

**access to food**

Background: Increasing vegetable farming in polythene greenhouses in the Lhasa area - Sichuan farmers take land on hire from Tibetan farmers and grow vegetables  
- *Tej Partap*

Top Inset: Vegetable market in Lhasa - vegetables grown in Lhasa available in the market  
- *Tej Partap*

Bottom inset: Harvesting barley (crop dominated system)  
- *Nyima Tashi*



*Seabuckthorn, girl and harvested Radish (Nima County) - Nyima Tashi*

## Chapter 3

# Access to Food

The main goals of agricultural development in Tibet are to ensure production of adequate food supplies, to improve accessibility to available food supplies, and to maximise stability in the flow of food supplies. The issues include greater demand for food driven by increases in population and income growth, resource scarcity determined by harsh natural conditions and limited utilisation capacity; inadequate distribution of food resulting from inappropriate management of food sources, and low institutional capability for making suitable food policies. This chapter analyses the achievements and problems in ensuring that everyone has access to food.

Some simplified indicators were used to measure access to food in Tibet and to show whether everyone has access to food.

Energy equivalent (kcal) and protein equivalent (g) are commonly used for measuring food availability and consumption (FAO 1996; Lu Liangsu 1991). Both energy and

protein equivalents measure the amount of food in equal units so that they are easy to compare. Per capita energy and protein availability and intake are important indicators of the levels of food availability and consumption. To calculate this, one must convert nutritional value to calorie, protein, and fat equivalents using standard nutritional values of food. In Tibet, cereals, oilseed, vegetables, meat, milk, eggs, sugar, and alcohol are the main food products, and statistics are available for supply and consumption. Calorie, protein, fat, and carbohydrate equivalents of these foods were calculated (Table 3.1).

However, the minimum energy required by the human body differs among individuals. Therefore, the ratio between the per capita energy supply and minimum required energy<sup>11</sup> is important for measuring the critical level of access to food. However, this does not reveal at which level the food supply is secure. Calculation of the size and percentage of the population whose average

Table 3.1: Main foods and their calorie, protein, fat, and carbohydrate equivalents

Food	Grain	Vegetables	Oil	Meat	Milk	Eggs	Sugar	Alcohol
Energy (kcal kg <sup>-1</sup> )	3,570	380	8,840	1,650	660	1,580	3,850	430
Protein (g kg <sup>-1</sup> )	94	16	0	187	33	128	0	5
Fat (g kg <sup>-1</sup> )	20	1,033	1,000	94	37	113	0	0
Carbohydrate (g kg <sup>-1</sup> )	754	85	0	0	47	12	995	35

Note: This conversion was based on, standard nutritional value of crops analysed by the Bureau of Agriculture of Tibet Autonomous Region (1990) and national standard nutritional values of meat, milk, eggs and alcohol.

energy intake falls below the minimum required was used to measure chronic food insecurity in a region. A more intuitive indicator to measure food adequacy (FA) was used, as defined in the following formula (FAO 1996), to calculate the level of food inadequacy.

$$FA = [(PUNNUR(CAVREQ - CAVUNNUR)) / PTOTAL * CAVAVAIL] * 100$$

(where PUNNUR is the number of under-nourished individuals; PTOTAL is the total population; CAVREQ is the average calorie requirement norm; CAVUNNUR is the average availability of calories for the under-nourished in the population; and CAVAVAIL is the average calorie availability).

Using these indicators, the status of access to food was analysed based on food supply and its stability, food consumption, and the balance between food supply and consumption.

### Food Production and Supply

The total food supply depends on food production, food trade, and food stocks. Food trade in Tibet is not as important as other trade and does not fluctuate greatly from year to year. Food stocks depend on food production and food grain procurement policy. For the majority of the population, locally produced food is crucial for ensuring food security. Food production is affected by

changes in biophysical conditions, inputs, and agricultural structure. The quantity and stability of local food production is therefore important for food accessibility and reflects the overall food supply situation.

