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Review

Indigenous vegetables of Nepal for biodiversity and food security

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Nepal has great biodiversity, as a result of its extreme variations in altitude, ecology, farming systems and varied socio-cultural settings. In Nepal, about 200 plant species are consumed as vegetables. The aim of paper is to point out existing indigenous vegetables in Nepal and how these are utilized for food security and biodiversity conservation. Indigenous vegetables are considered valuable because of their ability to fit into year round production, adaptability to adverse condition and their nutritional value. But, only a very few indigenous vegetables are still cultivated at field scale. Most of them are neglected and, many landraces of vegetables are in the process of being replaced by modern varieties. Along with this, the indigenous knowledge associated with the cultivation, utilization, and conservation of indigenous vegetables is also endangered. But, there has been very limited information available about the identification, occurrence, collection, and utilization of indigenous vegetables in Nepal. In this scenario, promotion, conservation, utilization and commercialization of indigenous vegetables can be a better alternative towards improving the food security and nutritional status of the community, particularly those people residing in remote areas and in the hills.

Key words: Commercialization, conservation, indigenous vegetables, landraces, vegetable diversity.

INTRODUCTION

Nepal is situated on the southern slopes of the central Himalayas. Nepal's great biodiversity is associated with the country's exceptional diversity of topographic, climatic, and agro-ecological conditions. According to these conditions, Nepal is divided into four main physiographic zones (MFSC/GEF/UNDP, 2002), High Himal (above 5 000 m asl.); High Mountains (3 000 - 5 000 m asl.) with alpine or sub-alpine climate; Mid-Hills (1000 - 3 000 m asl.) with temperate or subtropical climate, and Lowlands (below 1 000 m asl.) with tropical climate. As a result of diverse agro-ecological and socio-economic conditions high crop genetic diversity at farm level can be observed (Rana et al., 1998).

In Nepal, between 5 800 and 6 500 species of flowering plants (WCMC, 1994) have been estimated, about 1 500 of which are considered useful (Manandhar, 2002). Out of these, 651 species are economically useful including 440 species of wild food plants. About 200 plant species are consumed as vegetables (Manandhar, 2002), most of them, however, are regarded underutilized or neglected. The availability of the indigenous vegetables has declined over time drastically (Aryal et al., 2009) due to their high market demand and high profitability (Subhrendu and Sills, 2001) that may lead to the loss of local indigenous vegetables resources (Lohar et al., 1995). Promotion, utilization and commercialization of the indigenous vegetables can help in the conservation of these vegetables, at the same time combating the nation's food and nutrition insecurity particularly in remote and hilly region (ABTRACO, 2005). In Nepal, efforts to collect and utilize the largely eroding genetic resources of indigenous vegetable species have only incipiently started and very limited information available in relation to identification, status, collection, and utilization of indigenous vegetables. Hence, this paper aims at gathering the available information related to occurrence, conservation status and utilization of indigenous vegetables of Nepal.

MATERIALS AND METHODS

This paper was prepared on the basis of review from different printed materials, books, research papers, reports of different orga-

nizations like Department of Agriculture, LI-Bird, Forest and Soil Conservation Department and related different websites.

During the reviewed period, discussion was made with the professors, IAAS; technicians involved in vegetable development programs, indigenous communities and farmers involved in cultivation and exploration of these commodities.

RESULTS AND DISCUSSION

Why indigenous vegetables?

Cultivating and gathering indigenous vegetables for both self-consumption and sale are still very common in Nepal, particularly in remote areas (Manandhar, 1982). These vegetables mainly contribute to the well-being of thousands of poor farmers by enabling them to participate in markets (Weinberger and Msuya, 2004).

During food scarcity periods, people from urban and rural communities heavily depend on gathering these vegetables from their natural habitats (Dangol, 2003; Joshi et al., 2007). Indigenous vegetables are considered valuable because of their ability to fit into year round production systems, their nutritional value, and the danger of their extinction (Engle and Altoveros, 2000). Besides that, they could make a contribution to world food production because they are well adapted to adverse environmental conditions (Shava, 2005) and generally resistant to pests and diseases.

Furthermore, they have been traditional part of cropping systems, especially home gardens (Midmore et al., 1991). Some indigenous vegetables such as Dioscorea species were reported to be stored for future use in Chepang community of Nepal (Aryal et al., 2009). They play a highly significant role in food security of the under privileged in both urban and rural settings (Schippers, 1997). They are also valuable sources of energy and micronutrients in the diets of isolated communities (Grivetti and Ogle, 2000). Further, they may serve as income sources (Humphry et al., 1993, Smith et al., 1995, Smith et al., 1996).

In remote and hills of the country, lacking irrigation facilities and marginal lands, there is plenty of scope for cultivating underutilized plant species and exploiting their products to provide food for the rural poor (ABTRACO, 2005).

