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CULTIVATION AND CONSERVATION OF TRADITIONAL FOOD CROPS AND PERCEPTIONS OF FARMERS ON BIODIVERSITY LOSS IN THE CORDILLERA ADMINISTRATIVE REGION

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ABSTRACT

Traditional food crops are being planted for decades in the Cordillera Administrative Region and have been cultivated for various purposes. Traditional crops in the six provinces of the Region were documented and the perceptions of 221 farmers on the loss, utilization and conservation of traditional food crops were determined. A structured questionnaire containing indicators for the loss, utilization and conservation of traditional food crops was used. The farmer-respondents have been introduced to these crops by their forefathers from their childhood which they are cultivating due to their aroma, delicious taste and resistance to pests. Results show that there are 22 major traditional crops being cultivated in the Cordillera Administrative Region. The most commonly planted are rice, cowpeas, sweet potato, corn, taro and winged bean. Some traditional varieties are short-lived due to the introduction of high yielding varieties. Specifically, traditional varieties of rice had the highest loss since the farmers shifted to planting high value crops. Majority of the farmer-respondents utilize traditional food crops as source of food and additional income for their families. The farmers also conserve these food crops through continuous cultivation, storage of seeds and seed exchange with other farmers. In spite of the utilization and conservation efforts, the fact remains that the cultivation of traditional food crops especially rice is decreasing. Thus, there should be continuous conservation and establishment of community gene banks for traditional food crops.

Keywords: *traditional crops, traditional knowledge, conservation, Cordillera Administrative Region*

INTRODUCTION

Traditional food crops (TFCs) such as rice, sweet potato, pigeon pea, jute and others are cultivated by farmers in the Cordillera Administrative Region (CAR) especially in the higher elevation or in far-flung areas. CECAP and PhilRice (2000) reported that 84% of the rice varieties cultivated by the Cordilleran farmers are traditional and grown in the higher elevations of the region within six to seven months. According to DA-BAR, these traditional crops are naturally occurring or have been naturally established in the region. Traditional crops are preferred by some farmers in CAR due to their aroma (rice), nutritive value, good taste, resistance to pest and adaptability to the local climate. Traditional plants can be utilized not only for their nutritive value but also for their pharmaceutical and cosmeceutical properties (Dela Cruz, 2010).

Several researches conducted in CAR revealed that there are 49 traditional vegetables cultivated by farmers in two of the provinces of CAR. These traditional vegetables such as *Sonchus arvensis*, *Bidens pilosa* and *Amaranthus gracilis* were analyzed to contain high amounts of fiber, vitamins A and C, and antioxidants (Lirio *et al.*, 2007). It was also reported that farmers cultivate about 41 glutinous and non-glutinous rice landraces in Benguet alone (Solimen *et al.*, 2010). Traditional varieties of legume crops such as lima beans, pigeon pea, peanut, rice bean and winged bean are

also being cultivated by farmers in Benguet (Tadawan *et al.*, 2006).

Due to the introduction and the farmers' adoption of high yielding varieties, some traditional crop varieties are no longer being cultivated or lost. In Benguet, traditional crop varieties such as *Sabba* (rice), *Bokot* (sweet potato), *Kupon* (taro), *Kuppiti* (legume) are no longer being cultivated. Disregarding traditional food crops may lead to genetic erosion or loss of diversity. Traditional varieties are known to have a broad genetic base due to continuous selection by farmers through the years (CECAP and PhilRice, 2000). Thus, these varieties may be employed to preserve biodiversity in the region and as a mitigation strategy for climate change.

Consequently, traditional crop varieties should be utilized and conserved in the region. However, it is impossible to sustain the conservation and utilization of traditional food crops apart from the farmers and the community (Shand, 2014). The farmers are the most knowledgeable on the features, importance, production and utilization of traditional crops. Thus, determining their perception on the nature and loss of traditional food crops may increase their awareness on the importance of conserving these crops. In addition, proper documentation of traditional food crops could help promote their importance and ensure their preservation and utilization.