### Per capita food production and supply

Per capita food production has increased rapidly since 1978. This is attributed to the introduction of the household responsibility system of agricultural development in 1980. Production of cereals, oilseed, meat, and milk has significantly increased during the last 20 years. Per capita food grain production increased to 326 kg in 1997 from 266 kg in 1978-80. Figures for oilseed, meat, and milk also increased (Table 3.2). Strong emphasis on crop production since 1988 has also increased production of cereals and oilseed, improving food grain availability.

The stability of per capita food production can be measured by a fluctuation index. The fluctuation index<sup>11</sup> of production of food from 1978 to 1995 shows that stability of per capita food production, particularly cereals and meat, has improved since 1988. However, instability (negative fluctuation index) remains; milk production has fluctuated year by year. Figure 3.1 shows the overall trends of the fluctuation index of main food items.

One obvious characteristic of food production and supply is the low per capita food production and food trading in rural areas.

Table 3.2: Per capita food production

Food	1978-80	1981-85	1986-90	1991-95	1995	1997
Grain (kg person <sup>-1</sup> )	266.1	242.8	246.6	294.3	305.5	326.6
Rape seed (kg person <sup>-1</sup> )	4.9	6.3	6.8	11	14.3	13.8
Meat (kg person <sup>-1</sup> )	26.9	32.9	40.6	44.5	48	51.6
Beef (kg person <sup>-1</sup> )	11.6	15	20	23	26	29.3
Lamb and mutton (kg person <sup>-1</sup> )	14.1	16.7	18.9	19.6	19.2	22.3
Milk (kg person <sup>-1</sup> )	53	61.2	74.9	75.5	74.8	76.6

<sup>11</sup> the fluctuation index was calculated as:  $FSt = (P_t - Ap_t) / Ap_t$ , where

$P_t$  = actual value of a year

$Ap_t$  = average value in every five years, indicates the long-term changing trends

$P_t - Ap_t$  = value of fluctuation after deducting the average value

FSt = the fluctuation index. The higher the absolute value of FSt, the less stability or more fluctuation

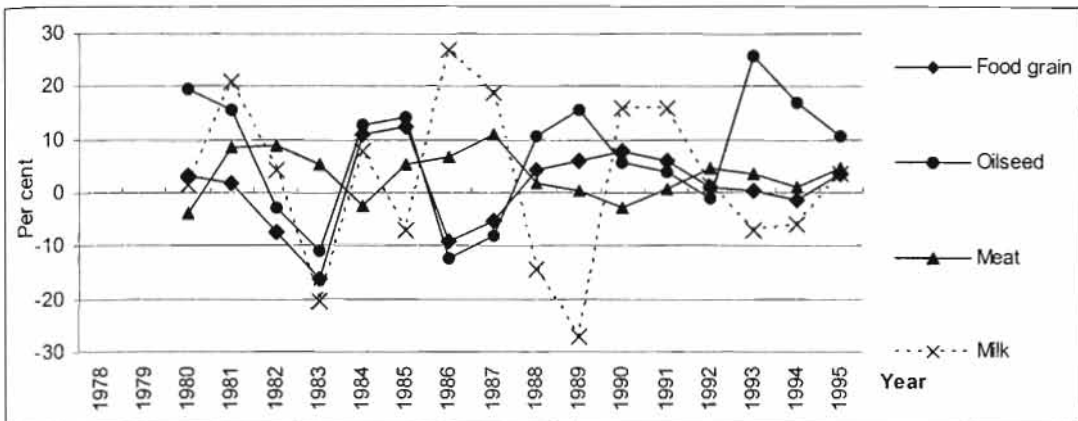


Figure 3.1: Fluctuation index per capita of main food items

This shows that an effective supply of food has not been achieved. The data for the last few years show that per capita food production by the rural population has decreased from 510.97 kg in 1991 to 492.82 kg in 1997. Except for pork and eggs, production of all other food items has declined (Table 3.3). The decline of per capita food production was mainly induced by rapid population growth. The proportion of food sold or traded by farmers over total production was at a low of about 1% but tending to increase. At present, assuming that per capita consumption of cereals is about 270 kg, on the basis of 10% food grain trading of 492.28 kg per capita production, then, 5-6 rural people can support one non-agricultural person.

