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Traditional Food Crops and their Role in the Nutrition Well-Being of a Semi-subsistent Community in Kibungan, Benguet, Philippines

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Abstract

Traditional food crops have helped the people of a community in Kibungan, Benguet survive since time immemorial. This study documented the existing traditional food crops, postharvest practices and cooking methods, estimated the nutrient value of these crops, and assessed the contribution of these to the nutritional well-being of the community. Participatory Rural Appraisal (PRA), key informant interviews, focus group discussion, participant observation, semi-structured interviews, anthropometric assessment, and 24-hour food recall were employed to gather data. Findings revealed 33 species of traditional food crops that are available to community members. Postharvest and cooking practices adopted were simple or traditional. Results showed that traditional food crops contribute to food security especially that they are readily available as sources of food at different times, cheaper than commercially grown food crops, and add taste and flavor or satiety to their diet. The study also showed that these crops are significant sources of micro and macronutrients, which improves the nutritional status of the people. With the introduction of commercial crops, increasing pests and diseases at present, and the continuing threat of climate change, traditional food crops needs to be propagated and its production improved. The development of postharvest technologies to sustain production and engaging in agricultural entrepreneur is also required to effectively contribute to people's resilience and nutritional well-being.

KEYWORDS

Nutrition
traditional food crops
post-harvest practices
24-hour food recall
semi-subsistent community

Introduction

The nutritional state of an individual is a result of how his/her body utilizes food. If adequate nutrition is achieved, there is an increased immunity = lesser susceptibility to diseases, better physical and mental development, and better productivity (World Health Organization [WHO], 2016). Several factors influence the state of nutrition and in most cases, accessibility and adequacy of food play a factor in preventing nutritional deficiencies among families.

Indigenous communities have proven that traditional food crops serve as an immediate source of sustenance. Knowledge on the utilization of various traditional food crops are also evident such that crops are not only used as source of nutrients but even used as alternative medicine for acute illnesses. Balangcod (2011) presented that in most Kalanguya villages, common ailments such as headache, stomachache (due to diarrhea or pinworms), toothache, urinary tract infection, sore eyes, measles or chicken pox, skin diseases

(such as scabies), common colds, cough and mouth sores are treated using medicinal plants. Crushed leaves of 'mulah' (*Ageratina adenophora)*, and 'lagpaw' (*Tithonia diversifolia*) are used for immediate treatment of cuts and wounds.

The traditional food crops are highly regarded as foods for food security at the household level. These have better adaptation and resistance to drought, pests, and diseases, and can even augment the nutritional needs of communities. For instance, a study among the Indigenous Peoples of Sebakwe, Zimbabwe found that traditional food crops and related practices are a 'source of community resilience enabling the residents to sustain their livelihood' (Shava et al., 2009).

The Philippines is a biodiverse country and several floral diversity have been used as traditional food crops (Philippine Biodiversity Conservation Priorities, 2002). Alugbati (*Basella alba*), for example, is a widely grown leafy vegetable in the lowlands. It is rich in vitamins A and C, calcium and iron. However, the 2008 National Nutrition Survey still shows that iron and vitamin A deficiency is still of public health significance in some parts of the Philippines. This condition is similar around the world. According to WHO, two billion or 30% of the global population are anemic largely due to iron deficiency and over 250 million pre-school aged children are estimated to have vitamin A deficiency (Sunderland et al., 2013).

The effects of vitamin A deficiency is greatly manifested among children which leads to growth retardation, lower resistance to infection, defective bone and teeth development. A more severe and irreversible effect of vitamin A deficiency is its consequence in the eyesight where it can lead to total blindness or a condition called xerophthalmia. On the other hand, anemia is a common effect of iron deficiency in the Philippines. Morbidity and mortality is increased among pregnant women and infants whose diet is lacking with iron. This indigenous vegetable then is a promising complement for alleviating the common nutritional deficiencies of iron among pregnant and lactating women and vitamin A for children. Other traditional food crops such as sweetpotato (*Ipomoea batatas*) and other rootcrops were long recognized as contributory to food and nutritional security of the communities producing and consuming these crops. Sweetpotato consumption, for example, could provide up to 95% of the inadequate nutrient intake of the farming and processing household members for Vitamins A and C, Iron and calcium (Gayao et al., 2003). Keatinge (2011) also underscored that low amount of vegetable intake has serious health consequences while its availability, affordability and consumption can reverse malnutrition. Besides, as quoted by Keatinge from Northstone (2011), a healthy diet to include vegetables and other food that are rich in nutrients increases IQ .