At the present, the world is over-dependent on a few plant species (Jaenicke and Hoschle-Zeledon, 2006). Intensive agriculture, using hybrid and modern crop varieties, has not been fully successful in combating the nation's food insecurity and nutrition issues in remote and hills of Nepal. In this scenario, promotion, conservation and utilization of indigenous crops can be a better alternative towards improving the food and nutrition security (ABTRACO, 2005), malnutrition alleviation and the diversification of the agricultural environment (Engle and Faustino, 2006), particularly those people residing in remote areas and in the hills.

Indigenous vegetables of Nepal

Indigenous vegetables found in Nepal are listed and their morphology, plant parts used, part propagated, habitat etc. are mentioned (Table 1).

Loss of indigenous vegetable diversity

Despite their importance for subsistence, income generation and culture; the availability of indigenous vegetables is declining at an alarming rate in all areas of Nepal (Aryal et al., 2009), combined with genetic and cultural erosion. This occurs particularly in easily accessible regions, where commercialization of the production is possi ble. Loss of these vegetables occurred due to population pressure (Upreti and Ghale Upreti, 2002); expansion of mechanized and intensive agriculture; introduction of exotic vegetable species and improved varieties (Manandhar, 1989); habitat destruction; over-exploitation of wild plants (Upreti et al., 2012) and natural resources (Lohar et al., 1995). This process also accelerated by improper land use and habitat change, climate change causing more frequent droughts and fires, and deforestation (Joshi et al., 2007). Along with this, the indigenous knowledge associated with the cultivation, utilization, and conservation of Indigenous vegetables is also endangered (Engle and Faustino, 2006). Consequently, indigenous land races of vegetables are being lost or in the process of being replaced by modern varieties as farmers prefer high yielding hybrid varieties (FAO, 1998). Ultimately, the farmers indigenous seed supply system has been weakened (Lohar et al., 1995). Only a very few indigenous vegetables such as *Fagopyrum esculentum* (Mithe phapar), *F. tartaricum* (Tite phapar), *Amaranthus caudatus* (Latte), and *A. lividus* (Lude) were still cultivated in farmer's field (Shrestha et al., 2004).

High profitability from indigenous vegetables and their products resulted in their high demand with limited supply, consequently, that may lead to over harvesting (Subhrendu and Sills, 2001). Species such as *Dryopteris cochleata* (Danthe), *Polygonum molle* (Thotne), *Asparagus racemosus* (Kurilo), and *Rheum australe* (Padamchal) were considered to be endangered because of their increasing market demand, but are mostly (and often excessively) gathered from their natural habitats instead of making deliberate efforts to cultivate them permanently as vegetables in their fields or home gardens (Joshi et al., 2007). Cultivation of exotic vegetables for subsistence and sale increases rapidly at the expense of indigenous ones, partly promoted by development programs (Shrestha et al., 2004). Many wetland sites, the important habitats of indigenous crop species are degrading and getting lost due to encroachment for conversion into rice fields, fish ponds, extended settlements, and sedimentation (Siwakoti and Tiwari, 2007). The disappearance of indigenous vegetables in some areas may also be a consequence of the introduction of improved agricultural techniques, in which many indigenous vegetables are treated as weeds

Table 1. List of indigenous vegetables found in Nepal.

