Table 4. The perception of respondents on the importance of TFCs

Particular	Benguet	Mountain Province	Kalinga	Ifugao	Apayao	Abra
Source of additional income/Provide employment to household members	Strongly Agree	Strongly agree	Agree	Strongly Agree	Strongly Agree	Strongly agree
Provide more food	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
Provide nutrition	Provide nutrition	Provide nutrition	Provide nutrition	Provide nutrition	Provide nutrition	Provide nutrition
Has ornamental/ aesthetic values	Agree	Agree	Agree	Agree	Agree	Agree
Used as animal feedstuff	Agree	Agree	Agree	Agree	Agree	Agree
Has cultural significance or used in rituals	Agree	Agree	Agree	Agree	Agree	Agree

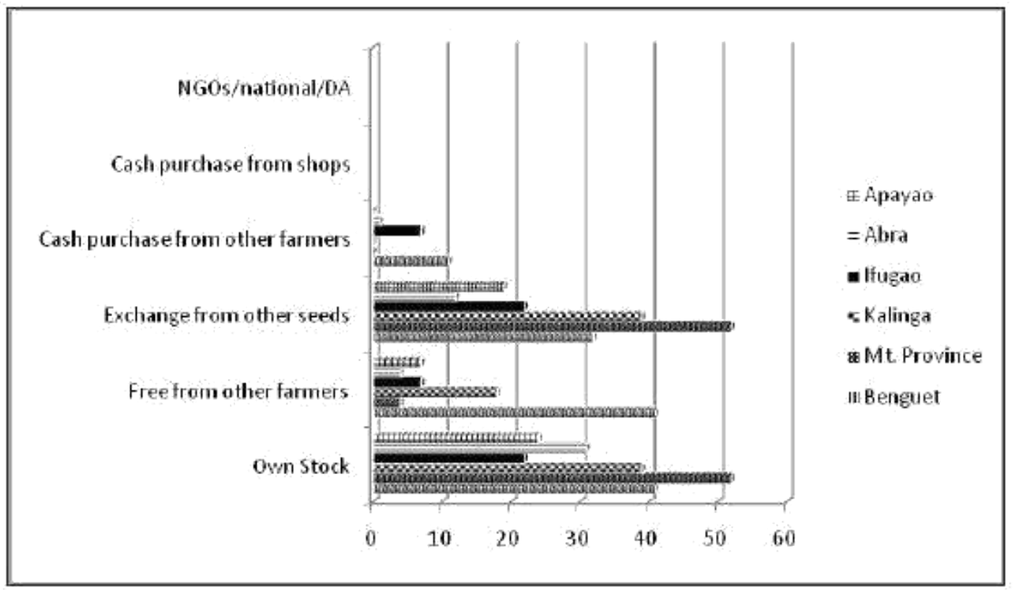

Figure 6. Sources of traditional seeds

Table 5. Utilization of Traditional Food Crops by farmers in CAR

Particulars	Benguet		Mountain Province		Kalinga		Apayao		Abra		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Selling of TFCs												
Yes	27	52	40	77	13	33	17	68	16	52	113	51
No	25	48	12	23	26	67	8	32	15	48	86	39
Selling place												
Town market	13	25	34	65	13	33	-	-	25	80	85	38
Village store	12	23	-	-	13	33	-	-	-	-	25	11
Neighbor	9	17	-	-	-	-	5	25	4	13	18	8
Buyer/middle man	1	2	-	-	-	-	17	68	2	6	20	9
City market	2	4	5	10	-	-	-	-	-	-	7	3
For export	-	-	33	63	-	-	-	-	-	-	33	15
Reason for selling												
Sources of additional income	30	58	40	77	13	33	17	68	16	52	116	52
Surplus/excess from produce	22	42	12	23	-	-	-	-	-	-	34	15
Reasons for not selling												
For consumption	25	48	12	23	26	67	8	32	15	48	86	39
Far from the market	-	-	-	-	5	13	-	-	-	-	5	2

