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ROOT AND TUBER FOOD PREPARATION PRACTICES AMONG INDIGENOUS PEOPLE IN NORTHERN PHILIPPINES

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INTRODUCTION

Rice is the staple food of the Philippines but rice imports have been filling-up the shortage in production. On the other hand, root and tuber crops have been identified as food crop to feed the world in coming decades (Scott *et al.*, 2000). Many of the developing world's poorest and most food insecure households will continuously look up to these crops as contributing, if not the principal source of food, nutrition, and cash income just like in the olden times where indigenous people in the Philippines regard roots and tubers an important alternate staple food. Continuing bias towards cash crop food production as well as changes in economic and educational development, in- and out-migration, environment, climatic and lifestyle changes risk the loss of indigenous knowledge and practices.

Indigenous knowledge and practice consist of knowledge or practice of people in a given community have developed over time and continuously developed to adapt to local culture and environment (NAARAP, 2009). The loss of indigenous food preparation and processing knowledge and practices among indigenous people in Northern Philippines could be also attributed to the failure to pass-on cultural practices and the lack of information (Figure 1).

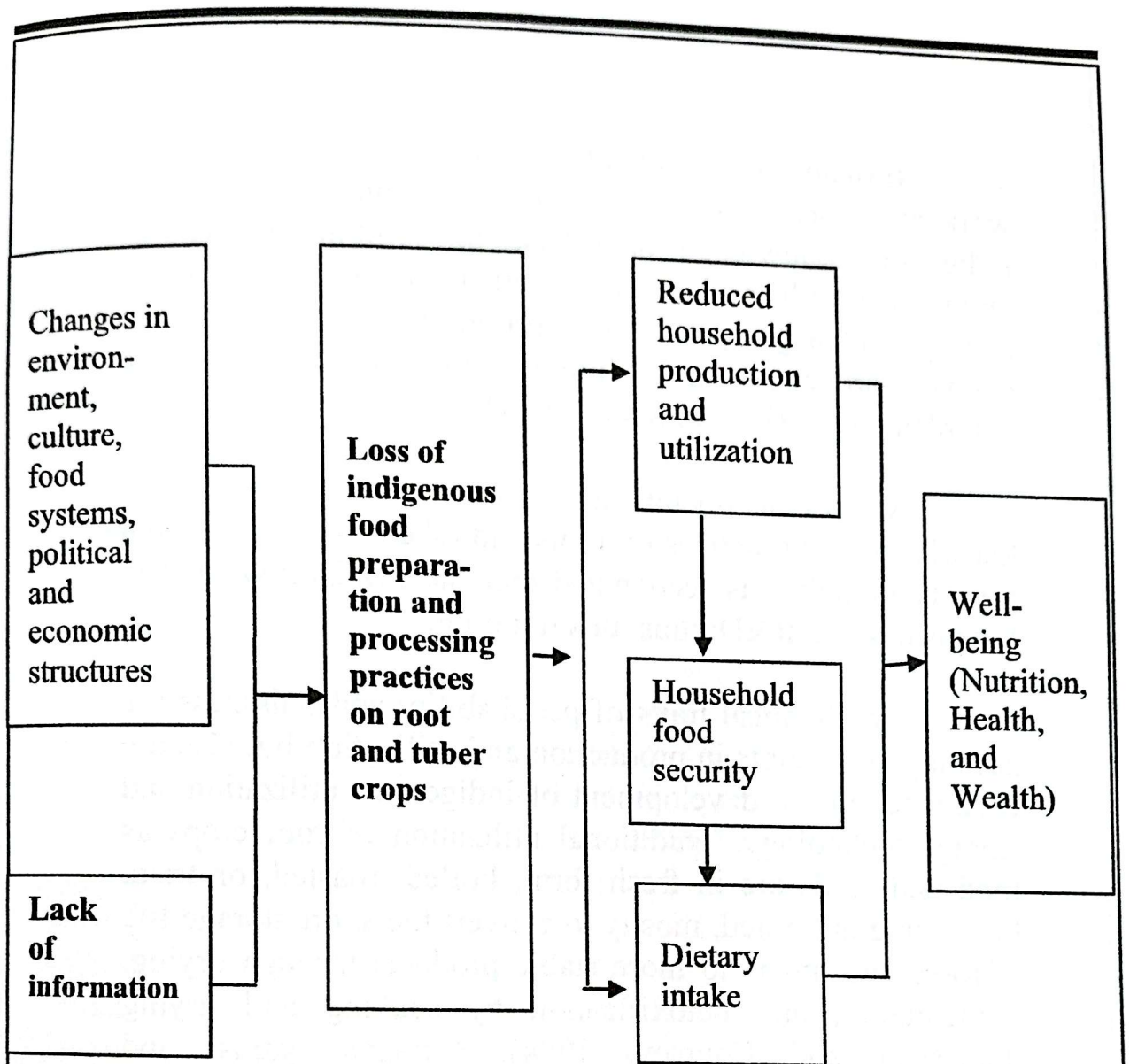


Fig. 1. The Conceptual Framework

Instead of re-inventing the wheel, development workers, researchers, and scientists can choose from indigenous knowledge data base or combine indigenous knowledge with modern or western technology for feasible solutions (Thiagarajan, 2008). Based on experiences from China, indigenous and foreign innovation efforts are complementary (Fu and Soete, 2011).

At present, documentation on the use of indigenous knowledge and practices on roots and tubers is not a research priority though it is recognized that the availability of data base is basic to R&D; thus, this write-up.

