Diversity in Food Ways of Bhutanese Communities Brought About by Ethnicity and Environment

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Introduction

In mountainous Bhutan, geographical isolation has helped in conserving local cultures and traditions in isolated pockets. The small population of about 700,000 is said to speak 19 living languages (Van Driem, 2004). Many of these communities are small in numbers, economically and socially marginalized, and live in remote regions. With road access and penetration of global forces like the media and international markets, many of these communities are in transition and their distinctive cultural practices are in serious danger of being lost without having been documented. While substantial information has been generated by scholars, promoters for culture, the tourist industry and the international media on the culture, language and religious practices typical of western Bhutan, information available for most of the minority communities is limited. Recent research documenting the traditional knowledge and practices of particular ethnic groups vulnerable to assimilation were published by Giri (2003) for the Monpa communities in Trongsa and by Sharma (2005) for the *Lhops* in Samtse district.

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The Bhutanese culture, food habits and the agriculture practices were no doubt influenced by those prevailing in the neighboring regions, especially Tibet, Arunachal Pradesh, Assam and West Bengal. Yet, most of the Bhutanese communities evolved with some degree of isolation resulting in specific food habits. With few exceptions, chili *(Capsicum annum)* is a very important ingredient for all Bhutanese, and no dishes, except perhaps medicinal food and baby food, are cooked without chili (Roder et al, 2008; Choden, 2007). Food culture of Bhutan has been discussed by Choden (Choden, 2007) who besides describing the food habits of mainstream Bhutanese society also provide information on food habits of shifting cultivators in Zhemgang and some groups of Nepalese origin.

Investigations were carried out with the objectives to document traditional food systems in five ethnically distinct communities in Bhutan, especially focusing on: 1) Ethnobotanic information, 2) Crop diversity, 3) Cultivation practices, and use of crops. All five communities are located in the lower mid hills of the country having subtropical climate (Table 1).

Table 1. General information of selected communities

Commun-ity	District	Respo-ndents (nos)[1]	Altitude range	Language	Distance to road in 2010[2] (hrs)	Main staple
Lotokuc-hu	Samtse	16	800-1800	Lhopu	2	Maize, millet
Lumbay	Samtse	15	600-1200	Rai	4	Maize, rice, cassava
Ngangla	Zhemgang	21	1225	Khengk-ha	12	Maize, rice
Kengkhar	Mongar	22		Tshangla kha	14	Maize, rice
Gongdu	Mongar	22		Gondupi kha	16	Maize, rice

[1]Respondents for household survey
[2]Distance in walking hours

Materials and methods

Selection of communities

The communities were selected for a larger project focusing on culture diversity, based on: 1) representing a distinct cultural identity, 2) danger of cultural erosion (plans of road access, modern education, impact of dominant culture), 3) potential for tourist activities, and 4) sufficient size of population (at least 100 households).

House hold survey

During 2010/11, surveys were carried out in all five communities visiting 14-26 households per community (Table 1). Information collected from each respondent included: crops cultivated, used or sold, number of varieties of individual crops, food eaten, food preferences.

Group discussions

Group discussion were conducted in all communities to get additional information on cultivation practices, food practices, production methods, and changes in food production and consumption practices.

Results

Cultivation practices

Traditionally three main land types of agriculture land are recognized in Bhutan: "wetland," mostly used for rice cultivation, "dry land" used for all kind of rainfed agriculture and "*tseri,*" a fallow rotation system similar to those used in other parts of asia (Roder et al. 1992). Rice fields are terraced but the area for this land type is limited due to lack of irrigation sources and extreme slope gradients. Only the Nalatong and Lumbay communities have appreciable rice cultivation. Dry land is the main category of agricultural land

in all four communities. Most of the dry land fields are not terraced but many fields would have bunds built up over years by the effect of ploughing and by collecting of stones by the cultivators.

Over the last decade, the Government of Bhutan has strongly disgouraged the use of the *tseri* system in the interest of safeguarding forest, forest products and wildlife, and to prevent environmental degradation. A reduction in *tseri* cultivation, resulting in an increase in dry land agriculture is thus the main change observed, especially for the Lotokutchu and Nganla communities were *tseri* was comparatively more important. Another important change observed is a decrease in the size of land holding per household as result from land fragmentations when families expand and establish new households.