Objectives

The study aimed to determine the perception of farmers on conservation, utilization and biodiversity loss of traditional food crops (TFCs) and to document the utilization and conservation practices of farmers cultivating traditional crops.

METHODOLOGY

The study followed the scheme as herein shown (Figure 1).

A structured questionnaire consisting of potential indicators for the importance, loss, utilization and conservation of TFC was used. The potential indicators for biodiversity loss include occurrence of TFCs (*e.g.* number, vernacular names, distinct morphological trait and others), reasons for biodiversity loss, brief assessment of introduced varieties and evolutionary history of the landraces. The questionnaire was pre-tested and necessary revisions were made before using in the final interviews and focus group discussions with key informants in each study site.

The farmer-respondents interviewed were selected based on the recommendation of the Office of the Municipal Agriculturist in each municipality visited.

Profile of the Respondents

A total of 221 farmer-respondents were purposively interviewed and invited for focus group discussions in selected barangays from each province. Most of the respondents were from Benguet (52) and Mountain Province (52) while 22 were from Ifugao (Table 1).

Majority of the farmer-respondents are married with family sizes of 6-10 members and residing for more than 20 years in their respective places. Only 8-21% of the farmer-respondents in the six provinces of CAR reached tertiary level while most finished either elementary or secondary level.

The farmer-respondents belong to different ethnic groups depending on the province they come from. For instance, most of the farmer-respondents from Benguet belong to the Ibaloi group while those who are in the Kankana-ey group are from Mountain Province. The vernacular names of some traditional crops planted are unique to the language and/ or culture of the ethnic groups the respondents belong to.

A few of the farms are being rented particularly by the farmer-respondents from Benguet. Most of the farmer-respondents in the six provinces of CAR fully own the lands they cultivate.

