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Ethnobotanical survey of indigenous leafy vegetables consumed in rural areas of Terai-Dooars region of West Bengal, India

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Abstract: There is always a need for novel, high quality, functional and inexpensive foods among consumers in the global markets. Leafy vegetables can fulfill such needs. Leafy vegetables are now used worldwide as food for their nutritional and medicinal values. In the present work an ethnobotanical survey was carried out on the utilization of edible plants by local communities of the Terai-Dooars Region of West Bengal. The information has been documented by interviewing traditional farmers, herbalists, various older men and women following different ethnobotanical methods. A total of 103 plant species under 44 families with their short botanical description, use, range of demands and cultivation status have been documented.

Keywords: Ethnobotany, indigenous, leafy vegetable, Terai-Dooars, tribe.

A large section of the population of the globe fulfil their nutritional requirements through the consumption of various leafy vegetables (Singh & Arora 1978). Technically, leafy vegetables refer to leaves of any plants used as vegetables, sometimes accompanied by petioles and shoots. In most cases, leafy vegetables are consumed for their nutritional values without much consideration for their medicinal importance. Leafy vegetables are primarily composed of polysaccharides, cellulose, hemicellulose, pectin, gum mucilage and some non-carbohydrate components (Islam et al. 2004). Epidemiological studies indicate that increased intake of leafy vegetables is associated with a decreased risk of nutrient depletion disorders as well as some serious diseases like cancers, cardiovascular disease, cataract, and other age-related diseases (Acho et al. 2014). Leafy vegetables deserve much attention in rural areas because of their possible usefulness during famine and similar scarcity situations. Rural tribal communities in many parts of the world depend on wild plants to fulfill their dietary requirements and these play a crucial role in their food security (Prasad et al. 2008). To earn additional income, they also sell them in their local markets. To fulfill the demands of the local markets several varieties of these leafy vegetables are either collected from the wild habitat or cultivated locally or even commercially. In the Terai-Dooars region of West Bengal, people have a long history of consuming leafy vegetables.

The Terai and Dooars region politically constitute the plains of Darjeeling District, the whole of Jalpaiguri and Alipurduar districts and the upper region of Cooch Behar District in West Bengal. The slope of the land is gentle, from north to south. The general height of the land is 80–100 m. The entire region is made up of sand, gravel and pebbles laid down by the Himalayan rivers namely, the Teesta, Torsa, Raidak, Jaldhaka, Sankosh and several other small rivulets. The Teesta has divided the area into two parts—the western part is known as the Terai whereas the eastern part is known as the Dooars

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or Duars. The area Dooars starts from the eastern bank of the river Teesta in the Jalpaiguri District stretching up to the western bank of the river Sankosh in Alipurduar District, spreading over a span of around 130km of which 40km area runs along the Himalayan foothills. This region is highly populated and characterized by the presence of different tribal communities. The local consumption of these leafy vegetables and their increased demand in the market, can create a threat to some species especially the wild species of this region. To overcome such problems the people of this region cultivate such threatened plants either in their home gardens for local consumption or in agricultural fields for marketing. Thus there is a real need of maintaining proper records of leafy vegetables and their status of conservation through agricultural practices. The present study was designed to evaluate the level of utilization, availability and cultivation practices of leafy vegetables of this region.

Materials and Methods

Study Area

The present study was carried out in several rural and semi-urban areas of Terai-Dooars region of West Bengal, India. To record the indigenous and under-utilized leafy vegetables, extensive field surveys were conducted during three consecutive years between January 2016 to March 2019. For this study several tribal villages, rural markets and agricultural fields were visited. The plant specimens were collected, mounted on herbarium sheets and identified through the available taxonomic literature, books and some relevant articles. Data was collected through a combination of tools and questionnaires. The information thus gathered was compared with available literature sources.

