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DIVERSITY OF ROOTS AND TUBERS GROWN AND KNOWN BY INDIGENOUS PEOPLES OF NORTHERN PHILIPPINES

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ABSTRACT

Since the olden times, indigenous peoples of Northern Philippines like the *Ivatans, Isnegs, Kalingas, Tingguians, Applais, Bagos, Kankana-eys, Iyattukas, Ibalois, Kalanguyas, Bugkalots, Aetas* and *Mangyans* have considered rootcrops as their staple food. With the changing lifestyles of the younger generation of indigenous peoples, indigenous root and tuber resources are at risk of disappearing. There has likewise been lack of documentation on these. Thus, this study was conducted to determine the diversity of roots and tubers grown and known by indigenous peoples of Northern Philippines. More than 20 roots and tubers consisting of 10 cultivated species and more than 10 species of wild roots and tubers were identified by indigenous people in Northern Philippines. The roots and tubers planted are cassava (*Manihot esculenta*), sweetpotato (*Ipomoea batata*), greater yam (*Dioscorea alata*), taro (*Colocasia esculenta*), tannia (*Xanthosoma sagittifolium*), lesser yam (*Dioscorea esculenta*), arrowroot (*Maranta arundinacea*), potato (*Solanum tuberosum*), yacon or Peruvian ground apple (*Smallanthus sanchifolius*) and yambean (*Pachyrhizus spp*.). Wild roots and tubers include nami (*Dioscorea hispida*), elephant yam (*Amorphopallus campanulatus*), giant taro (*Alocasia macrorrhizos; Cyrtosperma chamissonis*), canna (*Cannaceae*), wild yam bean and wild species of taro, greater yam and lesser yam known only by their local names. The indigenous peoples' familiarity with the local names has helped increase the number of roots and tubers they have grown or utilized. This ranged from 6-9 kinds among the *Bugkalots, Iyattukas, Ivatans and Mangyans,10-13 kinds among the Kalanguyas, Aetas, Bagos, Kankana-eys, Applai-Kankana-eys* and *Isnegs* and 14-15 kinds among the *Kalingas*, *Ibalois* and *Tingguians*. The diversity of roots and tubers observed is a reflection of the Indigenous peoples' food security practices and coping mechanisms during food scarcity.

Keywords: known and grown *roots and tubers, indigenous people, Northern Philippines*

INTRODUCTION

Root and tuber crops are collective terms for plants that are grown for their modified, thickened roots or stems which generally develop underground. Special terms for specific types are root crops for modified roots, tuber crops and corm crops for modified stems (Bareja, 2010).

The book `Roots and Tubers in the Global Food System: A Vision Statement to the Year 2020', identified root and tuber crops as food crop to feed the world in the coming decades. Scott, *et al*. (2000) pointed out that by year 2020, over two billion people in Asia, Africa and Latin America will depend on these crops for food, feed, or income. Many of the developing world's poorest and most food-insecure households will continuously look up to these crops as contributing source of food, nutrition, and cash income.

The Philippines is a rice-growing and rice-eating country, but for more than 25 years, rice imports have been filling up the shortage in local rice production. In 2008, the Philippines was reported by the International Rice Research Institute (IRRI) as the top importer of rice at 1.8 million tons. Broad and Cavanagh (2010) also reported that the country still imports 10% of its rice requirement annually. Today, importation is inevitable because of limitations in rice land, population growth and limited infrastruction for irrigation and roads.

Roots and tubers, on the other hand, have served as important alternate staple foods in the olden times especially among hillside, upland and forest dwellers, and most especially the indigenous peoples who are the traditional consumers and producers of root crops. However, past and continuing deforestation, in- and out-migration to urban areas as consequences of population growth, climate change, international and national policies that stress cash and industrial crops production rather than for local household consumption, are putting pressure on food self-sufficiency of indigenous peoples and to the role of root and tuber crops.

Earlier published and unpublished studies and newspaper articles in the Philippines had mentioned root crops, particularly sweetpotato, as survival crops among resource-poor families to weather the ill-effects of typhoons and food crises. This was also evident during World War II in the Cordillera highlands (Solimen *et al.*, 1998); the aftermath of the 1990 earthquake in Benguet (Sano *et al.*, 1991); swidden farming of marginal farmers in the rice terraces of Ifugao (Balaki and Solimen, 1991; Verdonk, 1991), and the year-round cultivation of sweetpotato (*Ipomea batatas*), ubi (*Dioscorea alata*) and tugui (*Dioscorea esculenta*). These were also considered as subsistence crops in the Batanes island province (Dayo *et al.*, 1998). Others include the consumption of wild yams, `nami' (*Dioscorea hispida*) by upland farmers in Mindanao due to crop losses as a result of El Niño, and the consumption of wild yam or `kamangeg' (*Dioscorea spp.*) by fishermen and farm laborers in the coastal village of Ilocos Sur before the harvest of rice.