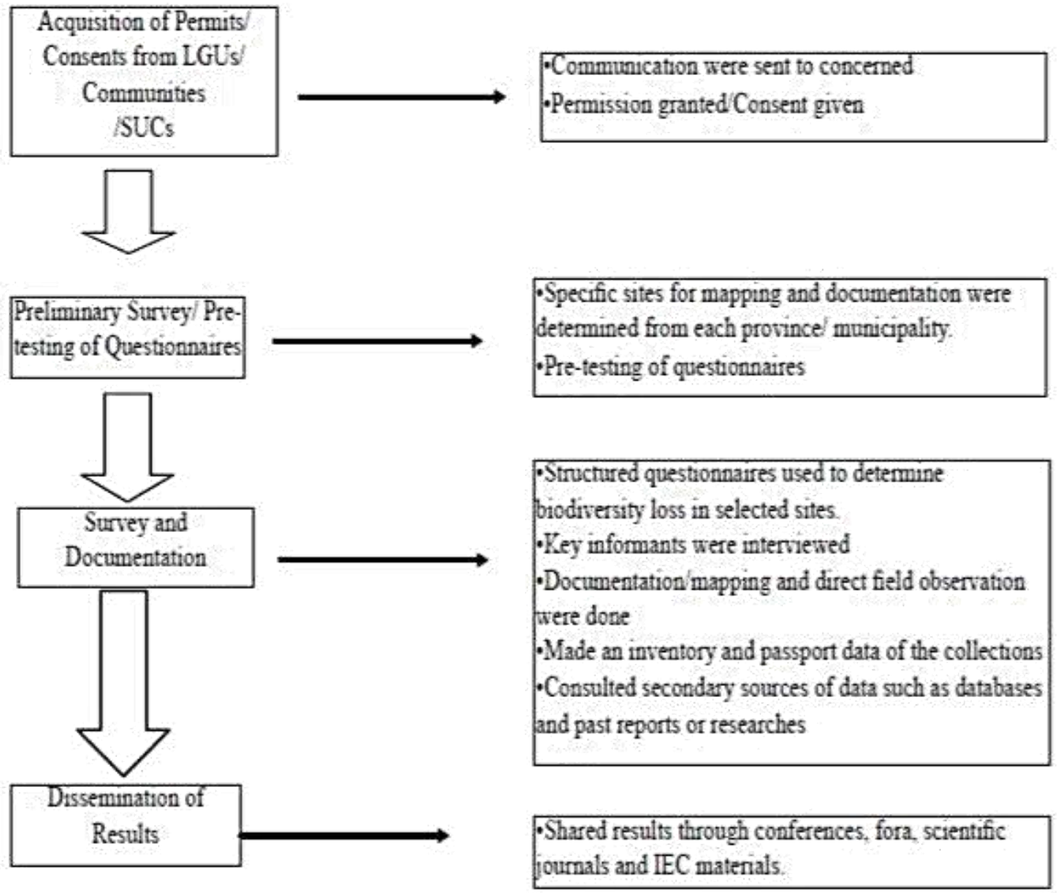

Figure 1. Process followed in the project

Table1. Profile of the farmer-respondents in the six provinces of CAR

Particular	Province											
	Benguet		Mountain Province		Kalinga		Ifugao		Apayao		Abra	
	n=52	%	n=52	%	n=39	%	n=22	%	n=25	%	n=31	%
Length of residence												
1-10	1	2	1	2	-	-	-	-	-	-	-	-
10-20	2	4	1	2	-	-	-	-	-	-	-	-
20-30	50	94	2	4	-	-	-	-	1	4	1	3
>30	-	-	48	92	39	100	22	100	24	96	30	97
Marital status												
Single	8	15	2	4	1	3	-	-	-	-	1	3
Married	45	85	43	82	34	87	21	95	21	84	29	94
Widowed	5	9	7	13	4	10	1	5	4	6	1	3
Education												
None	6	11	-	-	2	5	-	-	4	16	-	-
Primary	5	9	7	13	-	-	-	-	3	12	-	-
Elementary	23	43	15	29	18	46	10	45	7	28	9	29
Secondary	13	24	24	46	11	28	9	41	9	36	17	55
Tertiary	6	11	6	12	8	21	3	14	2	8	5	16
Ethnic background												
Kankanaey	5	28	43	83	-	-	-	-	-	-	-	-
Ibaloi	35	66	-	-	-	-	-	-	-	-	-	-
Karao	5	6	-	-	-	-	-	-	-	-	-	-
Sadanga	-	-	5	10	-	-	-	-	-	-	-	-
Barlig	-	-	4	8	-	-	-	-	-	-	-	-
Gubang	-	-	-	-	22	56	-	-	-	-	-	-
Salegseg	-	-	-	-	1	3	-	-	-	-	-	-
Lubuagan	-	-	-	-	16	41	-	-	-	-	-	-
Ayangan	-	-	-	-	-	-	4	18	-	-	-	-
Tuali	-	-	-	-	-	-	3	14	-	-	-	-
Iyatuka	-	-	-	-	-	-	15	68	-	-	-	-
Isnag	-	-	-	-	-	-	-	18	72	-	-	-
Kalinga	-	-	-	-	-	-	-	-	4	16	-	-
Ilocano	-	-	-	-	-	-	-	-	3	12	-	-
Itneg	-	-	-	-	-	-	-	-	-	-	14	45
Ilocano	-	-	-	-	-	-	-	-	-	-	17	55
Land Tenure												
Fully owned	39	74	51	98	37	95	20	91	23	92	29	94
Partly owned	9	17	1	2	2	5	2	9	2	8	2	6
Rented	5	9	-	-	-	-	-	-	-	-	-	-

There were more female than male respondents in all the six provinces of CAR (Figure 2). The female farmers usually cultivate crops (*e.g.* sweet potato and legumes) which require minimal management practices while the male farmers cultivated crops (*e.g.* rice) with more intensive practices.

Most of the farmer-respondents belonged to the 51-60 year old age bracket while very few are found in the age bracket of 20-30 years except in Kalinga (Figure 3). This result may imply that most of the younger farmers are no longer cultivating traditional crops.