While traditional food crops are potential sources of essential nutrients and phytochemicals, certain factors are taken into consideration for the conservation and maximization of these components. These include handling, cooking methods storage, etc. The major key in understanding the utilization of these food crops is the local people's knowledge. Lirio et al. (2006) had already established the existence of traditional food crops in Benguet and the Cordillera region but there are limited data on their nutritional contribution and the traditional practices in the conservation of these food crops. The preservation of indigenous knowledge on traditional foods specifically tillage, post-harvest practices, and cooking or utilization is a promising key to nutrition security for indigenous communities.

With the globalization of agriculture markets, changing lifestyle and rural to urban migration, traditional food are gradually disappearing. It should always be recalled that traditional crops over the years are often best adapted to their local environment withstanding different stresses in their own climate and condition (Trolio et al., 2016). Thus, there is an urgent need to document traditional food crops, how they are utilized by the members of the community and their nutritional content with the hopes of enriching programs for food and nutritional security. This study aimed to investigate the utilization of traditional food crops and its nutritional contribution to the well-being of the semi-subsistent community in Benguet. Specifically it aimed to: (a) identify the traditional food crops grown in the community; (b) document the post-harvest practices and cooking methods employed by the community in order to conserve the nutrient contents of the selected traditional food crops; (c) identify the nutrient composition of selected traditional food crops; and, (d) determine the contribution of selected traditional food crops in the nutritional status of the community based on standard measurement.

Methodology

The study was conducted in one semi-subsistent community in Kibungan, Benguet. It employed some tools from the Participatory Rural Appraisal (PRA), an approach that seeks to engage participants who are economically and/or socially marginalized groups in identifying or investigating local problems and from there conduct analysis and plan of action after (Doyle & Krasny, 2010; Cavestro, 2003; Chambers, 1999; Webber & Ison, 1995). This process accounts the inputs of community members coming from the different sectors. The principle of flexibility where combination of techniques that is appropriate considering the topic and location of the area was observed. Group workshop for instance was done to identify the different available traditional crops, where they are found, if they are for home consumption or for sale, as well as the postharvest and cooking practices done for each crop. A seasonal calendar to determine the availability of each crop and the kind of work-related production (Kamble, 2014) to these was also employed while a village walk helped the researchers appreciate the ethno-landscape of the community. Participant and natural observation in some related activities like postharvest practices, preservation and cooking of selected crops provided the researchers deeper understanding to be able to identify and describe the practices.

Interviews were also conducted among three identified key informants and 13 respondents for a semi-structured questionnaire to supplement the initial information gathered during the PRA. Purposive sampling was adopted in the selection of the households surveyed in this study. The significant criterion in selecting respondents were their involvement in traditional crops production and consumption. A focus group discussion with selected women farmers who are much knowledgable and have experiences on traditional food crops and related practices was also organized (Cavestro, 2003). The scientific names of the traditional food crops were later identified.

The proximate nutrient contents of selected traditional food crops were analyzed using the 1997 Philippine Food Composition Table (FCT) developed by the Food and Nutrition Research Institute-Department of Science and Technology (FNRI-DOST). The FCT is a list of common foods in the Philippines including traditional food crops with an analysis of their nutrient contents for every 100 g edible portion. A three (3) non-consecutive 24-hour food recall was conducted to gather food intake of the 20 participants. This is to ensure non-duplication of food consumed. The 24-hour food recall is one of the methods being used in the National Nutrition Surveys for estimating an individual's food intake. In the process, the food recall involves a face-to-face interview with respondent and is conducted by a trained personnel. In the course of data gathering, the researcher guided the key informants in recalling or listing the foods consumed. Specific instructions include indicating household measures and methods of cooking or preparing the food. Foods were also listed in interval days. After all food were itemized, a validation especially measurement and specific type of food were conducted so as to ensure that researcher and informants approximation is nearly the same. The foods consumed with their quantities were then computed indicating the total energy, carbohydrates, protein, fat, total vitamin A, iron and calcium intake for the three-day 24-hour food recall.

The foods consumed were further compared with the recommended amounts for energy and other nutrients in the 2015 Philippine Dietary Recommended Intakes (PDRI). A 100% of the recommended energy amount and 80% of nutrient recommendation were used as bases for ascertaining adequacy of food intake (FNRI, 2015).

