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Sikkim is a mountainous state of India with an area of 7096 sq. km and altitudes ranging from 300 m to 8500 m. Sikkim lies in the Eastern Himalayas between 27° 5' to 28° 9' North Latitude and 87° 59' to 88° 56' East Longitude. The state comprises four districts: North, East, South and West. A total population of Sikkim is 540,493 (Census, 2001) and is populated by three major ethnic groups of people, the Nepalis, the Bhutias and the Lepchas.

Agricultural and Livestock Resources

The agro-climatic condition of Sikkim varies from subtropical to alpine. Due to such altitudinal variation, various agricultural crops are being cultivated which include the cereal crops rice, maize, finger millet, wheat, buckwheat, barley; pulse crops black gram, soybeans, green gram, garden peas; vegetables such as cabbage, cauliflower, leafy mustard (*rayo sag*), young tendrils, fruits and tubers of squash (*iskus*), brinjal, chili, cucumber, young tendrils and fruits of pumpkin, sponge gourd, tomato, tree tomato, etc.; tubers and rhizome crops potato, sweet potato, cassava, colacasia, greater yam, ginger, turmeric, large cardamom; root crops radish, carrot, etc. Seasonal fruits such as orange, banana, mango, papaya, guava, pear, peach, apple, fig, avocado, etc. are cultivated and consumed (Subba, 2002). Livestock mostly plays a subsidiary role in a mixed farming system. The domestic livestock of Sikkim includes cattle, sheep, goats, pigs, yaks, poultry, etc., which is mainly, used for meat, milk and its products, and eggs. Yaks are reared mostly on extensive alpine and sub-alpine scrublands between 2100 m to 4500 m altitude for milk products and meat (Balaraman and Golay, 1991). River fish is consumed as fresh and also traditionally processed products in Sikkim (Thapa *et al.*, 2006).

Food Culture

Food culture in Sikkim has been reflected in the pattern of food production (Tamang, 2005). Food culture has been evolved as a result of traditional wisdom and empirical experiences of generations over a period of time, based on agro-climatic conditions, ethnic preference, socio-economic development status, religion and cultural practices of the region. Traditional foods have an important bearing in the dietary habits of the people of Sikkim. *Bhat-dal-tharkari-achar* (rice-legume soup-curry-pickle) is the basic dietary pattern of the Sikkimese meal. The morning starts with a full mug of tea with sugar or salt with or without milk, with a pinch of hot black pepper. The first meal in the morning is a simple *bhat-dal-tharkari-achar* (rice-legume soup-curry-pickle) corresponding to cooked rice, *dal*, vegetable mixed with potatoes, meat or milk products and pickles. It is followed by light refreshment with mostly traditional snacks and tea in the afternoon. The second meal is dinner around early evening, which consists of the same *bhat-dal-tharkari-achar*. Bhutias and Lepchas usually eat *thug-pa*, noodles in soup. Though the people of Sikkim are mainly rice eaters, nowadays, *roti* or *chapatti* (wheat-based baked bread) is replacing traditional rice eating habits among the urban population. In the rural areas, people mostly eat cooked maize as staple food. Popularly known as *dhenroh*, boiled maize-rice, it continues to be a staple food in villages. In high altitudes mainly north Sikkim, people drink *pheuja*, butter tea prepared from yak milk.

The Sikkimese food is less spicy and prepared in *gheu* or *maa* (butter), but now commercial edible oil is being used. The Bhutia and the Lepcha are non-vegetarians and prefer beef and pork. Some Nepalis are vegetarians. Nowadays, the vegetarian diet is becoming popular among

the different ethnic groups due to health, religion and personal preference. Non-vegetarians eat chicken, mutton, lamb and pork. Beef is taboo to a majority of the Nepalis except Tamang and Sherpa. Newar prefers to eat buffalo meat. Consumption of fish products in the local diet is comparatively less than other fermented products such as vegetable and dairy products. This may be attributed by pastoral system of agriculture and the consumption of dairy products in these regions. Women usually do cooking. Elders and male members are served the meals first and women eat afterwards in the kitchen.

Ethnic Fermented Foods and Beverages

Traditional foods are generally categorized into fermented foods and beverages, produced by microorganism(s), and non-fermented foods. Fermented foods are prepared by the action of microorganism(s), either naturally or by adding starter culture(s), which modify the substrates biochemically and organoleptically into edible products, and are thus generally palatable, safe and nutritious (Tamang and Holzapfel, 1999; Hansen, 2002). These inexpensive culturally acceptable traditional foods provide basic diet as staple, pickle, confectionery, condiment and alcoholic beverages, which supplement enhanced nutrition, palatability, wholesomeness of the product with acceptable flavour and texture. More than 20 varieties of ethnic fermented foods (Table A) and more than 10 types of fermented beverages (Table B) are consumed in Sikkim. Most of them are common while other fermented foods are less familiar and confined to particular community and places. Traditional alcoholic beverages constitute an integral part of dietary culture and have strong ritual importance among the ethnic people in the Himalayas where social activities require provision and consumption of appreciable quantities of alcohol (Tamang *et al.*, 1996).

Alcoholic beverages are exclusively prepared from locally grown cereal-grains using traditionally prepared mixed inocula or starter called *marcha* (Tsuyoshi *et al.*, 2005). Traditional alcohol brewing is a home-based industry mostly done by rural women using their indigenous knowledge of alcohol fermentation. Rural women also sell the food products in the local markets and earn their livelihood.

Food consumption survey is indispensable tool for assessment of nutritional intake and pattern of food consumption (Tee *et al.*, 2004). Yonzan and Tamang (1998) for the first time conducted a brief survey on consumption pattern of traditional fermented foods of the Darjeeling hills and Sikkim. Until date, no updating and detailed survey on consumption of traditional fermented and non-fermented foods in Sikkim has been conducted. The aim of this report is to update the survey data on consumption of various traditional foods in Sikkim.

Table A. Ethnic Fermented Foods of Sikkim

Product	Substrate	Nature and Use	Major consumer	Reference
<i>Kinema</i>	Soybean	Sticky soybeans; curry	non-Brahmin Nepalis	Tamang (2001)
<i>Maseura</i>	Black lentil	Dry, ball-like; condiment	Newar	Tamang (2005)
<i>Gundruk</i>	Leafy vegetable	Dried, sour; soup/pickle	All	Tamang <i>et al.</i> (2005)
<i>Sinki</i>	Radish tap root	Dried, sour; soup/pickle	All	Tamang and Sarkar (1993)
<i>Mesu</i>	Bamboo shoots	Sour; pickle	All	Tamang and Sarkar (1996)
<i>Khalpi</i>	Cucumber	Sour; pickle	Bahun-Chettri	Tamang <i>et al.</i> (2005)

<i>Selroti</i>	Rice-wheat flour	Round, deep fried; bread	Nepalis	Tamang (2005)
<i>Chhurpi</i> (soft)	Cow/yak milk	Soft, cheese-like, curry/pickle	All	Tamang <i>et al.</i> (2000)
<i>Chhurpi</i> (hard)	Cow/yak milk	Hard-mass; masticator	All	Tamang (2005)
<i>Chhu</i>	Cow/yak milk	Soft; strong-flavoured, dish	Bhutias, Sherpa, Lepchas	Dewan and Tamang (2006)
<i>Philu</i>	Cow/yak milk	Cream; fried curry with butter	Bhutias, Sherpa	Dewan and Tamang (2007)
<i>Somar</i>	Cow/yak milk	Paste, flavoured; condiment	Sherpa	Dewan and Tamang (2007)
<i>Dahi/Shyow</i>	Cow/yak milk	Curd; savory	All	Dewan and Tamang (2007)
<i>Mohi</i>	Cow milk	Butter-milk	All	Dewan and Tamang (2007)
<i>Gheu</i>	Cow milk	Butter	All	Tamang (2005)
<i>Sidra</i>	Fish	Dried fish; curry	Non-Brahmin Nepalis	Thapa <i>et al.</i> (2006)
<i>Sukuti</i>	Fish	Dried, salted	Non-Brahmin Nepalis	Thapa <i>et al.</i> (2006)
<i>Gnuchi</i>	River fish	Smoked fish; curry	Lepchas	Thapa <i>et al.</i> (2006)
<i>Kargyong</i>	Beef/Yak/Pork	Sausage; curry	Bhutias, Lepchas	Tamang (2005)
<i>Sukula</i>	Buffalo meat	Dried meat; curry	Newar	Tamang (2005)
<i>Sukako masu/Satchu</i>	Mutton/Yak/Beef/Pork	Smoked meat; curry	Non-vegetarian Nepalis; Bhutias, Lepchas	Tamang (2005)