Available information and local literature are mostly on cassava (*Manihot esculenta*), sweetpotato (*Ipomea batatas*) and potato (*Solanum tuberosum*). There are a few and inadequate information on yam (*Dioscorea alata*), and on the lesser known roots and tubers.

National crop statistics on cassava, sweetpotato, potato, greater yam, lesser yam (Dioscorea esculenta), taro (*Colocasia esculenta*) and tania (*Xanthosoma sagittifolium*) are available, however, there are no available crop statistics on arrowroot (*Maranta arundinacea*), yambean (*Pachyrhizus erosus*) and yacon (*Smallanthus sanchifolius*) and other roots and tubers (PSA, 2013).

This study aimed to determine the roots and tubers still planted, consumed, traded, and already lost but was known among the indigenous peoples in Northern Philippines. It sought to find out if the development of root crops, particularly the lesser known roots and tubers have made a difference as substitute or supplementary staple food, a seasonal food, a specialty food, a security food crop, a source of cash income, or whether these were not confined to museums or research gene banks.

METHODOLOGY

Data gathering procedure

Phase 1 involved gathering of secondary data (production statistics on roots and tubers, indigenous groups) from the Department of Agriculture (DA), local government units (LGU's) and the National Commission on Indigenous Peoples (NCIP). Market observations and linking for collaborative research in initially identified municipalities and/ or indigenous communities were also done. Thirteen IP groups namely: *Ibaloi, Bago, Aeta, Ivatan, Isneg, Buhid-Mangyans, Biga-Kalingas, Bugkalot, Kalanguya, Tingguian, Kankana-ey, Iyattuka* and *Applai-Kankana-ey* were selected for the study.

Phase 2 involved the conduct of key informant workshops in the selected communities. Key informants were invited with the assistance of collaborating researchers and agencies based on

familiarity with growing and consuming rootcrops and length of residence in the identified indigenous people's community. The interview started with story-telling about the village (sitios, ethnic groups or indigenous peoples residing in the village, story behind the name of the village, crops planted and food eaten). After the preliminary interview, the respondents named the rootcrops growing in their village while showing pictures of roots and tubers to aide in their recall of what and where the crops were planted or gathered, and their local names. The information shared were listed in cue cards or manila paper as guide for recalling the local names of the rootcrops and as basis for assessment of the extent of production and further data gathering (Fig. 1). The researchers also shared their knowledge on the local names of roots and tubers grown, eaten and used by other indigenous peoples. This was followed by a field visit to document or collect the identified roots and tubers.

Narrative description, photos or illustrations gave detailed information on the root and tuber crops.

Limitations

Excluded in this write up was the diversity of local varieties of sweetpotato, greater yam, taro, cassava, lesser yam and tannia, land use and cropping systems, seed system, crop and management practices and utilization which were used in separate studies. Actual area planted and yields of the different roots and tubers in the selected areas and among indigenous peoples were likewise not included in this report. Attempts have been done to gather information on costs and returns analysis but these were reported separately.

RESULTS AND DISCUSSION

Philippine Statistics on Roots and Tubers There are seven kinds of roots and tubers namely, cassava, sweetpotato, potato, greater yam (*ubi*), taro (*gabi*), tannia (*galiang/pao*) and lesser yam (*tugui*) included in the Philippine Statistics Authority (PSA) records. In terms of crop production in 2014, cassava ranks first in the Philippines at 2.54 million metric tons, followed by sweetpotato at 0.519 million metric tons, potato at 0.119 million metric tons and taro at 0.110 million metric tons. Greater yam (0.014 million), tannia (0.011 million metric tons) and lesser yam (0.003 million metric tons) were produced in lesser amounts (PSA, 2013). The bulk of root and tuber supply is for food consumption (95% for sweetpotato, *ubi* and *gabi*, 71% for potato, 82% for *galiang* and 86% for *tugui*) except cassava where bulk of it is for the processing industry (84%) and only 10% is for food consumption. Although the PSA report did not include the harvest data for *ubi* and sweetpotato used for processing, the Department of Agriculture Agribusiness Division listed several yam and sweetpotato processors.

The provinces of Isabela, Camarines Sur, Quezon, Albay, Apayao, Pangasinan, Batangas, Pampanga and Cagayan were the top producers of cassava in 2014. Top producing provinces for sweetpotato were Camarines Sur, Albay, Quezon, and Tarlac. On the other hand, potato production has been concentrated in Benguet and Mountain Province. Taro producers are Isabela, Albay, Cagayan and Benguet. Cagayan, Batanes and Albay were the top producers of greater yam (PSA, 2014). Throughout the country, however, almost all provinces are producing roots and tubers for food production (Table 1).