Lastly, the nutritional status or nutriture of the 20 traditional food crop farmers with an age range of 27 to 65 years old was assessed. The nutritional status is the condition of the body as a result of utilization of nutrients. This is measured in various methods. The most appropriate method is the Body Mass Index (BMI) which was also used in National Nutrition Surveys for determining nutritional status of adult males and females. The BMI specifically measures the leanness or adiposity of an individual. The World Health Organization (WHO) guidelines were used in interpreting body mass index where a BMI of <18.5 is classified as chronic energy deficient, 18.5-24.9 is normal, 25-29.9 as overweight and >30 is obese. In the process, key informants were weighed using a calibrated beam balance and height were obtained using stadiometer. Frequency and percentage were used to analyze data.

Results and Discussion

Traditional Food Crops of a Community in Kibungan

The different food crops identified by the participants in the community are presented in Table 1. These were categorized into rootcrops, vegetables, seeds, and fruits for easier identification.

Common rootcrops include 'gabi', 'galyang', camote, cassava, and peanuts. The 'gabi' or 'gamey' and galyang or 'bela' are usually found in the corners of the rice fields but are also planted in "nabasa" or water-logged areas of the frontyard or backyard of houses. 'Telay' or cassava is planted in the 'uma' (swidden farm) or at the side of the garden since it requires low maintenance and can grow on its own. Peanuts are usually intercropped with beans in the 'uma' while potato is planted in gardens.

Traditional food crops also include vegetables, which are not necessary leafy, but still supplies the food requirements of the community. These are mostly found in the gardens but some are also around the houses especially in households with home gardens, which are usually planted with various vegetables such as pechay and beans for household consumption. Wild herbs are not necessarily intentionally planted as they grow naturally in the rice fields and in the 'uma'. These are also viable for food such as the "kendey" and the "kinawwang" among others.

In the study site, gardens for vegetable production are small parcels of land and are not as extensive as those hectares found in Atok and Buguias. However, this does not limit them in producing cash crops, though, at a limited volume. Although the area is not readily accessible by regular public transport, many of the vegetables planted are sold at outlets in La Trinidad or in Beyeng. This becomes the source of cash for households who are able to produce and transport their crops amidst the rough road condition.

Seed crops such as legumes and grains are also planted both in the 'uma' and gardens. However, these are produced at a limited quantity, which is just enough for household consumption. Different kinds and varieties of legumes such as the "kedis" or pigeon pea, "batong" or "Sinai", and patani among others are still available in the community.

The fruit crops like guava, pomelo, avocado, and banana are mostly grown in the front or backyard and these are mostly consumed at the household level or shared with relatives and neighbors (Figure 1). Some extra can be bartered or sold around.

The participants during the Participatory Rural Appraisal claimed that most of their traditional food crops are produced mainly for home consumption and in cases of surplus, these are either sold or bartered with their neighbors or they bring it to Beyeng, a community near their place. Semi-temperate vegetable cash crops such as cabbage, 'wombok', sweet peas and others are also produced, though limited, and sold in Kibungan market or to contacts in La Trinidad. For crops intended for commercial market, the farmers usually send these via bus or jeeps who drop it at their target outlets where their contacts are already waiting. The payments are also sent via bus and such system makes the transaction simpler and cheaper as compared when the farmers transport their own products back and forth.

As earlier mentioned, most of the rootcrops, vegetables, legumes, and rootcrops are found in the swidden farms, front and backyard while some are in the rice fields. Few of these crops specifically 'wombok', potatoes, sweetpeas and 'amti' are grown in garden. Similar with the observation of Mayori (2011) among the people of Zimbabwe in South Africa that traditional vegetables provides food security, especially during winter, these food crops in Legleg sustain the needs of the people during different agricultural seasons of the year. Shava et al. (2009) also noted that these traditional food plants do not just contribute to food security of the community but they also make an important contribution to crop productivity. These plants are usually grown as a rotation crops between main crops and such practice minimize the build-up of pests and diseases. At the same time, when these are used as intercrops, they may act as an ecological barrier to diseases.