Darft bullocks are used in all communities for land preparation while all the other cultivation work is done manually, following traditional methods. Hand tools used are similar across communities, with the most important being the hoe and the sickle. The most common method of planting maize in dry land, by dibbling maize seeds after the plough, is commonly used in all five locations. Similarly, the main constraints to crop production are the same across communities: wild life damage, guarding fields against wildlife, weeds and storage problems. The crops that are stored for long time include foxtail millet, common millet and finger millet.

Soil fertility for dry and wet lands is largely maintained through inputs of nutrients and organic matter produced through livestock production systems. Much of these nutrients originate from the forest (Roder et al 2003). While farmers in Kengkhar and Gongdu are largely using stall feeding, and apply bedding materials to produce manure carried to the field before cultivation, no such tradition exists in Ngangla, Lotokuchu and Lumbay. In these communities,

cattle are kept overnight in the crop fields to retain the dung and graze freely during the fallow periods.

Crops and vegetables

Maize is by far the most important crop across all communities (Table 2, Figure 1). Other important crops cultivated by a large proportion of the households were banana, mandarin, ginger, taro and the different millet species. Cassava was important for Lotokuchu, Lumbay and Ngangla, while potato was important for Kengkhar and Ngangla only. Some of the crops would be planted on small areas only, and therefore the frequency of cultivation is not giving an indication of the area cultivated. However, it does provide a reasonably good indication of the importance of the particular crop. Often a mixture of crops is cultivated together. For example, in Kengkhar, one can find examples where five different tuber species are grown together, namely: potato, cassava, sweet potato, taro and *Canna edulis*.

Cash crops, especially mandarin are important sources of cash income in all communities. Cardamom is cultivated in Lumbay and Gongdu. Traditionally cardamom used to be planted under the canopy of natural forests, often encroaching upon government forest lands. Today there is an increasing trend to plant the cash crop in dry land, which is affecting cultivation areas for other traditional crops and cropping patterns.

Table 2. Frequency of crops cultivated

	Households cultivating species (%)				
Species	Lotokuchu	Lumbay	Ngangla	Kengkhar	Gongdu
Maize	100	100	100	100	100
Banana	94	47	76	91	32
Mandarin	38	47	91	77	86
Ginger	44	73	67	73	77
Taro	63	80	100	36	41

Species	Households cultivating species (%)				
	Lotokuchu	Lumbay	Ngangla	Kengkhar	Gongdu
Foxtail millet[1]	75	80	81	32	18
Cassava	63	73	57	36	32
Finger millet[2]	94	80	57	5	18
Sweet potato	38	53	71	59	14
Potato	6	7	43	91	27
Common millet[3]	81	20	19	23	27
S. buckwheat[4]	31	47	10	27	18
Mustard	75	33		5	14
B. buckwheat[5]	38	13	38		
Sorghum	19			9	32
Rice	6	20	24	9	
Barley	6		5	5	23
Cardamom[6]		27			5
Wheat				5	

[1]Setaria italica; [2]Eleusine coracana; [3]Panicum miliaceum; [4]Fagopyrum esculentum; [5]Fagopyrum tataricum; [6]Amomum Subulatum.