Table B. Ethnic Fermented Beverages of Sikkim

Product	Substrate	Nature and use	Major consumer	Reference
<i>Marcha/ Khesung/ Phab/ Buth</i>	Rice, wild herbs, spices	Starter culture to ferment alcoholic beverages	<i>Major producers:</i> Limboo, Rai and Lepcha	Tamang <i>et al.</i> (1996)
<i>Kodo ko jaanr/ Chyang/ Chee</i>	Finger millet	Mild-alcoholic, slightly sweet- acidic; beverage	Non-Brahmin Nepalis, Bhutias, Lepchas	Thapa and Tamang (2004, 2006)
<i>Bhaati jaanr</i>	Rice	Mild-alcoholic, sweet-sour, food beverage; paste	Non-Brahmin Nepalis, Bhutias, Lepchas	Tamang and Thapa (2006)
<i>Makai ko jaanr</i>	Maize	Mild-alcoholic, sweet-sour, beverage	Non-Brahmin Nepalis, Bhutias, Lepchas	Tamang <i>et al.</i> (1996)
<i>Gahoon ko jaanr</i>	Wheat	Mild-alcoholic, slightly acidic, beverage	Non-Brahmin Nepalis, Bhutias, Lepchas	Tamang <i>et al.</i> (1996)
<i>Simal tarul ko jaanr</i>	Cassava tuber	Mild-alcoholic, sweet-sour, food beverage; paste	Non-Brahmin Nepalis, Bhutias, Lepchas	Tamang <i>et al.</i> (1996)
<i>Jao ko jaanr</i>	Barley	Mild-alcoholic, slightly acidic, beverage	Non-Brahmin Nepalis, Bhutias, Lepchas	Tamang <i>et al.</i> (1996)
<i>Faapar ko jaanr</i>	Buck wheat	Mild-alcoholic, slightly acidic, beverage	Non-Brahmin Nepalis, Bhutias, Lepchas	Tamang <i>et al.</i> (1996)
<i>Raksi/ arak</i>	Cereals	Clear distilled liquor; high alcohol content drink	Non-Brahmin Nepalis, Bhutias, Lepchas	Kozaki <i>et al.</i> (2000)

METHODOLOGY

Survey was conducted in randomly selected 214 households in villages located in all four districts of Sikkim – North (54 households), West (48 households), South (42 households) and East (70 households), representing the major ethnic communities, namely the Nepalis, Bhutias and Lepchas as summarized in Table 1 and 2. Information was collected on consumption of traditional fermented foods and beverages using questionnaire (Table C) during 2001-2005. Amount of fermented foods and beverages consumed in every meal by each person was weighed directly by a portable weighing balance (Ishida, Germany) and daily per capita consumption was estimated as g/capita/day. Feeding frequency of fermented beverage by each family was also recorded in percentage. A data base was developed from the field data collection and analysed using statistical software (SPSS) at the Indian Statistical Institute, Kolkata.

Table C. Questionnaire on survey on food consumption with special preference to traditional fermented foods and beverages of Sikkim

I. General Information

1. Identification Number:
2. Name of the Head of the Household:
3. Name of the Informant:
4. Age of the Informant:
5. Ethnic Group:
6. Religion:
7. Name of (i) Village/Revenue Block: (ii) Sub-division: (iii) District:
8. Approximate number of
 - (i) Households in the Village:
 - (ii) Population of the Village:

II. Information on Household Composition

1. Household Type: Nuclear/Extended/Joint
2. Household Size:
(i.e. total number of individuals residing permanently in the household)
3. Number of adult(s): (i) Male(s): (ii) Female(s):
4. Number of children: (i) Boy(s): (ii) Girl(s):
5. Were all the members of the household present in the last 7 days: Yes/No
6. If no, who were absent: Adult: Child:

III. Information on Food Habits

Preference of diet (tick): Vegetarian/Non-Vegetarian

IV. Information on Food Consumption

What are the food items consumed in the household during the last 7 days?

Ingredient	Food Product	Estimated Quantity of Raw Food Items (Kg/L)
Rice		
Maize		
Wheat		
Other Cereals		
Pulses		
Roots and Tubers		
Green Leafy Vegetables		
Other Vegetables		
Fruits		
Eggs(Number)		
Meat		
Fish		
Salt		
Sugar		
Milk		
Oil		
Other (specify)		
Fermented Products		

Food consumption (for cooked food with combination of cereals-pulses-vegetables-fermented products)

Food Articles	Quantity of raw food utilized the day before the survey as measured in standardized containers	Quantity of cooked food as measured in standardized containers

V. Information on Fermented Products

Kindly provide information on fermented foods and beverages

Fermented Foods and Beverages	Raw material	Consume the fermented product (Yes/No)	If yes, consume (daily/ times per week/ occasionally)	Consumption estimate (at a time)	Whether prepared at home/ market purchased/ both	Whether raw materials are produced at home/ market purchased/ both

Consumption Patterns of Fermented Foods

Tables 1-16 show the data on food consumption in Sikkim. The food consumption patterns show that 11.7 % of rural people are vegetarians and 88.3 % are non-vegetarians in Sikkim (Table 3). Rice is the most staple food in the Sikkimese diet. An average per capita consumption of rice is 2.6 kg/week, followed by milk 1.2 L/week (Table 6). Among the fermented foods, milk products (*dahi* and *mohi*) are mostly consumed by all ethnic groups in the state. Per capita consumption of *mohi* (butter-milk) is 74.2 ml/day and *dahi* (curd) 34.1 ml/day (Table 11). *Kodo ko jaanr* or *chyang* (a fermented finger millet beverage) is the most common mild-alcoholic food beverage in rural Sikkim. Daily per capita consumption of *kodo ko jaanr* including the whole grits of fermented finger millets is 101.7 g/ml (Table 12). Majority of rural people also drink *raksi*, the clear distilled liquor.

In Sikkim, daily per capita consumption of more familiar fermented foods such as *kinema* is 2.3 g, *gundruk* 1.4 g, *sinki* 1.1 g, *dahi* 34.1 ml, soft-*chhurpi* 4.5 g, *mohi* 74.2 ml, respectively (Table 11). It was observed that *kinema*, *maseura* and *selroti* were not eaten daily. *Kinema*, a fermented soybean food which is a source of high plant protein food in the local diet is usually consumed 2-4 times in a week. Consumption of *maseura*, a fermented black gram is confined to very few places. *Selroti* was found to be eaten mostly in festival and special occasions. The survey report showed that 67.7 % of people prepared the fermented foods at home for consumption (Table 8). This suggests that production of the traditional fermented foods is mostly done at the level of individual households, except *chhurpi* (hard), *dudh chhurpi* and *marcha* which are purchased from markets for consumption (Table 8). Some rural women are economically dependent upon these products.

Proportion of fermented foods consumption to total food consumption is 12.6 % in the state (Fig 1). Consumption of fermented foods to total foods is highest in North district (18.6 %), followed by South (13.9 %), West (13.7 %) and East (7.5 %), respectively (Table 15 and Fig 2). The data shows that among the ethnic groups, the Bhutias consume 16.6 % of fermented foods to total food consumption, followed by the Lepchas (16.3 %) and the Nepalis (9.8 %), respectively (Table 16 and Fig 3).

In 1996-97 survey, a total amount of non-alcoholic fermented foods in Sikkim (*kinema*, *maseura*, *gundruk*, *sinki*, *chhurpi* (soft), *chhurpi* (hard), *sel roti*, *dahi* and *suka ko masu*) consumed was 87.6 g/capita/day representing 9.8 % of the total daily food consumed in local diet (Yonzan and Tamang, 1998). The present survey data showed that per capita consumption of fermented foods and beverages in Sikkim is 163.8 g/day. In the previous study (Yonzan and Tamang, 1998), selected fermented foods were considered in the survey. In the present study about 20 fermented foods and 9 fermented beverages were considered in the survey, which might have given the increased figure in the consumption rate from 87.6 g/day to 163.8 g/day.

The less familiar fermented foods play important role as source of protein, calories, minerals and vitamins in the diet. Since such fermented foods have been rooted in a long tradition as part of dietary culture, their consumption might not be affected by a short period of time. Food consumption data are needed to develop appropriate food-based dietary guidelines of the region and to monitor changes in dietary behaviours and patterns.