S/N	Scientific name	Family	Local name	Morphology	Used plant part	Part propagated	Altitude	Habitat	Season of availability
1	*Abelmoschus manihot*	Malvaceae	Ban nalu	Herb	Fruit	Seed	500		May - June
2	*Abelmoschus moschatus*	Malvaceae	Lata kasturi	Herb	Fruit	Seed	500		May - June
3	*Acmelia caliva*	Asteraceae	Lato ghans	Herb	Flower	Seed	1500	Forest	August - November
4	*Ageratum conyzoides*	Asteraceae	Gane	Herb	Leaf	Seed	1800	fallow	May - June
5	*Allium stracheyi*	alliaceae	Januarygali	Herb	Leaf	Seed	3900	Shrub land	August - October
6	*Allium wallichii*	alliaceae	Dundu	Herb	Leaf	Seed	2600	Shrub land	August - October
7	*Alternanthera Sessilis*	Amaranthaceae	Saranchi sag	Herb	Leaf		1300	Fallow	May - July
8	*Amaranthus caudatus*	Amaranthaceae	Latte sag	Herb	Leaf	Seed	1300	Fallow	April -July
9	*Amaranthus lividus*	Amaranthaceae	Lude sag	Herb	Leaf	Seed	1300	Fallow	April - July
10	*Amaranthus spinosus*	Amaranthaceae	Ban lunde	Herb	Leaf	Seed	1300	Fallow	April - July
11	*Amaranthus viridis*	Amaranthaceae	Lude sag	Herb	Leaf	Seed	1300	Fallow	April - July
12	*Anagallis arvensis*	Primulaceae	Armale	Herb	Leaf	Seed	1500	wild	December - March
13	*Arisaema consanguineum*	Araceae	Raksya banko	Herb	Shoot	Corm	2800	Forest	April - May
14	*Arisaema flavum*	Araceae	timchu	Herb	Shoot	Corm	2300	Forest	May - June
15	*Arisaema jacquemontii*	Araceae	Sarpa komaka	Herb	Root/Tuber	Corm	2800	Forest	April -May
16	*Arisaema tortuosum*	Araceae	banko	Herb	Root/tuber	Corm	1500	Forest	June- July
17	*Arisaema utile*	Araceae	dhokaya	Herb	Shoot	Corm	1800	Forest	June- Jul
18	*Artocarpus heterophyllus*	Moraceae	katahar	Herb	Tree	Seed	500		April - June
19	*Asparagus filicinus*	Asparagaceae	Ban kurilo	Herb	Shoot	Seed/root	1800	Forest	May - June
20	*Asparagus racemosus*	Asparagaceae	kurilo	Herb	Shoot	Seed/root	1800	Forest	April - June
21	*Basella alba*	Basellaceae	Poi sag	Herb	Leaf	seed	500	fallow	June -July
22	*Bassia latifolia*	Sapotaceae	mahuwa	tree	Flower		200	Forest	March-April
23	*Bauihinia malabarica*	Fabaceae		tree	Flower	Seed/stem	500		August - September
24	*Bauihinia purpurea*	Fabaceae	Tanki	tree	Flower	Seed/stem	1500		August - October
25	*Bauihinia vahii*	Fabaceae	Bhoria	climber	Fruit	Seed/stem	500	Forest	August - September
26	*Bauhinia variegate*	Fabaceae	Koiralo	tree	Flower	Seed/stem	1500	Forest.	April - May
27	*Bidens biternata*	Asteraceae	Kuro	Herb	Shoot	seed	1300	Fallow	May - June
28	*Bidens pilosa*	Asterceae	Kuro	Herb	Shoot	Seed	1400	Fallow	May - June
29	*Blumea lacera*	Asteraceae	Khicha bhwatha	Herb	Leaf	Seed	1400	Fallow	May - June
30	*Boerhavia diffusa*	Nyctaginceae	Punarva	Herb	Leaf	Seed	500	Fallow	June - July
31	*Bombax ceiba*	Bombaceae	Simal	Trees	Flower	Seed	500	Fallow	February - March
32	*Botrychium lanuginosum*	Ophioglossaceae	Jaluko	Herb	Shoot	Root	2100		May - June
33	*Caitha palustris*	ranunculaceae		Herb	Leaf		4200	Fallow	August - September
34	*Capparis spinosa*	Capparaceae	Bagh mukhwa	Shrub	Fruit	Seed	500	Forest.	November - December

Table 1. Contd.

35	*Capsella bursa-pastoris*	Brassicaceae	Tori ghans	Herb	Leaf	Seed	1500	Fallow	January – April
36	*Caragana brevispina*	Fabaceae		Shrub	Flower	Seed	3600	Fallow	August - September
37	*Cardamine scutata*	Brassicaceae	Chamsure ghans	Herb	Leaf	Seed	1500	Shrub land	February - March
38	*Cassia tora*	fabaceae	Chakramandi	Herb	Leaf	seed	200	Fallow	July - August
39	*Cautleya spicata*	Zingiberaceae	Sano saro	Herb	Stem	Rhizome	1800	Fores	May - June
40	*Centella asiatica*	Apiaceae	GhodtAprile	Herb	Leaf	seed	1500	Shrub land	February - April
41	*Chenopodium album*	chenopodiaceae	Bethe	Herb	Leaf	seed	1400	wild	January - March
42	*Chenopodium ambrosioides*	Chenopodiaceae	Rato latte	Herb	Leaf	seed	1500	Fallow	August - September
43	*Chenopodium murale*	chenopodiaceae	Kalo bethe	Herb	Leafv	seed	1800	wild	August - October
44	*Chloropohytum nepalense*	Liliaceae	Ban pyaj	Herb	Leaf	Seed	2000	Forest	August - Sepember
45	*Cirsium wallichii*	Asteraceae	Thakal	Herb	Shoot	Seed	1500	Fallow	June-July
46	*Clematis acuminata*	Ranunculaceae	Junege lahara	Climber	Shoot	Stem	2100	Forest	July - August
47	*Clematis buchananiana*	Ranunculaceae	Junege lahara	Climber	Shoot	Stem	2100	Forest	August - September
48	*Cleome viscosa*	Capparaceae	Swibhama	Herb	Leaf	Seed	500	Fallow	August - September
49	*Clintonia udensis*	liliaceae		Herb	Leaf		3600	Forest	March - June
50	*Colocasia esculenta*	Araceae	Pindalu	Herb	root /tuber	Tuber	1300		August - October
51	*Commmelina bengalensis*	Commelinaceae	Ban kane	Herb	root /tuber	Stem	500	Forest	June - July
52	*Commmelina paludosa*	Commelinaceae	Kane sag	Herb	root /tuber	Stem	500	Forest	June - July
53	*Chorchorus acutangulus*	Tiliaceae	Nalu	Shrub	Leaf		200	Shrub land	June - July
54	*Cortia depressa*	apiaceae	Bhutkesh	Herb	Leaf		1500	Shrub land	July - August
55	*Costus apeciosus*	Zingiberaceae	Betlauri	Herb	Shoot		1500		Junee-Jul.
56	*Crateva religiosa*	Capparaceae	sipligan	Tree	Shoot	Stem /root	1300		Mar.-April.
57	*Crotalaria pallida*	Fabaceae	Chhinchhine swan	Herb	Flower	Seed	500		May-Junee.
58	*Crotolaria spectabillis*	Fabaceae	Ban sanai	Herb	Flower	Seed	500	Fallow	August.-Nov.
59	*Crotolaria tetragona*	Fabaceae		Herb	Fruit	Seed	500	Fallow	Sept.-Oct.
60	*Deeringia amaranthaoides*	Amaranthaceae		Herb	Leaf	Seed	200	Shrub land	June - July
61	*Dendrocalamus hamiltonii*	Poaceae	Tama bans	Grass	Shoot	Seed	1300		June - July
62	*Dendrocalamus strictus*	Poaceae	Tama bans	Grass	Shoot	Stem	500		June - July
63	*Deparia boryana*	Dryopteridaceae	Kalo neuro	Herb	Leaf	Seed	1500	Forest	June - July
64	*Dillenia indica*	Dilleniaceae	Panchphal	Tree	Fruit		500		January - February
65	*Dioscorea alata*	Dioscoreaceae	Ghar tarul	climber	Root/tuber	Tuber	1300		December - February
66	*Dioscorea bulbifera*	Dioscoreaceae	Ban Tarul	climber	Root/tuber	Tuber	1500	Forest	December - February
67	*Dioscorea deltoidea*	Dioscoreaceae	Tarul	climber	Root/tuber	Tuber	1500		December - February