Figure 7. Traditional Food Crops sold in the market

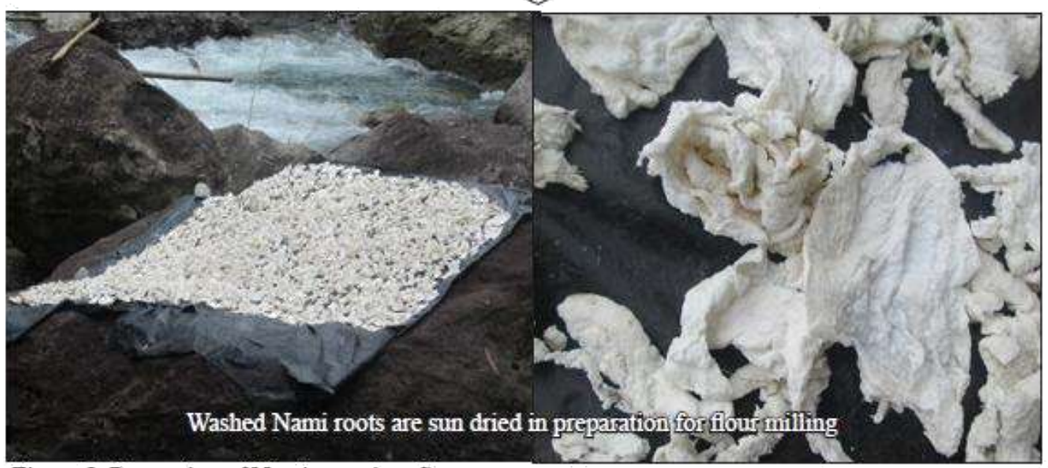

Figure 8. Processing of Nami roots into flour

Conservation of Traditional Food Crops

Method of Conserving Traditional Food Crops

The traditional conservation practice for TFCs of 76% of the farmers in CAR largely involves continuous cultivation or planting of crop landraces (Table 6). Continuous cultivation generally refers to planting of TFCs yearly during its appropriate cropping season. On the other hand, 21% (48) of farmers conserve TFCs through storage of seeds. The existing traditional storage practices are the use of *sooan*, plastic bags, small baskets, bottles and cans.

Other conservation practices for TFCs are sharing of knowledge and experience regarding heirloom or traditional rice especially by 16% (36) of the farmer-respondents in the Mountain Province. The older farmers usually pass on their knowledge of TFCs to the younger generation. Selection of the best seeds of TFCs is also done for either planting or storage for the next planting season. Seed exchange or trading of seeds with other farmers, selection and propagation of planting materials are practiced by less than 10% of farmers in CAR. In addition, about 8% (17) of the farmer-respondents in CAR lend their seeds to other farmers who will plant the TFCs and in turn, return the seeds at harvest.

Table 6. Method of conserving Traditional Food Crops by farmers in CAR

Method of Conservation	Frequency of Farmers						
	B*	MP*	K*	AP*	AB*	I*	Total
Continuous cultivation of Traditional Food Crops	38	47	23	10	31	22	171
Storage of seeds (*sooan, agamang*, bottles, *etc.*)	30	1	2	-	15	-	48
Seed exchange with other farmers	4	-	17	1	-	-	22
Seeds are lent to other farmers then returned from newly harvested plants	4	-	1	12	-	-	17
Propagation of planting materials	2	-	-	-	-	-	2
Seed selection	1	9	18	-	4	-	32
Sharing of knowledge and experience on planting heirloom/ traditional rice	-	36	-	-	-	-	36

Storage of Traditional Food Crops

More than 50% of the farmer-respondents practice traditional storage methods for grain crops such as rice, corn, common beans, rice bean, winged beans, lima bean and cowpea (Table 7). The farmer-respondents not practicing traditional storage of TFCs do not have an existing storage structure.

On the crop stored, traditional varieties of rice are the most common in all provinces. This indicates the inherent importance of rice as staple food and source of income of the Cordilleran farmers. Corn, likewise is sometimes stored together with dried rice panicles.