Table 1: Distribution of study households and types, age (in years) of informants by district in Sikkim

Households	District								Combined	
	North		South		East		West			
	No.	%	No.	%	No.	%	No.	%	No.	%
Nuclear	39	72.2	30	71.4	40	57.1	17	35.4	126	58.9
Extended/Joint	15	27.8	12	28.6	30	42.9	31	64.6	88	41.1
Total households surveyed	54	25.2	42	19.6	70	32.7	48	22.4	214	100
Minimum age (year)	21		16		19		18		16	
Maximum age (year)	56		65		70		70		70	
Age in years (mean \pm SD)	34.7 \pm 8.4		39.7 \pm 12.5		40.8 \pm 12.7		39.3 \pm 11.6		38.7 \pm 11.6	

Table 2: Distribution of study households and age (in years) of informants by ethnic groups

Parameters	Ethnic Group (Age in years)			
	Nepali	Bhutia	Lepcha	Total
No. of respondent	123	47	44	214
Percentage (%)	57.5	22.0	20.6	100
Minimum age	16	19	17	16
Maximum age	70	60	60	70
Age in years (mean \pm SD)	39.9 \pm 12.6	38.2 \pm 9.9	35.9 \pm 9.7	38.7 \pm 11.6

Table 3: Preference of diet among the study households by districts in Sikkim

Households consuming	District								Combined	
	North		South		East		West			
	No.	%	No.	%	No.	%	No.	%	No.	%
Vegetarian Diet	0	0	8	19.0	15	21.4	2	4.2	25	11.7
Non-Vegetarian Diet	54	100	34	81.0	55	78.6	46	95.8	189	88.3
Total	54	100	42	100	70	100	48	100	214	100

Table 4: Average consumption of food items per household per week by district

Non-fermented food Items	District (mean \pm SD)				Combined (mean \pm SD)
	North	South	East	West	
Rice (kg)	15.9 \pm 6.4	13.3 \pm 7.2	17.3 \pm 8.7	21.4 \pm 8.8	17.1 \pm 8.3
Maize (kg)	1.0 \pm 1.8	3.5 \pm 4.5	3.0 \pm 2.9	6.4 \pm 4.4	3.3 \pm 3.9
Wheat (kg)	2.6 \pm 2.3	2.7 \pm 2.4	2.6 \pm 3.2	0.4 \pm .9	2.1 \pm 2.6
Other cereals (kg)	8.4 \pm 8.1	0.1 \pm 0.3	0.6 \pm 2.6	0.2 \pm 0.9	2.4 \pm 9.8
Pulses (kg)	1.3 \pm 1.5	1.6 \pm 1.0	1.8 \pm 3.3	1.2 \pm 1.0	1.5 \pm 2.1
Roots and tubers (kg)	5.1 \pm 4.1	3.3 \pm 2.0	3.5 \pm 2.3	1.0 \pm 1.8	3.3 \pm 3.1
Green leafy vegetables (kg)	1.8 \pm 1.8	1.8 \pm 1.5	3.2 \pm 3.0	7.2 \pm 3.4	3.5 \pm 3.3
Other vegetables (kg)	1.3 \pm 3.9	0.7 \pm 0.9	1.1 \pm 1.5	2.2 \pm 2.6	1.3 \pm 2.6
Fruits (kg)	0.6 \pm 0.9	0.5 \pm 0.8	1.0 \pm 1.7	0.5 \pm 1.0	0.7 \pm 1.3
Eggs (number)	3.5 \pm 5.9	3.3 \pm 4.0	4.0 \pm 5.6	1.7 \pm 3.1	3.2 \pm 4.9
Meat (kg)	2.2 \pm 1.4	1.6 \pm 1.9	1.2 \pm 1.3	1.7 \pm 3.3	1.7 \pm 2.1
Fish (kg)	0.1 \pm 0.3	0.3 \pm 0.5	0.2 \pm 0.4	0.1 \pm 0.1	0.1 \pm 0.4
Sugar (kg)	0.7 \pm 0.6	1.2 \pm 0.7	1.2 \pm 1.0	0.9 \pm 0.9	1.0 \pm 0.9
Salt (kg)	1.0 \pm 0.6	1.0 \pm 0.7	1.0 \pm 0.7	0.6 \pm 0.3	0.8 \pm 0.6
Milk (Litre)	8.2 \pm 5.6	7.8 \pm 6.2	8.5 \pm 6.6	5.8 \pm 5.5	7.7 \pm 6.1
Oil (Litre)	1.0 \pm 0.4	0.9 \pm 0.4	1.0 \pm 0.6	0.7 \pm 0.4	0.9 \pm 0.5

Table 5: Average consumption of food items per household per week by ethnic groups

Food Items	Ethnic Groups (mean \pm SD)			
	Nepali	Bhutia	Lepcha	Total
Rice (kg)	17.9 \pm 9.15	15.6 \pm 6.4	16.3 \pm 7.7	17.1 \pm 8.3
Maize (kg)	4.2 \pm 4.2	2.5 \pm 3.6	1.9 \pm 3.0	3.3 \pm 3.9
Wheat (kg)	2.0 \pm 2.8	3.1 \pm 2.4	1.4 \pm 1.5	2.1 \pm 2.6
Other cereals (kg)	0.3 \pm 1.9	0.6 \pm 1.1	9.9 \pm 19.7	2.4 \pm 9.8
Pulses (kg)	1.7 \pm 2.6	1.1 \pm 0.8	1.5 \pm 1.5	1.5 \pm 2.1
Roots and tubers (kg)	2.7 \pm 2.4	5.1 \pm 3.7	2.9 \pm 3.4	3.3 \pm 3.1
Green leafy vegetables (kg)	4.4 \pm 3.7	2.4 \pm 1.9	1.9 \pm 2.3	3.5 \pm 3.3
Other vegetables (kg)	1.4 \pm 2.0	0.6 \pm 1.2	2.0 \pm 4.3	1.3 \pm 2.6
Fruits (kg)	0.8 \pm 1.5	0.4 \pm 0.7	0.8 \pm 1.1	0.7 \pm 1.3
Eggs (number)	2.7 \pm 4.3	5.1 \pm 7.1	2.5 \pm 3.4	3.2 \pm 4.9
Meat (kg)	1.2 \pm 2.2	2.5 \pm 1.6	2.1 \pm 1.7	1.7 \pm 2.1
Fish (kg)	0.2 \pm 0.4	0.1 \pm 0.3	0.2 \pm 0.4	0.1 \pm 0.4
Sugar (kg)	1.2 \pm 0.9	0.7 \pm 0.9	1.0 \pm 0.7	1. \pm 0.9
Salt (kg)	0.8 \pm 0.7	0.8 \pm 0.5	0.9 \pm 0.5	0.8 \pm 0.6
Milk (Litre)	7.3 \pm 6.4	9.3 \pm 4.7	7.0 \pm 6.4	7.7 \pm 6.1
Oil (Litre)	0.9 \pm 0.5	0.9 \pm 0.4	0.9 \pm 0.6	0.9 \pm 0.5