Results and Discussion

The present work is the outcome of ethno-botanical field survey of three consecutive years from different villages and markets of Terai-Dooars region of West Bengal. During the present investigation, it was found that 103 plant species are used as leafy vegetables in the study site. Most of the plants are used as health food and some are used only as medicines. The edible plants also have some medicinal values. The study records a total of 103 plant species belonging to 44 families (Table 1). The study provides important evidence about traditional knowledge and diversity of wild and cultivated leafy vegetables. Among the leafy vegetables, 54.81% are in high demand, 21.15% are in moderate demand, and 24.04% are rarely demanded. The study also reveals that among the plants 72.12% are collected or cultivated due to their edible leaves but 27.88% plants are notable for other parts like fruits, seeds, rhizomes, and leaves are of secondary importance.

Conclusion

These leafy vegetable plants and their utilization is well recognized by the local communities. It was observed that the majority of the local inhabitants were dependent on wild vegetation for under-utilized leafy vegetables but over-utilized leafy vegetable plants were

Table 1. List of leafy vegetable in Terai-Dooars region of West Bengal.

	Binomial name	Vernacular name	Family	Life form	Use	Range of use	Cultivation status	Major economical parts
1	*Hygrophila polysperma* (Roxb.) T. Anders.	Puinnya Shak	Acanthaceae	Herb	Cooked as vegetable	Limited	Wild	Leaf
2	*Andrographis paniculata* (Burm.f.) Nees	Kalmegh	Acanthaceae	Herb	Eaten raw as medicinal plant against stomach problem	Wide	Wild and locally cultivated	Leaf
3	*Justicia adhatoda* L.	Basak	Acanthaceae	Shrub	Leaf extract used as oral medicine for common cold and cough	Wide	Locally cultivated	Leaf
4	*Hygrophila auriculata* (Schumach.) Heine	Kulekhara	Acanthaceae	Herb	Eaten raw as medicinal plant	Wide	Wild and cultivated	Leaf
5	*Amaranthus tricolor* L.	Lalsak/Sadanote	Amaranthaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Leaf
6	*Amaranthus blitum* subsp. *oleraceus* (L.) Costea	Sadanote	Amaranthaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Leaf
7	*Digera muricata* (L.) Mart.	Latamouri/ Gungutiya	Amaranthaceae	Herb	Cooked as vegetable	Limited	Wild	Leaf
8	*Spinacia oleracea* L.	Palongsak	Amaranthaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Leaf
9	*Beta vulgaris* L.	Beet sak	Amaranthaceae	Herb	Cooked as vegetable	Moderate	Commercially cultivated	Fruit

