

Ethnobiology of wild leafy vegetables of Sikkim

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This paper is aimed to study the ethnobiology of wild leafy vegetables (WLV) consumed by the ethnic people of Sikkim. Traditional knowledge of the people on the ethnic value, foraging, mode of consumption, socio-economy of less familiar WLVs was documented. A wide range of adaptability with specific ecological habitat of some WLVs (*Amaranthus viridis*, *Chenopodium album*, *Diplazium esculentum*, *Nasturtium officinale* and *Urtica dioica*) were also recorded.

Keywords: Wild leafy vegetables, Ethnobiology, Sikkim

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Diversity of uncultivated plant species, their occurrence and relationship with cultivated species and their use by human has rarely been studied systematically¹. Many publications have emphasized on the diversity and value of wild edible plants². The systematic documentation of indigenous knowledge regarding the identity and use of wild foods by rural communities is now an urgent need because both indigenous knowledge and the biological resources are diminishing with habitat destruction and a disinterest among the younger generation³.

Sikkim is the Himalayan state of India with an area of 7096 sq km and the altitude ranges from 300 m to 8500 m. The state comprises of 4 districts: North, East, South and West with a total population is 6,07,688 lakh out of which 4,55,962 is rural population and 1,51,726 population is urban, respectively⁴. It is populated by three major ethnic groups of people, *Nepali*, *Bhutia* and *Lepcha*. The ethnic people of Sikkim consume roots, tubers, rhizomes, leaves and fruits of wild plants^{5,6}. Taxonomical description, distribution and ethnical importance of some wild edible plants have been previously documented^{7,8,9}. However, detailed ethnobiological study of wild leafy vegetables (WLV) of Sikkim has not been carried out. The present paper is aimed to document ethnobiological importance of some lesser-known WLVs of Sikkim.

Methods

Field survey was conducted in randomly selected 280 households in different villages of four districts of Sikkim, viz. North district (40 households), West (70 households), South (70 households) and East (100 households), representing the major ethnic communities, namely *Nepali*, *Bhutia* and *Lepcha*. Information was collected on ecological distribution, traditional knowledge, foraging, ethnobotany information, ethnobiological importance, mode of consumption, culinary and socio-economy of WLVs using questionnaire, semi-structured interviews, participant field collection and direct observation. Local names, uses, availability season, and trade of WLVs were also recorded. Taxonomical identification of WLVs was studied following the keys described by Quinlan¹⁰. The listed taxa were identified using transect walks for cross-checking of the gathered herbarium specimens from Botanical Survey of India, Sikkim circle, Gangtok, and semi-structured interviews with key informants. Herbaria of collected plants were deposited at Department of Botany, Sikkim Government College, Gangtok.

Results and discussion

Documentation of traditional knowledge

Based on personal observation and interviews with the key informants, village elders, farmers, vegetable vendors, consumers, vegetable middle man *Kharitey*,

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26 species of WLTV from Sikkim were documented, out of which, 5 less familiar and common WLTV species were prioritized for detail assessment. Prioritization was done using a set of criteria considered to be the main drivers of consumption and their availability in wild. These criteria are (a) taste, (b) frequency of occurrence, (c) ethnic consumer, (d) edibility acceptance, (e) medicinal value, (f) quantity used, (g) market demand, (h) supply volume, (i) supply source, (j) availability season and intensity and (k) preference by younger generation.

(1) *Amaranthus viridis* L.

Family: Amaranthaceae; English name: pig weed; Nepali name: *Lattey sag/Lunde sag*.

Leaves of *Amaranthus viridis* L. (Fig. 1a) are used as vegetable and are consumed by all ethnic people of Sikkim as side dish. People prefer to cook *lattey sag* either with potato or meat.

Ecological distribution

Amaranthus viridis L. is found luxuriantly growing as seasonal weed in the crop fields, around domestic livestock shed complex, waste lands, organic manure deposits and soil with no standing water, uncultivated fields, and home gardens of urban, peri urban and rural ecological environments. It is distributed within an altitudinal range in between 2500–6000 ft and is found growing in low hill, mid hill, low mid hill and mid upper hill (Table 1).