Table 1. Contd.

68	*Dioscorea esculenta*	Dioscoreaceae	Tarul	climber	Root/tuber	Tuber	1300		December - February
69	*Dioscorea pentaphylla*	Dioscoreaceae	Mithe tarul	climber	Root/tuber	Tuber	1500		December - February
70	*Diplazium esculentum*	Drypteridaceae	Masino neuro	Herb	Leaf	Seed	1300		May – Jul
71	*Diplazium*	Drypteridaceae	Neuro	Herb	Leaf	Seed	1300		May - July
72	*Diplazium*	Drypteridaceae	Neuro	Herb	Leaf	Seed	2100	Forest	May – July
73	*Diplazium*	Drypteridaceae	Neuro	Herb	Leaf	Seed	1300		May - June.
74	*Disporum cantoniense*	liliaceae	Sano kukur daino	Herb	Leaf	Seed		Forest	January - March
75	*Drepanostachyum falcatum*	Poaceae	Nigalo	Grass	Shoot	Stem	500		April - June
76	*Drymaria cordata*	Caryophyllaceae	Abhijalo	Herb	Leaf		1400	Forest	May - June
77	*Dryopteris cochleata*	Dryoperidaceae	Danthe	Herb	Leaf		500	Forest	March - May
78	*Eclipta prostrate*	Asteraceae	Bhringraj	Herb	Leaf	Seed	1300	wild	June - July
79	*Edgaria darjeelingensis*	Cucurbitaceae	Chathil	Climber	Fruit	Seed /stem	3600	Forest	August - Sept
80	*Elatostema platyphyllum*	Urticaceae	Sano gangleto	Herb	Leaf	Seed /stem	1500	Forest	May - June
81	*Elatostema sessile*	Urticaceae		Herb	Leaf	Seed /stem	1500	Forest	May - June
82	*Emilia sonchiholia*	Asteraceae	Tori phool	Herb	Leaf	seed	200	Fallow	July - August
83	*Eryngium foetidum*	Apiaceae	Brameli dhaniya	Herb	Leaf		1800		August.-Sept
84	*Erysimum hieracifolium*	Brassicaceae		Herb	Leaf	Seed	3600	Fallow	Junee.-Jul.
85	*Euphoria hirta*	Euphorbiaceae	Dudhe ghans	Herb	Leaf	Root	1400	Fallow	May - June
86	*Fagopyrum dibotrys*	Polygonaceae	Ban phaper	Herb	Leaf	Seed	1300		May - June
87	*Fagopyrum esculentus*	Polygonaceae	Mithe phaper	Herb	Leaf	Seed	1300		May - June
88	*Fagopyrum tataricum*	Polygonaceae	Tite phaper	Herb	Leaf	Seed	1300		May - June
89	*Ficus auriculata*	moraceae	Timila	tree	Leaf	Stem cutting	1500		January - March
90	*Ficus hispada*	moraceae	Khasreto	tree	fruit	Stem cutting	500	Forest	July - August
91	*Ficus lacor*	moraceae	kavro	tree	Leaf	Stem cutting	200	Forest	May - June
92	*Girardiana diversifolia*	Urticaceae	Lekali sisnu	Herb	Leaf	Rooted stem	2300	Shrub land	June - August
93	*Holarrhena pubescens*	Apocynaceae	Indrajau	shrub	Leaf		500	Forest	May - June
94	*Houttuynia cordata*	Saururaceae	Gane	Herb	Shoot		1500	Forest	May - June
95	*Impatiens bicornuta*	Balsaminaceae		Herb	Shoot		1800	Forest	August - September
96	*Indigofera hebepetala*	Fabaceae	Masino sakhino	Shrub	Fruit	Seed	2100	Forest	August - September
97	*Indigofera pulchella*	Fabaceae	sakhino	Shrub	Fruit	Seed	1800	Forest	September - December
98	*Ipomoea alba*	Convolvulaceae	Chandra kali	Herb	Flower	Seed,stem,root	500	Fallow	May - June