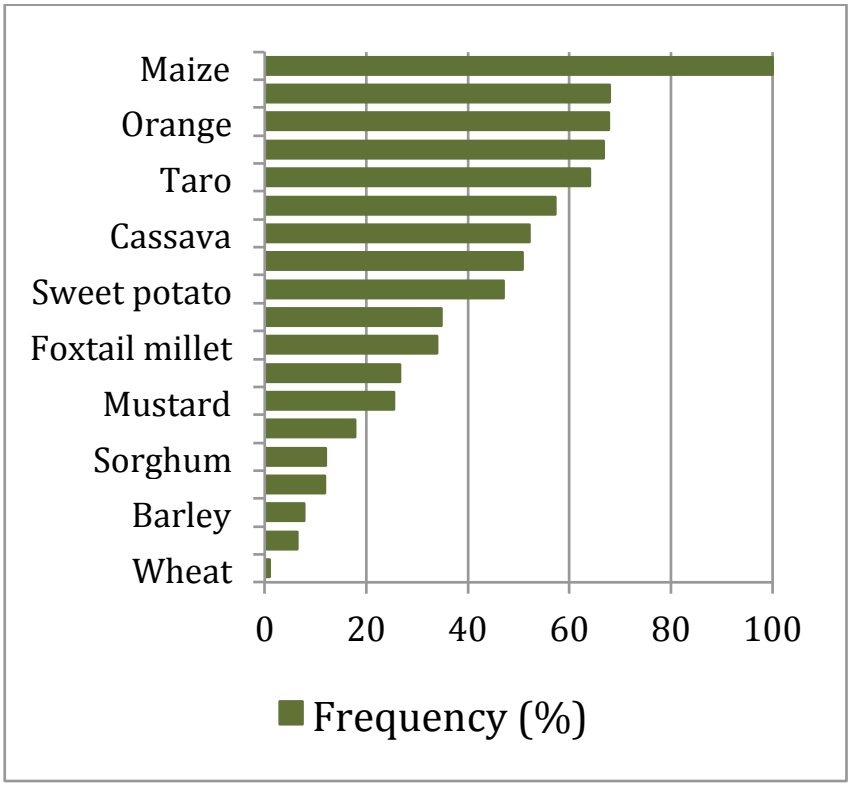

Figure 1. Average frequency of crops

Although the landholding with individual households are small, the variety of vegetables cultivated is high. Based on the house hold survey, mustard green, pumpkin, chilli and bean were the most important vegetables across all locations (Table 3, Figure 2). Radish was important for Ngangla, Gongdu and Kengkhar, while squash was important for Lotokuchu, Lumbay and Ngangla. Both, probably more a reflection of the climate rather than cultural preferences. These vegetables are generally grown on small pages near the individual houses.

Table 3. Frequency of vegetables cultivated

Species	Households cultivating species (%)				
	Lotokuchu	Lumbay	Ngangla	Kengkhar	Gongdu
Mustard green[1]	100	93	100	100	100
Pumpkin	94	80	100	100	86

Chilli	100	100	71	100	82
Dolichos bean[2]	94	47	95	86	91
Bean	38	80	100	100	64
Radish	31	60	91	77	91
Eggplant	63	73	81	36	55
Squash	94	87	81	32	5
Tomato	38	20	86	64	73
Cabbage	19	53	81	50	64
Olachoto[3]	69	47	38	64	41
Lufa		7	62	32	36
Turnip	19	20	24	9	59
Carrot			24	9	18
Gourds	13	20			

[1]*Brassica campestris* ssp. *pekinenesis;* [2]*Dolichos lablab;* [3]*Cyclanthera pedata*