	Binomial name	Vernacular name	Family	Life form	Use	Range of use	Cultivation status	Major economical parts
10	*Alternanthera sessilis* (L.) R.Br. ex DC.	Notesak	Amaranthaceae	Herb	Cooked as vegetable	Limited	Wild	Leaf
11	*Amaranthus viridis* L.	Katanote	Amaranthaceae	Herb	Cooked as vegetable	Moderate	Wild and cultivated	Leaf
12	*Centella asiatica* (L.) Urb.	Thankunisak	Apiaceae	Herb	Eaten raw as medicinal plant	Wide	Wild	Leaf
13	*Carum roxburgianum* Benth.	Radhuni pata	Apiaceae	Herb	Cooked as vegetable	Moderate	Commercially cultivated	Fruit
14	*Coriandrum sativum* L.	Dhonepata	Apiaceae	Herb	Used to prepare sauce and salade	Wide	Commercially cultivated	Fruit
15	*Trachyspermum ammi* (L.) Sprague	Ajwan pata	Apiaceae	Herb	Used to prepare sauce and salade	Moderate	Commercially cultivated	Fruit
16	*Colocasia esculenta* (L.) Schott	Kochu	Araceae	Herb	Cooked as vegetable	Wide	Wild and commercially cultivated	Leaf and Rhizome
17	*Homalomena aromatica* (Spreng.) Schott.	Bankochu	Araceae	Herb	Cooked as vegetable	Wide	Wild and commercially cultivated	Leaf and Rhizome
18	*Alocasia macrorrhizos* (L.) G.Don	Mankochu	Araceae	Herb	Cooked as vegetable	Wide	Wild and commercially cultivated	Leaf and Rhizome
19	*Amorphophallus bulbifer* (Roxb.) Blume	Oal	Araceae	Herb	Cooked as vegetable	Moderate	Wild and commercially cultivated	Leaf and Rhizome
20	*Lasia spinosa* (L.) Thwait., Enum. Pl. Zeyl.	Kantakochu	Araceae	Herb	Cooked as vegetable	Moderate	Wild	Leaf and Rhizome
21	*Colocasia antiquorum* Schott.	Mukhikochu	Araceae	Herb	Cooked as vegetable	Moderate	Wild and commercially cultivated	Leaf and Rhizome
22	*Xanthosoma sagittifolium* (L.) Schott.	Mankochu	Araceae	Herb	Cooked as vegetable	Wide	Wild and commercially cultivated	Leaf and Rhizome
23	*Eclipta prostrata* (L.) L.	Vringraj	Asteraceae	Herb	Cooked as vegetable	Moderate	Wild	Leaf
24	*Enhydra fluctuans* Lour.	Helecha	Asteraceae	Herb	Cooked as vegetable	Moderate	Wild	Leaf
25	*Sonchus arvensis* L.	Bonpalong	Asteraceae	Herb	Cooked as vegetable	Moderate	Wild	Leaf
26	*Diplazium esculentum* (Retz.) Sw.	Dheki	Athyriaceae	Herb	Cooked as vegetable	Wide	Wild and commercially cultivated	Leaf
27	*Basella alba* L.	Puisak	Basellaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Leaf
28	*Raphanus raphanistrum* subsp. *sativus* (L.) Domin	Mulo	Brassicaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Tuber
29	*Brassica oleracea* L. var. *capitata*	Badhakopi/ Patakopi	Brassicaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Leaf and Shoot
30	*Brassica oleracea* L. var. *botrytis*	Fulkopi	Brassicaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Bud
31	*Brassica oleracea* L. var. gangyloides	Oolkopi	Brassicaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Leaf and Shoot
32	*Brassica napus* L.	Sadasarisha/ Maghi sorisha shak	Brassicaceae	Herb	Cooked as vegetable	Moderate	Commercially cultivated	Seed
33	*Sinapis alba* L.	Sada sorisha shak	Brassicaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Seed
34	*Brassica nigra* (L.) K.Koch	Kalo sarisa	Brassicaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Seed
35	*Brassica rapa* L.	Shalgom	Brassicaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Seed
36	*Lepidium sativum* L.	Halimshak	Brassicaceae	Herb	Cooked as vegetable	Moderate	Wild and locally cultivated	Seed
37	*Ananas comosus* (L.) Merr.	Anaras	Bromeliaceae	Herb	Leaf extract is used as medicine against stomach problem	Limited	Commercially cultivated	Fruit
38	*Cannabis sativa* L.	Bhang	Cannabaceae	Herb	Leaf dust used as stimulatory substances	Wide	Wild	Leaf
39	*Chenopodium album* L.	Bothuasak	Chenopodiaceae	Herb	Cooked or boiled as vegetable	Wide	Wild	Leaf