Table 1. Contd.

99	*Ipomoea aquatica*	Convolvulaceae	Kalmi sag	Herb	Leaf	Seed, stem, root	500	Fallow	February - July
100	*Justicia adhatoda*	Acanthaceae	Asuro	Shrub	Leaf	Stem /root	1500	Shrub land	January - February.
101	*Lathyrus aphaca*	Fabaceae	Bahabulaba	Herb	Leaf	Seed	1300	Fallow	March - April.
102	*Launaea asplenifolia*	Asteraceae	Dudhe jhar	Herb	Leaf	Seed	500	Fallow	June - July
103	*Lecanthus peduncularis*	Urticaceae	Khole jhar	Herb	Leaf	Root	1500	Forest	May - June
104	*Leucas cephalotes*	Lamiaceae	Guma	Herb	Leaf		500	Shrub land	March - June
105	*Lilium nepalense*	Liliaceae	Ban Lasun	Herb	Leaf	Bulb	1800	Forest	March - April
106	*Lygodium japonicum*	Schizaeaceae	Januaryai lahara	Climber	Leaf	Stem /root	200	Forest	May-June
107	*Macropanax dispermus*	Araliaceae	Chiniya	Tree	Shoot		1800	Forest	Mar.-May
108	*Malva verticillata*	Malvaceae	Laphe sag	Herb	Leaf	Seed	500		May - June
109	*Manihot esculenta*	Euphorbiaceae	Simal tarul	Shrub	Root/tuber	Root/shoot	500		December - February.
110	*Medicago falcata*	Fabaceae	Bhirin sag	Herb	Leaf	Seed	500	Fallow	September - December
111	*Moringa oleifera*	Moringaceae	Sajiwan	Tree	Fruit		500		April - May
112	*Mucuna pruriens*	Fabaceae	Kauso	Climber	Fruit	Seed	1300		March - April
113	*Natsiatum herpeticum*	Icacinaceae	Kali lahara	Herb	Leaf	Seed	200	Fallow	May - June
114	*Oenanthe javanica*	Apiaceae		Herb	Leaf		1500	Forest	May - June
115	*Oenanthe linearis*	Apiaceae	Khaki baku	Herb	Leaf		1500	Forest	May - June.
116	*Ophioglossum nudicaule*	Ophioglossaceae	Jibre sag	Herb	Leaf	Root	1800	Fallow	March - April
117	*Ophioglossum reticulatum*	Ophioglossaceae	Jibre sag	Herb	Leaf	Root	1800	Fallow	March – April
118	*Oreocnide frutescens*	Urticaceae		Herb	Leaf	Seed	2000	Forest	August - September
119	*Oroxylum indicum*	Bignoniaceae	Tatelo	Tree	Fruit	Seed	500	Forest	March - May
120	*Osmunda claytoniana*	Osmundaceae		Herb	Leaf		2100	Forest	May – June
121	*Peperomia pellucida*	Piperaceae	Lata pate	Herb	Leaf	Seed, root, stem	200	Forest	July - August
122	*Persicaria microcephala*	Polygonaceae	Ban pire	Herb	Leaf	Seed	1500	Forest	July - August
123	*Persicaria nepalensis*	Polygonaceae	Priya ghans	Herb	Leaf	Seed	1500	Forest	May - June
124	*Persicaria perfoliata*	Polygonaceae	Ghumauro kanda	Climber	Leaf	Seed	1300	Fallow	May - June.
125	*Persicaria runcinata*	Polygonaceae		Herb	Leaf	Seed		Forest	July - August
126	*Phlogacanthus thyrsiformis*	Acanthaceae		Shrub	Leaf		500	Forest	March - May
127	*Phoenix acaulis*	Arecaceae	Thakal	Tree	Fruit	Seed/tuber	500		June - July
128	*Phytolacca acinosa*	Phytolaccaceae	Jaringo sag	Herb	Leaf			Forest	May - June
129	*Pilea symmeria*	Urticaceae		Herb	Leaf	Seed	1500		May - June
130	*Pilea umbrosa*	Urticaceae	Nil danthe	Herb	Leaf	Seed	1500		May - June
131	*Piptanthus nepalensis*	Fabaceae	Suga phool	Shrub	Flower	Seed	3400		April - May
132	*Pithecellobium dulce*	Fabaceae	Jalebi	Shrub	Flower	Seed	500	Forest	May - June
133	*Plantago erosa*	Plantaginaceae	Isapgo	Herb	Leaf		1500	Fallow	January - February

Table 1. Contd.