Ethnobiological importance

Ethno-medically *Amaranthus viridis* is found to act as antipyretic, analgesic, laxative, increase in appetite, antifungal and in the treatment of asthma. In traditional system *Amaranthus viridis* is also used as medicine to reduce labour pain. The Nepali uses this plant to treat several ailments such as malaria, hepatic disorders, jaundice, scanty urine or wounds, body ache, diabetes and to induce abortion. The Lepcha and Bhutia use the plant to treat diarrhoea, gastroenteritis and arthritis. They believe that curry prepared from *lattey sag* can stop diarrhoea. Seeds, ground into powder, are mixed with water and are taken as an infusion to cure general gastric problems. Beaten seeds are fried with butter and fed to pregnant women to lessen pregnancy pains. Root paste is applied on minor bone fracture and dislocation. Root and seed decoction is taken to treat diarrhoea and cough.

Table 1—Major villages and markets of Sikkim in different climatic zones

Climatic zone	Altitude (feet)	*Areas
Sub-tropical Zone (Low lands)	1000-2900	Rongpo, Mazitar, Kumrek, Kamling, Singtam, Jorethang, Jitlang, Mamring, Suntalay, Sirwani, Ranipool, 32 mile, Melli, Rongli, Legship, Makha, Samramsas, Rongli, 9 th mile, Reshi
Temperate Zone (Mid hills)	2900-6500	Khamdong, Namthang, Maniram, Sadam, Turuk, Aho, Rumtek, Mulukay, Ranka, Namchi, Tadong, Linding, Duga, Rhenock, Bermoik, Rakdong, Tintek, Central Pendam, Martam, Sang, Dikchu, Pendam, Assam, Lingey, Bhusuk, Mangan, Phodong, Phensong, Chungthang, Kabi lungchok, Pangthang, Aritaar, Pakyong, Gangtok, 6 th Mile, Rawtey, Rumtek, Sang, Tashiding, Soreng, Sombaria, Namchi, Temi Tarku, Lingey Payoong, Kewzing, Kaluk, Darmadin, Hee-Bermiok, Dzongu, Kabi, Okhrey, Geyzing, Chujachen, Lamaten, Sombaria, Naga, Sipygar, Kartok.
Temperate zone (High hills)	6500-9000	Pelling, Rabongla, Ben, Hilley
Alpine Zone	9000-16000	Lachen, Lachung, Barsey, Nathang, Changu, Phadamchen, Parts of Dzongu.

*Areas with *italics* were surveyed for collection of data and information.

Foraging

Foraging of *Amaranthus viridis* is done from waste lands, field margins, cultivated crop fields and furrows. Tender shoots and young leaves as edible parts are being collected from its natural habitat during the month of April to July (varying at different places based on altitude and climatic conditions). Based on the requirement, whether for home consumption or sale in the vegetable market, two different patterns of collection are practiced by the ethnic people of Sikkim. Elderly women are expert in plucking the edible parts for consumption.

Market chain analysis and socio-economic profile

A study on the market chain and socio-economy of *Amaranthus viridis* L. was conducted. There is a proportionate, unidirectional socio-economic gain involved in *lattey sag* market chain. For sale in the market and local periodical *haats*, the young plants are uprooted or plucked and carried to the tap water

or *dhara*, a traditionally designed, common washing and bathing place along, some nearby stream or kitchen courtyard. The washed materials are tied into bundles and inserted in a sack or bamboo-stripe made back-pack basket locally called *doko* and carried to the market locally called *haat* and other places for sale. If the villager is not a vegetable seller then it is either sold to vegetable vendor in the market or to the vegetable supplier, middle man locally called *kharitey* who purchases the vegetable in large scale from the villagers and supplies to the vendors at the market. *Kharitey* transports the vegetable load from village to the town by public carrier such as bus or taxi. From the terminus at the town, the load is transported to the vegetable vendor at the vegetable market place manually by the porter. *Kharitey* pays for the manual labour and transport expenses and supplies to the vegetable vendor at the market place and gets his return in cash. Consumer purchases from the vegetable vendor at the rate of Rs. 15-20 per bundle. The market chain is unidirectional where benefit flows from wild natural habitat to urban and rural consumers. Several stakeholders are benefited in this unidirectional chain of *lattey sag* marketing.

