Conservation and Utilization of Agricultural Plant Genetic Resources in Nepal

Proceedings of 2nd National Workshop
22-23 May 2017, Dhulikhel

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2017

NAGRC

FDD
DoA
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Conservation and Utilization of Agricultural Plant Genetic Resources in Nepal (BK Joshi, HB KC and AK Acharya, eds). Proceedings of 2nd National Workshop, 22-23 May 2017 Dhulikhel; NAGRC, FDD, DoA and MoAD; Kathmandu, Nepal

Semi-domesticated Plant Genetic Resources in Nepal

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ABSTRACT

Many plant species in the world are neither in fully wild state nor fully domesticated. The semi-domestication means a kind of plant species that is in between wild plants and domesticated crops. Semi-domesticated plants are mostly in or around the farm and are under human intervention to care and maintain them. These plants have different uses such as food, fruits and vegetables, spices, flower and others in the community. In Nepal, 42 plant species are in the state of semi-domestication, distributed in different ecological regions. Among them one species is uses as grain, 22 as vegetables, 9 as fruits, 3 as spices and condiments, one as flower juice and 6 as oil and fiber. Their values are increasing because of high adoptive capacity to environment, possessing medicinal properties and ease of maintenance. Research on diversity and nutrient properties of such species available in the country needs to initiate along with conservation activities.

Keywords: Community, distribution, plant species, semi-domesticated, use value

INTRODUCTION

Many plant species in the world are neither in fully wild state nor fully domesticated thus in the state of semi-domestication. Semi-domesticated plants are mostly in or around the farm and are under human intervention to care and maintain them. These plants have different uses in the community, as food item, fruits and vegetables, spices, flower and others. The domestication of plants in the form of cultivated crops is the great turning point in human history. The notion of semi-domestication originated to refer to a kind of plant that is in between wild plants and domesticated crops (Torigoe and Kada 2007). The semi-domesticated crops are thus mostly gathered/collected rather than harvested. These plants are mostly in wild state but are conserved due to their importance for human beings. Major features of semi domesticated species are i. they grow naturally in farming lands, ii. farmers' harvest economic parts without giving any inputs, iii. they do not adopt intensive cultivation practices, iv. seeding materials for next season maintain on-farm naturally (ie dormant and active period of life in same site), v. knowledge on agronomic practices, biology poorly understood, vi. population size in wild forms is narrow, etc. The domestication implies an increased interdependence between human cultivators and the plants they cultivate, and that this can be considered a case of symbiotic co-evolution (Rindos 1980). The transition between wild plant forms and domesticated species can be considered an evolutionary adaptation by plants in response to a human driven ecology (Fuller and Allaby 2009). Agricultural scientists regards these species mostly on the developmental stage of domestication due to their importance to human beings while Anthropologists do not consider semi-cultivated plants to be in a developmental process from wild to domesticated plants, but instead regard them as having their own specific cultural roles. There are a number of plant species growing naturally in the farming lands and they have religious, cultural, food and nutritional values. They have high potential in agri-business; however, attention has not been given by development organizations. Here we have documented semi domesticated plant species applicable to Nepal after literatures survey, key informants interview including farmers and field visits.

HISTORY AND TREND OF SEMI-DOMESTICATED PLANT SPECIES

Actual date of giving value to semi domesticated plant species are not known in Nepal. It is generally perceived that after modernization of agriculture in around 1980s, many farmers and consumers started giving due attention to such plant species. Main attractions of these species are their good taste, easy growing and high adaptation. Now a day, areas and number of such plant species is increasing in farming lands as well as in the market.

SEMI-DOMESTICATED SPECIES

The category of semi-domesticated species is sometimes confusing thus it overlaps with wilds or plants that are now started cultivation. It also differs in different localities. The plants listed here are selected based on

their state of semi-domestication in certain part of the country. Most of them are being used either as vegetables, fruits, spices and other various purposes by the local people since long. In Nepal, many plant species are in the state of semi-domestication and distributed in different ecological regions. However, any systematic survey to list out the semi-domesticated crops has not been done so far. Few reports list them as semi-domesticated (Joshi et al 2017) or underutilized crops (Aryal et al 2009, Khanal et al 2014) or minor crops. Based on the available literature and personal communication with key informants, altogether 42 plant species are listed here as semi-domesticated plant species in Nepal (**Table** 1).