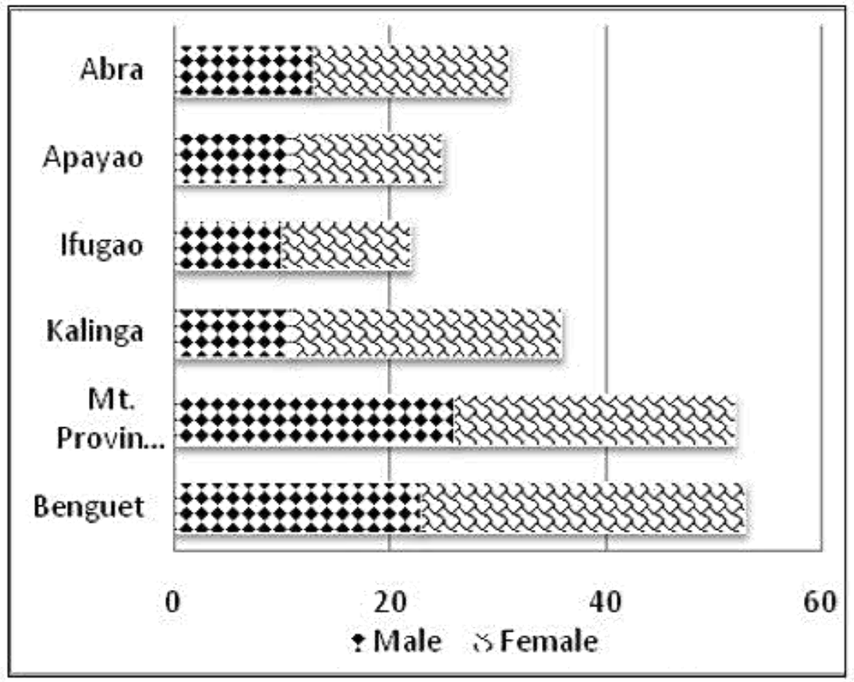

Figure 2. Number of male and female respondents in the six provinces of CAR

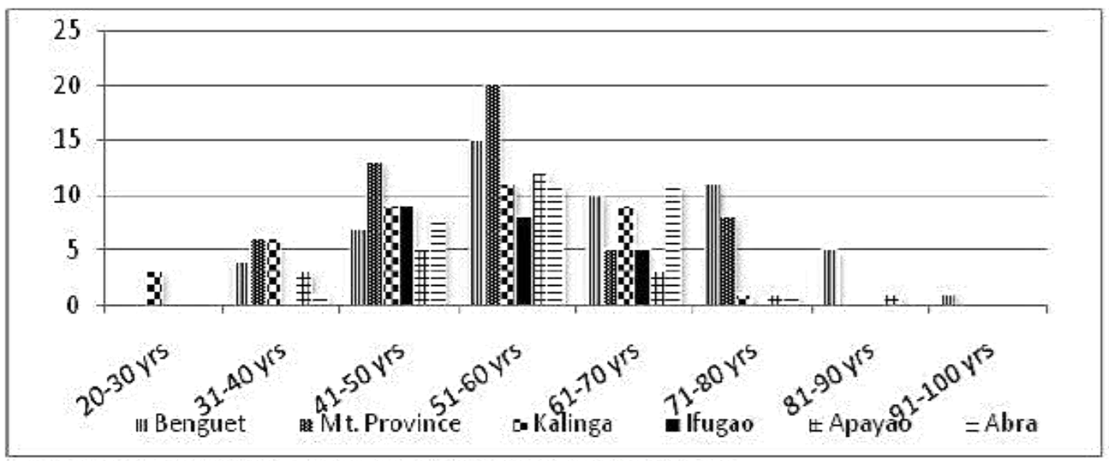

Figure 3. Number of respondents according to age bracket in the six provinces

RESULTS AND DISCUSSION

Documentation of Cultivated Traditional Food Crops in CAR

There are 22 major traditional food crops currently cultivated by farmer-respondents in CAR. The top six crops cultivated are rice, cowpea, sweet potato, corn, taro and winged bean (Table 2). These crops are grown in about 20 to 300 m^2 areas located either in the farmers' backyard or field. 148 traditional varieties of rice are mostly cultivated by the farmer-respondents due to their aroma, resistance to pest, good eating quality and glutinous grains. Some of the traditional rice varieties grown are *Kintoman, Balatinao, Bongkitan* and *Baiyen*. Some of the vernacular names of these rice varieties are based on the season of planting or a unique feature of the variety.