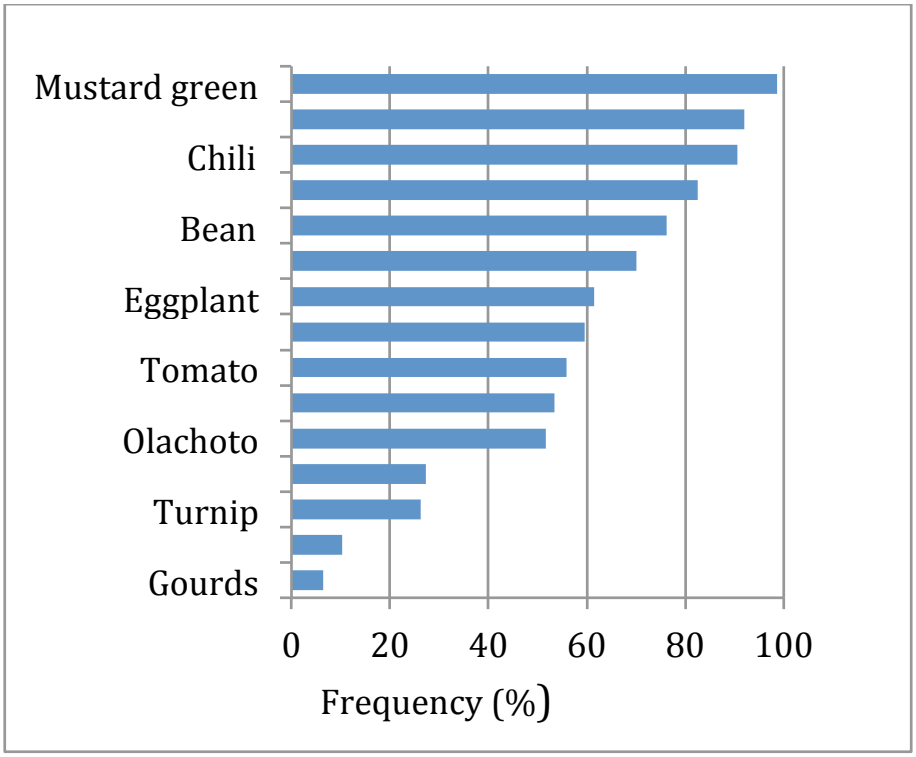

Figure 2. Frequency of vegetables cultivated

Diversity of crops and varieties

There is no clear difference in crop diversity, as all five communities cultivate a large number of different crops and vegetables. The communities in Lotokuchu and Ngangla have, however a comparatively higher number of varieties for individual species. The highest diversity within the same species was reported in Lotokuchu for foxtail millet, cassava, sweet potato, banana, chilli, tomato, lablab bean, squash, eggplant and ginger, while Ngangla had the highest number of varieties for maize, finger millet and pumpkin (Tables 4 and 5). Species were all communities mentioned an average of one variety only were common millet, radish, *olachoto* and mustard (not shown in tables 4 and 5).

Table 4. Varieties of crops

Community	Average number of varieties (nos)						
	Maize	Rice	Finger millet	Foxtail millet	Cassa-va	Sweet potato	Ban-ana
Lotokuchu	1.4	2.0	1.4	1.4	1.4	1.5	1.2
Lumbay	1.7	1.0	1.1	1.0	1.0	1.0	1.1
Ngangla	1.9	1.6	1.7	1.0	1.0	1.0	1.0
Kengkhar	1.7	2.0	1.4	1.0	1.0	1.0	1.0
Gongdu	1.6		1.0	1.0	1.0	1.0	1.0

In Kengkhar, three local varieties of maize i.e *Beipu long, Betpa, Ashom, Teksumpa* and *Barkong tsanma* used to be cultivated in the past. *Teksumpa* and *Barpong* varieties are now replaced by dominant maize species introduced by the agriculture ministry. *Teksumpa* is a maize variety which can be harvested in three months after its cultivation. In Lotokuchu, two local varieties of maize, *Lhongrahm* and *Serahm* are still grown. *Serahm* is cultivated in the lower altitude along the banks of the Moti river (Toorsa) towards the end of January through the first half of February. *Lhongrahm* is cultivated a month later in the higher regions of Lotokuchu.

Teksumpa is also a dominant local variety of maize grown in Kaktong.

In Gongdu, a species of bean named *gamgali* (Dolichos bean) and four varieties of chili are grown. In Lotokuchu, a local variety of beans called *dukseiiy* and a bitter brinjal called *Beang* is still grown.

Table 5. Varieties of vegetables

Community	Average number of varieties (nos)							
	Chilli	Tomato	Dolichos bean	Mustard green	Pumpkin	Squash	Egg plant	Ginger
Lotokuchu	2.4	1.6	2.2	1.1	1.7	1.2	1.4	1.3
Lumbay	1.3	1.0	2.0	1.1	1.2	1.1	1.3	1.0
Ngangla	1.8	1.1	1.7	1.5	2.2	1.0	1.0	1.0
Kengkhar	1.6	1.1	1.3	1.6	2.2	1.0	1.0	1.0
Gongdu	1.5	1.1	1.2	1.0	1.4	-	1.0	1.0

Crops used for feed, alcohol and trade

Maize is the most important species used for animal feed (Table 6) and alcohol (Table 7). Other important species for animal feed were millets, cassava and mustard (Table 6). For alcohol production, millets and cassava are important in all communities.

The most important species traded were mandarin, ginger and cardamom. Ngangla and Lotokuchu reported a wide range of different species traded. In addition to the species listed in table 8, households from Ngangla also recorded sales of sweet buckwheat, bitter buckwheat, finger millet, common millet, foxtail millet, barley and lufa by 4.8, 9.5, 4.8, 14.3, 4.8, 4.8 and 19%, respectively. Kengkhar and Gongdu reported low frequency of trade beside mandarin with a small number of households in Kengkhar trading of banana (9%) and maize (14%), and a small number of households in Gongdu reported trading ginger (5%) and chilli (9%).