Nutritional value¹¹

Protein: 19.8 % DM (dry matter), fat: 4.2 % DM, crude fibre: 12.9 % DM, ash: 12.2 % DM; food value: 343.0 kcal/100 gm DM.

(2) *Chenopodium album* L.

Family: Chenopodiaceae; English name: Lamb's quarters/pig weed/goose foot; Nepali name: *bethu sag*.

Leaves of *Chenopodium album* L. (Fig. 1b) is cooked and consumed as a side dish. The village people prefer to cook *bethu sag* either with potatoes or meat.

Ecological distribution

It is found growing as a seasonal weed in the crop fields, fallows, uncultivated fields, home gardens, organic manure deposits, soils with no standing water in altitudinal range up to 12000 ft. It multiplies at a very fast rate, because of a large number of small seeds produced per plant. It grows in low hill, mid hill, low mid hill, mid upper hill and upper hill at varying distribution density. In its natural habitat it is seen growing in association with plant species such as *Amaranthus* sp., *Cepsella* sp., *Cardamine* sp., *Centella asiatica*, *Polygonum* sp., *Galinsoga* sp.,

etc.,. Some ethnic people in Sikkim believe that the *bethu* seeds fall to the ground from the sky. This could be attributed to its anemophilic mechanism of seed dispersal.

Ethnobiological importance

In ancient times, as reported by some elderly informants, seeds of *Chenopodium album* L. were also used for baking bread. *Lachungpa* community of *Bhutia* in Lachung valley of North Sikkim uses *C. album* seeds in the preparation of *chhyang*, a traditionally prepared alcoholic beverage from finger millets, to enhance the taste of the product. *Chenopodium album* is commonly used both as food and medicine. It is used to cure piles and clearing worms, to enhance digestive power, appetite, and strength of the body, treatments of hepatic disorders, spleen enlargement, intestinal ulcers and burns. *Bethu sag* is used in TSM to cure constipation and joint pain in Sikkim.

Foraging

Foraging of *Chenopodium album* is done from cultivated crop or vegetable fields and furrows. The tender shoots and young leaves are collected during the month of April to July. Based on the requirement, whether for home consumption or sale in the vegetable market, two different patterns of collection are practiced by the ethnic people of Sikkim. For consumption at home, the tender shoots with leaves are collected by plucking them with hand. Elderly women are expert in plucking the edible parts for consumption.

Market chain analysis and socio-economic profile

Forging of *bethu sag* is done from the crop-field habitat. Young plants are uprooted or plucked, washed and tied into bundles and inserted in a sack or bamboo-made basket and carried to the vegetable market for sale. Consumer purchases from the vegetable vendor at the rate of Rs. 15-20 per bundle.

Nutritional value¹¹

Protein: 23.0 % DM (dry matter), fat: 3.4 % DM, crude fibre: 8.2 % DM, ash: 16.2 % DM; food value: 368.2 kcal/100 gm DM.

(3) *Diplazium esculentum* (Retz.) Sw

Family: Dryopteridaceae/Athyraceae; English name: fern; Nepali name: *ningro*

In Sikkim the ethnic people consume cooked young fronds (circinately coiled) of *Diplazium esculentum* (Retz.) Sw (Fig. 1c) as curry in meals. It is either prepared alone or with potato or *chhurpi* (cottage cheese-like product). The most popular *ningro* culinary in Sikkim is *ningro-chhurpi* curry which is even served during festivals, social parties, food festivals and also in the hotels.

Ecological distribution

Diplazium esculentum is an aggressive fern of wasteland, forest and undisturbed areas in the forest and farm land proximities. It commonly grows in moist and shady places, and is found growing in the field margins and vertical slopes of the terraced crop fields within an altitudinal range of 4000-8000 ft in Sikkim.