Bio-chemical traits of perishability and bulkiness are not only constraints in production and utilization but also are challenges in the development of indigenous utilization and storage technology. Traditional utilization of root crops as food and feeds are in fresh form, boiled, roasted, or fried. Processing is limited, mostly to convert the short storage life of roots and tubers to more stable products through drying, fermentation, and detoxification by soaking and drying (Lancaster and Coursey, 1984). Cassava, yams, and sweetpotato, for instance, are harvested when needed or buried in pits, or covered with mud paste, soaked in water, or pounded and fermented as '*fufu, fuba, gari, or farinha*' in Africa and Brazil; sun-dried or dried over a fire just like the chips called '*gaplek*' in Indonesia and later on ground into flour for bread or porridge. Grated and dried, cassava rice called '*landang*', '*lafun flour*', '*chapati*' and starch for spiced sauce called '*cassareep*' are prepared (Lancaster and Coursey, 1984; Scott *et al.*, 1992). Sweetpotato roots and

vines including dried chips are feeds for livestock (Scott *et al.* 1992). The *Colocasia* and *Xanthosoma* species of aroids are the two most important food crops of the South Pacific, the Carribeans, and West Africa (Alexander, 1969; Coursey, 1968; Lamber, 1979; Massal and Barrau, 1955 as cited by Lancaster and Coursey, 1984) and are normally consumed after harvest since they are only harvested as needed. A fermented product known as *poi* or *ma* is prepared from *Colocasia* in Hawaii and in the Anuta Islands (Greenwell, 1947; Stewart, 1928, Massal and Barrau, 1955; and Yen, 1973 as cited by Lancaster and Coursey, 1984).

Earlier published and unpublished studies and newspaper articles in the Philippines had mentioned importance of root crops, particularly sweetpotato, as survival crops among resource-poor families to weather the ill-effects of typhoons and during food crises. The World War II in the Cordillera highlands (Solimen *et al.*, 1998), the 1990 earthquake in Benguet (Sano *et al.*, 1991), swidden farming of sweetpotato for marginal farmers who don't own rice terraces in Ifugao (Balaki and Solimen, 1991; Verdonk, 1991; Gayao, Meldoz, and Backian, 2014), and the year-round cultivation of sweetpotato (*Ipomoea batatas*), ubi (*Dioscorea alata*), and tugui (*Dioscorea esculenta*) as subsistence crop in the Batanes island province (Dayo *et al.* 1998), the consumption of wild yams 'nami' (*Dioscorea hispida*) by upland farmers in Mindanao due to crop losses resulting from the *El Nino*, and the consumption of wild yam 'kamangeg' (*Dioscorea spp.*) by fishermen/ farm

laborers in the coastal village of Ilocos Sur before the harvest of the wet rice cropping are phenomenal instances. These records led to the derogatory perceptions that root crops as starchy staples (energy source) are only poor men's diet. According to Horton (1988), storage roots and tubers contain varied quantities of protein, essential vitamins, and minerals. Furthermore, cassava, potato, and sweetpotato significantly out yielded the cereals in dry matter/caloric production per unit area and even on a per day basis like in the case of potato.

METHODOLOGY

This write-up focusing on indigenous food preparation and processing practices is an offshoot of the project documentation on the 'Role of roots and tubers in household food security and income of indigenous peoples in Northern Philippines' and from information passed on in previous surveys, root crops consumption promotion, and informal interactions with indigenous people.

The steps in carrying out the research on the 'Role of roots and tubers in household food security and income of indigenous peoples in Northern Philippines' is shown in Figure 2, beginning with the gathering of secondary data from local government agriculture, planning and development units, and from the National Commission on Indigenous People records or libraries, market observation, and linking for collaborative researches, which were simultaneously done in selected municipalities/communities (Figure 3), populated by indigenous peoples, namely: *Ibalois, Bagos, Ivatans, Isnags, Kalingas, Tingguians, Applais, Kankana-eyes, Iyattukas, Kalanguyas, Bugkalots, Aetas, and Mangyans*. Field work for the main research started from February 2012 to October 2013 although follow-up inquiries and integration write-ups extended beyond 2017. Integration write-ups include not only information gathered from the 13 IPs but also those food preparation practices previously gathered/documentated from other IPs.