No barter or sale was reported for rice, wheat, sorghum, cassava, potato, tomato, radish, gourd, eggplant and carrot. From Ngangla, bartering was reported only for maize, buckwheat, millets and barley.

Table 6. Crops and vegetables used for animal feed

	Households reporting the use of species for animal feed (% house holds)														
	Lotokuchu			Lumbay			Ngangla			Kengkhar			Gongdu		
Species	cow	Pig	hen	cow	pig	hen	cow	Pig	hen	cow	pig	hen	cow	Pig	hen
Maize	69	50	56	73	67	47	76	86	90	100	18	68	32	36	55
Buck-wheat sweet	6		6			7	5	5	5	27		14	14	14	14
Buck-wheat bitter	13	6	13			7	10	19	14						
Finger millet		6	13			7	10	14	5	32			14	14	9
Commo n millet	6	6	6			7	14	14		27			5	9	9
Foxtail millet		6	13							18			9	14	5
Cassava	19	31	6	13	53			14							
Taro	13	31		20	53			14		14	9			14	
Radish	6						5	5		9			9	14	
Pumpki n	31	31		7			14	5		14			5	9	
Squash	13	25		7	7		5	5		9			5	5	5
Mustard	44	44	19	20	13					5			5		
Others <10%[1]	T, MG, BN	B, MG, BN	B		T, MG		MG	B	B	B, T			T, MG, S	T, MG, S	

[1]B = barley, T = Turnip, MG = Mustard green, S = Sorghum, BN = Banana

Table 7. Crops used for alcohol

Species[1]	Households using species for alcohol (%)				
	Lotokuchu	Lumbay	Ngangla	Kengkhar	Gongdu
Maize	81	67	100	100	100
Finger millet	44	53	62	32	18
Common millet	6	53	62	27	14
Foxtail millet	13		10	18	18
Cassava	56	33	10	18	9

[1]Others reported were: buckwheat in Ngangla (24%), taro in Khengkhar (36%), wheat in Ngangla (5%), and barley in Ngangla (5%) and Gondu (5%).

Table 8. Crops traded (barter or sale)

Species[1]	Households selling species (%)				
	Lotokuchu	Lumbay	Ngangla	Kengkhar	Gongdu
Orange	38	40	86	36	86
Ginger	31	40	10		5
Banana	6		14	9	
Cardamom		20	19		
Maize			33	14	
Sweet potato	13		71		
Chilli			14		9
Dolichos bean	6		14		
Mustard green	13		24		
Cabbage		7	19		
Mustard	19	7			

[1]Others reported were: Bean in Ngangla (48%), squash in Lotokuchu (38%), turnip in Ngangla (19%), pumpkin in Lotokuchu (6%) and *olachoto* in Lotokuchu (6%).

Crops eaten, prefered crops and changes in preferences

Maize and rice are the most important staple foods for all communities (Table 9). A high frequencey of millet is reported from Lotokuchu, where during the summer, millet is more frequently eaten than rice. Cassava is an important food for Lumbay and Lotokutchu only.

With some exceptions, the most widely cultivated crops and vegetables are also the most frequently eaten species. Preference for maize crop, due to its high adaptability even in dry soil conditions, rocky slopes and swallow soils, is widespread across the five communities. Crops like maize need less labour and tending. It can be grown and harvested two times a year in low warmer altitudes like Lumbay, Kengkhar, Gongdu and Kaktong. In Lotokuchu, the fertile alluvial soils along the banks of the river Amochu provide perfect land for maize growth. Among the crops grown in these communities, the yield for maize is considered much better than the yield of other local crops. As a result, maize has eased their dependence on other traditional crops like finger millets, foxtail millets, barley, wheat, buckwheat, rice and sorghum. This trend, however, may contribute to further loss of traditional species and varieties. As cash crop cultivation encroach aggressively on dry lands, the traditional crops are gradually pushed on to smaller peripheral lands leading to reduced grain productions. This trend has led to increasing dependence on imported rice from neighbouring India to supplement seasonal grain shortages.