134	*Plantago lanceolata*	Plantaginaceae		Herb	Leaf		2300	Fallow	January - February
135	*Pleurospermum angelicoides*	Apiaceae		Herb	Leaf		2500	Fallow	Jul.-August.
136	*Pleurospermum apiolens*	Apiaceae		Herb	Leaf		3600	Fallow	August - September
137	*Polygonatum cirrhifolium*	Liliaceae		Herb	Leaf		3600	Forest	August - September
138	*Polygonatum verticillatum*	Liliaceae	Khinraula	Herb	Leaf		3600	Forest	May - June.
139	*Polygonum molle*	Polygonaceae	Thotne	Herb	Shoot	Seed	1500		February - April
140	*Polygonum plebeium*	Polygonaceae	Baluni sag	Herb	Leaf	Seed	1300	Fallow	Year round
141	*Polystichum squarrosum*	Dryopteridaceae	Phusre neuro	Herb	Shoot		1500	Forest	May - June.
142	*Portulaca oleracea*	*Portulaca oleracea*	Nundhiki	Herb	Shoot		1300	Fallow	Year round
143	*Pouzolzia sanguinea*	Urticaceae		Herb	Leaf	Seed/root	2100	Fallow	July - August
144	*Pteridium aquilinum*	Dennstaedtiaceae		Herb	Shoot		1400	Forest	July – July
145	*Ranunculus diffusus*	Ranunculaceae	Nakore	Herb	Leaf		1500	Fallow	January-February
146	*Ranunculus sceleratus*	Ranunculaceae		Herb	Leaf		1500	Fallow	Year round
147	*Remusatia pumila*	Araceae		Herb	Leaf	Tuber	2500	Forest	May - June
148	*Rheum australe*	Polygonaceae	Padamchal	Herb	Leaf	Seed	3900	Shrub land	May - August
149	*Rhododendron arboreum*	Ericaceae	Laligurans	Tree	Flower		1500	Forest	February - April
150	*Rorripa indica*	Brassicaceae	Pahelo jhar	Herb	Leaf	Seed	1300	Forest	February - May
151	*Rorripa nasturtium*	Brassicaceae	Sim sag	Herb	Leaf	Seed	1500	Forest	Year round
152	*Rumex acetosa*	Polygonaceae	Amile ghans	Herb	Leaf	Seed	2000	Forest	August - September
153	*Rumex dentatus*	Polygonaceae		Herb	Leaf	Seed	1800	Forest	July - August
154	*Rumex hastatus*	Polygonaceae	Charemala	Herb	Leaf	Seed	500	Forest	February - March
155	*Rumex nepalensis*	Polygonaceae	Halhale	Herb	Leaf	Seed	1500	Fallow	August - September
156	*Rumex vesicarius*	Polygonaceae	Bhote palunge	Herb	Leaf	Seed	2000	Fallow	May - June
157	*Sagittaria sagittifolia*	Alismataceae		Herb	Leaf		500	Fallow	July - August
158	*Sambucus adnata*	CAprilifoliaceae		Shrub	Shoot		200	Forest	May - June
159	*Smilax aspera*	Smilacaceae	Kukurdiano	Climber	Shoot	Seed/corm	1500	Forest	May - June
160	*Smilax ferox*	Smilacaceae	Kukurdiano	Climber	Shoot	Seed/corm	1500	Forest	May - June
161	*Smilax lanceifolia*	Smilacaceae	Chhatiwan	Climber	Shoot	Seed/corm	1500	Forest	May - June
162	*Smilax ovalifolia*	Smilacaceae	Kukurdiano	Climber	Shoot	Seed/corm	2100	Forest	May – June
163	*Smilax perfoliata*	Smilacaceae	Kukurdiano	Climber	Fruit	Seed/corm	1800	Forest	May - June
164	*Smilax rigida*	Smilacaceae		Climber	Fruit	Seed/corm	1800	Forest	May – June
165	*Solanum nigrum*	Solanaceae	Kalo bihi	Leaf	Leaf	Seed	1500	Fallow	May - June
166	*Solanum torvum*	Solanaceae	Thulo bihi	Herb	Fruit	Seed	500	Fallow	August – October
167	*Solena heterophylla*	Cucurbitaceae	Golkankri	Herb	Fruit	Seed/stem	1500	Forest	Jul - August
168	*Sonchus oleraceus*	Asteraceae	Dudhi kanda	Herb	Leaf	Root /seed	1300	Fallow	May - June

Table 1. Contd.