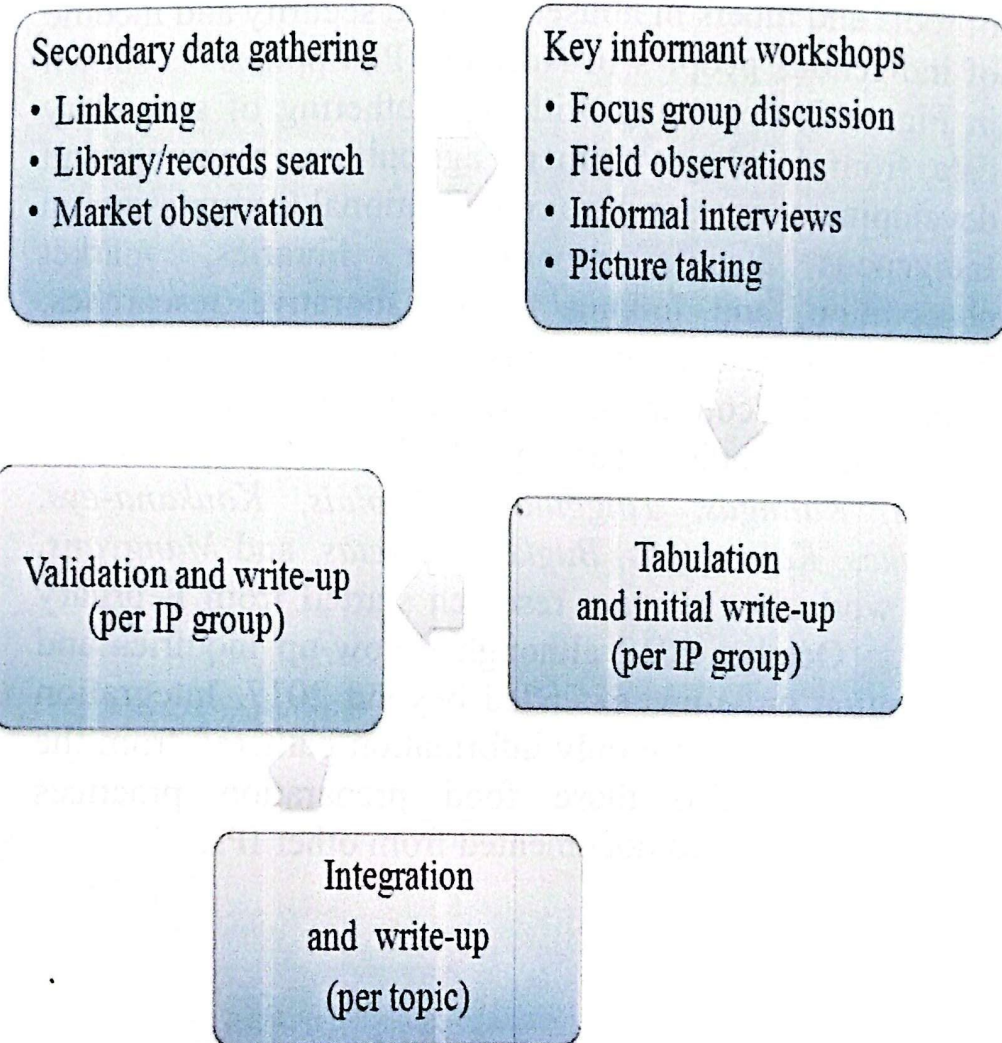


Fig. 2. The Research Process

The research reports per indigenous people (IP) group were published in the 'Traditional Roots and Tubers Knowledge Series, December 2013 to June 2014, #1-14' as part of the research commitment to the IP informants and collaborating researchers/agencies. It is in this series that the details of the IPs and study sites were described and can be accessed at rootcrops-bsu.hostclink.net. A similar write-up on traditional storage and utilization practices of selected indigenous people and also the diversity of roots and tubers known, grown, and utilized by IPs in the Northern Philippines is published in the BSU Research Journal #75 and #76, respectively (2016).

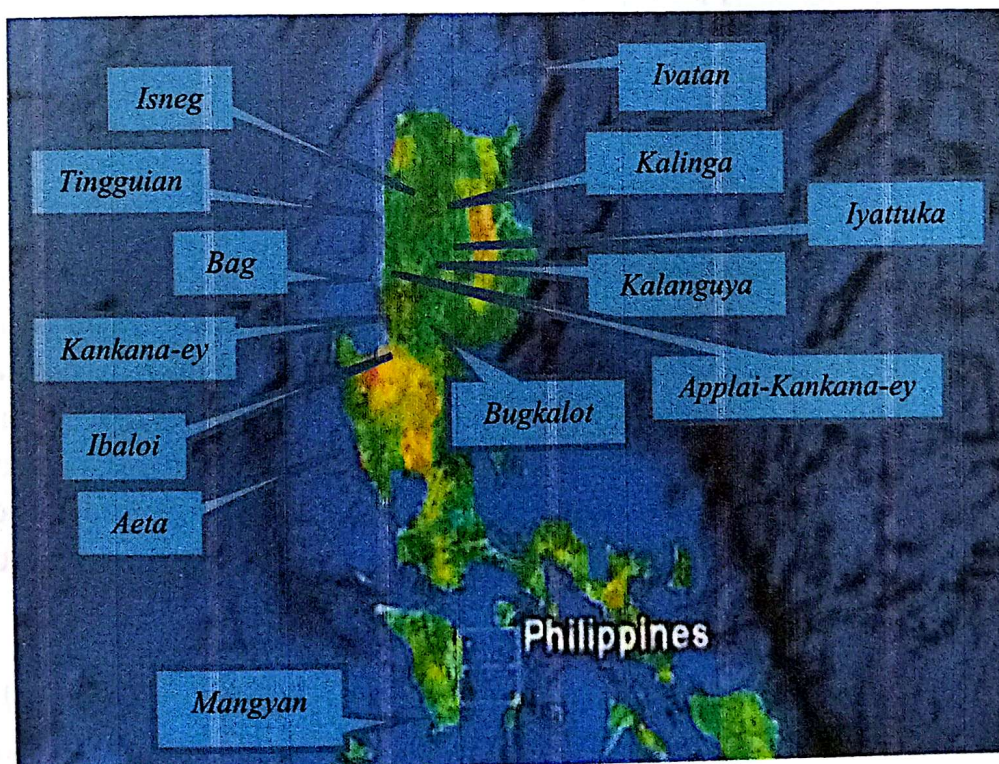


Fig.3. The Location of the IP Respondents in Northern Philippines.

DISCUSSION OF RESULTS

Roots and Tubers Known and Utilized

There were more than 20 roots and tubers identified by the indigenous peoples (IPs) in Northern Philippines. These consist of five root crops with enlarged or modified roots as well as 12 tubers and six corms with modified underground stems.

Belonging to the root crops are cassava (*Manihot esculenta*), sweetpotato (*Ipomoea batatas*), yambean (*Pachyrhizus spp.*), yacon (*Smallanthus sanchifolius*), and wild yambean. Cassava and sweetpotato are widely grown and used by all the 13 IP's selected in this study while only few plants of yambean and yacon are grown for household use.

The tuber crops are greater yam (*Dioscorea alata*), lesser yam (*Dioscorea esculenta*), arrowroot (*Maranta arundinacea*), potato (*Solanum tuberosum*), canna (*Cannaceae*), aerial yam (*Dioscorea bulbifera*), nami (*Dioscorea hispida*), elephant yam (*Amorphopallus campanulatus*), wild lesser yam (*Dioscorea spp.*), and three wild species of greater yam. Greater yam, lesser yam, and potato are the tuber crops mostly planted.

The corm crops are taro (*Colocasia esculenta*), tannia (*Xanthosoma sagittifolium* and *Xanthosoma violaceum*), giant taro (*Alocasia macrorrhiza*) and three wild

taro species. Taro is more familiar than tannia whose corm is oftentimes mistaken as taro.

Cassava, sweetpotato, potato and yam are among the major food crops in developing countries in addition to rice, wheat and corn (Scott *et al.*, 2000). Taro, yam bean, tannia, lesser yam, arrowroot, potato, and yacon are commodities that make up the root and tuber crops in the CG (Consultative Group) System (FAO, 2017).

The storage roots and tubers are usually consumed as boiled or steamed, roasted, and fried. However, some IPs had cooking preparation or recipes specific to each kind of roots or tubers.

Sweetpotato



Indigenous Peoples (IPs) normally harvest sweetpotato enough for immediate consumption or sale. However, depending on variety, farmscape, and postharvest management, sweetpotato roots have shelf-life

of 2 to 3 days if harvested from irrigated fields and up to 7 days if harvested from the dry farms (*Ibaloi*); a shelf-life of one month (*Aeta*), or even longer up to 8 months storage in *pukok* (IPs of Bayyo, Bontoc, Mountain Province) or in *agamang* or *kamalig* of the *Tinguians*. Sweetpotato roots become sweeter when cooked after a month. If not, sweetpotato is processed into dried chips or fed to animals like pigs, dogs, swine, and chicken to avoid wastage.