Traditionally, food from the wild, either from the forest or from the fallow vegetation of *tseri* fields, were important food sources, especially for the Lotokuchu and Ngangla communities. These plants included wild yam species and a wide range of species used as vegetables. Based on the meals reported, wild vegetables are still widely used for the Lotokuchu, Lumbay and Ngangla communites, especially in the winter (Table 9).

Table 9. Meals reported

Species	Lotokuchu		Lumbay		Ngangla		Kengkhar		Gongdu	
	s[1]	w[2]	S	w	S	w	s	w	s	w
Staple food species (%)										
Maize	54	24	53	47	27	92	79	98	79	86
Millet	25	42	1	7					2	2
Rice	20	52	51	65	76	92	25	97	18	40
Cassava		12		30					1	
Vegetable species (%)										
Chili	100	97	89	100	97	100	98	100	99	100
Mustard green	6	48	12	16	22	16	20	17	18	14
Pumpk-in	19	12	8	5	14	20	16	24	6	20
Bean	11	3	6		28	33	14	17	21	14
Potato		30	4	7	6	23	10	23	5	14
Radish			1		10	15	20	12	34	23
Cabbage	3	21	4	5	5	23	9	17	3	15
Taro		6	1	9	11	13	2		5	9
Squash	22	9	13	5	1					
Eggplant	12		11		10	8			4	2
Olachoto		12		2		5	2	15		9
Turnip					6	8	1		6	17
Wild vegetab-les	3	12	9	7	8	30				
Others[3]	G, BW		BN	BN	C, B	B, CF	C		C, CF	C

[1]During summer; [2]During winter; [3]G = gourd; BW = buckwheat, BN = bitter nut, C = carrot, B = broccoli, CF = cauliflower

Discussions

In spite of the diversity in climate, soil conditions and ethnicity, our research showed many similarities in terms of crops used, ways of eating, food preferences and especially production methods. The agriculture practices, species used and their relative importance are similar across the five communities. In all locations, the dry land agriculture system used has evolved from traditional slash-and-burn systems,

which are typical for the subtropical regions of Southeast Asia. The tools and implements are similar across all locations. The weed species are also similar. For example, the introduced species *Ageratum_conyzoides* is commonly found in all four communities.

Surprisingly, the most important staple; maize and four out of the five most important vegetables; chili, pumpkin, dolichos bean and bean are species originating from the American continents. The fact that they are widespread in all five communities is a strong indication of the intensive exchange and interactions taking place between these so called isolated communities.

The extent of trading reported is strongly influenced by the access to markets. The specific hill environment offered opportunities for marketing summer produced vegetables in the nearby markets of India. Because of the good market, products may occasionally be carried to the market as described by Roder et al (2008) for potato. Boarding schools close to the community may also have offered market opportunities for the communities.

The increasing preference for maize across all the communities, besides helping in grain self-sufficiency and providing some food security, may lead towards mono-cropping, thus affecting crop diversity. Furthermore, modernization of agriculture to boost food production has altered traditional agricultural practices in many countries. Improved quality of seeds and crops have replaced traditional local varieties. Trends towards such changes are becoming visible in the communities studied. The preference and introduction of selected crops and cropping patterns have brought about higher yields to feed the growing population. At the same time, this trend has resulted in the erosion of crop genetic diversity. For example, in the past, Lumbay cultivated a number of millet and buckwheat varieties on *tseri* lands. Such cropping practice is now discontinued.

In Lotokuchu, a number of traditional millet varieties are still cultivated. This is because millets have significant function in the life cycle of the Lhops. Millets survived due to their significance as ritual crop; millets constitute important ingredients of traditional ritual offering. It is considered as the food of the deities, gods and goddesses. Lhops consider death as an important cycle of life, and elaborate rituals for the dead include offering of meals for the dead soul. The meal must be prepared from no other crop than *Chacktoh,* a variety of foxtail millet. Lhops also say that millets are drought resistant and can be easily propagated and stored up to 10-15 years. Despite the significance of the millets in the lives of the Lhops, three varieties of millets are no more cultivated.

Thus, it is advisable to initiate in situ conservation within the communities through the establishment of low technology (combining local traditional knowledge) germplasm repository of local crops to conserve and revive local traditional varieties.

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