Diversity of Roots and Tubers Known by Indigenous Peoples

Aside from the seven roots and tubers listed in the country's agricultural statistics, there were more than 20 roots and tubers identified by the informants. These consisted of five root crops, 12 tuber crops and six corm crops (Table 2). The root crops like cassava, sweetpotato, yambean, yacon and wild yambean have enlarged or modified roots used for food or feed. Tuber crops like greater yam, lesser yam, arrowroot, potato, canna, nami, elephant yam, wild lesser yam and three wild species of greater yam have modified underground stems. The stem of taro, tannia, giant taro and three wild taro species have developed corms. Aside from the roots, tubers and corms, other plant parts that can be utilized for human consumption are the young leaves or shoots of the cassava and sweetpotato, young stalks, leaves, petioles and runners of taro and tannia, and young pods of wild

Figure 1. Categorization in the assessment of the extent of production according to the key informants

a. Large area-many growers (abundant)
b. Large area-few growers (abundant)
c. small area-many growers/users (occasional)
d. small area-few growers/users (rare; need of conservation)

Modified based on understanding extent and distribution of diversity (Sthapit *et al*., 2001; IPGRI, 2002)

Table 1. Top 10 root and tuber-producing provinces in Northern Philippines

Rank	Cassava		Sweetpotato		Taro		Greater Yam		Potato	
	Province	MT	Province	MT	Province	MT	Province	MT	Province	MT
Philippines		2,540,254		519,855		110,365		15,260		119,140
1	Isabela	121,291	Camarines Sur	40,619	Isabela	8,354	Cagayan	1,205	Benguet	89,918
2	Camarines Sur	76,518	Albay	33,582	Albay	5,177	Batanes	566	Mountain Province	12,195
3	Quezon	37,728	Quezon	28,828	Cagayan	4,315	Albay	439	Nueva Vizcaya	446
4	Albay	13,774	Tarlac	21,727	Benguet	4,305	Bulacan	234	Ifugao	142
5	Apayao	10,929	Pangasinan	8,214	Quezon	2,851	La Union	210		
6	Pangasinan	10,685	Ifugao	7,251	Camarines Sur	2,683	Palawan	204		
7	Batangas	9,843	Occidental Mindoro	6,792	Nueva Vizcaya	2,245	Isabela	191		
8	Pampanga	9,757	Sorsogon	5,999	Oriental Mindoro	2,218	Cavite	190		
9	Cagayan	9,339	Benguet	5,670	Pampanga	2,140	Nueva Vizcaya	165		
10	Sorsogon	7,562	Catanduanes	5,349	Sorsogon	1,885	Occidental Mindoro	157		

Source: Philippine Statistics Authority, 2013 and 2014

yambean. Roots, tubers, corms, rhizomes, vines, stalks and leaves are also used for animal feed.

Cassava, sweetpotato, greater yam, lesser yam, taro and tannia are the roots and tubers commonly planted by the 13 IPs selected in this study (Figure 3). Arrowroot, however, is not being planted by the *Ivatans*, *Bugkalots* and *Iyattukas*. Potato is grown only by the *Ibalois* and *Kankana-eys*, yacon by the *Ibalois* and *Kalanguyas* and yambean by the *Applai-Kankana-eys*. Arrowroot, lesser yam and tania sometimes grow voluntarily while canna, aerial yam and wild species of taro like *bitajon* are domesticated.

Wild roots and tubers like nami, elephant yam, giant taro and unknown species of *Dioscore*a and *Colocasia* were once harvested for food and feed (e.g. during the war or Japanese occupation) which were not known to some IP informants and added that they do not have local terms for these crops.

Table 2. Roots and tubers grown or known by the indigenous peoples in Northern Philippines