Table 1

Some Traditional Food Crops Available in the Community

Root Crops		**Vegetables**		**Seed Crops**		**Fruits**	
Local/Common Name	Scientific Name	Local/Common Name	Scientific Name	Local/Common Name	Scientific Name	Local/Common Name	Scientific Name
'lukto', camote	*Ipomoea batatas*	Pechay	*Brassica rapa*	'Kardis'	*Glycine max*	'Balangkas', pomelo	*Citrus maxima*
'telay', cassava	*Manihot esculenta*	Sayote tops	*Sechium edule*	'Batong'	*Vigna aconitipolia*	'Saba', banana	*Musa acuminata*
'gamey', 'buyon', gabi	*Colocasia esculenta*	Mustard	*Brassica nigra*	"Itab'	*Lablab purpureus*	'Abokado', avocado	*Persea americana*
'ubi', ube	*Dioscorea alata*	Squash	*Cucurbita maxima*	'Mani'	*Arachis hypogea*	'Manga', Mango	*Mangifera indica*
'bela', galyang	*Xanthosoma sagittifolium*	Wombok	*Brassica oleracea*	'Mais'	*Zea mays*	Orange	*Citrus japonica*
'mani', peanut	*Arachis hypogea*	Sweetpeas	*Pisum sativum*	'Lebyas'	*Phaseolus vulgaris*	'Pinya', pineapple	*Ananas comosus*
'patatas', potatoes	*Solanum tuberosum*	'Pising', laing	*Colocasia esculenta*	'Utong'	*Vigna unguiculata ssp. sesquipedalis*	Kalamansi	*Citrus x microcarpa*
		'Malunggay'	*Breynia androgyna*	'Aggey'	*Coix lacryma-jobi*	'Bayabas', guava	*Psidium guajava*
		Camote tops	*Ipomoea batatas*				
		'Tongsoy'	*Nasturtium officinale*				
		'Amti'	*Solanum americanum*				
		'Kinawwang'	Asteraceae sp.				
		'Kendey'	*Rorippa indica*				
		Kangkong	*Ipomoea aquatica*				

Figure 1. A Household in Kibungan Surrounded with Traditional Fruits and Rootcrops

With the increasing hybrid and commercial crops, though, the production of traditional food crops declined because of the need for cash to buy other food and basic needs. Besides, educational needs and health services especially outside the community is getting more expensive. While they appreciate their own food crops, the presence of pests and diseases like fusarium wilt for sweetpotato have adversely affected their production.

Post-harvest Practices and Cooking Methods Employed by Communities to Conserve the Nutrients of Food Crops

Result showed that the community has simple post-harvest practices in handling their traditional food crops since most of what they are producing are generally for home consumption. Their harvest are immediately consumed since many of their crops are located either in the frontyard, backyard or swidden farm near their households. This post-harvest practice is a sure way of getting most of the nutrients as the produce are in its freshest state. Produce that had a prolonged exposure to heat or went through excessive handling like the commercial vegetables that are transported to trading centers have higher nutrient loss including vitamin C (Ruiz & Claudio, 2010). Also, a good practice observed in the community is the barter system. Key respondents commented that surplus, particularly those that are perishable, are either exchanged for another food with their neighbors or is sold to those who are capable to buy. Semi-perishable foods such as legumes and rootcrops undergo food preservation. Though these foods undergo drying and some water-soluble vitamins may have evaporated they are still significant sources of carbohydrates, fiber, and other nutrients during the lean season. These postharvest practices ensures a stable source of nutrition for the households. The common post-harvest practices and cooking methods for semi-perishable produce are presented in Table 2.

One distinct practice in this community is 'panagkilang' or 'panagkirog' where legumes are roasted before storage. This is only applicable to legumes that are intended to be consumed or eaten and such can be stored for a year. This is not applicable to legumes that are kept as seeds for the next planting season. This is usually practiced for legumes like "kardis" and "patani" for more efficient storage. According to one of the respondents, roasted "kardis" can be stored for a year without being infected with weevil. However, it was observed that the longer the legume is stored, the longer it takes to cook. They observed that the roasted legume does not loss its "taste" aside from a minor odor, but is tolerable even for children.

Table 2

The Common Post-harvest Method Employed for Traditional Food Crops in a Community of Kibungan

Post-harvest	Description	Traditional Food Crops Applied
'Panagbilag' or Sun Drying	Involves sun-drying of food crops to remove moisture before storage	legumes and some rootcrops
'Panag-suo'	An alternative way of drying seed crops where these are placed above the "dalikan" or fireplace. This is common during rainy season when the sun seldom shines. In most cases, seed crops are dried under the sun at day time and put it on the "suolan" in the evening.	Legumes and grains
'Panagkilang' or 'panagkirog'	A distinct practice in this community. Seed crops such as legumes are roasted before storage in either a bottle, plastic or cellophane to avoid "bukbok" or molding.	Legumes
'Panag-buko'	Involves peeling of rootcrops, usually sweetpotato, then slicing it to thin layer before sun-dried until crisp. After this, sun-dried sweetpotato chips can be stored or powdered as flour.	Usually done for sweetpotato but could also be applicable to gabi and cassava

In terms of cooking practices, the participants in the PRA shared that they have simple cooking methods in the community. Most of their crops are either boiled or 'ginisa' (sauteed) or stir fried. Legumes for instance are boiled or "agasen" to soften before other vegetables and spices can be mixed. For vegetables though, these are usually sauteed (*nagigisa*) in lard and some spices whenever available. Otherwise, they can just be boiled and added with salt.