Furthermore, it was observed that the traditional legume crops stored by the farmer-respondents are almost similar. This may indicate that traditional varieties for pigeon pea, rice bean, winged bean are conserved and continuously planted by the farmers. This result corroborates with the results of Tadawan *et al.* (2006) that traditional varieties of lima beans, pigeon pea, rice bean and winged bean are being cultivated in 10 municipalities of Benguet.

Table 7. Frequency of farmers practicing traditional storage and type of crops and varieties stored

Province	No. of Farmers		Type of crop stored	No. of Varieties per crop
	Practicing	Not Practicing		
Benguet	30	20	Rice	17
			Corn	5
			Pigeon pea	1
			Common bean	7
			Rice bean	2
			Winged bean	2
			Lima bean	4
			Cowpea	2
Mountain Province	18	36	Rice	28
			Corn	3
			Cowpea	4
			Common bean	3
			Rice bean	2
			Pigeon pea	1
			Winged bean	1
			Lima bean	1
Kalinga	36	3	Rice	22
			Corn	1
			Cowpea	4
			Winged bean	3
			Lima bean	1
			Pigeon pea	1
Apayao	7	18	Rice	17
			Cowpea	2
			Common pea	2
			Rice bean	1
Abra	12	19	Rice	9
			Sorghum	2
			Common bean	3
			Pigeon pea	1
			Cowpea	1
			Rice bean	1
			Winged bean	1
			Zucchini	1
Ifugao	18	4	Rice	5
			Corn	2
			Lima bean	1
			Winged bean	1
			Cowpea	2
			Peanut	1
			Common bean	1
Total	121	100		

Most (114) of the farmer-respondents store their dried rice panicles in the granaries locally known as *Agamang* or *Alang* in Benguet, Mountain Province, Kalinga, and Abra or *Huguhug* in Ifugao. The *Agamang* or *Huguhug* has a roof made up of dried grass with wooden walls and floors. The granaries are also equipped with structures that prevent rodents or other pests from eating the grains. Seeds of corn or legumes are also stored in the *Agamang*.

The use of bottles or cans during storage is another traditional seed storage practice (Table 8). *Saleng* or chopped pine wood, *dap-o* or wood ash, garlic, ginger and moth balls are incorporated with the seeds inside the bottles or cans to avoid infestation of insect pests. If not treated, stored seeds were observed to be severely infested with insect pests and could no longer be used as planting materials for the next cropping season. Plastic bags are also used as storage materials by 23 farmers interviewed. Seeds of corn, legume crops and cucurbits are packed in plastic bags then stored. Another storage method identified by 20 farmer-respondents is the use of *sooan* which is a place where harvested seeds are dried beneath the traditional kitchen. *Sooan* is mostly used for harvested panicles of traditional rice varieties. This practice is being done in Bokod, Bakun and Kibungan. Straw sacks are sometimes used as storage material for seeds.

Table 8. Traditional seed storage methods of farmers

Storage Method	Frequency of Farmers						
	B*	MP*	K*	AP*	AB*	I*	Total
Sooan	20	0	0	0	0	0	20
Use of Bottle or Can	18	12	20	14	25	22	111
Agamang/Alang/ Huguhug	2	42	38	0	10	22	114
Use of Sack	1	0	0	0	4	0	5
Plastic Bag	0	0	1	12	10	0	23

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

Seed and Plant Material Exchange of Traditional Food Crops

Seed exchange is one of the strategies of assuring the continuous cultivation of traditional food crops while at the same time conserving these traditional crops.

Majority of the farmer-respondents are involved in seed exchange. When farmers were asked the question, "how many farmers did you give seeds to and received seeds from during the past years?", about 70-100% of the farmers in Mountain Province, Kalinga, Apayao and Ifugao answered that they gave seeds to more than four farmers during the past years (Figure 9). Only 37% of farmers in Benguet gave seeds to more than four farmers while 40% of the farmer-respondents chose not to share their seeds but stored them instead. Similarly, 55% of the farmer-respondents in Abra were not involved in seed exchange while 45% of the farmers shared their seeds to about one to four farmer-respondents during the past years.