There are 49 traditional varieties of cowpea and 45 traditional varieties of sweet potato cultivated by farmers due to their good yield and resistance to pests (Figure 4). Some of the sweet potato varieties documented were *Kalbo-oy, Galikgikan* and *Sinapaw*. The farmers-respondents prefer these varieties due to their high yield, resistance to pests, large storage roots and good eating quality.

The 40 traditional corn varieties are preferred by farmer-respondents for their glutinous kernels and resistance to pests. These corn varieties are locally called as *diket* in Benguet, Kalinga, Apayao and Ifugao and *falliwun* in Mountain Province. The other crops cultivated are taro, winged beans, rice beans, banana, squash, hyacinth bean and others. Most of these traditional crops are propagated through seeds.

Table 2. Traditional food crops currently cultivated by farmers

Crop	Crops of Traditional Varieties Cultivated						
	B*	K*	MP*	I*	AP*	AB*	TOTAL
Rice	27	45	31	6	26	13	148
Corn	19	3	9	6	-	3	40
Pigeon pea	2	1	-	-	-	3	6
Rice beans	5	2	3	1	1	1	13
Winged beans	4	5	1	4	-	2	16
Lima beans	6	1	-	-	-	2	9
Cow pea	6	12	9	10	8	4	49
Peanut	5	1	5	2	-	1	14
Hyacinth bean	0	1	3	2	-	5	11
Mungbean	0	1	1	1	-	-	3
Squash	4	-	-	-	4	2	10
Zuchini	7	-	-	-	-	5	12
Cassava	3	-	-	-	4	-	7
Purple yam	3	-	-	-	-	-	3
Sweet potato	16	4	20	1	4	-	45
Taro	7	6	2	-	8	5	28
Pineapple	4	-	-	-	-	-	4
Banana	10	-	-	-	-	-	10
Hot pepper	5	-	-	-	-	-	5
Ginger	4	-	-	1	-	-	5
Sugar cane	6	-	-	-	-	1	7
Coffee	4	-	-	-	-	-	4

*B- Benguet; K- Kalinga; MP- Mountain Province; I- Ifugao; AP- Apayao; AB- Abra

Figure 4. Traditional varieties of taro and sweet potato in farmers' fields

Characteristics, Source and Importance of Traditional Food Crops

Characteristics of Traditional Food Crops

The top six positive traits of traditional food crops as perceived by about 50% of the farmer-respondents are aromatic grains of traditional rice, delicious taste, resistance to insect pests and diseases, minimal or no application of fertilizers and pesticides, good grain quality and high nutritive value (Table 3). The grain qualities preferred by the farmers are high volume expansion of cooked grains and big-sized grains. Moreover, the traditional crop varieties are light users of nutrients and are resistant to pests making the application of fertilizers and pesticides unnecessary.

However, negative feed backs of these traditional crop varieties are long maturity, low yield and require more labor due to a longer growing season. Because of low yield, most of these traditional crop varieties are grown as subsistence crops. Due to these reasons, some farmers shifted to planting high yielding crop varieties. However, other farmer-respondents still choose to retain their traditional food crops due to the benefits such as aroma, nutritive quality and grain quality which outweighed the identified negative characteristics.

Period and Source of Knowledge Acquisition about Traditional Food Crops

Most of the farmer-respondents revealed that they have known the importance of traditional food crops since childhood from their forefathers (Figure 5). They further reported that cultivation and utilization of traditional food crops were an integral part of their daily living and were passed on from generation to generation. Cultivation and preservation of TFCs are usually associated with traditional knowledge which is transferred from the parents to the younger generations, thereby making these knowledge contributors to biodiversity conservation (Parajuli and Das, 2013). Most of the TFCs documented were rice, legumes, sweet potato, taro and corn that have cultural significance and corresponding traditional knowledge.