Ethnobiological importance

The matured leaves of *Diplazium esculentum* locally called *uneuw* are widely used as cattle bedding from the month of June to October/November. During these six months *Diplazium* sp. along with few other ferns is the major cattle bedding for the livestock of Sikkim. The organic manure prepared out of such cattle bedding are considered to be amongst the best manures for ginger crops and vegetable farming. The leaves are used as vegetables and the dried rhizomes used as insecticides. *Diplazium esculentum* has several medicinal values. The decoction is used to cure haemoptysis and cough. Eating fresh and dry root helps stop dysentery. The availability and use period varies for different species of edible ferns. The study indicated that the knowledge is eroding due to changing social values and non participation of younger generation in collection and processing of such wild leafy vegetables. *Uneu* is also used for constructing roadside and forest huts locally called *dehra* which are used as temporary shelters by migrant labourers and cardamom field workers in the remote forests of Sikkim. *Uneu* is also used by the ethnic people of Sikkim for incubating *marcha* (dry, mixed, amylytic starter for production of alcoholic beverages) and *kodo ko jaanr* (fermented finger millet alcoholic beverage)¹².

Foraging

Foraging of *Diplazium esculentum* is done from its wild habitat. Tender fern crochets (from the scrolled tip to about 18 cm towards base) are much in demand in the market. It comes in small bundles containing

35–50 crochets and sold afresh. *Diplazium esculentum* is the most commonly used and widely available vegetable fern. Young fronds and crochets of the plant are collected by the women folk of the rural villages as they are experienced in identifying the edible fern species, growing along with poisonous ferns.

Market chain analysis and socio-economic profile

Our study on the market chain and socio-economy of *Diplazium esculentum* reveals the fact that *ningro* foraging is not an easy task. Leeches, summer burn and monsoon rain are the major hardships of *ningro* foraging in the forests. Despite of the hardships there is a proportionate socio-economic gain involved in *ningro* market chain. For sale in the vegetable market, roadside stall, local periodical *haat*, the young twigs with tender leaves and cercinate vernations are hand plucked and collected in a bamboo basket. The collected parts are tied into small bundles weighing about 250-500 gm each, with the help of a strap drawn out of cardamom petiole or green straw. The bundles are then inserted into a sack or bamboo basket and carried to the local markets. Consumer buys at the rate of Rs. 15-20 per bundle weighing about 300-500 gm.

Nutritional value¹¹

Protein: 31.2 % DM (dry matter), fat: 8.3 % DM, crude fibre: 9.9 % DM, ash: 19.5 % DM; food value: 376.7 kcal/100 gm DM.

(4) *Nasturtium officinale* R.Br.

Family: Cruciferae; English name: watercress; Nepali name: *simrayo*; Lepcha name: *shamrock*.

Simrayo (*Nasturtium officinale* R.Br.) leaves (Fig. 1d) are consumed as a side dish or soup. It is cooked either alone or with potatoes or meat. *Simrayo* is also consumed as a potherb and soup. *Bhutia* of Sikkim prefers to cook *simrayo* with meat.

Ecological distribution

Nasturtium officinale is found naturalized in many parts of Sikkim and commonly grows in ditches, pools and margins of shallow streams, up to an altitude of 12,000 ft. It is found growing in low hill, mid hill, low mid hill, mid upper hill and upper hill (Table 1). It grows submerged, floating in water, or spread over sandy surfaces in flowing water. *N. officinale* is found in abundance near springs and open-running waterways, and in some perennial

ditches, where the kitchen wash constantly flows. *Simrayo* cluster is seen to form a soft green carpet along the drinking water sources locally called *pani ko muhaan* of rural villages and marshy places of the hill. The plant is also believed to purify the spring water sources in the villages of Sikkim. *Simrayo* occurs naturally along running water and grows floating in shallow water.

Ethnobiological importance

Nasturtium officinale has several medicinal values. The ethnic people of Sikkim believe that *simrayo* is useful in goitre. It is believed to possess antiscorbutic and stimulant properties and is eaten to improve appetite. A decoction of the plant is given as a blood purifier, vermifuge and diuretic. It is used for dry throat and cold in the head, asthma and tuberculosis. *N. officinale* is believed to have anti-cancer properties and is effective against high blood pressure. The aerial part decoction is given to relieve body pain.