Table 1 shows the common and unique sweetpotato based food among the different IPs.

Table 1. The sweetpotato-based menus among the indigenous peoples in Northern Philippines.

<i>Ibaloi</i>	<i>Bago</i>	<i>Aeta</i>	<i>Ilocano/ Kapampangan</i>	<i>Ivatan</i>	<i>Isneg</i>	<i>Buhid- Mangyan</i>
Boiled	Boiled	Boiled	Boiled	Boiled	Boiled	Boiled
Steam	Cue	Roast	Fried	Fries	Cue	Roast
Roast	Buku flour	Lubi or suman	Cue	Cue	Chips	Boil leaves
Fries			Snack ingredient	Maruya	Guinata an	
Cue	Leaf salad		Suman			
Buku-tupig			Tnumi			
Guinataan	Guinata an		Vegetable ingredient like in sinigang			
Nilubian						
Tips sautee'						

Laing. This delicacy is one of the local *vegetable* dishes in the Philippines, which originated from the Bicol Region. *Laing* is made of gabi stalks, leaves, and chopped corms boiled in coconut milk and seasoned with fish sauce, minced ginger and garlic, hot chili, and dried fish (optional).

Gabi Leaves with Coconut Milk. A Filipino dish made of taro stalks and leaves with a mixture of *tinapa* (smoked fish), fish sauce, minced ginger, and a dash of ground pepper; a bite-sized mixture is then wrapped in clean taro leaves; arranged on a bed of taro stalks; and steamed in coconut milk.

Gabi Stew. A local vegetable dish of Filipino made from a mixture of meat, minced garlic or onion, dash of black pepper, ginger and salt to taste; when meat is tender add gabi corms or tannia cormels (as soup thickener) and lastly cabbage or pechay.

Sinigang with Gabi. Another popular vegetable dish of Filipino consisting of seafood or meat garnished with gabi corms, string beans, garlic, onions, black pepper, and salt or *patis* to taste and seasoned with fresh green tamarind juice.

Glazed Gabi. A snack item of sweetened gabi. Cooked in water and mixed with brown sugar and margarine.

Gabi with Peanut. For dessert or for snack, gabi cake cooked in milk and garnished with ground peanuts.

Gabi Pastillas. A healthy indulgence for sweet-tooth, the mashed gabi is mixed with condensed/evaporated milk, sugar, and flavored with vanilla; then cut into bite size and wrapped in cellophane.

Gabi Cookies. For dessert or snack, this baked food is made up of mashed gabi with butter sugar, egg yolks, and vanilla.

Buku-Gabi Cookies. Another interesting baked food, the mashed gabi is mixed with sifted flour, shredded buko (young coconut), baking powder, sugar, beaten eggs, and fresh milk.

Gabi Pudding. This delightful *pudding* is always a treat and easy to make using mashed gabi with common pastry ingredients like flour, milk (thick) or evaporated milk, sugar, egg, and shredded *buko* (young coconut), then baked or steamed.

Gabi Maja. This native delicacy consists of mashed gabi with coconut milk or milk, cornstarch, white and brown sugar, and vanilla. Cooked in low fire stirring constantly until it thickens then poured in pans to cool off and harden.

Inab-abusang or Guinataang Camote. This is a native snack made of cubed roots and added to glutinous rice and when boiling, sugar or molasses is added. When cooked, coconut milk is added as desired (Rita Walsiyen in Alupias *et al.*, 1994).

Pinallak. This is also native snack which is pound or unpound sweetpotato chips and mixed with rice and cooked in clay pot; or cubed roots are mixed with rice or glutinous rice when already boiling.

Hiit or In-inte. A jelly or jam prepared from left-over sweetpotato broth.

Hebeng, Sabeng or Tengba. Traditional sweetpotato non-alcoholic fermented drink. Salt is added to the left-over water in boiling sweetpotato roots then fermented for 15 days to one month or longer. It is used as a substitute for vinegar and believed to prolong human life if regularly consumed.

Nawnaw or Laplap. A healthy soup essentially made of mashed sweetpotato, which the *Kalingas* use as main dish.

Tnumi. This is a native delicacy of *Ivatans* in Batanes. A mixture of mashed sweetpotato, and taro and eaten with fish.

Buku or Bakol. A traditional staple food of the IPs in the olden times. Excess sweetpotato roots are sliced and sun-dried then stored for future use. These dried chips are crushed or pound into flour and used in the previously mentioned menus.

Boiled Roots. A staple or snack item called *lommog*, with skin and *isihibak*, if peeled.

Camote Halaya. A custard-like dessert made from mashed sweetpotato with condensed/evaporated milk or coconut milk and butter. Others make the *halaya* with glutinous rice or marshmallow (Sonia Briones in Alupias *et al.*, 1994).

Incalte. This is also a traditional sticky dessert made from sweetpotato roots, coconut milk, and molasses (Ma. Clarita Valdez in Alupias, 1994).

Maja. A snack or dessert made from a mixture of water, mashed sweetpotato, coconut milk, corn starch, sugar, and vanilla (Dorothy Paatan in Alupias *et al.*, 1994).

Kutchinta. One of the popular snacks all over the country. This steamed cake is made of sweetpotato flour, ground sticky rice, sugar, baking powder, all blended in coconut milk (Colbina Almoda in Alupias *et al.*, 1994).

Sweetpotato roots and tips/shoots are also used as one of the ingredients in one of the following dishes:

Kinkinalot. A traditional one-meal dish of *Applai-Kankana-ey*s made from fresh sweetpotato roots and leaves plus taro corms and stalk mixed with glutinous rice or plain rice and cooked as porridge and seasoned with *bakkay* or *tengba*.

Bakkay. A substitute of oil or *bagoong*, a condiment made of anchovies when cooking vegetables. Water, garlic or ginger, salt, and other additives are added to ground rice, corn kernels, and sweetpotato then fermented for one month or more.