Table 6: Average per capita food consumption per week by districts

Food Items	District (mean \pm SD)				Combined (mean \pm SD)
	North	South	East	West	
Rice (kg)	2.3 \pm 0.9	2.2 \pm 1.2	2.5 \pm 1.1	3.3 \pm 1.0	2.6 \pm 1.1
Maize (kg)	0.1 \pm 0.3	0.6 \pm 0.7	0.4 \pm 0.4	1.0 \pm 0.7	0.5 \pm 0.6
Wheat (kg)	0.4 \pm 0.4	0.4 \pm 0.3	0.4 \pm 0.7	0.1 \pm 0.2	0.4 \pm 0.5
Other cereals (kg)	1.0 \pm 1.7	0.02 \pm 0.1	0.1 \pm 0.6	0.02 \pm 0.1	0.3 \pm 1.0
Pulses (kg)	0.2 \pm 0.2	0.3 \pm 0.2	0.3 \pm 0.3	0.2 \pm 0.2	0.2 \pm 0.2
Roots and tubers (kg)	0.8 \pm 0.7	0.6 \pm 0.4	0.5 \pm 0.4	0.2 \pm 0.3	0.5 \pm 0.5
Green leafy vegetables (kg)	0.3 \pm 0.3	0.3 \pm 0.3	0.5 \pm 0.4	1.1 \pm 0.5	0.5 \pm 0.5
Other vegetables (kg)	0.2 \pm 0.5	0.1 \pm 0.2	0.2 \pm 0.3	0.4 \pm 0.4	0.2 \pm 0.4
Fruits (kg)	0.1 \pm 0.1	0.1 \pm 0.1	0.2 \pm 0.2	0.1 \pm 0.2	0.1 \pm 0.2
Eggs (number)	0.6 \pm 1.1	0.6 \pm 0.7	0.6 \pm 0.9	0.3 \pm 0.5	0.5 \pm 0.8
Meat (kg)	0.3 \pm 0.2	0.3 \pm 0.3	0.2 \pm 0.2	0.3 \pm 0.5	0.3 \pm 0.3
Fish (kg)	0.01 \pm 0.04	0.05 \pm 0.1	0.03 \pm 0.1	0 \pm 0.01	0.02 \pm 0.1
Sugar (kg)	0.1 \pm 0.1	0.2 \pm 0.1	0.2 \pm 0.1	0.16 \pm 0.1	0.2 \pm 0.1
Salt (kg)	0.1 \pm 0.1	0.2 \pm 0.1	0.1 \pm 0.10	0.1 \pm 0.04	0.1 \pm 0.1
Milk (Litre)	1.2 \pm 0.7	1.3 \pm 0.9	1.3 \pm 1.0	1.0 \pm 0.8	1.2 \pm 0.9
Oil (Litre)	0.2 \pm 0.1	0.2 \pm 0.1	0.2 \pm 0.1	0.1 \pm 0.1	0.2 \pm 0.1

Table 7: Average per capita food consumption per week by ethnic groups

Food Items	Ethnic Groups (mean \pm SD)			
	Nepali	Bhutia	Lepcha	Total
Rice (kg)	2.7 \pm 1.2	2.4 \pm 0.8	2.3 \pm 1.1	2.6 \pm 1.1
Maize (kg)	0.6 \pm 0.6	0.4 \pm 0.4	0.3 \pm 0.5	0.5 \pm 0.6
Wheat (kg)	0.3 \pm 0.6	0.5 \pm 0.4	0.2 \pm 0.3	0.4 \pm 0.5
Other cereals (kg)	0.1 \pm 0.5	0.1 \pm 0.1	1.2 \pm 1.8	0.3 \pm 1.0
Pulses (kg)	0.3 \pm 0.3	0.2 \pm 0.1	0.2 \pm 0.1	0.2 \pm 0.2
Roots and tubers (kg)	0.4 \pm 0.4	0.8 \pm 0.7	0.4 \pm 0.5	0.5 \pm 0.5
Green leafy vegetables (kg)	0.7 \pm 0.5	0.4 \pm 0.3	0.3 \pm 0.4	0.5 \pm 0.5
Other vegetables (kg)	0.2 \pm 0.3	0.1 \pm 0.1	0.3 \pm 0.5	0.2 \pm 0.4
Fruits (kg)	0.1 \pm 0.1	0.1 \pm 0.1	0.1 \pm 0.1	0.1 \pm 0.2
Eggs (number)	0.4 \pm 0.6	0.8 \pm 1.3	0.4 \pm 0.6	0.5 \pm 0.8
Meat (kg)	0.2 \pm 0.3	0.4 \pm 0.3	0.3 \pm 0.2	0.3 \pm 0.3
Fish (kg)	0.03 \pm 0.1	0.01 \pm 0.1	0.02 \pm 0.1	0.02 \pm 0.1
Sugar (kg)	0.2 \pm 0.1	0.1 \pm 0.2	0.2 \pm 0.1	0.2 \pm 0.1
Salt (kg)	0.1 \pm 0.1	0.1 \pm 0.1	0.1 \pm 0.1	0.1 \pm 0.1
Milk (Litre)	1.2 \pm 1.1	1.4 \pm 0.6	1.0 \pm 0.8	1.2 \pm 0.9
Oil (Litre)	0.2 \pm 0.1	0.2 \pm 0.1	0.1 \pm 0.1	0.2 \pm 0.1

Table 8: Distribution of households indicating source of acquiring fermented products by ethnic groups

Fermented Products	Source of acquiring fermented products											
	Nepali				Bhutia				Lepcha			
	HP	MP	Both	Total	HP	MP	Both	Total	HP	MP	Both	Total
<i>Kinema</i>	46	25	9	80	5	23	6	34	31	7	2	40
%	57.5	31.3	11.3	100	14.7	67.7	17.7	100	77.5	17.5	5.0	100
<i>Maseura</i>	11	5	0	16	0	0	0	0	1	0	0	1
%	68.8	31.3	0	100	0	0	0	0	100	0	0	100
<i>Gundruk</i>	99	12	5	116	21	11	4	36	34	4	2	40
%	85.3	10.3	4.3	100	58.3	30.6	11.1	100	85.0	10	5.0	100
<i>Sinki</i>	77	17	1	95	12	4	1	17	7	3	0	10
%	81.1	17.9	1.1	100	70.6	23.5	5.9	100	70	30	0	100
<i>Mesu</i>	27	3	0	30	12	1	1	14	33	2	0	35
%	90	10	0	100	85.7	7.1	7.1	100	94.3	5.7	0	100
<i>Khalpi</i>	19	0	0	19	0	0	0	0	1	0	0	1
%	100	0	0	100	0	0	0	0	100	0	0	100
<i>Dahi</i>	101	17	4	122	34	5	7	46	32	7	0	39
%	82.8	13.9	3.3	100	73.9	10.9	15.2	100.0	82.1	17.9	0	100
<i>Mohi</i>	89	4	1	94	25	0	0	25	28	2	0	30
%	94.7	4.3	1.1	100	100	0	0	100	93.3	6.7	0	100
<i>Gheu</i>	78	26	11	115	28	6	8	42	30	9	0	39
%	67.8	22.6	9.6	100	66.7	14.3	19.1	100	76.9	23.1	0	100
<i>Chhurpi-soft</i>	44	34	9	87	10	11	8	29	16	8	0	24
%	50.6	39.1	10.3	100	34.5	37.9	27.6	100	66.7	33.3	0	100
<i>Chhurpi-hard</i>	0	34	0	34	2	33	2	37	1	24	0	25
%	0	100	0	100	5.4	89.2	5.4	100	4.0	96	0	100
<i>Dudh Chhurpi</i>	0	12	0	12	2	18	0	20	0	2	0	2
%	0	100	0	100	10.0	90	0	100	0	100	0	100
<i>Chhu</i>	0	0	0	0	34	3	4	41	16	1	0	17
%	0	0	0	0	83	7.3	9.8	100	94.1	5.9	0	100
<i>Somar</i>	0	0	0	0	2	0	0	2	1	0	0	1
%	0	0	0	0	100	0	0	100	100	0	0	100

Contd.

Fermented Products	Source of acquiring fermented products											
	Nepali				Bhutia				Lepcha			
	HP	MP	Both	Total	HP	MP	Both	Total	HP	MP	Both	Total
<i>Philu</i>	0	0	0	0	26	2	0	28	1	0	0	1
%	0	0	0	0	92.9	7.1	0	100	100	0	0	100
<i>Sukako masu</i>	33	7	0	40	42	5	0	47	37	1	1	39
%	82.5	17.5	0	100	89.4	10.6	0	100	94.9	2.6	2.6	100
<i>Sel roti</i>	114	5	3	122	4	1	1	6	6	2	1	9
%	93.4	4.1	2.5	100	66.7	16.7	16.7	100	66.7	22.2	11.1	100
<i>Kodo ko jaanr</i>	41	11	2	54	38	5	2	45	39	3	0	42
%	75.9	20.4	3.7	100	84.4	11.1	4.4	100	92.9	7.1	0	100
<i>Makai ko jaanr</i>	28	4	3	35	10	0	2	12	19	0	0	19
%	80	11.4	8.6	100	83.3	0	16.7	100	100	0	0	100
<i>Bhaati jaanr</i>	8	3	0	11	23	0	0	23	11	0	0	11
%	72.7	27.3	0	100	100	0	0	100	100	0	0	100
<i>Gahoon jaanr</i>	8	1	1	10	4	0	0	4	12	2	0	14
%	80	10	10	100	100	0	0	100	85.7	14.3	0	100
<i>Simal tarul jaanr</i>	4	0	0	4	0	0	0	0	11	0	0	11
%	100	0	0	100	0	0	0	0	100	0	0	100
<i>Raski</i>	11	6	2	19	6	4	1	11	21	2	0	23
%	57.9	31.6	10.5	100	54.5	36.4	9.1	100	91.3	8.7	0	100
^a <i>Marcha</i>	7	36	0	43	0	39	1	40	3	35	0	38
%	16.3	83.7	0	100	0	97.5	2.50	100	7.89	92.1	0	100

HP, Home produced; MP, Market purchase

^a*Marcha* is not a food, it is starter culture for alcohol production.