Table 1. List of semi-domesticated crops in Nepal with their distribution and uses

SN	English name	Nepali name	Scientific name	Distribution	Use value
1.		Dhatelo	Prinsepia utilis Royale	1500-2000 m	Oil/fence
2.	Amaranthus	Latte/ lude sag	Amaranthus tricolor L./ A. blitum L.	Mid Hill and Tarai	Vegetables
3.	Ander	Castor	Ricinus communis L.	Low Hill and Tarai	Oil
4.	Gooseberry	Amala	Phyllanthus emblica L.	Mid Hill and Tarai	Fruits
5.	Barnyard millet	Sama	Echinochloa crus-galli (L.) P.Beauv.	Mid Hill and Tarai	Seeds Used as millet
6.	Black Plum, Java Plum, Surinam Cherry	Jamun	Syzygium cumini (L.) Skeels	low Hill and Tarai	Fruits
7.	Butter tree/Bassia	Chiuri	Diploknema butyracea (Roxb.) H.J.Lam	Mid Hill	Butter
8.	Caraway	Himalijeera	Carum carvi L.	High Hill	Spices
9.	Chinese date, Indian cherry plum	Bayer	Ziziphus jujuba Mill.	Mid Hill and Tarai	Fruits
10.	Chinese Leek	Dundusaag	Allium tuberosum Rottler ex Spreng.	High Hill	Vegetables
11.	Cinnamon	Tejpat/ Dalchini	Cinnamomum tamala (Buch.-Ham.) T.Nees & Eberm.	450-2100 m	Spices/condiments
12.	Citron	Bimiro	Citrus medica L.	Mid Hill	Fruits
13.	Deltoid Yam	Vyakur	Dioscorea nepalensis (Jacquem. ex Prain & Burkill) Sweet ex Bernardi	Mid Hill and Tarai	Vegetables
14.	Edible Emetic nut	Pidar	Tamilnadia uliginosa (Retz.) Tirveng. & Sastre	Tarai and Inner Tarai	Fruits
15.	Garlic pear	Sipligan	Crateva religiosa G.Forst	Mid Hill	Vegetables
16.	Hairy vetch	Kutilkosa	Vicia hirsuta (L.) Gray	Mid Hill and Tarai	Vegetables
17.	Himalayan Bamboo	Nigalo/tusa/ Kalonigalo	Arundinaria falcata Nees/Phyllostachys nigra (Lodd. ex Lindl.) Munro	High Hill	Vegetables/ hedges
18.	Himalayan Nettle	Allo	Girardinia diversifolia (Link) Friis	1200-3000 m	Bark for fibre
19.	Horse chestnut	Pangra, Pangar	Aesculus indica (Wall. ex Cambess) Hook.	900-3000 m	Leaves to make flour
20.	Indian Poke	Jaringo	Phytolacca acinosa Roxb.	500-2400 m	Vegetables
21.	Ivy guord	Kundruk	Coccinia grandis (L.) Voigt	Mid Hill and Tarai	Vegetables
22.	Lamb's Quater	Bethe	Chenopodium album L.	All ecological range	Vegetables
23.	Malabar Night Shade / Indian Spinach	Poisag	Basella alba L.	Mid Hill and Tarai	Vegetables
24.	Mexican Coriander	Ban Dhaniya	Eryngium foetidum L.	Mid Hill	Vegetables/pickles
25.	Mint	Pudina	Mentha arvensis L.	1200-2700 m	Vegetables
26.	Mountain ebony	Koiralo	Bauhinia variegata L.	Mid Hill	Vegetables
27.	Nepali bamboo	Tama bans/ Phusre bans	Bambusa nepalensis Stapleton	Mid Hill	Vegetables
28.	Nepali Peeper	Timur	Zanthoxylum armatum	1100-	Spices/condiments