Omelet, Adobo, Buridibod, Dinengdeng, Lumpia, and Sinigang. In all these dishes are sweetpotato roots and shoots/tips prepared in different forms and added to eggs, meat, fish, and other vegetables.

Leaf-tips Salad/ Sautéed. An appetizer or main dish, the tips or leaves of sweetpotato is blanched or sautéed and seasoned with fresh sliced tomato, salted fish sauce, and calamansi or lemon.

Camote Juice. This beverage is made of sweetpotato leaf broth and flavored with calamansi and sugar.

Cassava



Cassava has a very short shelf- life, the roots turning black after 3 days. According to the *Ibalois*, the only way to prolong shelf- life is to soak cassava roots in water. The *Isnegs* say that it has one week shelf-life if not mechanically damaged and unwashed. In West Africa, cassava roots are soaked in water for 3 to 4 days to soften before peeling, pounding, and boiling or steaming and eating (Lancaster and Coursey, 1984).

Indigenous peoples usually consume cassava as boiled, fried, and roasted or sautéed. Table 2 shows the list of cassava-based food as substitute staple, viand, and snacks, some of which are similar to sweetpotato menus.

Table 2. The cassava-based menus among the indigenous people in Northern Philippines

<i>Ibaloi</i>	<i>Bago</i>	<i>Aeta</i>	<i>Ilocano/ Kapampangan</i>	<i>Ivatan</i>	<i>Isneg</i>	<i>Buhid- Mangyan</i>
Boiled w/ or w/o gata	Boiled	Boiled	Boiled	Boiled	Boiled	Boiled
Suman	Nilub- yan	Kisa	Ukoy	Suman	Nilubyan	Roast
Buku- tupig	Tapey	Ginisa		Bibingka	Guinataan	
Binubo- dan	Guinata an					
Steamed/ baked cake	Buko Tupig Cassava cake			Pitchi- pitchi	Vegetable dish	
<i>Biga- Kalinga</i>	<i>Bugka- lot</i>	<i>Kala nguya</i>	<i>Kankana- ey</i>	<i>Ting- guian</i>	<i>Iyattuka</i>	<i>Applai- Kankana- ey</i>
Boiled (Iluknog)	Boiled	Boiled	Boiled	Boiled	Boiled	Boiled
Inis-isna		Cassava roll	Binubo dan	Lubi-lubi	Tapuey	Chips
Lubi-lubi		Tupig		Guinata an	Binubo dan	Potapot
Dinakan		Binubo dan		Pancakes	Flour	Salapusop
Vegetable stew				Buko flour		Bakkay
Padpadli nan dila				Rice mixture		
				Salok- sok		

Kisa. An *Aeta* menu is similar to the *Tingguians'* where cubed cassava roots are placed at the bottom of uncooked rice and brought to boil. This serves as a rice extender.

Suman, Calamay, Salapusop, Inis-isna, Bibingka. A cake and served as a snack. It is made from grated cassava roots mixed with coconut, sugar, and milk/coconut milk; or grated cassava is mixed with butter or margarine, sugar, and wheat flour (optional) wrapped in banana leaves or placed in pans then steamed or baked.

Sadkik. A pancake-type item for breakfast or for snacks made from cassava chips flour.

Buku or Cassava Chips. Cassava roots are sliced then dried to be used in preparing *potapot* and *salapusop* menus. *Buku* are known in Indonesia as *gaplek* and *kokonte* in Ghana (Anonymous, 1941 and Dovlo, 1973 as cited by Lancaster and Coursey, 1984).

Potapot. A native snack made from *buku* or cassava chips flour and mixed with wheat flour (optional), baking powder, and sugar then wrapped with banana leaves and steamed.

Tupig or Salapusop. A snack item made from cassava chips flour mixed with water and sugar then steamed or cooked in a clay pot.

Pinallak. This is a traditional meal or snack item among IPs. It is a mixture of *buku* or cassava chips and rice then cooked in a clay pot.

Saloksok. Among the *Tingguians*, *saloksok* is a snack item made from grated cassava roots mixed with flour then fried.

Nilubyan, Lubi-lubi, Nilupak. A favorite snack item made of boiled cassava roots and tannia tubers (optional) pounded together with coconut and sugar.

Ukoy. A Filipino version of shrimp fritters. This is a simple appetizer or served as main dish. Made up of grated cassava roots, grated green papaya, small shrimps, onions, pepper, and salt; or mashed cassava, minced green onions, chopped red pepper, ground meat, egg, flour, and salt and black pepper to taste. The mixture is formed into a patty and deep-fried.

Pitchi-pitchi. Prepared as dessert or snack, grated cassavas is mixed with coconut milk and sugar then cooked in low fire stirring constantly until thick and cooked and formed into balls rolled-over in grated young coconut. Or the grated cassava mixture is placed in pans then steamed (Zita Aguinaldo-Gayao, personal communication).

Guinataan or Dinakan. An ingredient in famous native snack among Filipinos, cubed cassava roots are added to sticky rice balls, banana, taro, sweetpotato, sago, greater yam and cooked in coconut milk with sugar added.

Cassava Roll. A dessert or snack of grated boiled roots of cassava, flattened and sprinkled with ground peanut or spread with jam and margarine then rolled.

Tapay/Tapuey. Usually served as an appetizer, this stuff is made from boiled cassava roots and treated with *benekbek* (yeast made from fermented ground rice with pepper and *angwad* weeds), and then fermented in the winnower for 3 days before transferring in the jar to continue fermentation for 2 weeks if a sweeter taste is desired or up to one month for stronger alcohol content.

Binubodan. This is similar to *Tapay*. Boiled cassava roots are treated with *benekbek* fermented for 3 days then serve as snack food. For every 2.5 kg of cassava roots, one piece of native *bubod* or yeast (30-50g) is added. To make into wine, the *bubod* is sprinkled in the cooked cassava roots, covered with banana leaves then when it starts to ferment place in the jar (*Koli*) until juice oozes (Maricel Pedro, personal communication).

Sautéed Cassava Leaves. A vegetable dish, the cassava leaves are blanched, strained sautéed with coconut milk.

Isneg Cassava-Squash Vegetable Dish. Shoots of squash are added to cassava and cooked in coconut milk.