Table 9: Average annual production of fermented foods (gram) per household per year by ethnic groups

Fermented Products	Ethnic Groups (g/household/annum)					F-Values
		Nepali	Bhutia	Lepcha	Total	
<i>Kinema</i>	Mean	7955.6	3081.8	3751.5	6012.7	1.47
	N	55	11	33	99	
	SD	16073.5	3862.3	6362.4	12724.2	
<i>Maseura</i>	Mean	1272.7	0	800.0	1233.3	0.72
	N	11	0	1	12	
	SD	868.4	0	0	839.2	
<i>Gundruk</i>	Mean	3906.3	2767.2	1575.6	3225.2	4.47*
	N	104	25	36	165	
	SD	4513.4	4648.4	1908.3	4201.9	
<i>Sinki</i>	Mean	3849.2	1189.2	542.8	3260.2	0.90
	N	78	13	7	98	
	SD	9586.4	1926.8	97.6	8648.6	
<i>Mesu</i>	Mean	2266.7	923.1	1429.4	1651.9	0.82
	N	27	13	32	72	
	SD	5102.3	561.5	1804.6	3357.4	
<i>Khalpi</i>	Mean	11373.7	0	800	10845	0.06
	N	19	0	1	20	
	SD	41486.8	0	0	40449.4	
<i>Dahi (ml)</i>	Mean	98429	83776.8	74390.6	90732.6	0.94
	N	105	41	32	178	
	SD	105840.7	64888.2	84515.2	94229.9	
<i>Mohi (ml)</i>	Mean	229644.4	84480	161214.3	190867.1	7.21**
	N	90	25	28	143	
	SD	191504.2	75093.9	182786.9	182785.9	
<i>Gheu</i>	Mean	17431.7	36209.7	8235.7	20013.2	7.11**
	N	89	36	30	155	
	SD	37118.7	28572.6	8096.4	32823.7	
<i>Chhurpi (soft)</i>	Mean	9464.1	21588.9	12162.5	12468.9	2.85
	N	53	18	16	87	
	SD	18292.7	23863.7	11808.9	19031.9	

Contd.

Fermented Products	Ethnic Groups (g/household/annum)					F-Values
		Nepali	Bhutia	Lepcha	Total	
<i>Chhurpi</i> (hard)	Mean	0	2314	4.0	1852	0.29
	N	0	4	1	5	
	SD	0	3835.8	0	3478.8	
<i>Dudh Chhurpi</i>	Mean	0	4	0	4	
	N	0	2	0	2	
	SD	0	0	0	0	
<i>Chhu</i>	Mean	0	12046	21687.5	14902.8	2.42
	N	0	38	16	54	
	SD	0	20239.1	22121.2	21076.2	
<i>Somar</i>	Mean	0	300	18000	6200	10443.00**
	N	0	2	1	3	
	SD	0	141.4	0	10219.6	
<i>Philu</i>	Mean	0	2069.2	400	2007.4	0.58
	N	0	26	1	27	
	SD	0	2141.4	0	2124.2	
<i>Sukako masu</i>	Mean	12042.4	76536.9	24414.5	40174.3	25.58**
	N	33	42	38	113	
	SD	13111.2	63317.8	26477.2	50612.6	
<i>Sel roti</i>	Mean	19240.2	11200	11428.6	18504.6	0.33
	N	117	5	7	129	
	SD	33364.4	8197.6	4859.9	31895.9	
<i>Marcha</i>	Mean	6600	13000	349600	100727.3	1.43
	N	7	1	3	11	
	SD	4337.4	0	597904.1	311547.7	
<i>Kodo ko jaanr</i>	Mean	183755.8	334475	308393.6	272722.8	1.95
	N	43	40	38	121	
	SD	174355.1	541169.9	316554.7	375803.7	
<i>Makai ko jaanr</i>	Mean	50451.6	227833.3	49368.4	84451.6	3.45*
	N	31	12	19	62	
	SD	53353.4	477154	37771.5	218843.3	
<i>Bhaati jaanr</i>	Mean	47751	19652.2	23600	26097.8	2.24
	N	8	23	10	41	
	SD	73386.2	7900.6	12429.4	33627.1	

Contd.

Fermented Products	Ethnic Groups (g/household/annum)					F-Values
		Nepali	Bhutia	Lepcha	Total	
<i>Gahoon ko jaanr</i>	Mean	89111.1	213500	44791.7	87740	1.78
	N	9	4	12	25	
	SD	131541.3	347176.7	51387.8	160010.6	
<i>Simal tarul ko jaanr</i>	Mean	9000	0	52000	40533.3	7.38*
	N	4	0	11	15	
	SD	2000	0	30880.4	32701.8	
<i>Raksi (ml)</i>	Mean	84134.6	652900.0	18952.4	148754.9	3.78*
	N	13	7	21	41	
	SD	92815.6	1347053.5	10437.8	574022.8	

*Values differ significantly ($P < 0.05$).

** Values differ significantly ($P < 0.01$).

Table 10: Average annual production of fermented foods (gram) per household per year by districts

Fermented Products	Des. Statistics	District (g/household/annum)				State (g/household /annum)	F-Values
		North	South	East	West		
<i>Kinema</i>	Mean	4192.3	4498.5	16095	1755.6	6012.7	6.40**
	N	26	26	20	27	99	
	SD	6903.1	5947.4	24056	2216.9	12724.2	
<i>Maseura</i>	Mean	0	700	1766.7	0	1233.3	7.88**
	N	0	6	6	0	12	
	SD	0	666.3	650.1	0	839.2	
<i>Gundruk</i>	Mean	1262.2	4004.6	4684.6	1842.4	3225.2	7.45**
	N	36	35	61	33	165	
	SD	1881.9	3948.8	5349.5	2315.6	4201.9	
<i>Sinki</i>	Mean	0	1382.2	4340.4	2811.8	3260.2	1.08
	N	0	27	54	17	98	
	SD	0	2262.7	11325.7	3184.7	8648.6	
<i>Mesu</i>	Mean	1314.2	837.5	2534.6	1057.1	1651.9	0.98
	N	24	8	26	14	72	
	SD	1574.4	570.6	5310.4	460.3	3357.4	
<i>Khalpi</i>	Mean	0	400	11394.7	0	10845	0.07
	N	0	1.0	19	0	20	
	SD	0	0	41481.0	0	40449.4	
<i>Dahi (ml)</i>	Mean	79507.6	87072.4	132187.3	49076.9	90732.6	6.96**
	N	46	38	55	39	178	
	SD	78104.1	108051.2	107968.5	42039.7	94230	
<i>Mohi (ml)</i>	Mean	103333	154294.1	249183.7	238074.1	190867.1	5.77**
	N	33	34	49	27	143	
	SD	108480	136474.3	249721.6	94999.9	182785.9	
<i>Gheu</i>	Mean	25642.9	11959	28582.8	4822.2	20013.2	4.42**
	N	47	33	48	27	155	
	SD	26716.2	12913.3	49194.4	4884.3	32823.7	
<i>Chhurpi (soft)</i>	Mean	21365.2	17109.1	5935.7	3628.6	12468.9	4.77**
	N	23	22	28	14	87	
	SD	17348.1	25066.4	15307.2	5717.4	19031.9	

Contd.

