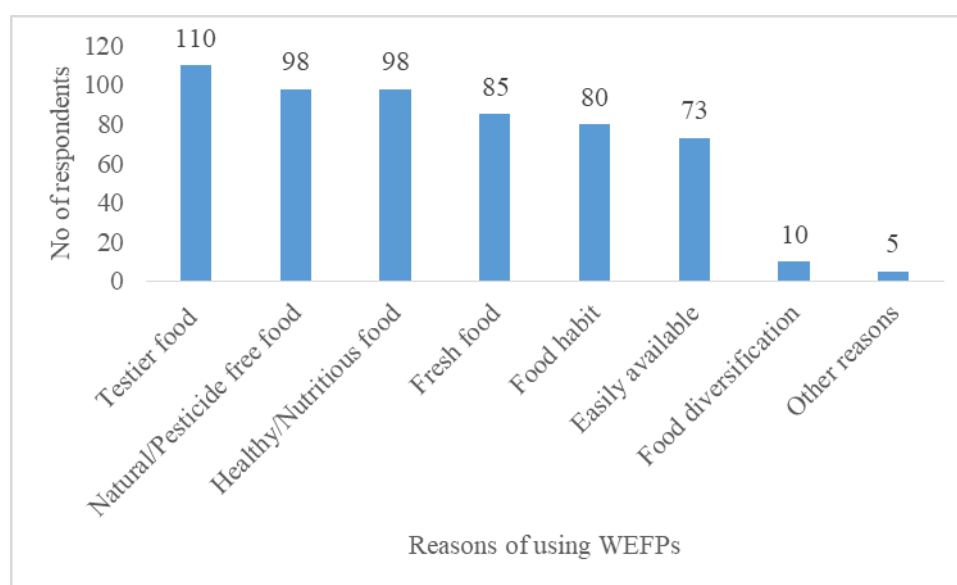


Figure 8. Motivators for using wild edible food plants in study area

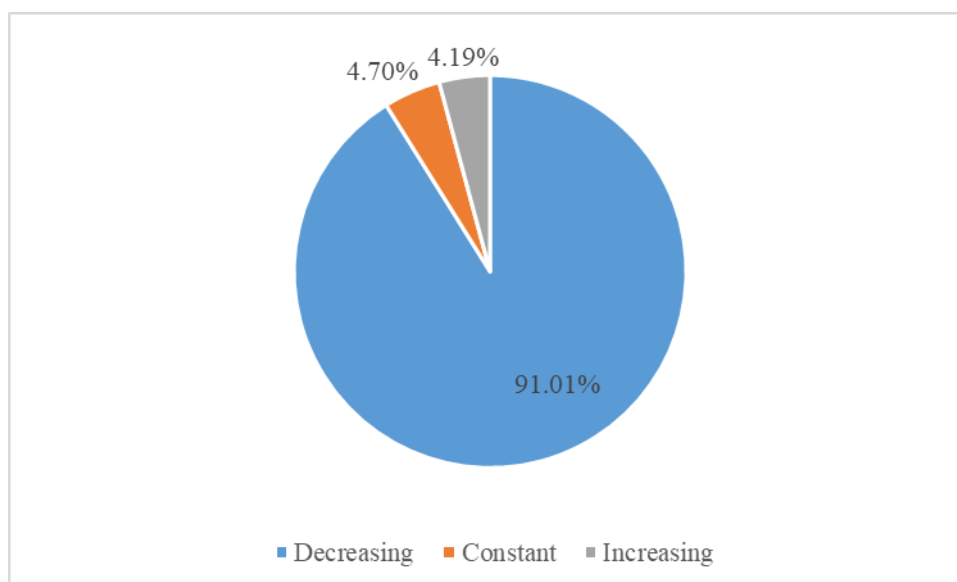


Figure 9. Consumption pattern of wild food plant species in study area

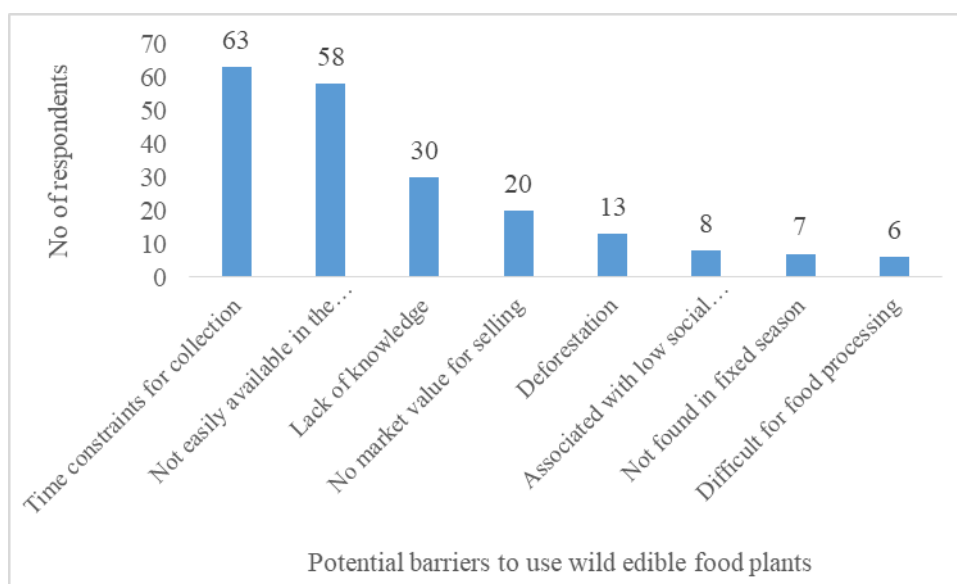


Figure 10. Potential barriers to use wild food plant species in study area

Preference of wild edible food plant species in study area

Table 3 presents a ranking of ten most preferred wild edible plant species in the study area, with *Stenochlaena palustris* (Burm.f.) Bedd. (Niuro) being the most favored, followed by *Rubus thomsonii* Focke (Ainselu) and *Myrica esculenta* Buch. - Ham. Ex D. Don (Haade kaafal). The high preference for Niuro is attributed to its unique taste, nutritional value, availability and cultural significance. Ainselu and kaafal are also highly regarded for their delectable taste, especially among children.

Table 3. Preference ranking among ten wild food plant species based on their use as perceived by the respondents

| S.N. | Plant species | Preferred by respondents | Rank |
|------|---|--------------------------|------|
| 1 | <i>Stenochlaena palustris</i> (Burm.f.) Bedd. (Niuro) | 24 | 1 |
| 2 | <i>Rubus thomsonii</i> Focke (Ainselu) | 23 | 2 |
| 3 | <i>Myrica esculenta</i> Buch. - Ham. Ex D. Don (Haade kaafal) | 20 | 3 |
| 4 | <i>Prunus napaulensis</i> (Ser.) C. K. Schneid. | 14 | 4 |
| 5 | <i>Aegle marmelos</i> L. (Bel) | 12 | 5 |

| S.N. | Plant species | Preferred by respondents | Rank |