Kalinga Dinengdeng or Vegetable Stew. Cassava is the main ingredient in the stew with crabs (*agatol*) or shells (*susu, bisokol and leddeg*) and spiced with hot pepper.

Bakkay. An oil substitute or fish sauce substitute when cooking vegetables. Among the *Applai-Kankana-ays*, cassava roots are also ingredient in making *bakkay*, a mixture of pounded arrowroot, sweetpotato, corn or rice, and dried mushroom with salt, garlic, ginger, chili pepper (*sili*) then stored or fermented from one to two months.

Taro, Wild Taro, and Tannia



Vunes or Venes

Taro has a short shelf-life from harvest, about 3 days. Hence, the indigenous people prefer to harvest only when needed and leave the matured ones in the ground. For some IPs, taro corms are sliced and sun-dried to make *buku* or chips. Among the *Ibalois* and *Kankana-eyes* of Benguet, stalks of taro are sliced and sun-dried to remove itchiness or to prolong shelf-life. The *Ivatans* of Batanes also harvest matured and dried taro stalks called *vunes* or *venes*. Tannia cormels (not the mother corm used only as seeds or feeds), on the other hand, have a longer shelf-life extending beyond one month.

Indigenous peoples use the whole taro plant for food; the corms are boiled and served as snack food or as a staple in special occasions or an ingredient in some recipes while the stalks and leaves as vegetable dish (Table 3). For tannia or cocoyam, only the cormels are commonly used for food, and few IPs are aware that tannia shoots or stalks of the violet variety can be prepared as vegetable. Tannia cormels in place of taro corms are used in some of the menus listed below.

Table 3. Menus of taro, wild taro, and tannia among indigenous people in Northern Philippines

<i>Ibaloi</i>	<i>Bago</i>	<i>Aeta</i>	<i>Ilocano/ Kapampangan</i>	<i>Ivatan</i>	<i>Isneg</i>	<i>Buhid- Mangyan</i>
Boiled	Boiled	Boiled	Veg. dish	Boiled	Boiled	Boiled
Veg. dish	Nilubyan	Sukit	Kalamay	Winakajapa	Sinorsor	Roast (Leaves)
Nilubian	Halaya	Veg. dish		Rinakan	Binasal	
	Guinataan	Guinataan		Vunes or Venes	Guinataan	
					Veg. dish	
					Nilubyan	
<i>Biga-Kalinga</i>	<i>Bugkalot</i>	<i>Kalanguya</i>	<i>Kankanaey</i>	<i>Tingguian</i>	<i>Iyattuka</i>	<i>Applai-Kankanaey</i>
Veg. dish	Boiled	Boiled	Boiled	Boiled	Veg. coconut dish	Veg. dish
		Baksay	Veg.-meat dish	Sinag-it	Flour	Veg. with sabeng
		Guinataan		Guinataan		
		In-utom		Rolled pikaw sautee		Sautéed leaves
		Steamed (bilagot)		Pork dish soup thickener		Bassa
						Galiang sasaladen

Sinigang Gandus. For this sour-soup viand, the *Aetas* use the taro stalk with leaves where *pingol bato*, a wild begonia plant growing in rocks or forest, as sour seasoning.

Sukit. Another traditional viand of *Aetas*, the mixture consists of taro or *gabi*, *sweetpotato* or *camote*, and *patani* or *sitaw* (a legume) flavored with *baokok* leaves as seasoning.

Dinamdang* or *Roasted Tayagang. The wild taro 'tayagang' is also roasted in ash by the *Applai-Kankana-eyes* in their *nom-a* (swidden fields) for viand.

Bassa. This is a vegetable dish among *Applai-Kankana-eyes*. Taro (*pising* or *pikaw*) stalk or leaves are rolled, including corm (optional) and boiled or sautéed in oil and flavored with vinegar (*tengba*).

Sinorsor* or *Binasal. An *Isneg* dish where *sili* (hot pepper), sardines (optional), *bagoong* (fish sauce), tomato, and onions are added to spice taro stalks and leaves of *ateng* (cultivated taro) or *lanipog* (wild taro).

Baksay. Traditional dish of *Kalanguyas*. The leaves and stalks of *pihing* (taro) are rolled then steamed or placed on top of boiling sweetpotato.

Guinataang Pihing. Another traditional dish made of taro stalks and leaves with roasted ground peanut or in place of coconut milk. The pot cover should be open only once to mix the ingredients to prevent itchiness.

In-utom. A vegetable dishes of *Kalanguyas*. The taro stalks and leaves are wrapped with banana or *rono* leaves placed inside the bamboo then cooked by roasting.

Boiled or Steamed *Bilagot*. A rice-substitute, the corms of *bilagot* (wild taro) are crushed in netbags using wood and then washed thoroughly in flowing water to remove itchiness.

Sinag-it. A special vegetable dish of the *Tingguians*, where *both* lapa (dashen type) and *loko* (eddoe type), taro varieties are used. The stalks and corms are roasted and mixed with *kuhol* (golden snail) and cooked in coconut milk. Techniques done to remove itchiness are roasting and continuous stirring without covering the pot when cooking.

Sautéed *Pikaw*. Another special vegetable dish of *Tingguians*, the stalks and leaves of *pikaw* (wild taro) are rolled and sautéed with sardines or squid.

Winakajapa. This is the *Ivatans'* version of salted *gabi* stalks as viand or main dish.

Rinakan. An *Ivatan* vegetable dish using *gabi* stalks alone (no meat or fish).

Dinukdok. A vegetable dish of the *Kalingas*, this is a boiled taro leaves with mashed black beans, *sili* or hot pepper, coconut milk (*gata*), crabs (*agatol*) or shells (*susu*, *bisokol* and *leddeg*).

Venes or Vunes. Dried *sudi* (taro) stalks gathered only during the dry season or summer months are cooked as vegetable dish.

Kalamay, Halaya, Nilubyan. The *Kapampangans*, *Bagos*, and *Isnags* prepare this snack food by mixing grated *gandus* or mashed boiled taro corms or tannia cormels with coconut, sugar, and milk or coconut milk similar to the procedure in making sweetpotato and cassava *nilubyan*.