169	*Sonchus wightianus*	Asteraceae	Tite sag	Herb	Leaf	Root /seed	1300	Fallow	July - August
170	*Spermadictyon suaveolens*	Rubiaceae	Ban champa	Shrub	Shoot		1400	Forest	August - September
171	*Stellaria monosperma*	Caryophyllaceae	Jethimadhu	Herb	Leaf		1500	Forest	May - June
172	*Tamilnadia uliginosa*	Rubiaceae	Pidar/Maidal	Shrub	Fruit		500	Shrub land	September -October
173	*Tectaria macrodonta*	Dryopteridaceae	Kalo neuro	Herb	Shoot	Rhizome	1500	Forest	June – July
174	*Thamonocalamus aristatus*	Poaceae	Ban nigalo	Grass	Shoot	Stem	200	Forest	June - July
175	*Thelypteris multilineata*	Thelypteridaceae	Koche	Herb	Shoot	Rhizome	2100	Forest	June - July
176	*Trianthema portulacastrum*	Aizoaceae	Gadapuraina	Herb	Shoot		500	Fallow	April-May
177	*Urtica dioica*	Urticaceae	Sisnu	Herb	Leaf	Seed /plant	1400	Fallow	Year round
178	*Vicia angustifolia*	Fabaceae	Kutilkosa	Herb	Fruit	Seed	500	Fallow	March - April
179	*Vicia hirsuta*	Fabaceae	Kutilkosa	Herb	Fruit	Seed	200	Fallow	June – July
180	*Woodwardia biserrata*	Blechnaceae		Herb	Stem		1500	Fallow	June - July
181	*Unidentified a)*	Araceae	Dudhe pidalu	Herb	Root/tuber	Corm			January -March
182	*Unidentified b)*	Araceae	Hathi paile pidalu	Herb	Root/tuber	Corm			January – March
183	*Unidentified c)*	Araceae	Khari pidalu	Herb	Root/tuber	Corm			January - March
184	*Unidentified d)*	Araceae	Panchmukhi pidalu	Herb	Root/tuber	Corm			
185	*Unidentified e)*	Zingiberaceae	badeer	Herb	Tender shoot	Rhizome			Spring
186	*Trichosanthes cucumerina*	Cucurbitaceae	Ban chichinda	Annual	Fruit	Seed		Forest	Autumn
187	*Solanum aculeatissum*	solanaceae	Chharheta	Annual	Fruit	Seed		Upland	Summer – rainy
188	*Unidentified f)*		Chhitarik sag	Annual	Shoot tip	Seed		Forest	Spring
189	*Unidentified g)*		Chuchche palungo	Annual	Leaf and terminal shoot	Seed		Upland	Summer
190	*Hibiscus sabdariffa*	Malvaceae	Chhuka	Shrub	Leaf, fruits	Seed		Upland	Winter
191	*Unidentified h)*		Dankarioth	Vine	Tender shoot	stem		Canal	Summer
192	*Unidentified i)*		Dhungre sag	Annual	Tender shoot	Seed/stem		Lowland	Spring – summer
193	*Monochoria hastana*	Pontederaceae	Thokara	Herb	leaf,tender shoot	Seed		Canal	Rainy
194	*Arisaema orubescens*	Araceae	Gurbo	Herb	Corm, shoot	Corm		Upland	Summer– rainy
195	*Guizotia abyssinica*	Asteraceae	Jhuse til	Annual	Seed	Seed		Upland	Winter
196	*Comellina benghalensis*	Comellinaceae	Kane bon	Herb	Leaf, shoot	Stem		Upland	Autumn
197	*Gmelina arborea*	Verbenaceae	Khamari	Tree	Flower	Seed, cutting		Wetland	Summer
198	*Thelypteris auriculata*	Pteridaceae	Kochaya	Herb	Young shoot	Rhizome		Forest	Spring
199	*Malva parviflora*	Malvaceae	Kongatahari	Annual	Leaf	Seed		Upland	Winter
200	*Coccinea grandis*	Cucibitaceae	Kudurani	Climber	Green fruit	Seed ,root		Upland	Summer
201	*Xeromphis spinosus*	Rubiaceae	Main kanda	Tree	Fruit and flower	Seed		Upland	Summer
202	*Phragmites maxima*	Gramineae	Narkat	Perennial	shoot	Root		Upland	Summer

Table 1. Contd.