Cooking methods of the powdered 'camote' or cassava can be creative like adding some sugar and coconut, if these are available, and wrapping it with banana leaves before steaming. This will later be consumed as snacks while at work or while at home. Some households manage to sell these snacks to their neighbors or outside the community especially if there are occasions at Php5.00 per piece. On the other hand, 'aggey' can just be boiled for snacks or it can also be mixed in preparing 'kintoman' or sticky rice as rice wine to add flavor and texture.

Nutrient Composition of Selected Traditional Food Crops

The traditional food crops grown in the community provides a variety of essential nutrients. As seen in Table 3, every 100g of the edible portion of rootcrops contain energy, carbohydrates, protein, crude fiber, calcium and ascorbic acid or vitamin C. In the interviews conducted, almost all residents of the community consume sweetpotato. Sweetpotato when compared to other rootcrops such as potatoes, yam, and cassava yields the highest dietary energy at 70,000 kcal/ha/day. However, in the Philippine Food Composition Tables, sweetpotato is one of the root crops that yields lower calorie or energy content. This is because the nutrient composition will vary from place to place depending on soil, climate, crop variety and other factors. Meanwhile, when compared to cereals, root crops has lower energy yield (FNRI, 1997). Key respondents related that sometimes rice is replaced with tubers or rootcrops as energy source and a cheap snack for filling the hungry stomach. Mercado (1952) indicated that two pieces of boiled sweetpotato contain food energy almost equivalent to one cup of boiled rice.

On the other hand, majority of the leafy vegetables (Table 3) contain very high beta carotene, a common provitamin A. This becomes biologically active when converted to retinol. Beta carotene is called the safe form of vitamin A since the body converts only what is needed (Ruiz & Claudio, 2010). It is worth noting that 'sayote' tops, which are abundant in Benguet, rank first as the richest source of beta-carotene,

Table 3

Macronutrient and Micronutrient Contents of Traditional Food Crops (based on 100 g E.P)*

Traditional Food Crops	Energy (Kcal)	Carbohydrates (g)	Protein (g)	Crude Fiber (Dietary Fiber (g)	B-Carotene	Calcium (mg)	Ascorbic Acid (mg)
Rootcrops							
Camote	125	29.8	0.6	0.9	35	21	41
Cassava	145	35.3	0.6	(1.8)	10	30	50
Taro	141	32.6	2.3	(2.8)	30	39	9
Ubi	97	22.2	1.7	(2.8)	0	19	6
Peanut (with pod)	401	22.9	17.4	(5.4)	20	61	0
Patatas	78	16.8	2.4	(1.6)	0	36	31
Vegetable							
Pechay	25	3.2	2.0	(2.2)	1280	168	54
Sayote Tops	44	5.7	4.6	1.2	11765	81	20
Camote Tops	69	11.3	4.7	3.9	3890	105	36
Pising/gabi petiole	21	4.6	0.3	0.7	185	57	10
Malunggay	91	12.4	6.1	1.8	7740	346	231
Sweet Peas (Sitsaro)	67	12.8	3.0	(2.1)	315	92	67
Mustard	28	3.8	2.2	0.8	1625	174	64
Squash	44	8.6	1.4	(2.2)	880	61	20
Wombok	21	2.9	1.7	(1.7)	540	120	34
Tongsoy	26	4.8	1.0	(2.9)	129	204	30
Amti	58	7.1	5.3	2.3	Tr	363	58
Kendey**	ND***	40.89%	26.01%	8.10%	ND	1.89%	ND
Kangkong	38	4.6	3.5	1.0	2575	92	30
Seed Crops							
Kardis	149	27.4	8.2	27.4	105	77	16
Batong	374	69.1	20.2	(22.1)	Tr	230	0
Itab	126	21.7	0.7	1.2	40	27	26
Lebyas	36	6.8	2.0	1.2	360	77	17
Utong	47	8.8	2.2	8.8	295	45	18
Fruits							
Balangkas (pomelo)	51	10.6	0.7	(0.9)	0	15	4
Abokado	101	10.5	0.9	(1.7)	130	16	14
Manga	53	12.5	0.3	(0.9)	205	11	61
Orange	35	7.8	0.4	(1.8)	45	28	24
Pinya	55	13.0	0.4	(1.4)	10	19	20
Kalamansi	44	8.3	0.4	Tr	0	18	45
Bayabas	70	16.0	0.8	(5.3)	40	31	127
Saba (dippig)	110	25.5	1.1	0.6	190	23	32