Guinataan. A snack or dessert food, diced taro corms are added as one of the main ingredients in *guinataan*. *Aetas* version of *guinataan* is made of boiled and pound taro corms mixed in coconut milk.

Tannia Salad. Raw violet tannia stalks is *sasaladen*, i.e. salad garnished with vinegar, salt, pepper, and ginger (*Tingguian*). Thinly sliced green stalks of tannia can also be used (*Kankana-ey*).

Tannia Sautéed. Only the unopened young leaves are gathered, chopped, and sautéed in garlic and oil and seasoned with fish sauce or salt (*Ibaloi*).

Versions of Vegetable Dishes. Without specifying the name of vegetable, the IPs had varied ways of preparing taro as a vegetable dish:

The *Isnegs* use *ateng* or taro mixed with shoots of squash and cooked in coconut milk.

The *Kankana-ey-Applais* mix the stalks and leaves with seed legumes (*bukel*) and meat; or cook the taro with legumes or pechay, *endey*, chayote tops, or water cress and meat; or the corms and stalk of taro are cooked with *sabeng* (sweetpotato vinegar). *Kalingas* cook stalks of *lidoy* (taro) with fish sauce (*bagoong*), coconut milk, and hot pepper.

Kankana-eyes of Benguet sauté taro stalks with peanut or *karing*/dried anchovies or *gata* or noodles or *etag*/meat or mixed with *bukel* or legumes. Sometimes, stalks are sliced and sun-dried to eliminate the itchiness.

Taro or wild taro (*bitayon* and *pikaw*) stalks and leaves are sautéed in little oil before adding to meat stew as an acrid-free cooking procedure by the *Ibalois*.

Mangyans prefer to roast taro leaves without stalks.

In previous vegetables, roots and tubers consumption, promotion, and cooking festivals, that the authors were involved in, several taro food preparation, which are versions or innovations of the aforementioned indigenous people were also presented, namely:

Burger Pihing. A burger is used for sandwiches or as a main dish made of taro leaves, egg, chopped onion, cornstarch, and salt to taste. A tablespoonful of the mixture is shaped into patties and fried (Violy Dulnuan, Amduntog, Asipulo, Ifugao).

Gabi Omelet. A dish made of gabi or taro stalks with eggs, minced onion, ground pepper, salt and oil to taste.

Gabi Stalks with Tomatoes. Served as main dish made out of stalks, medium ripe tomatoes (sliced), minced ginger, and salt to taste.

Gabi Balls. A main dish using mashed boiled gabi, flour, finely diced carrots, and minced onion and garlic, egg, ground pepper, and salt to taste. A tablespoonful of the mixture is formed into balls and deep fried.

Gabi-Sayote-Sardines Dish. A sautéed veggie dish of sliced onion, canned sardines, diced boiled gabi, diced chayote and seasoned with curry powder and salt then served hot.

Guinataang Gabi Stalk. A vegetable dish using coconut milk (second extraction) to cook banana (sliced), squash (cubed), gabi stalk (sliced), and eggplant (sliced), and pure coco milk seasoned with fish sauce.

<i>Biga-Kalinga</i>	<i>Bugka lot</i>	<i>Kalanguya</i>	<i>Kankana-ey</i>	<i>Tingguian</i>	<i>Iyattuka</i>	<i>Applai-Kankana-ey</i>
Boiled	Boiled	Bakol	Buku flour	Boiled	Boiled	Damdam
Cue						
Chips		Hebeng	Tips sautee'	Cue	Fry	Cue
Inis-isna		Hiit		Lubi-lubi	Cue	Potapot
Lubi-lubi		Cake-halaya	Sabeng	Guinataan	Laplap	Salapu sop
Dinakan				Omelet	Nilubian	Kinkina lot or bakkay
Nawnaw				Buku flour		
Leaf salad				Rice mixture		Buridi bod
Dineng deng/ stew					Tengba	
Adobo					In-inte	

Camote Cue. This recipe is a common snack item in the Philippines. Big sweetpotato roots are peeled and sliced (no need to slice small roots) and deep fried. When already soft or cooked, sugar or molasses is added stirring from time to time until the sweetpotato slices are coated with the melted sugar and finally served hot or cold.

Maruya. It is a popular snack or dessert among *Ivatans* and other IPs in the Philippines. Strips of sweetpotato roots are coated with flour then deep fried and dipped in sweet and sour condiment for a more flavorful taste.

Nilubian or Lubi-lubi. The favorite snack stuff made of mashed sweetpotato roots. These are boiled and when cooked, mashed and mixed with sugar and coconut milk or milk.

Inis-isna, Tupig or Suman. A common snack in the Philippines made of fresh grated sweetpotato roots and mixed with or without glutinous rice, sugar and coconut milk or milk, then wrapped in banana leaves and steamed.

Potapot. Another native snack food made from wet sweetpotato flour that was molded and wrapped in camote leaves then steamed.

Salapusop. A native snack made from sweetpotato flour and mixed with water and sugar then steamed or cooked in a clay pot.

Gabi Butse. Another way but equally palatable for a snack or dessert, the mashed gabi is mixed with sugar, flour, baking powder, powder milk, and eggs. Knead the mixture; form into balls; flatten and put the gabi mixture and gather the edges together and deep fry.

Gabi Flour *Bitsu-Bitsu*. This deep-fried dessert or snack item is made up of gabi flour mixed with the usual pastry items (salt, egg, and milk).

Gabi Chips. Using the mashed gabi (white variety) mixed with salt, and a dash of pepper, this crunchy snack is an ever welcome treat any time of the day.