	Roots and Tubers	Scientific Name*	Part of Plant Used as	
			Human Food	Animal feed
Root crops				
1	Cassava	*Manihot esculenta*	roots, young leaves or shoot	roots
2	Sweetpotato	*Ipomoea batata*	roots, young leaves or shoot	roots, vines, leaves
3	Greater Yam	*Dioscocrea alata*	roots	
4	Taro	*Colocasia esculenta*	roots, young pod	
5	Tannia	*Xanthosoma sagittifolium (white); Xanthosoma violaceum (purple)*	roots	
Tuber crops				
6	Greater Yam	*Dioscorea alata*	tubers	
7	Lesser yam	*Dioscorea esculenta*	tubers	
8	Arrowroot	*Maranta arundinacea*	rhizome	rhizome
9	Aerial yam	*Dioscorea bulbifera*	tubers	
10	Potato	*Solanum spp.*	tubers	
11	Canna	*Cannaceae*	rhizome	
12	Nami	*Dioscorea hispida*	tubers	
13	Wild Greater Yam (3 species)	*Dioscorea spp.*	tubers	tubers
14	Wild Lesser Yam	*Dioscorea papillaris*	tubers	
15	Elephant Yam	*Amorphopallus companulatus*	young stalk or petiole	
Corm crops				
16	Taro	*Colocasia esculenta*	corms, stalk, leaves, petiole, runners	corm, stalk, leaves
17	Tannia	*Xanthosoma sagittifolium (white); Xanthosoma violaceum (purple)*	cormels, young stalks and leaves	corm, stalk, leaves
18	Wild Taro (3 species)	*Colocasia spp.*	young stalk, leaves, petiole	stalk, leaves
19	Giant Taro	*Alocasia macrorrhiza*		stalk, leaves

*Scott, G.J., R. Best, M. Rosegrant and M. Bokanga. 2000

Habitat, use and extent of production

The IP informants classified the areas where these root and tuber crops can be found. Ten were found to be deliberately planted, three are volunteer plants, three are domesticated wild plants and more than six are wild roots and tubers (Table 3). Planted crops are found in swidden farms, rainfed farms, irrigated paddies, homegardens and even riverbanks (Table 4). Volunteer plants are found in old and newly operated farms, pathways and waterways, backyards and riverbanks. Wild plants are found in the forest, old swidden farms and along undisturbed lands near farms, pathways and waterways. Sometimes wild plants are maintained in swidden farms or transplanted to backyard gardens.

The IPs differ in their assessment of production and use of these roots and tubers like cassava, sweetpotato, greater yam, taro and potato are grown for food or for sale, the extent of production as perceived by the IP informants ranged from small to large scale production. When the roots and tubers are mainly used for food or feed like tannia and lesser yam, the extent of production was basically for household consumption. Small amounts of yacon, yambean, and arrowroot are grown or consumed by few IP's although large