#### Total food production and supply

During the 1980s, production of cereals stagnated at around 0.5 million tonnes. By 1997, total food grain production had

reached nearly 0.8 million tonnes. Oilseed production has grown steadily and is currently about 33,700 tonnes. Increases in both food grain and oilseed production in the past two decades have been driven by better yields rather than expansion of cultivated land. The yield of cereals has increased by 1.65 tonnes ha<sup>-1</sup> from the late 1970s to 1997 and oilseed yield has doubled. This has been due to the adoption of new, high-yielding crop varieties. However, the amount of food grain imported from China (mainly rice and wheat) has increased to 70,300 tonnes/yr<sup>1</sup> in 1997, up from 25,600 tonnes yr<sup>1</sup> in the late 1970s (Table 3.4). Population growth was the driving force for this but another important factor was that more people are consuming wheat and rice rather than barley.

Meat and milk production have nearly doubled over the last two decades, to 121,500t and 186,000t, respectively, in 1997

Table 3.3: Per capita production and trading of major food items in rural areas

Year	1991		1993		1995		1997	
	Produced	Sold	Produced	Sold	Produced	Sold	Produced	Sold
Food production and food trading								
Food grain (kg person <sup>-1</sup> )	511	80.4	529.1	42.9	528.9	56.5	492.8	51.5
Rape seed (kg person <sup>-1</sup> )	16.9	5.2	18.5	4.2	20.9	4.3	17	3.5
Vegetables (kg person <sup>-1</sup> )	75	8	47.5	4.8	61.7	4.3	59	9.3
Fruit (kg person <sup>-1</sup> )	5.4	2.9	6.6	1.5	4.4	0.7	5.9	0.9
Pork (kg household <sup>-1</sup> )	21.7	1.2	29.6	2.6	21.8	0.3	23.3	5.8
Meat (kg person <sup>-1</sup> )	61.2	8.3	81.4	2.4	52.8	1	61.2	15.8
Milk (kg person <sup>-1</sup> )	354.9	1.9	417.9	4.9	318.3	3.1	329.1	3.4
Eggs (kg person <sup>-1</sup> )	4.5	0.6	10.4	1.1	10.7	0.6	12.1	1.2

Table 3.4: Total availability of major foods

	1978-1980	1981-1985	1986-1990	1991-1995	1995	1997
Food grain production ('000 t yr <sup>-1</sup> )	480.6	465.1	517.7	671.5	719.6	791.9
Grain yield (t ha <sup>-1</sup> )	2.4	2.4	2.7	3.5	3.8	4.02
Rape seed production ('000 t yr <sup>-1</sup> )	8.9	12	14.3	25.1	33.7	33.7
Rape seed yield (t ha <sup>-1</sup> )	0.8	1.1	1.4	1.8	1.8	1.9
Meat production ('000 t yr <sup>-1</sup> )	48.6	63.1	85.4	101.4	112.1	121.5
Milk production ('000 t yr <sup>-1</sup> )	95.7	116.9	167.4	173.3	176.1	186.0
Imported grain ('000 t yr <sup>-1</sup> )	25.6	30.6	74.1	58.1	70.3	70.3

from 48,600t and 95,700t, respectively, in the late 1970s. This is a significant increase, but has been made at the cost of acceleration of overgrazing and rangeland degradation.

With population growth, greater demand for meat and milk means that consumption is now ahead of production. For instance, total butter production is about 1,200t but average per capita butter consumption has reached 3.25 kg and total demand is 8,000t, creating a 6,800t deficit.

Food production is distributed unequally among prefectures. Almost 90% of cereals, oilseed, and vegetables are produced in central Tibet in Lhasa, Shigatse, and Shannan prefectures, whereas northern Tibet, including Naqu and Ali prefectures, produces less of these foods but relatively more meat and milk (Table 3.5). The large area of Tibet and long distances mean that unequally distributed food production creates

pressures on redistribution. Thus, achieving an effective supply of food in Tibet is more challenging than merely producing more food.