Fermented Products	Des. Statistics	District (g/household/annum)				State (g/household /annum)	F-Values
		North	South	East	West		
<i>Chhurpi</i> (hard)	Mean	1852	0	0	0	1852	--
	N	5	0	0	0	0	
	SD	3478.8	0	0	0	3478.9	
<i>Dudh Chhurpi</i>	Mean	4	0	0	0	4	--
	N	2	0	0	0	2	
	SD	0	0	0	0	0	
<i>Chhu</i>	Mean	14158.2	55287.5	4435	12250	14902.8	8.39**
	N	34	4	12	4	54	
	SD	18289.7	34906.0	5592.4	14364.2	21076.2	
<i>Somar</i>	Mean	0	400	9100	0	6200	0.33
	N	0	1	2	0	3	
	SD	0	0	12586.5	0	10219.6	
<i>Philu</i>	Mean	2052.6	2360	400	1500	2007.4	0.25
	N	19	5	1	2	27	
	SD	2023	3150.7	0	424.3	2124.2	
<i>Sukako masu</i>	Mean	49537.2	24202.8	54819.6	15085.7	40174.3	3.81*
	N	51	18	23	21	113	
	SD	58422.4	39745.9	52029.3	11444.6	50612.6	
<i>Sel roti</i>	Mean	0	10131.4	26386	16209.1	18504.6	2.93
	N	0	35	50	44	129	
	SD	0	11322.9	48919.7	8077.9	31895.9	
<i>Marcha</i>	Mean	1040000.0	0	8057.1	3866.7	100727.3	30672.07**
	N	1.0	0	7	3	11	
	SD	0	0	0	2722.7	311547.7	
<i>Kodo ko jaanr</i>	Mean	292364.2	523970.6	199401.8	149634.6	272722.8	4.17**
	N	50	17	28	26	121	
	SD	276950	798755.9	152769.9	168980.9	375803.7	
<i>Makai ko jaanr</i>	Mean	55692.3	358285.7	40588.2	52560	84451.6	4.93**
	N	13	7	17	25	62	
	SD	34658.8	607001.8	56172.8	46567.2	218843.3	

Contd.

Fermented Products	Des. Statistics	District (g/household/annum)				State (g/household /annum)	F-Values
		North	South	East	West		
<i>Bhaati jaanr</i>	Mean	21241.4	24000	58000	6002	26097.8	3.25*
	N	29	1	7	4	41	
	SD	9745.5	0	74233.9	5160.9	33627.1	
<i>Gahoon ko jaanr</i>	Mean	48500	279333.3	88250	38666.7	87740	1.96
	N	11	3	8	3	25	
	SD	52184.8	393478.5	139846.6	56615.7	160010.6	
<i>Simal tarul ko jaanr</i>	Mean	52000	0	0	9000	40533.3	7.38*
	N	11	0	0	4	15	
	SD	30880.4	0	0	2000	32701.8	
<i>Raksi (ml)</i>	Mean	19594.7	601593.7	71250	11000	147854.9	2.29
	N	19	8	12	2	41	
	SD	10696.7	1255906.7	79379.9	9899.5	574022.8	

*Values differ significantly ($P < 0.05$).

** Values differ significantly ($P < 0.01$).

Table 11: Per capita consumption of fermented foods (gram) per day by ethnic groups

Fermented Products	Des. Statistics	Per capita consumption (g/day)				F-Values
		Nepali	Bhutia	Lepcha	Total	
<i>Kinema</i>	Mean ± SD	3.4 ± 6.9	1.1 ± 1.7	1.4 ± 2.4	2.3 ± 5.3	2.90
	N	80	34	40	154	
<i>Maseura</i>	Mean ± SD	0.5 ± 0.3	0	0	0.5 ± 0.3	0.09
	N	16	0	0	16	
<i>Gundruk</i>	Mean ± SD	1.7 ± 2.1	0.9 ± 1.8	0.6 ± 0.9	1.4 ± 1.9	6.68**
	N	116	36	40	192	
<i>Sinki</i>	Mean ± SD	1.3 ± 2.8	0.5 ± 0.9	0.2 ± 0.1	1.1 ± 2.5	1.42
	N	96	18	10	124	
<i>Mesu</i>	Mean ± SD	0.9 ± 1.7	0.3 ± 0.2	0.5 ± 0.6	0.6 ± 1.1	1.17
	N	31	14	35	80	
<i>Khalpi</i>	Mean ± SD	7.3 ± 28.5	0	0.2 ± 0.1	6.9 ± 27.8	0.06
	N	19	0	1	20	
<i>Dahi (ml)</i>	Mean ± SD	37.1 ± 41.9	32.8 ± 26.8	26.5 ± 34.4	34.1 ± 37.7	1.22
	N	122	46	39	207	
<i>Mohi (ml)</i>	Mean ± SD	89.7 ± 67.2	33.8 ± 29.7	58.9 ± 95.4	74.2 ± 72.4	7.30**
	N	95	25	30	150	
<i>Gheu</i>	Mean ± SD	7.1 ± 17.4	14.9 ± 14.2	2.8 ± 2.4	7.9 ± 15.4	7.19**
	N	115	42	39	196	
<i>Chhurpi (soft)</i>	Mean ± SD	3.4 ± 7.7	8.1 ± 10.0	4.0 ± 6.2	4.5 ± 8.2	3.91
	N	86	29	24	139	
<i>Chhurpi (hard)</i>	Mean ± SD	0.02 ± 0.1	0.8 ± 2.7	0.01 ± 0.04	0.3 ± 1.7	2.43
	N	34	36	25	95	

Contd.

Fermented Products	Des. Statistics	Per capita consumption (g/day)				F-Values
		Nepali	Bhutia	Lepcha	Total	
<i>Dudh Chhurpi</i>	Mean ± SD	0.03 ± 0.1	0.01 ± 0.02	0	0.01 ± 0.04	0.96
	N	12	20	2	34	
<i>Chhu</i>	Mean ± SD	0	5.0 ± 9.7	7.0 ± .6	5.6 ± 9.1	0.59
	N	0	41	17	58	
<i>Somar</i>	Mean ± SD	0	0.1 ± 0	8.3 ± 0	2.8 ± 4.8	--
	N	0	2	1	3	
<i>Philu</i>	Mean ± SD	0	0.9 ± 0.9	0.1 ± 0	0.9 ± 0.9	0.83
	N	0	28	1	29	
<i>Sukako masu</i>	Mean ± SD	6.7 ± 7.4	30.3 ± 20.7	9.8 ± 10.8	16.3 ± 17.9	31.73**
	N	40	46	39	125	
<i>Sel roti</i>	Mean ± SD	8.4 ± 13.5	3.6 ± 3.1	5.9 ± 2.1	8.0 ± 12.8	0.67
	N	122	6	9	137	
<i>Kodo ko jaanr</i>	Mean ± SD	71.7 ± 83.9	124.7 ± 157.5	115.6 ± 131.6	101.7 ± 126.9	2.55
	N	54	45	42	141	
<i>Makai ko jaanr</i>	Mean ± SD	18.9 ± 19.3	86.4 ± 184.7	41.7 ± 108.9	37.8 ± 99.6	2.15
	N	35	12	20	67	
<i>Bhaati jaanr</i>	Mean ± SD	14.9 ± 24.9	8.9 ± 4.0	8.9 ± 5.0	10.4 ± 12.8	0.91
	N	11	23	10	44	
<i>Gahoon ko jaanr</i>	Mean ± SD	30.8 ± 38.8	56.8 ± 75.8	14.6 ± 21.2	26.4 ± 39.7	1.99
	N	10	4	14	28	
<i>Simal tarul ko jaanr</i>	Mean ± SD	3.8 ± 0.7	0.7 ± 0	16.8 ± 10.4	13.4 ± 10.6	5.99*
	N	4	0	11	15	
<i>Raksi (ml)</i>	Mean ± SD	33.7 ± 51.5	203.8 ± 597.7	7.9 ± 5.9	57.7 ± 274.7	2.09
	N	19	11	23	53	

*Values differ significantly ($P < 0.05$).