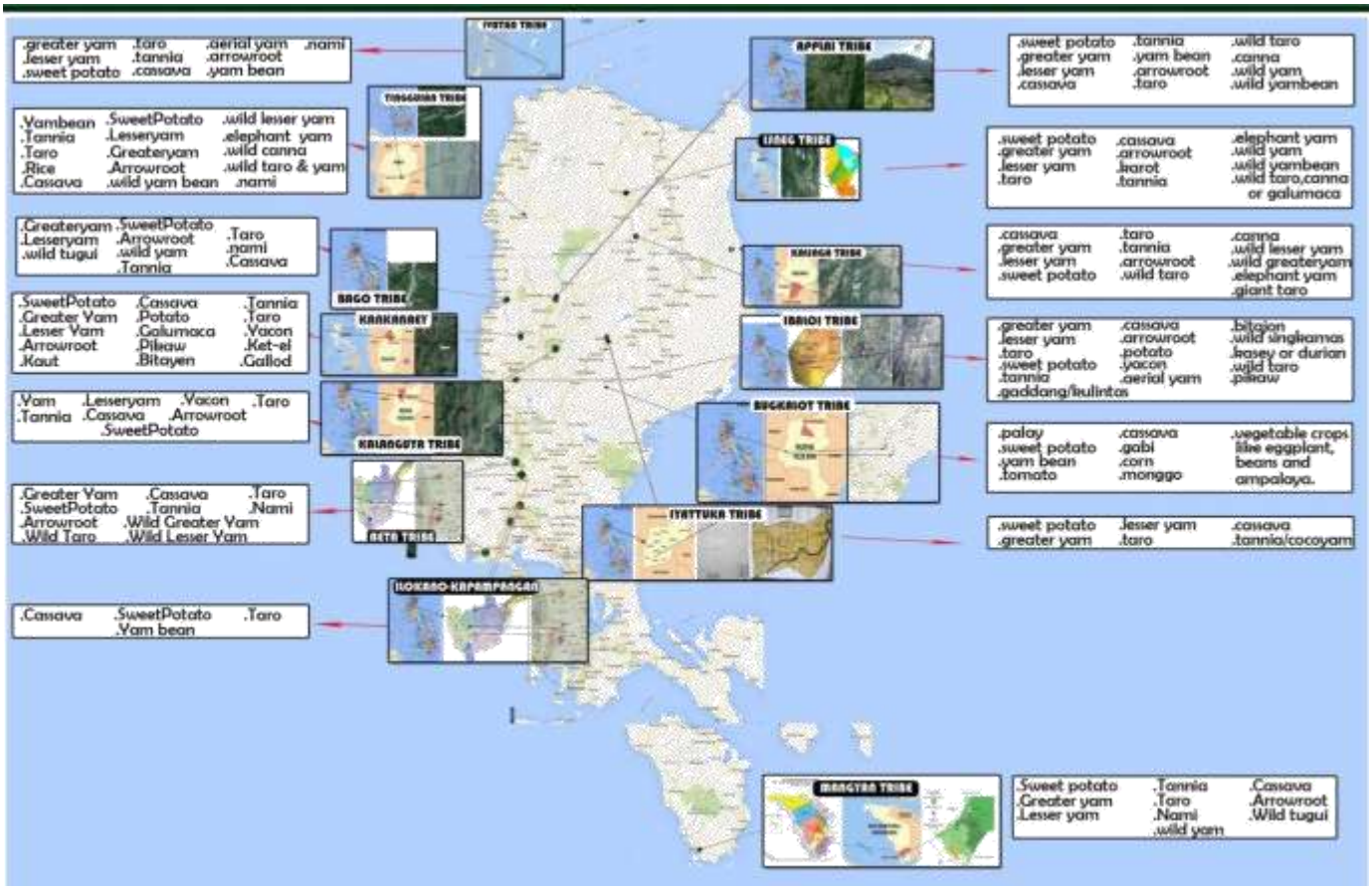

Fig.2. Diversity of roots and tubers known by indigenous peoples in northern Philippines

areas of yambean are grown in Central Luzon.

Cultivation of yacon and arrowroot, together with the gathering of wild roots and tubers are now becoming rare. According to the informants, the limited cultivation of roots and tubers are due to the low marketability and availability of other alternative source of food and income. The *Bago* informants mentioned that since the implementation of the DSWD's Pantawid Pamilyang Pilipino Program (4Ps), there were no longer families gathering *nami* (wild yam) from the mountains for food.

Only a few households domesticate or gather wild roots and tubers for food, feeds or for sale. The *Aeta* farmers gather wild roots and tubers to sell or consume as substitute to rice. Wild roots and tubers are gathered from September to December when the men in the community go to their swidden farms or to the forests to hunt. The *Iyattukas, Isnegs, Kalingas* and *Tingguians* harvest wild taro anytime of the year as alternative feeds for pigs if sweetpotato is not available. Among the *Tingguians,* the wild taro (*pikaw*) is harvested as

Fig.3. Kulintas plant and rhizomes

vegetable and sometimes sold to people in the capital town of Bangued, Abra. Wild Taro is also used as *palwad* or tokens for visitors during weddings. The informants stated that *pikaw* thrives along creeks or some rocky areas. Wild species of taro are usually gathered as viand and feeds for swine. Occasionally, children dig wild yambeans (*sagsag-ot*) during summer vacation or a household would cook *ubi* for a gathering. The *Aeta* informants claimed that

Table 3. Habitat category, use and extent of production of roots and tubers known by the indigenous peoples of Northern Luzon

Roots and Tubers	Habitat Category				Use	Extent of Production and Use
	Palnted Crop	Volunteer Plant	Domesticated Wild Plant	Wild Plant		
Cassava	x				food, feed, sale	small to large
Sweetpotato	x				food,feed, sale	small to large
Greater Yam	x				sale,food	small to large
Taro	x				sale,food	small to large
Potato	x				sale,food	small to large
Tannia	x	x		x	sale,food, feed	small to many
Lesser yam	x				food,sale	small to many
Yambean	x				food	small to few
Yacon	x	x			food, sale	small to few
Arrowroot	x	x			food,feed	small to few
Aerial Yam			x		food	few
Wild Yambean			x		food	few
Canna			x		food	few
Wild Taro (3 species)			x	x	feed,food, sale	few
Wild Yam (3 species)				x	food,sale, sale	few
Nami				x	food	few
Elephant Yam				x	food	few
Wild Lesser Yam				x	food	few
Giant Taro				x	food	few

a. Large area-many growers (abundant)
b. Large area-few growers (abundant)
c. Small area-many growers/users (occasional)
d. Small area-few growers/users (rare)

only a few of these wild rootcrops have remained, thus, are endangered. The wild yam called *amakey* by the *Tingguians* have been lost because most of its habitat have been converted to rice paddies. In some swidden farms, wild yam, locally called *ka-sey* and *kalot* plants are rarely harvested because of their thorny stems or vines.

The IP's knowledge of the diversity of roots and tubers, the habitat where these crops are found and the diversity of their use reflect the ability of the plants to adapt to the changing physical environment (elevation, climate and vegetation), and social conditions (population, livelihood and utilization).

Local Names of Roots and Tubers among the Indigenous Peoples

The IPs have different local terms for the roots and tubers (Table 4). Their local terms for the roots and tubers reflect their familiarity with the roots and tubers they grow or eat.