Fluctuation of total production of various foods has stabilised remarkably since 1988, whereas during the 1980s there were great fluctuations from year to year (Figure 3.2). Comparing the pattern of fluctuation of food production with agricultural policies adopted between the 1980s and 1990s, the greater stability can be attributed to the emphasis on inputs, technology, and infrastructure development.

#### *Per capita calorie and protein supply*

Converting the food produced in Tibet into calorie and protein equivalents, the maximum production of per capita calories and protein in 1997 was 3,936 kcal day<sup>-1</sup> and 113g day<sup>-1</sup>, respectively (Table 3.6). These

Table 3.5: Total supply of major food items (1997)

Prefecture	Crop-based food			Livestock-based food			Total population ('000 persons)
	Food grain ('000 t)	Rape seed (t)	Vegetables (t)	Meat ('000 t)	Milk ('000 t)	Eggs (t)	
Lhasa	153	9,668	43,148	12.1	14.7	343	39.3
Changdu	121.5	747	6,836	35.2	43.3	16	54.5
Shannan	140	5,067	20,552	13.2	33.1	834	31.1
Shigatse	295	16,090	39,836	21.1	4.3	428	61.8
Naqu	4	8	1,897	29.1	28.8		34.5
Ali	4.7	31	75	5.1	6.1		7.2
Linshi	70.6	2,045	7,174	4.2	16.6	427	14.4
Other	3	26	21,959	1.4			
Tibet	791.9	33.7	141,478	121.5	186	1,418	2,408

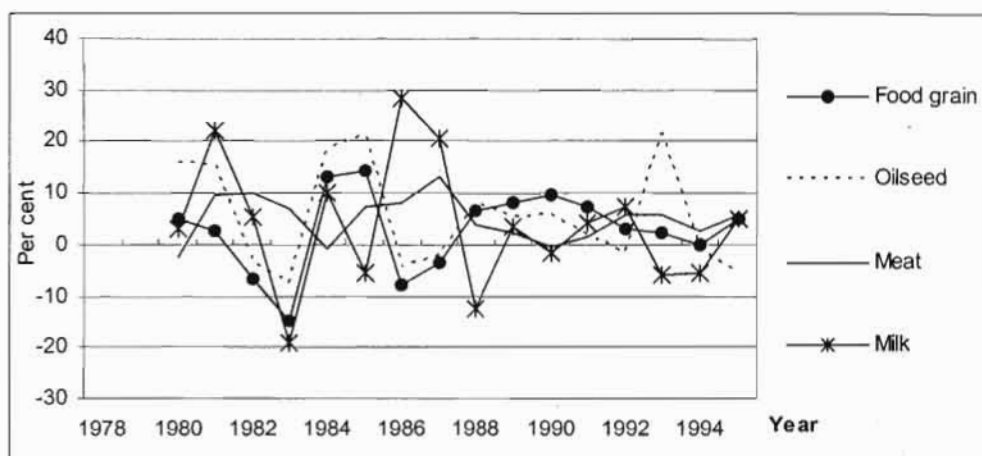


Figure 3.2: Fluctuation index of supply of main food items

Table 3.6: Per capita calorie and protein available

	1978-80	1981-85	1986-90	1991-95	1995	1997
Total energy (kcal person <sup>-1</sup> day <sup>-1</sup> )	2,938.9	2,786.3	2,895.7	3,482.7	3,686.3	3,936.3
Total protein (g person <sup>-1</sup> day <sup>-1</sup> )	87.1	84.9	91.1	105.42	110.	113.7

are considerable increases from 2938 kcal day<sup>-1</sup> and 87g day<sup>-1</sup> in 1978-1980. However, 20% of food grain is estimated to be used as seed, animal feed, or lost during storage and distribution, and 10% of meat, milk, vegetables, and other food items are lost during redistribution, storage, and processing. After deducting these losses from total production, the actual availability of calories and protein were estimated as 2796 kcal day<sup>-1</sup> and 97g day<sup>-1</sup>. These amounts of calories and protein are slightly higher than basic requirements for people in the plains of China (2,400 kcal day<sup>-1</sup> calories and 70g day<sup>-1</sup> protein; Lu Liangsu 1993). Considering that more energy and protein are required for people living at higher altitudes (FAO 1990), the amounts of calories and protein produced in Tibet at present are only just meeting basic requirements.