**Source: 1997 Philippine Food Composition Tables*
***Source: Lirio,L. et.al*
****No data available*

even higher compared to malunggay that are abundantly grown in the lowlands. Traditional vegetables and fruits are also rich in ascorbic acid or vitamin C. This vitamin is needed in maintaining the integrity of cells. Commonly, it is also known to give the body resistance against infection. The utilization of iron in the body is also enhanced by vitamin C making it more available for hemoglobin formation and red blood cell maturation. Since vitamin C is unstable, it is important that food containing this nutrient must not be exposed to heat, oxidation, and irradiation or sunlight. Three servings of fruits and two to three kinds of vegetables is believed to provide the vitamin C supply of a person.

Legumes are dubbed as "poor man's meat". Sagum (2013) mentioned that legumes have twice the protein content of cereal grains and an economical source of good quality protein. Table 3 shows the significant nutrient contents of legumes. It is a fiber rich source of both insoluble and soluble fiber. The fiber content of legumes is also beneficial in preventing colon diseases. The traditional legumes also provide carbohydrates that supply the energy needs of the body and has a low glycemic index, helpful in controlling blood sugar. Apart from milk, traditional legumes are also rich in calcium, which is needed for bone and teeth formation as well as muscle contraction. The National Heart Foundation of Australia recommends the inclusion of legumes in at least 2 meals every week.

Lastly, fruits also provide a variety of essential nutrients. Vitamin C is highest in most fruits. Guava and kalamansi, which are grown in Sitio Legleg, serve as the cheapest sources of vitamin C. In interviews conducted, the respondents did not mention any symptom or complain about lowered resistance to infection or vitamin C deficiency such as scorbutic symptoms characterized by bleeding, swollen gums, loose teeth, swollen tender joints, internal hemorrhages underneath the skin, etc. (Ruiz & Claudio, 2010) Thus, it can be inferred that respondents have adequate intake of vitamin C from consuming traditional fruits. The traditional fruits are also sources of phytochemicals that prevents free radicals in the body from forming into carcinogenic matter (Ruiz & Claudio, 2010). The Daily Nutritional Guide Pyramid for Filipino Adults suggests 2-3 servings of fruits everyday.

Contribution of Selected Traditional Food Crops in the Recommended Nutrient Intake of Traditional Food Crop Farmers

The Food and Nutrition Research Institute of the Department of Science and Technology, Benguet State University established 100% as basis for indicating energy intake as adequate. Thus, lower than 100% indicates insufficient energy consumption while more than 100% is excessive. Energy from food is measured in terms of kilo calories and this is made up of carbohydrates, protein, and fat. Table 4 shows that more than half of the traditional food crop farmers excessively consumed energy rich-foods compared to the recommended intakes. Majority of the energy-rich food sources consumed by farmers were rice, legumes like "kardis", and potatoes. The body depends on energy-rich foods for voluntary and involuntary activities. An acute deficit of energy nutrients leads to body weakening and chronic deficiency leads to energy malnutrition characterized by underweight among adults while wasting in children (Ruiz & Claudio, 2010).

Meanwhile, the established criteria for indicating carbohydrate, protein, fat, Vitamin A, iron, and calcium intake adequacy is between 80 to 100%. The same as energy intake adequacy, the carbohydrate intake among high percentage of traditional food crop farmers is higher than the recommended intakes. Sweetpotato was mentioned by traditional farmers as the main source of carbohydrates followed by rice. It was more frequently eaten in combination with viand or singly and was perceived to adequately sustain them throughout the day's work. But at the time of data collection, there was no sweetpotato tuber consumed from their lists. Only shoots were reported to have been consumed. This is because *fusarium* virus attacked their sweetpotato making it difficult for the plant to produce storage roots. This has greatly influenced their food pattern and increased their dependence to rice. The rice, however, needed to be bought from nearby barangays who have better access to La Trinidad or Baguio.