Foraging

Foraging of *Nasturtium officinale* is done from its natural habitat, marshy places in the wild, ditches and homesteads. It is collected from the wild habitat by the women and children folk. *Simrayo* as a vegetable dish though liked by all the ethnic communities in Sikkim, has not yet entered into the food menu of elites and festivals of *Sikkimese*. One of the reasons of this could be the natural habitat of *simrayo* as it also grows in several polluted marshy places. This fact perhaps, dissuades its wider acceptability. The hill people are therefore, very selective in terms of its wild source of foraging. It was observed during the present study that *simrayo* is being cultivated in some fringe areas of the state and is being produced for economic return.

Market chain analysis and socio-economic profile

Simrayo foraging is done from the natural habitat, semi-domesticated or wild. The collected parts of *simrayo* are washed; roots are removed with the help of any cutting implements such as sickle or knife. The upper edible parts, tender stem and leaves are separated minutely by eliminating the matured stem, root and root hair. The selected edible portions are tied into bundles. Green straw or lacerated cardamom leaves are used to tie the bundles. The bundles are then inserted in a bamboo basket and carried to the market. The price of each bundle is Rs.15-20.

Nutritional value¹¹

Protein: 33.8 % DM (dry matter), fat: 9.6 % DM, crude fibre: 4.6 % DM, ash: 24.9 % DM; food value: 348.4 kcal/100 gm DM.

(5) *Urtica dioica* L. Urticaceae

Family: Urticaceae; English name: stinging nettle; Vernacular name: *sisnoo* (Nepali), *sarong* (Lepcha).

Urtica dioica or *sisnoo* (Fig. 1e) is never consumed raw as salad, due to the presence of stinging hair on its stems and leaves. Boiling and cooking destroys the stinging effect of *sisnoo* stinging hairs. Both leaves and flowers of *sisnoo* are consumed as vegetables in the form of pot herb and soup. The *Bhutia* prefers consumption of *sisnoo* with meat. *Sisnoo* which was once considered to be the food of poor, illiterates and marginalized people, have now become a favourite dish of several elites and literates. It is served during festival, marriage, and has also entered into the food menu of restaurants in Sikkim.

Ecological distribution

Urtica dioica is found luxuriantly growing in wasteland, roadside verges, hedgerows, walls, compost heaps, damp spots in the forest, along the margins of streams and river side, uncultivated fields, field margins and home gardens, undisturbed damp places or waste disposed areas. Presence of *sisnoo* population in a particular location, indicates, fertile or damp soil. It thrives in rich soil, moist woodlands, thickets, disturbed areas along partially shaded trails and riversides within an altitudinal range of 4000-9500 ft and is found growing in mid-hill, low mid hill, mid upper hill and upper hill (Table 1).

Foraging

Sisnoo is the first WLV to enter into the local vegetable market after the cold freezing winter ends. It is sold as small bundles with about 20-25 twigs per bundle. *Sisnoo* is collected by rural women. For a large scale collection, a pair of hand gloves, a traditionally designed metallic tongue called *chimta*, a bamboo-stripe made basket called *thumchey* and a sickle are the essential appliances. The tender shoots are held with the help of metallic tongue at a length of about 12-18 inches down the apex along the base. At this point, the next hand holding the sickle cuts the tender shoot at a gap of about 1-2 inches below the point where the metallic tongue has held. With the metallic tongue still holding the cut end is then