|------|---|--------------------------|------|
| 6 | <i>Aesandra butyracea</i> (Roxb.) Bachni. (Chiuree) | 10 | 6 |
| 7 | <i>Urtica dioica</i> L. (Sisnu) | 9 | 7 |
| 8 | <i>Diospyros malabarica</i> (Desr.) Kostel. (Tiju) | 9 | 8 |
| 9 | <i>Phoenix sylvestris</i> (L.) Roxb. (Thaakal) | 8 | 9 |
| 10 | <i>Morus alba</i> L. (Kimbu) | 8 | 10 |

Conclusion

The study highlights the rich diversity of wild edible food plants (WEFPs) in Nepal, which contribute significantly to dietary intake and act as supplementary food during food scarcity. However, the utilization of these species has decreased over the years due to various barriers such as time constraints for collection, limited availability in markets, lack of knowledge and no market value for selling. The study recommends the conservation and management of WEFPs through initiatives such as community-based conservation programs, the promotion of sustainable harvesting practices and the documentation and dissemination of traditional knowledge associated with these plant species. Furthermore, the cultivation and domestication of WEFPs should be encouraged and technical and material support should be provided. The findings of the study have potential implications for human food supply, with WEFPs being substitute foods to combat food insecurity in Nepal. Therefore, there is a need for concerted efforts from all stakeholders to ensure the sustainable management and utilization of WEFPs to support food security and local livelihoods.

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