On the other hand, majority of the farmer-respondents in Mountain Province and Apayao received seeds of traditional food crops from at least one farmer in the past years. At present, more or less than 50% of the farmer-respondents in Kalinga, Benguet, Abra and Ifugao received seeds of TFCs from more than four farmer-respondents. About 30% to 50% farmers in Benguet and Abra have not received any seeds from other farmers.

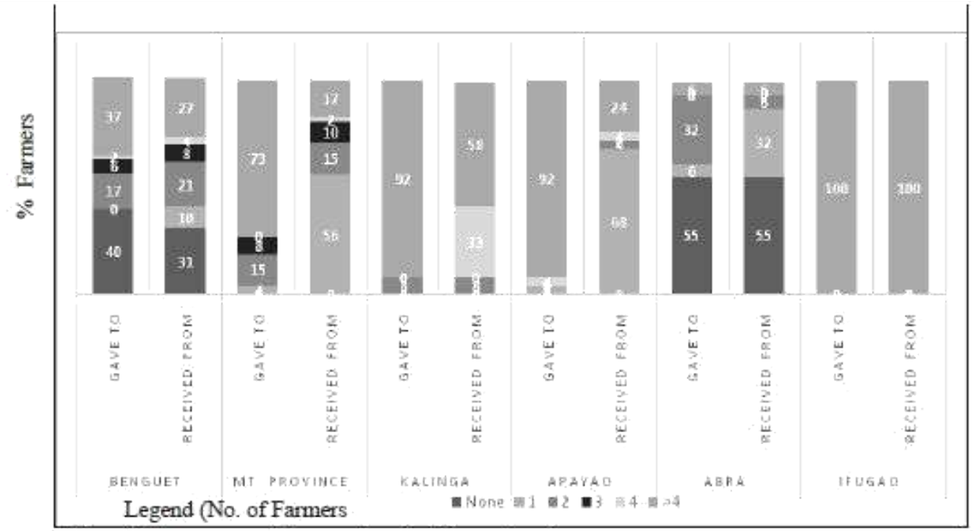

Figure 9. Percentage of farmers involved in seed exchange

Loss of Traditional Food Crops

Observed Level of Existence of Traditional Food Crops

Most of the farmer-respondents from the different provinces observed that the cultivation of TFC varieties in their respective farms and municipalities had decreased in the past 10 to 20 years (Figure 10).

A small percentage of the farmer-respondents in Mountain Province, Benguet and Abra claimed however, that the number of TFC varieties being cultivated in their respective farms or towns is the same. None claimed that the number of TFC varieties being cultivated in their area had increased.