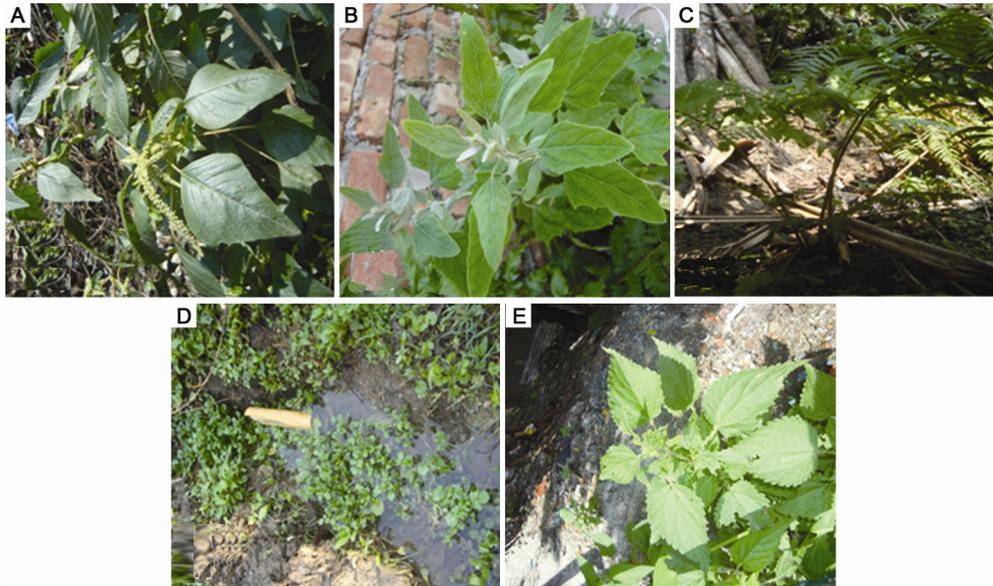


Fig. 1—a-e: Wild leafy vegetables of Sikkim (a) *Amaranthus viridis* L.; (b) *Chenopodium album* L.; (c) *Diplazium esculentum* (Retz.) Sw.; (d) *Nasturtium officinale* R.Br.; (e) *Urtica dioica* L.

cautiously moved parabolically above and across the head and the tender shoot is dropped into the *thumchey* carried at the back. The knowledge of foraging is transmitted from the elders to the younger generation and also the market chain parameters. Stinging nettles can be planted alongside of gardens to help control pests such as *Chamaepsila rosae* (carrot fly), aphids and black flies. These insects often prefer eating *Urtica dioica* instead of carrots and other garden produces. Thus, planting nettles can allow for alternative, organic gardening methods that eliminate the need to use pesticides. *Urtica dioica* stems are very fibrous and have been used by humans for hundreds of years to make rope and cloth.

Ethnobiological importance

Sisnoo is one of the popular WLVs and is in high demand. The local populace use *sisnoo* in the treatment of several illnesses such as arthritis, anaemia, rheumatism, skin complaints, problems of bone, diabetes, to treat gout, sciatica, skin complaints. *Lepcha* use it in the treatment of arthritis and rheumatism or joint ache by beating the fresh *sisnoo* leaves on to the skin. Root paste of *sisnoo* is applied on minor bone fracture and dislocation. Root and seed decoction are taken to treat diarrhoea and cough. Curry, prepared using shoot tips, is given to female during child delivery. Beside food and medicine, *sisnoo* is also a component of traditions and culture of

Sikkim. The *Nepali* and *Bhutia* use *sisnoo* for fun play during arranged marriages. It is also used by ethnic folk healers (*jhankri*, *bejuwa*, *bunghing*, *phedangma*) of Sikkim. Many believe that *sisnoo* keeps evil spirit away from a person or house. It is also used when the new born babies are ill. All the ethnic communities of Sikkim forbid the use of *sisnoo* during death in the family or during mourning. *Sisnoo* is not eaten by elderly conservative *Brahmin* community of *Nepali*. In the rural villages it is also believed that a person who has been bitten by a dog should not consume *sisnoo*. It is believed to enhance hydrophobia. Stems are beaten, dried and boiled to make threads and woven into traditional nettle clothing. Spines are believed to stimulate milk production, when cows do not lactate. *Shamans* beat humans during exorcism rituals with nettles in a belief to drive away evil spirits from body. There is a strong belief amongst the natives of Sikkim that *sisnoo* should not be touched or eaten by family members of deceased person on the day of death.

Market chain analysis and socio-economic profile

Blood sucking leeches, snakes, *sisnoo* stinging hairs, summer burn and monsoon rain are the major hardships of *sisnoo* foraging in the forests. Despite of the hardship, there is a proportionate socio-economic gain involved in *sisnoo* market chain. Skilled foragers collect the edible parts from the forest. The collected

twigs are tied into small bundles with the help of straw or lacerated cardamom leaves or petioles bundles of 250-400 gm each. Each bundle containing 20-25 twigs with young leaves. These bundles are inserted into a bamboo basket and carried to the market, and *Kharitey* supplies to the vegetable vendor. Consumer purchases from the vegetable vendor @ Rs. 15-20 per bundles. Several stakeholders are benefited in this unidirectional chain of *sisnoo* marketing. *Sisnoo* marketing is a seasonal family activity.