Kahoy is the most popular name for cassava among the IPs aside from being named *katimoro, moro, dutung, balinghoy, balangoy, padpadli,*

Table 4. Land use for root and tuber crop farming among selected indigenous peoples of Northern Philippines

IP Groups	Land use/Local Names				
	Swidden farms	Rainfed Paddies	Irrigated Paddies	Homegardens	Riverbanks
A. Cordillera Region					
Ibaloi *Kankana-ey*	*uma* *uma or nom-a*	*Bangkag* *Garden*	*Talon or Payew*	*Baeng* *Baangan*	
Applai-Kankana-ey *Iyattuka*	*nom-a* *habal*	*Bangkag*	*payew* **payoh (tonong,ap-ing,lobah)* **Dulyah*	*Baangan* *Ardattan and/or ligligan*	
Tingguian	*um-uma*		*Tal-talon*		
Isneg	*kuman*		*payaw*	*amwag*	
Biga-Kalinga	*uma*	*Bangkag*		*galden*	
B. Ilocos Region					
Bago	*uma*	*Bangkag*	*Talon*		*sebba*
C. Cagayan Region					
Ivatan *Bugkalot* *Kalanguya*	*uma* *inum-an*	*asakatakey* *inuged* *Bangkag or Garden*	*Pajaw*	*homegarden* *amtaden* *baangan*	
D. Central Luzon					
Aeta	*kaingin, gasak or lali*				
E. Mimaropa Region					
Buhid-Mangyan	*tamnan*				

samal, *hanglay* and *kalasan*. The sweetpotato is commonly known among the *Kalanguyas, Iyattukas* and *Applai-Kankana-eys* as *ubi* which is also the most popular local name of greater yam *(ube, uve, ubi, uvi)* among the IPs. The *Ibaloi*, *Kankana-ey* and *Applai-Kankana-ey,* on the other hand, name the sweetpotato as *dokto, lokto* or *tugi* which is also a more popular local term for lesser yam (*lokto, luktoh, lufto, tugui*, *tugtugi*) among the other IPs. There are also other local names for sweetpotato, greater yam, lesser yam, taro and tannia aside from those aforementioned (Table 4). Nevertheless, the IPs have the same local terms for potato, yacon and singkamas (yambean).

Pictures or descriptions were gathered for the wild or less known roots and tubers. The *gaddang* (arrowroot) is similar to the *kulintas* (arrowroot of the *Ibaloi*s) except that the former has a maroon-colored stalk as compared to the green stalk of *kulintas* (Figure 4). This is also similar to the *galumaca* of the *Isnegs*, *bonte-ek* of the *Kalingas* and *litogak* or *sag-ot* of the *Tingguians* and *awwing* of the *Applais*. *Tingguians* claim that *litogak* has sticky rhizomes when roasted.

The arrowroot is sometimes interchanged with canna which is also called *awing* or *galumaca* by the *Kalanguyas* and *Applai-Kankanaeys*; or *sugod, sago, araro, ahoki, biyas, wikan, luslussi* and *kurita* (Figure 5) among the other IPs. Once planted, arrowroot grows continuously. Some arrowroot varieties are also grown for ornamental purposes.

The less known *Dioscorea* species which grows wild and is sometimes domesticated is known as, the aerial yam (Figure 6) known as *kafu-ngaw, batata and ilos* among the *Ibalois, Ivatans* and *Tingguians.* The *ilos* was described to have a smooth outer skin that is easily removed when

Table 5. Local names of roots and tubers among indigenous peoples in Northern Philippines