Some of the protein sources in the diet of traditional food crop farmers include legumes, dried and frozen fish, and chicken meat. Legumes and other plant proteins are considered

Table 4

Energy and Mineral Intake Adequacy in Traditional Food Crop Farmers

% Adequacy	Percentage (%) of Traditional Food Crop Farmers						
	Energy Intake	Carbohydrate Intake	Protein Intake	Fat Intake	Vitamin A Intake	Iron Intake	Calcium Intake
Lower RI	35	5	20	85	65	70	55
Equal RI	0	10	40	0	15	5	25
Higher RI	65	85	40	15	20	25	20
Total	100	100	100	100	100	100	100

Where: RI = recommended intake (lower RI = <100% for energy intake, <80% for the rest; equal RI = 100% for energy intake, 80-100% for the rest; higher RI = >100%)

semi-essential sources of amino acids. These are protein sources that contribute one or more of the essential amino acids. Meats, on the other hand, are complete source of essential amino acids. Primarily, amino acids support growth and development. Thus, prolonged deficiency can lead to stunting in children and decreased immunity in adults. On the other hand, obesity and some kidney diseases can result from excessive protein intake (Ruiz & Claudio, 2010). Few farmer respondents consume less than the recommended rate while majority are consuming within the recommended intake and some even more than the recommended intake.

As related by farmers, protein sources in the community are restricted and largely dependent on legumes. *"It would have allowed variety of protein sources if there is a market within the community,"* suggested by one farmer. A market exists in the nearest barangay, Beyeng, but is still far from the community. Lately, businessmen from Beyeng developed a means of marketing fish and chicken in the place. A motor bike that carries frozen fish and chicken goes to different areas selling to households. However, only few can buy since the price is much higher compared when directly bought at Beyeng. There is also a limited mechanical means of preserving perishable foods. To prolong their supply of fish and chicken for a week, households cook all the fish then store it in an iron pot or plastic container. This then is added with vegetables to serve as the 'sahog'. Another informant mentioned opportunities of consuming high value proteins like carabao and goat meat when neighbors butcher these to celebrate lifetime milestones. These are distibuted to the community in the form of 'watwat'.

It is worth noting that almost all or 85% of the traditional food crop farmers consumed less than the recommended fat intake. For economic reason, vegetables are often blanched rather than sautéed with fat or oil. Leaner meats are also most preferred by households over a fatty meat. Informants revealed that larger quantities of fat is only used when frying fish or chicken, which is usually once or twice a week. In the list of food intake by traditional food crop famers, no visible fats were reported like butter, creamer, and the likes. Fat is oftentimes unwanted because of its ill effect to health. While it is true that excessive fat intake leads to hypercholesterolemia, its other function cannot be overlooked. Vitamins and minerals from vegetables become more available for the body when sautéed with a little fat or oil. The oil also improves the absorption of vitamins A, D, E, and K from vegetables (Ruiz & Claudio, 2010).

For vitamin A consumption, majority of the farmers were not able to meet the recommended dietary intake. The Philippine Dietary Recommended Intakes (PDRI) of FNRI (2015) for vitamin A intake in adult males (19-70 years old) is 700 micrograms retinol equivalent (ugRE) while 600 micrograms retinol equivalent for adult females (19-70 years old). It is observed that crops traditionally grown does not include some vitamin A-rich vegetables. Unlike other municipalities of Benguet, Kibungan does not produce vegetables like carrots, cabbages or even broccoli. In the food listed, mainly sayote tops, camote tops, "engwad" leaves, pako, and "saringit" are sources of beta carotene. The presence of these traditional leafy vegetables provide an immediate sources of vitamin A for the community. Sweetpotato leaves is one

of the highest sources of beta carotene, however, its availability in the community was affected by the virus infestation. To augment their source of vitamin A, the respondents were forced to buy instant milk.

The major food sources of iron are meats and internal organs of animals like liver and spleen. These sources are called heme iron as they are readily utilized or available in the body. Leafy vegetables can also be sources of iron but in terms of bioavailability, the iron present in these plants require conversion in the body. Iron is a micronutrient essential in producing red blood cells for the body. Deficiency of iron can be debilitating to women as this affect overall health and reproduction. Male adults require 12 mg of iron each day while adult females aged 50-70 yrs. old needs 10 mg. Female adults aged 19-49 yrs. old needs 28 mg each day but this is not met by diet alone and so intake of iron rich-foods and supplementation is required (FNRI, 2015). In the food list of the respondents, a low consumption of meats and internal organs can be inferred which contributed to the lower than recommended intake for iron. This result highlights the contribution of traditional vegetables in providing iron to the diet of the farmers, though still not within the recommended intake. Uncooked "kadis" or pigeon pea provides 1.5 mg of iron for every 100 g (FNRI, 1997) .