Greater Yam and Lesser Yam



The indigenous people have different experiences in the storability of yam tubers so that most prefer to harvest only as needed and thus, avoiding wastage. The *Tingguians*, *Iyattukas*, and

Bagos claimed that consumption can be prolonged up to one month from harvest while the *Ivatans* and *Ibalois* claimed that the tubers can be stored up to seven months without serious weight loss provided the tubers are unwashed and free from damages. For short storage, the tubers are placed in some corners of the house, the *Iyattukas* called *tekdol*, or in the *agamang* or *kamalig*. For longer storage, the *Ibalois* store in pit storage in dry soil preferably under the house or under trees and banana plants then covered with dry grass. For temporary storage, the *Ivatans* used to keep big *uvi* tubers called *vaaken* in earth covered pits called *valeng*. More or less one month after, these are dug up and piled/stored in a square 'nipa' structure called 'sarwap' made of reeds as walling and using cogon as roof. At present, they just leave the greater yam in the field covered with dried grass to collect a week after. These greater yams are then stored in a dry place near or within the dwelling area up to three or seven months or until needed as an alternative to rice (Gayao, Meldoz and Backian, 2014-15). In other parts of Asia and Africa, freshly harvested tubers are packed in ashes and covered with soil or simply covered with little soil and grass mulch. Yams may also be stored in silos, i.e., hollowed out pits in the ground or in barns specifically constructed for yam storage (Lancaster and Coursey, 1984).

Indigenous people consumed yam simply as boiled. Sometimes, the *Aetas* and *Mangyans* had these tubers roasted, and *Tingguians* simply eat lesser yam raw.

On occasions, however, and if time permits, certain food uses or preparation practices are done (Table 4).

Table 4. Common greater yam- and lesser yam- based menus among the indigenous people in Northern Philippines

<i>Ibaloi</i>	<i>Bago</i>	<i>Aeta</i>	<i>Ilocano/ Kapampangan</i>	<i>Ivatan</i>	<i>Isneg</i>	<i>Buhid- Mangyan</i>
Boiled	Boiled	Boiled	Halaya	Boiled	Boiled	Boiled
<i>Halaya</i>	<i>Halaya</i>	Roasted		<i>Dukay</i> salad		Pan roast or broil
Buku- tupig		Calamay				
<i>Guinata an</i>						
Wine						
<i>Biga- Kalinga</i>	<i>Bugka lot</i>	<i>Kalangu ya</i>	<i>Kankan- ey</i>	<i>Ting- guian</i>	<i>Iyattuka</i>	<i>Applai- Kankan- ey</i>
Boiled	Boiled	Boiled	Boiled	Boiled	Boiled	
		<i>Halaya</i>		<i>Guinat aan</i>	<i>Pukopuk</i>	
				Veg. dish		
				Raw (tugui)		

Halaya or Calamay. Similar to the procedure in making sweetpotato and cassava *nilubyan* for dessert or snack is using grated or mashed tubers mixed with coconut, sugar, and milk or coconut milk or butter.

Tupig. The yam *buko* or chips are pounded and mixed with water and sugar, wrapped in banana leaves then steamed. Served as dessert or snack.

Dukay as Substitute to Macaroni Noodles. The *Ivatans* cut the boiled lesser yam into cubes and used these in salad preparation.

Lokto Cake or Halaya. The boiled tubers are mashed or grated and mixed with sugar, butter, or margarine and served as dessert or snack.

Pukupok. The cooked roots called *pukupok* is a practice of *Iyattukas* where the lesser yam tubers are placed in the *alang* after boiling. They claimed that the cooked tubers will not spoil and this practice makes the *luktoh* or lesser yam sweet after two weeks of storage. Used as staple or snack.

As ingredients in snack and vegetable dishes. The *Tingguians* also use cubed yam tubers as ingredient in *guinataan* snack food and as a vegetable dish when mixed with sardines or pork.

Lesser Known Roots and Tubers



Arrowroot, canna, and wild yam known in various names among the IPs as *araro*, *sugod*, *wikan*, *kulintas galumaca*, *boga*, *lugiman*, and *karot* or *kalot* are gathered from the farm, or from the wild and cooked/processed for food.

The arrowroot is simply boiled by the *Aetas* and *Tingguians* and roasted among the *Kalingas*. The *Kalinga* and *Bago*, especially the children, sometimes eat them raw. Arrowroot and canna are sliced and sun dried as chips among the *Ibalois*. Dried chips stored in plastic sacks could last for 3 months. Depending on need, the dried chips are pounded and cooked as rice substitute or wrapped in banana leaves and boiled or steamed as snack food called *tupig*. The flour if mixed with wheat flour improves the texture and there is no need to add baking powder in making pancake.

Arrowroot and canna could also be mixed with other roots and tubers as ingredients in *guinataan*. Arrowroot can also be the main ingredient in making *bakkay* (*Applai-Kankana-ey* preserve), a substitute for oil or *bagoong* when cooking vegetables. In making *bakkay*, rhizomes of arrowroot, cassava tubers are pounded, and mixed with corn, rice, dried mushroom (*kuwat* or *kodi*), garlic, ginger, *sili*, and salt then fermented for 1 to 2 months. Indigenous people informants claimed that *bakkay* is medicinal.

The wild yam *karot* or *kalot* must be processed to become edible. The *Buhid-Mangyans'* processing technology includes the following steps: (1) peel the skin, (2) chip the tuber, (3) spread in tree barks to sun-dry for 2 to 3 days, (4) soak the dried chipped tubers for 2 days, and (4) wash three times before cooking. Broil or pan roast until done. This can be eaten alone or mixed with *kamote* tips or *gabi* leaves. From experience in childhood (Gayao), processed *karot* are stir-fried in butter and eaten as snacks.

Among the *Aetas*, the *kalot* tubers are grated then placed in *buslo* or bamboo basket then washed and soaked in flowing water (the river) for 3 days. To test if already edible, the *Aeta* squeeze a little juice to the eyes and if it stings then processed grates are still poisonous.

The *Ibalois* on the other hand, slice the *kalot* tubers, rub salt, soak for 24 hours in flowing water then wash well by stepping on it, then air dried for 3 days. The processed chips are boiled or steamed with sugar and coconut milk.

Among the *Tingguians*, the wild lesser yam '*boga*' can be a viand if mixed with sardines; or as soup thickener in boiled pork.

CONCLUSION

Traditional food preparation practices for roots and tubers among indigenous people in Northern Philippines are simple but are also unique among each tribe depending on availability of local food resources and ingredients, and to some extent the purpose for said food preparation. Since, indigenous people are no longer isolated and became part of a bigger market-oriented community, innovations were introduced and adopted. There is no shortage of dishes that could be prepared and these only show the versatility of roots and tubers as food and as a major ingredient in many recipes.

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