Roots and Tubers	IP Group						
	Ibaloi	*Bago*	*Aeta*	*Ivatan*	*Isneg*	*Mangyan*	*Kalinga*
Aerial Yam	*Kafu-ngaw*			*Batata*			
Arrowroot	*Sugod*	*Sago*	*Araro*		*Ahoki*	*Biyas*	*Wikan*
Canna	*Kulintas, Gaddang*				*Galumaca*		*Bonte-ek*
Cassava	*Katimoro*	*Kahoy*	*Kamoteng Dutung, Moros*	*Kamoteng kahoy*	*Kahoy*	*Balinghoy, Kayo-kayo*	*Padpadli*
Elephant Yam					*Tigi*		*Boton lakay, Bageng*
Giant Taro							*Bila*
Greater Yam	*Uve*	*Ubi*	*Ubi, Liwet*	*Uvi*	*Ubi*	*Ubi*	*Ubi*
Lesser Yam	*Balugan*	*Tugtugi*	*Limeng*	*Dukay*	*Lufto*	*Buwang*	*Lokto, Ontoy*
Nami	*Kalot*	*Ka-ot, Karot*	*Kalot,*	*Ligaw na Liwet*	*Mintakey*	*Karot*	*Karot, Kalot*
Potato	*Pafas*						
Sweetpotato	*Dokto*	*Tugui, Palay*	*Kamoteng Gapang, Kamochi*	*Wakay*	*Kantila*	*Baynaw, Kamote*	*Gaselang*
Tannia	*Galyang*	*Bila, Galiang*	*Galyan, Biga*	*Canaka, Tanaka*	*Lusya*	*Singapor, Bulawan*	*Galiang lidoy*
Taro	*Ava*	*Gamey,*					
Aba, Buyon	*Gandus*	*Sudi*	*Ateng*	*Gabi*	*Lidoy*		
Wild Greater Yam	*Kasey, Durian*	*Lima-lima, Dimurian*	*Labit, Diyan, Kabwang*		*Amakey*	*Borot, Lugiman*	*Atap ubi*
Wild Lesser Yam		*Boga*					*Atap ontoy*
Wild Taro	*Pikaw, Bitajon*		*Lapa*		*Lanipog or Pikaw, Bileng*		*Pi-aw or bulagot*
Wild Yam bean	*Badang dingkamas*	*Singkamas*			*Singkamas*		*Sagsag- ot*
Yacon	*Yacon*						
Yambean							
# known	15	11	10	8	13	9	14

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boiled. Other wild yam species (Figure 7) are *kamangeg* among the *Tingguians, ka-sey* among the *Ibalois* and *lima-lima* among the *Bagos*, *durian* or *dimurian* which is similar to the *labit, ipo*y and *dalakit* and may be different from the *diyan, amakey, borot, lugiman, kanapan,* and *gallod* of the other IPs. The *Aetas* described the *labit* as having long tubers similar to human legs or to the *durian* of the *Ilocano* tribe. The *Bagos* described the wild yam *dimurian* as white-fleshed- elongated tuber. The *liwet* or *kabwang* produces more white tubers. The wild yam, *ipoy,* has long (six feet) and wide (6 inches diameter) elongated white fleshy tuber. It is high -yielding and deep-rooted, requiring the use an iron bar to harvest. Sometimes, the wild yam grows voluntarily in the *habal* (swidden farm) of the *Iyattukas*. The *dalakit* tuber also grows deep. Wild lesser yam is known as *boga* among the

Continuation of Table 5...

Roots and Tubers	IP Group						Total # of IP's*
	Bugkalot	Kalanguya	Kankanaey	Tingguians	Iyattuka	Applai-kankana-ey	
Aerial Yam				Ilos			3
Arrowroot		Awing	Luslussi	Kurita		Galumaca	10
Canna			Galumaca	Litogak, Sag-ot		Awwing	6
Cassava	Samal	Hanglay	Kahoy, Balangoy, Kaka-iw	Molo,Kahoy	Kahoy	Kahoy, Kalasan, Padpadli	13
Elephant Yam				Tigi,Pokpoklit			3
Giant Taro							3
Greater Yam	Ubi	Ongo	Ulang	Ubi	Guhhuddan	Ubi	13
Lesser Yam	Tugi	Lokto	Tugui	Tugui	Luktoh, Pukupuk	Lukto	13
Nami			Kaut	Karot, Kalot			8
Potato			Patatas, papas				2
Sweetpotato	Bella	Ubbi	Lokto	Katila,Camote	Ubih	Tugi,	13
Tannia	Galjang	Galyang	Bila	Amasyan	Bilah	Galiang, Bila	13
Taro	Putlo	Pihing,Aba	Gamey,Aba	Lapa, Aba, Gabi, Loko, Rabok	Abah,Pihing	Pising	13
Wild Greater Yam		Dalakit	Gallod	Iyog-iyogan, Kamangeg	Ipoy	Kanapan	11
Wild Lesser Yam				Anayed,Boga			3
Wild Taro		Lubinga, Bilagot	Pikaw, Bitayen	Pikaw,Kalapon	Pih-kaw,Wild abah	Pikaw, Sed-ing, Hed-ing, Tayagan	9
Wild Yam bean			Ket-el, Singkamas	Battog		Kitkili, Singkamas ti bantay	7
Yacon		Yacon					2
Yambean						Singkamas	1
# known	6	10	13	15	8	12	

*Number of IP's familiar with the crop

Bagos, *anayed* among the *Tingguians* and *atap ontoy* among the *Kalingas*. The *Bagos* described *boga* as having a tough crunchy texture which is why it is only harvested for pig feeds. *Tingguians* described *anayed* as having long spines along the vine especially those near the ground, and the tuber as having a sweet taste when boiled. Many of these wild yams hardly exist nowadays, and some are already non existent such as the purple-fleshed yams of the *Mangyans*.