Some of the farmer-respondents especially from Kalinga, Apayao and Abra learned about the importance of TFCs through their own experiences in farming while others learned from their neighbors or co-farmers.

Table 3. Perceived characteristics of traditional food crops in CAR

Characteristics	Frequency of Farmers													
	Bontoc*		Mountain Province*		Kalinga*		Apayao*		Abra*		Ifugao*		TOTAL	
	n=52	%	n=52	%	n=41	%	n=27	%	n=31	%	n=22	%	n=225	%
Positive														
Aromatic (rice)	25	60	46	88	41	100	14	52	19	61	22	100	167	74
Good/Delicious taste	28	67	1	2	31	76	6	22	10	32	15	68	91	40
Zero to minimal application of fertilizer/pesticide	13	31	-	-	6	15	20	74	12	39	7	32	58	26
Resistance to pest	-	-	37	71	32	78	6	22	9	29	-	-	84	37
Attractive	6	14	1	2	1	2	-	-	-	-	-	-	4	4
Tolerance to climate stress (e.g. drought, flood)	2	5	4	8	1	2	5	19	4	13	-	-	16	7
Good grain quality (Volume expansion, big grains)	2	5	4	8	5	12	1	4	22	71	7	32	41	18
Longer shelf life	3	7	1	2	-	-	-	-	9	29	-	-	13	6
Nutritious	11	26	5	10	-	-	-	-	4	13	-	-	20	9
Soil fertility is retained	1	2	-	-	-	-	-	-	-	-	-	-	1	-
Available in backyard gardens	1	2	-	-	-	-	-	-	-	-	-	-	1	-
Early maturing	-	-	-	-	5	12	-	-	-	-	-	-	5	2
Adapted to local conditions	-	-	-	-	-	-	2	7	-	-	-	-	2	1
Sustainable yeild	-	-	-	-	-	-	-	-	9	29	-	-	9	4
Negative														
Late maturing	29	69	45	87	36	88	14	52	31	100	22	100	177	79
Seasonal (Planted once a year)	4	10	-	-	1	2	-	-	21	68	7	32	33	15
Low yield	13	31	6	12	36	88	5	19	15	48	-	-	75	38
Laborious	3	7	5	10	-	-	12	44	21	68	7	32	48	21
Not uniform growth	2	5	-	-	-	-	-	-	-	-	-	-	2	1
Some are susceptible to pest	3	7	-	-	-	-	-	-	-	-	-	-	3	1
Bitter taste after prolonged storage (rice)	1	2	-	-	-	-	-	-	-	-	-	-	-	1

*Multiple responses

Figure 5. Period and source of knowledge acquisition of TFCs

Perception of Farmer-Respondents on the Importance of Traditional Food Crops

Most of the farmer-respondents from the six provinces strongly agreed that TFCs could be sources of income or may provide employment and more nutrition as food (Table 4). The respondents claimed that the TFCs are rich sources of vitamins and minerals. This claim is substantiated by FAO's statement that TFCs can be harnessed to improve nutrition levels and prevent malnutrition (Antonio *et al*., 2011). In addition, some TFCs with ornamental or aesthetic value as backyard crops, have cultural significance as these are used in certain rituals and others are utilized as animal feeds.

Sources of Seeds for Traditional Food Crops

The seeds of TFCs planted in each cropping season come mostly from the farmer's own stock or exchanges with other farmers (Figure 6). Some farmers lend their seeds to other farmers for planting as long as the seeds are returned back after harvest. Seeds are also purchased from neighboring farms or farmers cultivating TFCs.

Utilization of Traditional Food Crops

Majority of the farmer-respondents in the six provinces sell their TFCs in the town market or village stores to neighbors, middle men or consumers (Table 5, Figure 7). TFCs sold by the respondents are the surplus from their production, hence, source of additional income. Some farmer-respondents from Mountain Province also reported that selected varieties of heirloom rice are being exported.

In contrast, other respondents cultivate TFCs for family consumption only due to their nutritive value, delicious taste, aroma and absence of chemical spray. Root crops are also processed into flour (Figure 8), cooked during special occasions and could serve as gift or tokens to visitors.