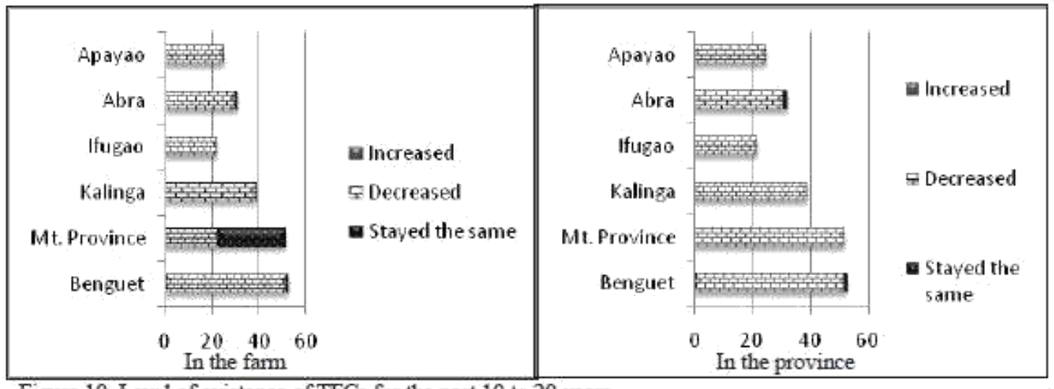

Figure 10. Level of existence of TFCs for the past 10 to 20 years

Number of Traditional Food Crops Lost

The farmers identified traditional varieties of rice, corn, sweet potato, taro, legumes and banana that they are no longer cultivating. Rice had the most number (138) of traditional varieties lost especially between 1990 and 2000 (Figure 11). The reasons for not cultivating these rice varieties were the introduction of new varieties or high yielding varieties especially during the start of the 21st century and a shift to planting of other crops due to high grain shattering and milling problems in rice.

There are about 35 traditional varieties of sweetpotato that farmers are no longer planting since 2005. The reason for this is that farmers

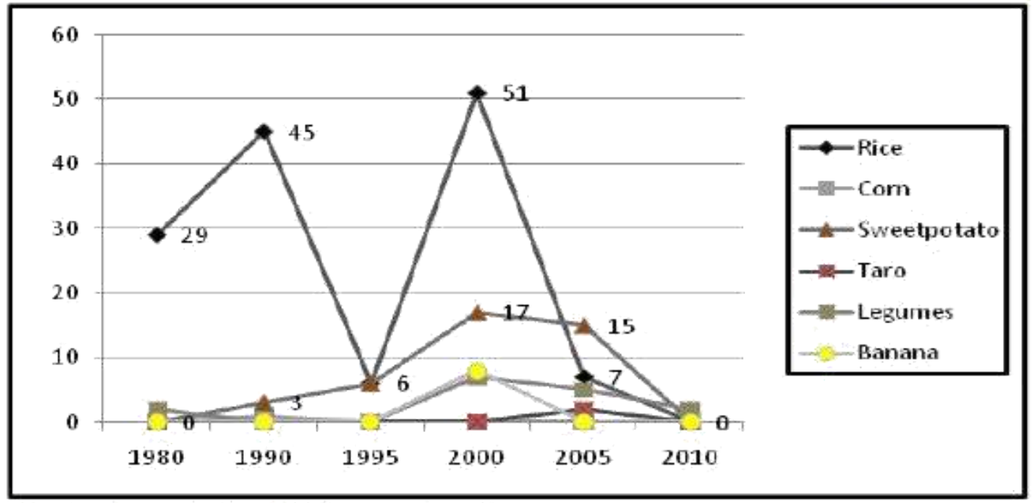

Figure 11. Number of lost TFCs from 1980-2010

shifted to planting high value crops which resulted in loss of planting materials of the traditional sweet potato varieties.

Some (16) traditional varieties of legume crops such as pigeon pea, winged bean, rice bean and others were no longer planted by farmers especially from 2000 to 2010 due to a shift in crop preference and lack of planting materials. A total of eight traditional varieties of banana are no longer planted since 2000 due to disease infections claimed by the farmer-respondents in Apayao.

Reasons for Loss of Traditional Food Crops

Most of the farmer-respondents perceived that the primary cause of the loss of TFCs is the introduction of high yielding varieties (Figure 12). In fact, the two main reasons for the farmers' preference of new varieties are high yielding ability and early maturity.

The second reason for loss of TFCs is the occurrence of insect pests and diseases. Some of the farmer-respondents who are currently cultivating rice mentioned the problem of earthworms in their rice fields. Rodents were also mentioned as pests