Pikaw, pi-aw, pihkaw, bilagot/bulagot or *lanipog* is the local term for wild taro (Figure 8) among the IPs which closely resembles the *bitajon*

Fig. 4. Arrowroot plant and tubers

Fig. 5. Aerial yam (yellow and purple varieties)

Kamangeg Ka-sey or Lima-lima roots and leaves Boga or Anayed

Fig. 6. Wild *Dioscorea* species

Pikaw stalk and leaves Bitajon Wild Abah

Fig. 7. Wild *Colacasia* species

(*Ibaloi*) or *bitayen (Kankana-ey)*. According to the IPs, *pikaw* is a sensitive plant growing along the creeks or rocks. Stalks and leaves of the *bilagot* growing wild in streams are used as swine feed.

The wild taro which looks similar to the cultivated varieties was identified by the IPs as *lapa, bileng, lubingan, kalapon, wild abah, sed-ing/hed-ing* and *tayagan*. The *lapa* has an edible stalk and grows along creeks or swampy areas. *Kalapon*, another wild species of taro, is described as having leaves resembling that of bitter gourd, and its stalk is gathered and boiled for animal feed. The *lubingan* naturally grows in creeks and has small elongated corms, green stalks and leaves. However, only the stalk of *lubingan* is harvested for home consumption.

Aroids which are oftentimes interchanged by the IPs as the tania are referred to as *galyang, galiang, galyan, bila, bilah, biga, amasyan, lusya, bulawan, singapor* and *gaselang* while the giant taro is called *bila* by the *Kalingas* (Figure 9). *Galyang* is also a cultivated crop among the IPs but wild species also grow abundantly.

Other roots and tubers mentioned by the IPs are: the *nami* commonly referred to as *kalot, karot, ka-ut, ligaw na liwet* and *mintakey*; the wild yambean called *badang singkamas, singkamas ti bantay, ket-el, battog, sagsag-ot, or kitkitli*; and the elephant yam known as *tigi* among the *Isnegs* and *Tingguians* or *pokpoklit, boton lakay* or *bageng* among the *Kalingas* (Figure 10).

The *kalot* (wild yam) requires thorough processing and thus is rarely gathered. On the other hand, according to the *Tingguians*, the wild yam bean is aromatic, and two kinds of *tigi* profusely grow in the village even in *um-uma*, borders of rice terraces and along the fields. The *tigi* has a prickly, light green and white-spotted stalk. They were once fed to pigs but are now only considered as weeds in the *um-uma* (swidden farms). The other kind with smooth brownish and white-spotted stalk is gathered for human consumption.

CONCLUSIONS

Indigenous peoples of Northern Philippines identified 20 roots and tubers consisting of 10 cultivated species and 10 wild species. The IP's have their own local names for each of the roots and tubers. In some instances, the IP's have similar local names for the same kind of roots and tubers, but there are also instances where they refer to a different kind of root and tuber with the same local name. Nevertheless, the IPs' familiarity with the local names of roots and tubers indicates the number of roots and tubers they grow or utilize. The roots and tubers commonly planted are cassava, sweetpotato, greater yam, taro, tannia, lesser yam, arrowroot, potato, yacon and yambean. Wild roots and tubers include nami, elephant yam, giant taro, canna, wild yam bean, and three species of wild taro, three species of wild greater yam and a specie of wild lesser yam. Roots and tubers with higher rates of survival are the arrowroot, some varieties of sweetpotato and tannia.

Most of the IPs plant roots and tubers for food, feed and as a source of income especially sweetpotato, cassava, greater yam, taro, tannia and potato. However, planting and gathering of wild roots and tubers among IP households have been reduced due to lack of marketability and availability of other sources of income, food and feed. Thus, it is possible that the continuing reduction of planting and consumption of roots and tubers may compromise food security especially among the younger generations of IP's.

RECOMMENDATIONS

The continuing promotion and transfer of traditional knowledge, and the improved production, processing, and market utilization of the root and tuber resources are recommended to ensure the conservation, sustained production and the increased consumption of roots and tubers. In the long run, these may reduce rice staple importation, improve quality of food intake and provide additional sources of household income.

Further, the diversity of roots and tubers and their ability to grow in different habitats- the swidden

Two varieties of galyang growing in in Benguet

Tanaka/Canaka in Batanes Bauko Galiang Bila in Kalinga

Fig. 8. Aroids known by IPs in northern Philippines

Kalot/ Karot/ Ka-ut Battog Tigi/ Pokpoklit/Bageng

Fig. 9. Wild roots and tubers

farms, rainfed and irrigated paddies, homegardens, forests, pathways and waterways are indicators of the crops' adaptation that may be looked into to support climate change mitigation efforts.

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