	Binomial name	Vernacular name	Family	Life form	Use	Range of use	Cultivation status	Major economical parts
40	*Operculina turpethum* (L.) Silva Manso	Dudh Kolmi	Convolvulaceae	Herb	Cooked as vegetable	Wide	Wild	Leaf
41	*Hewittia malabarica* (L.) Suresh	Dhudla Shak	Convolvulaceae	Herb	Cooked as vegetable	Limited	Wild	Leaf
42	*Ipomoea batatus* Lam.	Misti aloo	Convolvulacea	Herb	Cooked as vegetable	Moderate	Commercially cultivated	Tuber
43	*Ipomoea aquatica* Forssk.	Kolmi	Convolvulaceae	Herb	Cooked as vegetable	Wide	Wild	Leaf
44	*Stellaria media* (L.) Vill.	Marmurishak	Caryophyllaceae	Herb	Cooked as vegetable	Limited	Wild	Leaf
45	*Commelina benghalensis* L.	Kanshira	Commelinaceae	Herb	Cooked as vegetable	Limited	Wild	Leaf
46	*Bryophyllum pinnatum* (Lam.) Oken	Pathorkuchi	Crassulaceae	Herb	Eaten raw as healthy food	Wide	Wild and locally cultivated	Leaf
47	*Sechium edule* (Jacq.) Sw.	Squash/ Koash	Cucurbitaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Fruit
48	*Momordica charantia* L.	Karola	Cucurbitaceae	Herb	Cooked as vegetable	Limited	Commercially cultivated	Leaf
49	*Lagenaria siceraria* (Molina) Standl.	Lao	Cucurbitaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Leaf and Fruit
50	*Cucurbita maxima* Duchesne	Misti Kumra	Cucurbitaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Leaf and Fruit
51	*Luffa cylindrica* (L.) M.Roem.	Dhundol	Cucurbitaceae	Herb	Cooked as vegetable	Moderate	Commercially cultivated	Leaf and Fruit
52	*Benincasa hispida* (Thunb.) Cogn.	Chalkumra	Cucurbitaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Leaf and Fruit
53	*Luffa acutangula* (L.) Roxb.	Jhinge	Cucurbitaceae	Herb	Cooked as vegetable	Moderate	Commercially cultivated	Fruit
54	*Momordica cochinchinensis* (Lour.) Spreng.	Kakrol	Cucurbitaceae	Herb	Cooked as vegetable	Moderate	Commercially cultivated	Fruit
55	*Coccinea cordifolia* (L.) Cogn.	Telakucha	Cucurbitaceae	Herb	Cooked as vegetable	Moderate	Wild	Leaf and Fruit
56	*Microlepia strigosa* (Thunb.) C. Presl	Fita Dhekia	Dennstaedtiaceae	Herb	Cooked as vegetable	Limited	Wild	Leaf
57	*Dioscorea pentaphylla* L.	Kanta Aloo	Dioscoriaceae	Herb	Leaf extract is used as medicine against stomach problem	Moderate	Wild	Rhizome
58	*Cajanus cajan* (L.)Millsp.	Arahar sak	Fabaceae	Shrub	Leaf extract is used as medicine against jandice	Moderate	Commercially cultivated	Seed
59	*Pisum sativum* L.	Matorsak	Fabaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Seed
60	*Cicer arietinum* L.	Chholasak But shak	Fabaceae	Herb	Cooked as vegetable	Limited	Commercially cultivated	Seed
61	*Lathyrus sativus* L.	Kashari shak	Fabaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Seed
62	*Trigonella foenum-graecum* L.	Methisak	Fabaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Fruit
63	*Leucas aspera* (Willd.) Link	Dandokalas/ Swetodron	Lamiaceae	Herb	Cooked as vegetable	Wide	Wild and locally cultivated	Leaf
64	*Mentha sicata* L.	Pudina	Lamiaceae	Herb	Cooked as vegetable	Wide	Locally cultivated	Leaf
65	*Ocimum gratissimum* L.	Ramtulsi	Lamiaceae	Shrub	Leaves are used as home remedy in the treatment of cough and cold.	Wide	Wild and locally cultivated	Leaf
66	*Ocimum tenuiflorum* L.	Krisna Tulsi	Lamiaceae	Herb	Leaves are used as home remedy in the treatment of cough and cold	Wide	Wild and locally cultivated	Leaf
67	*Ocimum basilicum* L.	Ban tulsi	Lamiaceae	Herb	Leaves are used as home remedy in the treatment of cough and cold	Wide	Wild and locally cultivated	Leaf
68	*Cinnamomum tamala* (Buch.-Ham.) T.Nees & Eberm.	Tej pata	Lauraceae	Tree	Leaves are used as spice	Wide	Commercially cultivated	Leaf
69	*Cinnamomum verum* J.Presl	Darcchini	Lauraceae	Tree	Leaves are used as spice	Limited	Commercially cultivated	Bark
70	*Allium cepa* L.	Peyaj	Liliaceae	Herb	Leaves are eaten raw and also cooked as vegetable	Wide	Commercially cultivated	Tuber