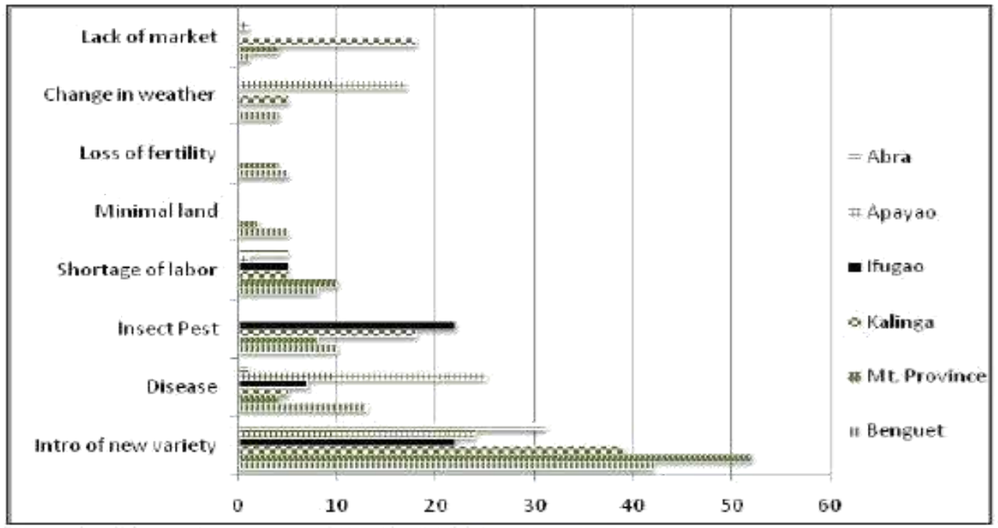

Figure 12. Farmers' perception on reasons for biodiversity loss

in rice and some root crops. Diseases, on the other hand, became major problems in the cultivation of banana and some rice varieties. The farmers also reported that some TFC varieties are resistant to pest and diseases.

The third reason for loss of TFCs is the shortage of farm labor. It was a common observation that the number of farmers planting TFCs is declining due to migration to seek for "better" job opportunities. Only the older farmers maintain TFCs in their farms.

Another reason for the loss of TFCs is change in weather patterns. Increasing temperatures and unpredictable variable rainfall patterns brought about by climate change has resulted in decreased crop productivity and increased or altered patterns of pest activity (PAR Agro biodiversity, 2014).

The other reasons for the loss of TFCs are limited land for cultivation and lack of market for TFCs. It was reported that when farms are far from the market, TFCs are no longer considered as a source of income. In addition, the lack of information on the value of TFCs may have led to its neglect.

Impact of HYVs on TFCs

The introduction of high yielding varieties resulted in the loss or neglect of traditional crop varieties according to 82% of the farmer-respondents (Table 9). The loss of traditional varieties also resulted in farmers not remembering the vernacular names and unique traits of some traditional crop varieties. On the other hand, 39% of the farmer-respondents shifted to planting high value crops and allot smaller plots or areas for traditional crops for family consumption only. Less than 1% of the farmers retain their traditional crop varieties and rotate these with high yielding varieties.

The gradual loss of traditional crop varieties necessitates the continuous utilization and sustainable conservation to avoid genetic erosion or extinction of these crops.

Table 9. Farmers' perception on the impact of high yielding varieties on the cultivation of traditional varieties

Impact of HYVs	Frequency of Farmers	
	n=221	%
Traditional crop varieties are lost or neglected	186	82
Farmers shift to planting high value crops	39	17
Smaller area allotted for cultivating traditional crops	3	1
High yielding crops rotated with traditional crops	1	0.4
Farmers forget the features and vernacular names of traditional crop varieties	18	8

Possibility of Tracing the Lost Traditional Food Crops

More than 75% of the farmer-respondents in all the provinces positively responded to the possibility of tracing the lost TFCs (Figure 13). Most of the farmers claimed that the TFCs that are no longer present in their farms may be found in far-flung barangays. Other farmer-respondents claimed that the TFCs may be present in neighboring areas but may be called by a different vernacular name.

Majority of the farmer-respondents are also concerned with the neglect and decreasing cultivation of TFCs. These farmers recognize the important traits of traditional varieties such as aroma, delicious taste, nutritive value, resistance to pest and tolerance to climatic stresses. In addition, farm inputs for newly introduced crops such as hybrid rice are expensive, encouraging farmers to cultivate traditional crop varieties again.