Major sources of calcium include milk, fish, seafoods, dairy products, and cheese. Some leafy vegetables also contain significant amounts of calcium. In the lowlands, uncooked 'malunggay', a traditional food crop serves as source of their calcium providing 346 mg for every 100 g (FNRI, 1997). Legumes are also alternative rich sources of calcium. The study conducted in Western Kenya by Orecha et al. (2009) found that almost all traditional leafy vegetables including spinach has high levels of calcium, iron and zinc. This confirms that majority of calcium sources in the diet of key informants were derived from leafy vegetables and legumes. These plant foods provided readily available calcium inspite the inaccessibility of milk, fish, seafoods, and cheeses.

Nutritional Status of Respondents Based on Body Mass Index

Table 5 shows that eight in every 10 of traditional food crop farmers have a normal nutritional status while only one-fifth are overweight. This result is opposite with the study conducted by Degay (2017) with government employee of Cordillera Administrative Region where majority are overweight. It also contradicts the result of the 8th National Nutrition Survey which indicated that at the national level, 3 in every 10 (or 31.1%) Filipino adults are overweight or obese and as to age group, 40-49 years old male and female had the highest prevalence of overweight or obesity. This survey noted that adults living in urban areas were more chronic energy deficient or overweight/obese than those in the rural areas. The Cordillera Administrative Region ranked third in the national survey for the prevalence of overweight/obesity in adults at 34.5%, slightly higher than the national prevalence at 31.1%. Compared to the national figure, the case of overnutrition specifically overweight among respondents is low. It can be inferred that the inclusion of traditional food crops such as unprocessed leafy vegetables and slightly processed root crops and legumes played a part in the low prevalence of overweight among the respondents.

Table 5

Body Mass Index of Traditional Food Crop Farmers

BMI Criteria (WHO Classification)	Frequency	Percentage
Underweight (<18.5)	0	0
Normal (18.5-24.9)	22	78.57
Overweight (25.0-29.9)	6	21.43
Obese I (30.0-34.9)	0	0
Obese II (35.0-39.9)	0	0
Obese III	0	0
N=	28	100.00

Conclusions

Traditional food crops, though diminishing, are still available and found to have numerous advantages especially in terms of household food security, as they are particularly important in the coping strategies and consumption of people from a semi-subsistent community in Kibungan. Many of these plants are drought resistant and can be grown without expensive inputs and have good storage qualities. Community members practice simple postharvest and cooking methods which conserves the nutrient of the traditional food crops. The absence of mechanized means of preserving foods, however, limits them in keeping perishable foods for a longer period of time. The community believes that their traditional food crops which are free from pesticides are also medicinal and enhances their nutritional status. Seasonal food scarcity accentuates the severity and incidence of malnutrition. As a remedy, rural people grow traditional food plants near their homes using available family labor. These traditional legumes, fruits and vegetables add taste and flavor to their diet, improve palatability and help to balance protein, vitamin, and mineral intakes. Lastly, the case of over- nutrition in the community is low, which is a good indication of lower risk to diseases brought about by excessive calorie supply in the body. This semi-subsistent community in Kibungan has rich traditional food crops specifically the traditional vegetables that supply pro-vitamin A, vitamin C, iron, calcium and many other micronutrients. These prevent acute and possible chronic diseases brought about by the deficiency of these micronutrients .

Recommendations

Valuing the nutritional contribution of traditional vegetables must be promoted to encourage all of the community members to engage in traditional food crops production and consumption. Mechanical means or technologies of post-harvest practices should also be introduced to ensure retention of nutrients in processed traditional vegetables. Education and trainings on production to processing of traditional food crops should be sustained until the community is able to regain its capacity of producing and multiplying their own crops that are already disintegrating. The continued partnership of the community with BSU can be a mechanism as the latter had developed appropriate technologies related to this. Agricultural entrepreneurship to include product development like snacks from their food crops which was earlier introduced during the trainings may also be enriched to provide them an opportunity to source out income from the added value of their products, especially the young mothers.

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