	Binomial name	Vernacular name	Family	Life form	Use	Range of use	Cultivation status	Major economical parts
71	*Allium sativum* L.	Rosun	Liliaceae	Herb	Cooked as vegetable	Limited	Commercially cultivated	Tuber
72	*Corchorus capsularis* L.	Titapat	Malvaceae	Shrub	Cooked as vegetable	Wide	Commercially cultivated	Fibre and Leaf
73	*Corchorus olitorius* L.	Mithapat	Malvaceae	Shrub	Cooked as vegetable	Wide	Commercially cultivated	Fibre and Leaf
74	*Malva verticillata* L.	Lafasak	Malvaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Leaf
75	*Marsilea quadrifolia*	Sushni	Marsileaceae	Herb	Cooked as vegetable	Wide	Wild	Leaf
76	*Marsilea minuta (L.) Mant.*	Sushni	Marsileaceae	Herb	Cooked as vegetable	Wide	Wild	Leaf
77	*Azadirachta indica A.Juss.*	Neem	Meliaceae	Tree	Cooked as vegetable	Wide	Commercially cultivated	Leaf
78	*Tinospora sinensis* (Lour.) Merr.	Guloncha	Menispermaceae	Shrub	Cooked as vegetable	Limited	Wild	Leaf
79	*Moringa oleifera* Lam.	Sajina	Moringaceae	Tree	Cooked as vegetable	Wide	Commercially cultivated	Fruits
80	*Glinus oppositifolius* (L.) Aug.DC.	Gimasak	Molluginaceae	Herb	Cooked as vegetable	Wide	Wild	Leaf
81	*Mollugo pentaphylla L.*	Khetpapra	Molluginaceae	Herb	Cooked as vegetable	Limited	Wild	Leaf
82	*Nymphaea lotus* L.	Sapla	Nymphaeaceae	Herb	Cooked as vegetable	Wide	Wild	Leaf
83	*Boerhavia repens L.*	Purnima shak	Nyctaginaceae	Herb	Cooked as vegetable	Limited	Wild	Leaf
84	*Nyctanthes arbor-tristis* L.	Sephali	Oleaceae	Shrub	Leaf extract used as medicine against common cough	Limited	Locally cultivated	Leaf
85	*Ludwigia adscendens* (L.) H.Hara	Keshardam /Mulcha	Onagraceae	Herb	Cooked as vegetable	Limited	Wild	Leaf
86	*Oxalis corniculata* L.	Aamrul/Takpata	Oxalidaceae	Herb	Cooked as vegetable	Moderate	Wild	Leaf
87	*Oxalis debilis* Kunth	Aamrul	Oxalidaceae	Herb	Cooked as vegetable	Moderate	Wild	Leaf
88	*Bacopa monnieri* (L.) Wettst.	Bramhi	Plantaginaceae	Herb	Cooked as vegetable	Wide	Locally cultivated	Leaf
89	*Piper nigrum* L.	Kalomorich	Piperaceae	Herb	Eaten raw	Wide	Locally and commercially cultivated	Leaf
90	*Piper betle* L.	Panpata	Piperaceae	Herb	Eaten raw	Wide	Commercially cultivated	Leaf
91	*Piper longum* L.	Lata Pipul	Piperaceae	Shrub	Cooked as vegetable	Limited	Locally cultivated	Leaf
92	*Portulaca oleracea* L.	Baro Nunia shak	Portulacaceae	Herb	Leaves are used as flavouring substance	Limited	Wild	Leaf
93	*Portulaca quadrifida* L.	Choto Nunia shak	Portulacaceae	Herb	Leaves are used as flavouring substance	Limited	Wild	Leaf
94	*Pteris cretica* L.	Dhekia	Pteridaceae	Herb	Cooked as vegetable	Wide	Wild	Leaf
95	*Paederia foedtida* L.	Gando vadoli	Rubiaceae	Herb	Cooked as vegetable	Moderate	Locally Cultivated	Leaf
96	*Murraya koenigii* (L.) Spreng.	Kurrypata	Rutaceae	Tree	Leaves are used as flavouring substance	Wide	Locally cultivated	Leaf
97	*Citrus aurantiifolia* (Christm.) Swingle	Patilebu	Rutaceae	Shrub	Leaves are used as flavouring substance	Limited	Locally and commercially cultivated	Fruit
98	*Solanum tuberosum* L.	Aalu	Solanaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Tuber
99	*Nicotiana tabacum* L.	Tamak	Solanaceae	Herb	Cooked as vegetable	Wide	Commercially cultivated	Leaf
100	*Camellia sinensis* (L.) Kuntze	Cha/Tea	Theaceae	Shrub	Leaves are used as flavouring substance	Wide	Commercially cultivated	Leaf
101	*Cyphostemma setosum* (Roxb.) Alston	Hashjor	Vitaceae	Herb	Cooked as vegetable	Limited	Wild	Leaf
102	*Aloe vera* (L.) Burm.f.	Grithakumari	Xanthorrhoeaceae	Herb	Leaf extract is eaten as healthy food	Wide	Locally and commercially cultivated	Leaf
103	*Zingiber officinale* Roscoe	Aada	Zingiberaceae	Herb	Leaves are used as flavouring substance	Limited	Locally and commercially cultivated	Rhizome