** Values differ significantly ($P < 0.01$).

Table 12: Per capita consumption of fermented foods (gram) per day by districts

Fermented Foods	Des. Statistics	Per capita consumption (g/day)					F-Values
		District				State	
		North	South	East	West		
<i>Kinema</i>	Mean ± SD	1.1 ± 2.2	1.7 ± 2.2	5.3 ± 9.1	0.8 ± 0.9	2.3 ± 5.3	7.11**
	N	44	34	42	34	154	
<i>Maseura</i>	Mean ± SD	0	0.4 ± 0.3	0.7 ± 0.2	0	0.5 ± 0.3	5.51*
	N	0	8	9	0	17	
<i>Gundruk</i>	Mean ± SD	0.4 ± 0.8	1.6 ± 1.8	2.1 ± 2.4	0.7 ± 0.9	1.4 ± 1.9	9.72**
	N	44	42	69	37	192	
<i>Sinki</i>	Mean ± SD	0	0.6 ± 1.2	1.5 ± 3.2	1.0 ± 1.4	1.1 ± 2.5	1.66
	N	0	38	65	21	124	
<i>Mesu</i>	Mean ± SD	0.5 ± 0.6	0.3 ± 0.2	1.0 ± 1.9	0.5 ± 0.2	0.6 ± 1.1	1.20
	N	27	10	26	17	80	
<i>Khalpi</i>	Mean ± SD	0	0.1 ± 0	7.3 ± 28.5	0	6.9 ± 27.8	0.06
	N	0	1	19	0	20	
<i>Dahi (ml)</i>	Mean ± SD	32.3 ± 34.7	32.2 ± 36.6	47.5 ± 45.9	19.2 ± 19.2	34.1 ± 37.7	5.72**
	N	50	42	67	48	207	
<i>Mohi (ml)</i>	Mean ± SD	36.0 ± 35.2	64.4 ± 58.1	96.2 ± 96.8	92.2 ± 45.5	74.2 ± 72.4	6.13**
	N	34	36	52	28	150	
<i>Gheu</i>	Mean ± SD	10.7 ± 12.9	4.7 ± 5.1	11.7 ± 23.4	1.9 ± 2.0	7.9 ± 15.4	4.72**
	N	52	40	62	42	196	
<i>Chhurpi (soft)</i>	Mean ± SD	8.5 ± 8.0	6.9 ± 12.1	2.7 ± 6.4	1.0 ± 1.9	4.5 ± 8.2	7.00**
	N	32	29	43	35	139	
<i>Chhu</i>	Mean ± SD	5.3 ± 6.6	20.9 ± 20.4	1.3 ± 1.6	4.8 ± 5.0	5.6 ± 9.1	7.85**
	N	35	5	14	4	58	
<i>Chhurpi (hard)</i>	Mean ± SD	0.7 ± 2.5	0.04 ± 0.1	0.02 ± 0.03	0.01 ± 0.01	0.3 ± 1.7	1.53
	N	43	20	25	7	95	

Contd.

Fermented Foods	Des. Statistics	Per capita consumption (g/day)					F-Values
		District				State	
		North	South	East	West		
<i>Dudh Chhurpi</i>	Mean ± SD	0	0.01 ± 0.02	0.02 ± 0.1	0	0.01 ± 0.04	1.20
	N	14	5	15	0	34	
<i>Somar</i>	Mean ± SD	0	0.1 ± 0	4.2 ± 5.8	0	2.8 ± 4.8	0.33
	N	0	1	2	0	3	
<i>Philu</i>	Mean ± SD	1.0 ± 1.0	0.7 ± 0.7	0.3 ± 0.04	0.6 ± 0.3	1.0 ± 0.9	0.55
	N	20	5	2	2	29	
<i>Sukako masu</i>	Mean ± SD	20.6 ± 21.3	11.2 ± 15.4	18.1 ± 15.9	8.5 ± 10.2	16.3 ± 17.9	3.35*
	N	52	17	32	24	125	
<i>Selroti</i>	Mean ± SD	0.6 ± 0	5.0 ± 6.3	10.8 ± 19.2	7.3 ± 3.8	8.0 ± 12.8	1.81
	N	1	36	54	46	137	
<i>Kodo ko jaanr</i>	Mean ± SD	113.9 ± 105.2	204.3 ± 231.9	71.4 ± 72.8	58.3 ± 93.4	101.7 ± 126.9	6.79**
	N	54	18	37	32	141	
<i>Makai ko jaanr</i>	Mean ± SD	19.7 ± 14.3	136.6 ± 235.1	15.3 ± 21.5	36.0 ± 90.8	37.8 ± 99.6	3.00*
	N	13	7	18	29	67	
<i>Bhaati jaanr</i>	Mean ± SD	9.2 ± 4.3	5.6 ± 0	23.9 ± 28.2	2.7 ± 2.2	10.4 ± 12.8	4.41**
	N	29	1	7	7	44	
<i>Gahoon ko jaanr</i>	Mean ± SD	17.7 ± 23.0	72.4 ± 84.7	25.4 ± 37.9	15.9 ± 21.6	26.4 ± 39.7	1.72
	N	11	3	11	3	28	
<i>Simal tarul ko jaanr</i>	Mean ± SD	16.8 ± 10.4	0	0	3.8 ± 0.7	13.4 ± 10.6	5.99**
	N	11	0	0	4	15	
<i>Raksi (ml)</i>	Mean ± SD	5.9 ± 3.9	246.3 ± 619.9	26.7 ± 39.2	7.3 ± 7.9	57.7 ± 274.7	2.07
	N	22	10	16	5	53	

*Values differ significantly ($P < 0.05$).

** Values differ significantly ($P < 0.01$).

Table 13: Proportion of fermented food consumption to total food consumption (kg) per week by district

Parameters	Districts				Combined
	North	South	East	West	
Number of households	54	42	70	48	214
Total non-fermented foods consumption (kg/week)	2756.6	1685.8	3301.8	2406.5	10150.7
Percentage (%)	88.3	87.9	93	88.9	89.9
Total fermented food consumption (kg/week)	365.1	231.1	249.8	300.8	1146.8
Percentage (%)	11.7	12.1	7	11.1	10.2
Total foods consumption (kg/week)	3121.7	1916.9	3551.6	2707.3	11297.5
Percentage (%)	100	100	100	100	100

Table 14: Proportion of fermented food consumption to total food consumption (kg) per week by ethnic group

Parameters	Ethnic Groups			
	Nepali	Bhutia	Lepcha	Total
Number of households	123	47	44	214
Total non-fermented food consumption (kg/week)	5776.5	2153.2	2221	10150
Percentage (%)	91.6	83.3	92.2	89.8
Total fermented food consumption (kg/week)	528.1	430.1	188.6	1146.8
Percentage (%)	8.4	16.6	7.8	10.2
Total food consumption (kg/week)	6304.6	2583.3	2409.6	11297.5
Percentage (%)	100	100	100	100

Table 15: Proportion of fermented food consumption to total food consumption (kg) per week by district (excluding the households, which did not consume fermented foods)

Parameters	Districts				Total
	North	South	East	West	
Number of households	31	36	65	35	167
Total non-fermented foods consumption (kg/week)	1592.8	1421	3064.4	1888.7	7966.9
Percentage (%)	81.3	86	92.5	86.3	87.4
Total fermented food consumption (kg/week)	365.1	231.1	249.8	300.8	1146.8
Percentage (%)	18.6	13.9	7.5	13.7	12.6
Total foods consumption (kg/week)	1957.9	1652.1	3314.2	2189.5	9113.7
Percentage (%)	100	100	100	100	100

Table 16: Proportion of fermented food consumption to total food consumption (kg) per week by district (excluding the households, which did not consume fermented foods and beverages)

Parameters	Ethnic groups			
	Nepali	Bhutia	Lepcha	Total
Number of households	101	47	19	167
Total non-fermented foods consumption (kg/week)	4843.8	2153.2	969.9	7966.9
Percentage (%)	90.2	83.3	83.7	87.4
Total fermented food consumption (kg/week)	528.1	430.1	188.6	1146.8
Percentage (%)	9.8	16.6	16.3	12.6
Total foods consumption (kg/week)	5371.9	2583.3	1158.5	9113.7
Percentage (%)	100	100	100	100

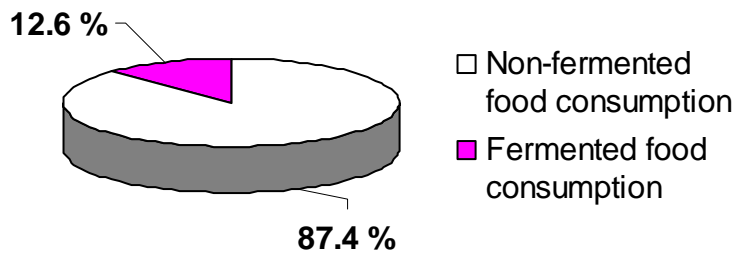


Fig 1. Proportion of fermented food consumption to total food consumption (per capita/week) (excluding the households which did not consume fermented foods)