Nutritional value¹¹

Protein: 28.5 % DM (dry matter), fat: 5.2 % DM, crude fibre: 13.2 % DM, ash: 18.9 % DM; food value: 353.4 kcal/100 gm DM.

Socio-economy

WLVs of Sikkim are broadly divided into two groups on the basis of consumption, the one which are not consumed regularly on account of their limited seasonal availability while others are frequently consumed due to easy availability. None of WLV species have been domesticated for large scale commercial cultivation in the field through any regularized agency. A study on the year-wise, market price of WLVs (maximum per bundle price in a season), in rural and urban markets of Sikkim data collected for year 2001-2011 envisages their commercial viability. A comparative analysis of urban and rural market price in rupees (maximum per bundle price in a season) per bundle of WLVs of Sikkim has revealed the fact that within a span of 11 yrs there is a sharp rise in price rate of WLVs. In 2001 per bundle price of the selected five WLVs in urban market were Rs 2 and that in rural markets Rs.1-1.5. However, in 2011 the urban market price reached to Rs 15 and that in rural market it ranged from Rs.12-15. And therefore even the low income in the form of hard cash is considered as good profit because often the collectors are directly involved in selling of the produce. In most cases 100 % profit is made out of selling WLVs and the profit is used for livelihood. Except for labour cost, time and space these WLVs are almost zero investment economic-gain to the rural ethnic people of Sikkim, as they are collected from their natural habitat. There is no Government regulation and intervention over the market price of WLVs commercialized in Sikkim yet it is at a reasonable growth within the purchasing capacity of the people. Except *Amaranthus viridis* and

Chenopodium album which are of moderate demand, *Diplazium esculentum*, *Nasturtium officinale* and *Urtica dioica* are of high demand in all the major, urban and rural markets of Sikkim.

Gender profile of WLV vendors

A study on the gender percentage profile of WLV vendors in Sikkim reveals that the state has 74 % female vendors and 26 % male vendors, respectively. It is interesting to note that in all four districts the percentage of female vegetable vendors dealing with the marketing of WLV is higher than that of male. Women were found to play a major role in the collection and preparation of WLVs whereas men and youth generally do not harvest or prepare wild vegetables.

The results of assessment on ethnic community-wise edibility acceptance percentage amongst the younger generation of 20-24 yrs age group has shown that *ningro* and *sisnoo* are consumed by 82.2-90 % of young generation belonging to the three ethnic communities of Sikkim. The edibility acceptance percentage of *simrayo* was also found to be almost equal for all the three ethnic communities which were within the range of 85.5-87.7 %. Consumption of *bethu* is higher amongst *Nepali* younger generation with 55.5 % while 35.5% and 27.7 % of *Lepcha* and *Bhutia* younger generation, respectively. It is quite interesting to note that 42.2 % of younger generation belonging to *Nepali* community accepts the edibility of *lattey sag* and only 28.8 % and 20 % values estimated for *Lepcha* and *Bhutia*, respectively. *Ningro* is accepted by 90 % *Bhutia*, 86.6 % *Nepali* and 82.2 % *Lepcha*, whereas 90 % of *Nepali* and *Bhutia* and 84.4 % *Lepcha* consume *sisnoo*. Edibility acceptance percentage of *simrayo* for all the three ethnic groups is more than 85%.

Conclusion

Information on traditional knowledge, ecological distribution, and socio-economy of WLVs of Sikkim is sparse outside the region. Foraging from wild is an age old tradition of the ethnic communities of Sikkim however; it has several adverse effects as identified during the study. The study on marketing and socioeconomic profile has surfaced out the commercial viability of WLVs examined. Based on the synergetic inference of all these results domestication strategy of WLV may be proposed for sustainable development of the regions.

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