SN	English name	Nepali name	Scientific name	Distribution	Use value
			DC.	2500m	
29.	Pig Weed	Lude sag	Amaranthus viridis L.	Mid Hill and Tarai	Vegetables
30.	Potato Yam, Air Potato	Gittha	Dioscorea bulbifera L.		
31.	Rhododendron	Lalighuras	Rhododendron arboreum Sm.	Mid to High Hill	Flower juice
32.	Rough lemon	Jyamir	Citrus jambhiri Lush.	Mid Hill	Fruits
33.	See buckthorn	Dale chuk	Hippophae rhamnoides L.	High Hill	Fruits/juice
34.	Sikkim knotweed	Thotne	Polygonum molle D. Don	1200-3500 m	Vegetables
35.	Slender adder's-tongue	Jibresag	Ophioglossum nudicaule L. f.	Mid Hill and Tarai (upto 1800 m)	Vegetables
36.	Stinging nettle	Sisnu	Urtica dioica L.		Tender shoots and leaves cooked as vegetable, also used in maize to make porridge (*khole*)
37.	Water chestnut	Singhada	Trapa bispinosa Roxb.	Mid Hill	Fruits
38.	Water cress	Simsag	Nasturtium officinale R.Br.	Mid Hill	Vegetables
39.	Water Spinach / Swamp cabbage	Kalami sag / karmaiya sag/Ramia/Kerunge	Ipomoea aquatica Forssk.	Mid Hill and Tarai	Vegetables
40.	Wild Edible Yam	Ban tarul	Dioscorea bulbifera L.	Mid Hill	Vegetables
41.	Wild Onion	Jimmu	Allium hypsistum Stearn	High Hill	Spices/condiments
42.	Wood apple	Bel	Aegle marmelos (L.) Corrêa	Low Hill and Tarai	Fruits/juice

Source: Josh et al 2017, Acharya and Niraoula 2014, Shrestha 2008, Upadhyay and Joshi 2003, Khanal et al 2014, Aryal et al 2009, Joshi 2017.

DISTRIBUTION

Such types of plant species are distributed across the country. However, Mid Hill region has higher number of semi-domesticated species (**Table** 1). Most of the household keep such plant species growing in their field without any care and harvest at appropriate time. Such plant species are mostly found around home garden. The populations of such species are generally small in wild state; however, their size is increasingly larger in farming areas depending on their economic value.

USE VALUE

Most of the semi-domesticated plants are used as vegetables (**Table** 1) and some are for fresh fruits. Among the 42 semi-domesticated plant species, one is used as grain, 22 as vegetables, 9 as fruits, 3 as spices and condiments, one for flower juice and 6 others. They grow naturally in the cultivated lands, breed naturally, matured seeds conserved in the fields and very few intervention are applied by farmers to harvest from such plant species. Minor amount of the product are also sold in the market. They are preferred mainly because of having some medicinal values. Consumers also prefer being natural and organic. Farmers are rich in knowledge for their use value.

WAY FORWARD

Farmers and consumers are using APGRs from three stages namely wild, semi domestication and domestication. Wild to semi domestication to domestication is very long process and mainly selection is the major part to accelerate the process. A number of wild edible plants may have potential to grow in human made environment. Farmers are getting benefit from semi-domesticated plant species without giving any inputs and time. Their capacity to adopt adverse conditions and to tolerate stresses should be the future scope in agricultural business. As these crops have importance for the food and nutrition security and have commercial value adding diversity in the market, the technology for their cultivation and use should be developed and delivered. Many systematic studies including nutrient content and diversity assessment are necessary to explore the status and details about these crops. Local farmers, because of their close association with nature and natural environment often developed very practical knowledge system about their use and management (Shrestha and Dhillion 2006), hence exploration of such knowledge and practices can provide very good basis for species domestication. In the other hand, conservation and sustainable use of these plant

resources received relatively little attention even by its users and promoters as they perceive these are the free resources getting from the nature (Aryal et al 2013, 2009). Furthermore, these genetic resources are neglected in research and development activities as well as not adequately addressed by policy and program of the country (Aryal et al 2009). Hence an integrated participatory collaborative approach (including the local farmers) is necessary to identify such species having multiple use value for further research and development for the promotion of semi-domesticated plant species for conservation as well as contribution in livelihood of the people.

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Annex 1. Some semi-domesticated plant species

 Gooseberry/ Amala: ***Phyllanthus emblica*** L.	 Citron /Bimiro: *Citrus medica* L.	 Wood apple/ Bel: *Aegle marmelos* (L.) Corrêa
 Lamb's Quater/ Bethe: *Chenopodium album* L.	 Wild Onion/ Jimmu: ***Allium hypsistum*** Stearn	 See buckthorn/ Dale chuk: *Hippophae rhamnoides* L.
 Garlic pear/ Sipligan*: Crateva religiosa* G.Forst	 Stinging nettle/ Sisnu: *Urtica dioica* L.	 Nepali bamboo/ Tama bans: ***Bambusa nepalensis*** Stapleton
 Water cress/ Simsag: ***Nasturtium officinale*** R.Br.	 Amaranthus/ Latte: *Amaranthus tricolor* L.	 Mountain ebony/ Koiralo: *Bauhinia variegata* L.