203	*Lygodium flexuosum*	Schizaeaceae	Parandi sag	Herb	Leaf, young shoot	Stem /root	Forest	Spring - summer - rainy
204	*Typha latifolia*	Typhaceae	Pat	Herb	tender shoot	Rhizome	Marshy	All round year
205	*Typha anguistifolia*	Typhaceae	Pat (caftail)	Herb	Young leaves	Rhizome	Upland	Summer – rainy
206	*Gardenia companiluta*	Rubiaceae	Pedar	Perennial	Flower	Seed	Upland	spring
207	*Physalis minima*	Solanaceae	Photongi	Annual	Fruit	Seed	Upland	Winter
208	*Murdania nudiflora*	Commelinaceae	Ryau ryau	Annual	young shoot	Seed, root	Cultivated land	Rainy
209	*Piper sp.*	Piperacae	Pipla	Perennial	Fruit	Seed	forest	Rainy
210	*Sagittaria sagittifolia*	Alismataceae	Sigangodai	Herb	rhizome	Tuber	Rice field	Winter
212	*Diplocyclos palmate*	Cucurbitaceae	Titambi	vine	Flower	Seed/root	Upland	Rainy
213	*Pteris vittata*	Pteridaceae	Urakthewn	Herb	shoot	Rhizome	Canal	spring

Acharya and Acharya, 2010; Joshi et al., 2007; Pant et al., 2005; Shakya et al., 1995; Shrestha and Dhillion, 2006; Sunwar et al., 2006; Upreti et al., 2012

(Joshi et al., 2007). Apart from this, it might have occurred as indigenous vegetable crops are very much location specific, so it's difficult for cultivation and commercialization (Weinberger and Msuya, 2004).

Conservation and commercialization of indigenous vegetables

Indigenous vegetable diversity has enormous value for present and future generations, and more strenuous efforts must be made for its conservation and sustainable utilization (Brush, 1995). In the present context, conservation of genetic resources is done through ex-situ or *in situ* methods (Sthapit et al., 1996). In Nepal, *in-situ* conservation and domestication of several important indigenous species has been started in indigenous community (Aryal et al., 2009). Scientific cultivation, conservation and sustainable use of indigenous plant species by ethnic communities would be highly advantageous for conservation of rare and endangered plant species and the indigenous knowledge for the future generations (Malla and Chhetri, 2009). Community level seed banking, in which farming communities take active part in the maintenance, use and exchange of indigenous genetic resources, is one of the ways of in-situ conservation (Rana et al., 1998). Home gardens are living gene banks and a reservoir of plant genetic resources that preserve landraces, cultivars, rare and endangered species as well as species neglected in large-scale agro-ecosystems (Galluzzi et al., 2010).

Participatory variety selection provides an opportunity to adopt different varieties resulting in varietal diversity at household and community level (Sthapit et al., 1996; Joshi and Witcombe, 1996). Awareness program on benefit of genetic resources and need for conservation at different levels: community, Government Organizations, Non Government Organizations, entrepreneurs and consumers may play a great role in conservation of indigenous vegetables (Rana et al., 1998). Local communities who have knowledge of indigenous food plants and their uses should empower economically to involve them in conservation of these plants (Shava, 2005). Identification of markets, marketing channels, marketing mechanisms (Rana et al., 1998) and promotion of value chains (Will, 2008) for indigenous vegetables at local, regional and national level will ultimately facilitate in expanding and strengthening opportunities for such produce. Diversification of production and consumption habits to include a broader range of plant species, in particular those currently identified as indigenous, can contribute significantly to improved health and nutrition, livelihoods, household food security and ecological sustainability (Jaenicke and Hoschle-Zeledon, 2006).

Promotion of indigenous food crops and their products in domestic as well as wider markets may be the possible approach for increasing household income, which ultimately acts as incentive for conservation and sustainable use of these species (Wunder, 2001). Rural women and indigenous communities hold and maintain the knowledge about gathering locations and seasons, preservation, processing, and culinary uses of such plants may play a great role in conservation and commercialization of indigenous vegetables (Joshi et al., 2007). Research, promotion, extraction, utilization and conservation of indigenous species lead to exploration of new staple crops and motivate

the people to consume in a sustainable manner (Kunwar et al., 2012). In general,Commercialization results in the erosion of varietal diversity (Rana et al., 1998) but if indigenous vegetables are not prepared and consumed, this is the first step to their extinction (Keller, 2004). Commercialization of wild food plants should be accompanied by their cultivation so as to protect them from their over-exploitation which can result in their extinction (Shava, 2005).

CONCLUSION

Vegetables are a significant component of the human diet, and indigenous ones are still important, although they have mostly been neglected in research and development. Indigenous vegetables could make a contribution to world food production because they are well adapted to adverse environmental conditions and generally resistant to pests and pathogens. But, the availability of these vegetables is declined drastically with the introduction of the modern and exotic varieties.

To avoid or minimize the impending genetic and cultural erosion of indigenous vegetables, their germplasm should intensively be collected and conserved. Related indigenous knowledge urgently needs to be documented for serving future generations. Utilization of indigenous vegetables is to be made good option for food security and maintain the biodiversity in Nepal. Adequate priority for indigenous crops in the various plans and policy of a developing country like Nepal can obviously lead to sustainable development and help in tackling the food insecurity situation of the country.

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