In contrast, there are less than 20% of farmers who are no longer interested in tracing the lost varieties. These farmers prefer the new high yielding varieties due to convenience in managing and marketing.

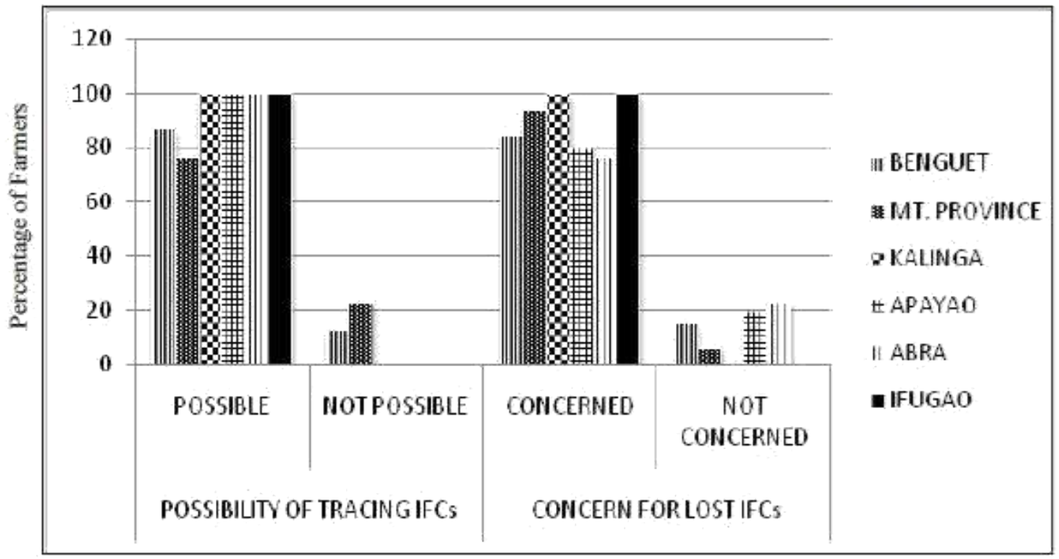

Figure 13. Perception of farmers on the possibility of tracing and concern for the lost TFCs

CONCLUSIONS AND RECOMMENDATIONS

Most of the farmers interviewed are from the six provinces of CAR know about TFCs since childhood from their forefathers. The farmers also prefer traditional rice due to their aroma, good taste, resistance to pests and minimal application of cultural management practices.

Most of the farmers observe a decrease in the existence of TFCs in their farms and localities in general in spite of their strong agreement that TFCs are sources of income, food and nutrition. Specifically, a total of 138 traditional varieties of rice in the six provinces are no longer cultivated by the farmers since 1990s and 2000. There are also 35 traditional varieties of sweet potato which are no longer being cultivated by the farmers in the provinces of Benguet, Mountain Province and Abra. The main reason for the loss of traditional rice varieties is the introduction of high yielding varieties by local government units and other research institutions. In terms of utilization, most of the farmers grow TFCs for family consumption or sell their surplus in the town market.

The main conservation practice identified by the farmers is continuous planting of traditional rice, cowpea, sweet potato and others. Storage of seeds in a rice granary (*Agamang* or *Huguhug*) or in bottles and cans are the most common methods used by farmers. More than 50% of the farmer-respondents who are practicing traditional storage methods store traditional varieties of rice, lima bean, pigeon pea, winged bean and other legume crops. Seed exchange is another conservation practice identified by the farmers. In fact, 70% to 100% of the farmer-respondents give seeds to more than four farmers at a time.

In spite of the existing utilization and conservation practices of farmers, the observed loss of traditional food crops demand the continuous and more serious conservation and propagation of existing TFCs. Establishment and maintenance of gene banks *in situ* or *ex situ* is recommended as a conservation strategy.

Most of the farmers in the six provinces in CAR know about traditional food crops (TFCs).

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