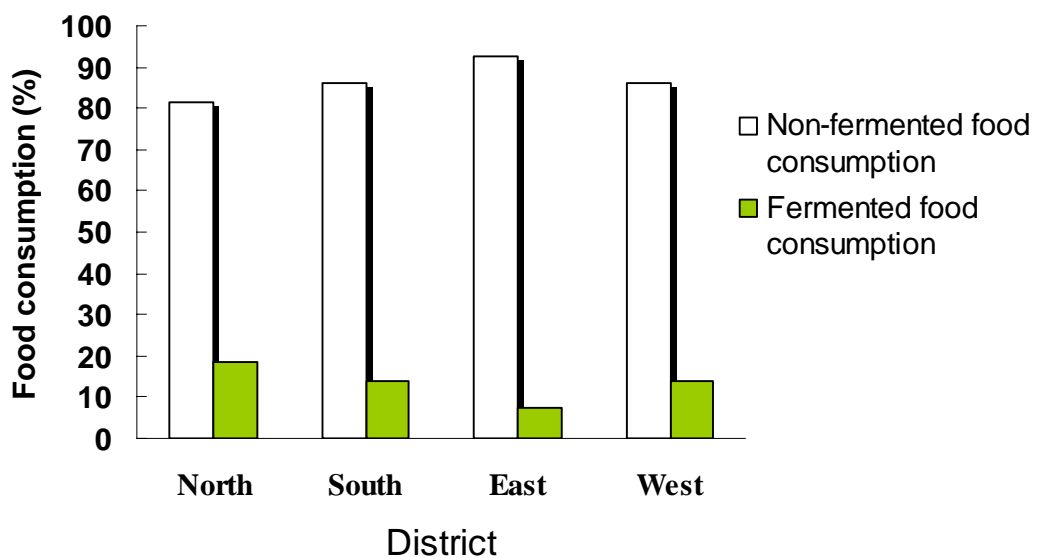


Fig 2. Proportion of fermented food consumption to total food consumption (kg) per week by district (excluding the households which did not consume fermented foods)

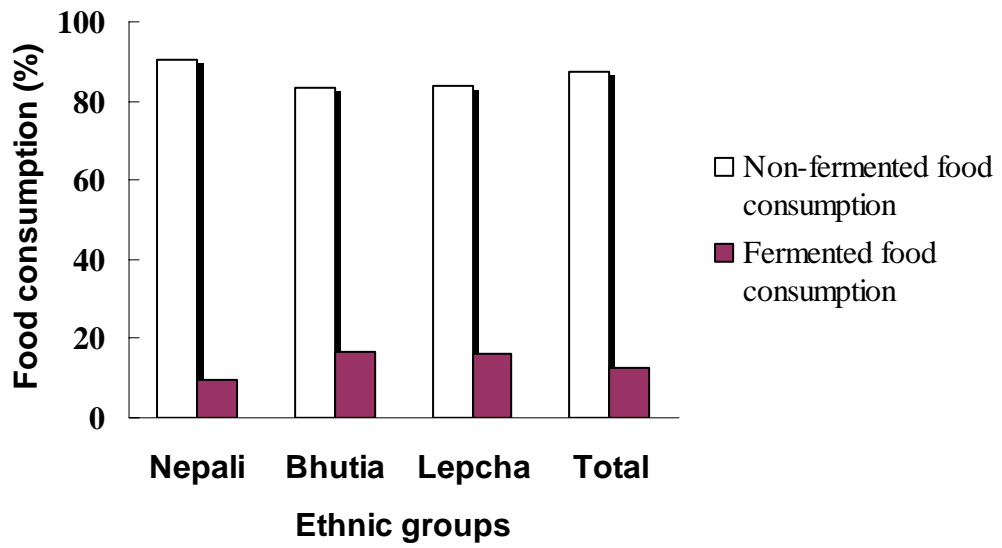


Fig 3. Proportion of fermented food consumption to total food consumption (kg) per week by ethnic group (*excluding the households which did not consume fermented foods*)

References

- Balaraman, N. and Golay, M.M. (1991). *Livestock Production in Sikkim*. Sikkim Science Society, Gangtok.
- Census of India (2001). Series-12: *Sikkim. Provisional Population Totals*.
- Dewan, S. and Tamang, J.P. (2006). Microbial and analytical characterization of Chhu, a traditional fermented milk product of the Sikkim Himalayas. *Journal of Scientific and Industrial Research* **65**: 747-752.
- Dewan, S. and Tamang, J.P. (2007). Dominant lactic acid bacteria and their technological properties isolated from the Himalayan ethnic fermented milk products. *Antonie van Leeuwenhoek International Journal of General and Molecular Microbiology* (in press).
- Hansen, E.B. (2002). Commercial bacterial starter cultures for fermented foods of the future. *International Journal of Food Microbiology* **78**: 119-131.
- Kozaki, M., Tamang, J.P., Kataoka, J., Yamanaka, S. and Yoshida, S. (2000). Cereal wine (*jaanr*) and distilled wine (*raksi*) in Sikkim. *Journal of Brewing Society of Japan* **95** (2): 115-122.
- Subba, J.R. (2002). Biodiversity of the Sikkim Himalayas. Sukhim Yakthung Mundhum Saplopa, Gangtok, pp. 187.
- Tamang, J.P. (2001). Kinema. *Food Culture* **3**: 11-14.
- Tamang, J.P. (2005). *Food Culture of Sikkim*. Sikkim Study Series volume IV. Information and Public Relations Department, Government of Sikkim, Gangtok, pp. 120.
- Tamang, J.P. and Holzapfel, W.H. (1999). Biochemical identification techniques-modern techniques: Microfloras of fermented foods. In: *Encyclopedia of Food Microbiology* (Eds: Robinson, R.K., Batt, C.A. and Patel, P.D.), Academic Press: London. P. 249-252.

- Tamang, J.P. and Sarkar, P.K. (1993). Sinki - a traditional lactic acid fermented radish tap root product. *Journal of General and Applied Microbiology* **39**: 395-408.
- Tamang, J.P. and Sarkar, P.K. (1996). Microbiology of mesu, a traditional fermented bamboo shoot product. *International Journal of Food Microbiology* **29**: 49-58.
- Tamang, J.P. and Thapa, S. (2006). Fermentation dynamics during production of bhaati jaanr, a traditional fermented rice beverage of the Eastern Himalayas. *Food Biotechnology* **20 (3)**: 251-261.
- Tamang, J.P., Thapa, S., Tamang, N. and Rai, B. (1996). Indigenous fermented food beverages of Darjeeling hills and Sikkim: process and product characterization. *Journal of Hill Research* **9 (2)**: 401-411.
- Tamang, J.P., Dewan, S., Thapa, S., Olasupo, N. A., Schillinger, U. and Holzapfel, W. H. (2000). Identification and enzymatic profiles of predominant lactic acid bacteria isolated from soft-variety *chhurpi*, a traditional cheese typical of the Sikkim Himalayas. *Food Biotechnology* **14 (1&2)**: 99-112.
- Tamang, J.P., Tamang, B., Schillinger, U., Franz, C.M.A.P., Gores, M. and Holzapfel, W.H. (2005). Identification of predominant lactic acid bacteria isolated from traditional fermented vegetable products of the Eastern Himalayas. *International Journal of Food Microbiology* **105 (3)**: 347-356.
- Thapa, N., Pal, J. and Tamang, J.P. (2006). Phenotypic identification and technological properties of lactic acid bacteria isolated from traditionally processed fish products of the Eastern Himalayas. *International Journal of Food Microbiology* **107 (1)**: 33-38.
- Thapa, S. and Tamang, J.P. (2004). Product characterization of kodo ko jaanr: fermented finger millet beverage of the Himalayas. *Food Microbiology* **21**: 617-622.

- Thapa, S. and Tamang, J.P. (2006). Microbiological and physico-chemical changes during fermentation of kodo ko jaanr, a traditional alcoholic beverage of the Darjeeling hills and Sikkim. *Indian Journal of Microbiology* **46 (4)**: 333-341.
- Tee, E-S., Dop, M.C. and Winichagoon, P. (2004). Proceedings of the workshop on food-consumption surveys in developing countries: future challenges. *Food and Nutrition Bulletin* **25 (4)**: 407-414.
- Tsuyoshi, N., Fudou, R., Yamanaka, S., Kozaki, M., Tamang, N., Thapa, S. and Tamang, J.P. (2005). Identification of yeast strains isolated from marcha in Sikkim, a microbial starter for amylolytic fermentation. *International Journal of Food Microbiology* **99 (2)**: 135-146.
- Yonzan, H. and Tamang, J.P. (1998). Consumption pattern of traditional fermented foods in the Sikkim Himalaya. *Journal of Hill Research* **11(1)**: 112-115.