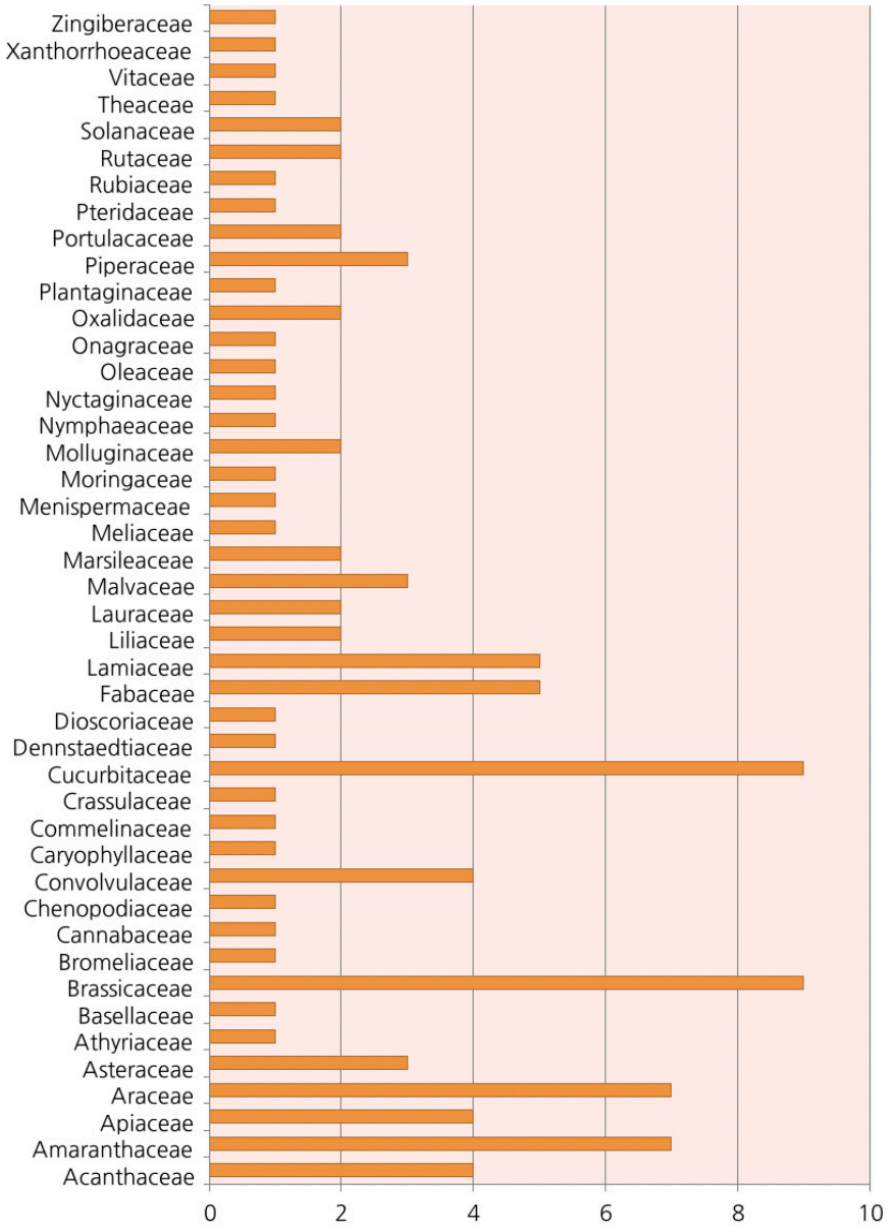

Figure 1. Number of leafy vegetables distributed in different families

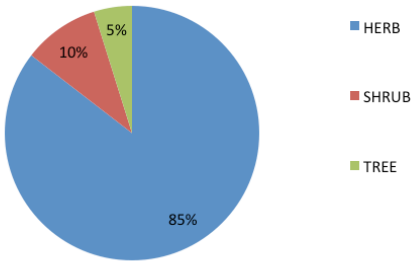

Figure 2. Percentage of herb, shrub, tree used as leafy vegetable.

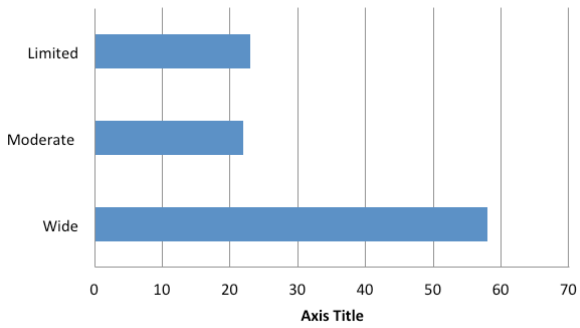

Figure 3. Percentage of range of use of leafy vegetables.

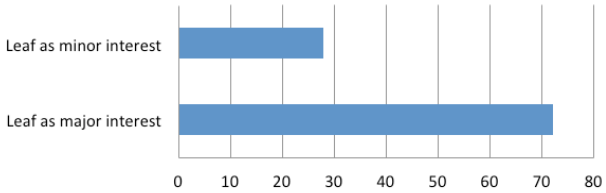

Figure 4. Number of leafy vegetables of major and minor interest.

commercially cultivated. In some cases over-utilization of such wild leafy vegetable may affect the diversity and create threats to the vegetation. Therefore, both wild and cultivated leafy vegetable plants need to be used in a sustainable manner. Using the present study as a baseline, if the nutrient compositions and other nutra-medicinal properties of the leafy vegetables, particularly under-utilized species could be determined, it would be possible to alleviate poverty and malnutrition in different corners of world.

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