Calorie and protein production are not only low, but also exhibited great geographic variation. In 1995, 4615 kcal day<sup>-1</sup> of calories were available in Shigatse Prefecture, while

only 630 kcal day<sup>-1</sup> were produced in Ali Prefecture. The availability of protein in Linzhi Prefecture was about 137g day<sup>-1</sup>, twice as much as in Naqu and Ali Prefectures (Table 3.7). These two prefectures are in pastoral zones that can produce more animal products such as meat and milk per capita. Per capita protein produced from meat and milk is much higher than other prefectures but still limited in quantity. Lhasa, Shigatse, Shannan, and Linzhi prefectures produce large quantities of food grain and other food products per capita. Prefectures such as Ali and Naqu need to import large amounts of cereals to meet basic requirements for energy. When there is difficulty in importing cereals, then food grain inadequacy and even food insecurity occur. Undernourishment of some of the population may be unavoidable, and some areas are particularly vulnerable to disturbances in food grain distribution. Large quantities of cereals from Qinghai and central Tibet are imported each year to Naqu Prefecture; similarly, the Xingjiang Autonomous Region and Shigatse Prefecture supply

Table 3.7: Per capita supply of the major food items and expressed as energy and protein in each prefecture

	Lhasa	Changdu	Shannan	Shigatse	Naqu	Ali	Linzi	Tibet
kg person <sup>-1</sup>	314.5	150.5	374.4	423.3	3.7	62.1	410.9	268.2
Calories person <sup>-1</sup> day <sup>-1</sup>	3075.9	1471.8	3,661.7	4140.5	36.6	607.5	4018.6	2,623
Protein (g person <sup>-1</sup> day <sup>-1</sup> )	81	38.7	96.4	109	1	16	105.8	70
kg person <sup>-1</sup>	8.2	0.3	5.3	9.1	0	0.1	5.03	4.7
Calories person <sup>-1</sup> day <sup>-1</sup>	199.8	7.6	128.6	220.4	0.3	1.9	121.9	114.3
kg person <sup>-1</sup>	60.6	13.	73.3	1	0	1.3	72.3	28.9
Calories person <sup>-1</sup> day <sup>-1</sup>	63.1	13.6	76.3	1	0	1.3	75.2	28.
Protein (g person <sup>-1</sup> day <sup>-1</sup> )	2.6	0.6	3.1	0	0	0	3.1	1.2
kg person <sup>-1</sup>	26.9	56.3	43.6	28.8	93.85	81.7	34.2	47.6
Calories person <sup>-1</sup> day <sup>-1</sup>	121.5	254.7	197.1	130.4	424.27	369.6	154.5	215.1
Protein (g person <sup>-1</sup> day <sup>-1</sup> )	13.8	28.9	22.3	14.8	48.08	41.9	17.5	24.4
kg person <sup>-1</sup>	34.4	73.9	99.7	66.5	93.85	89	117.5	74.7
Calories person <sup>-1</sup> day <sup>-1</sup>	62.3	133.6	180.3	120.3	169.71	161.02	212.5	135.2
Protein (g person <sup>-1</sup> day <sup>-1</sup> )	3.1	6.7	9.	6	8.5	8	10.6	6.8
kg person <sup>-1</sup>	0.4	0.	1.9	0.7	0	0	1.9	0.6
Calories person <sup>-1</sup> day <sup>-1</sup>	1.7	0.1	8.3	2.9	0	0	8.1	2.6
Protein (g person <sup>-1</sup> day <sup>-1</sup> )	0.1	0.	0.7	0.2	0	0	0.7	0.2
Calories person <sup>-1</sup> day <sup>-1</sup>	3,524.4	1,881.4	4,252.3	4,615.6	630.9	1,141.3	4,591	3,118.3
Protein (g person <sup>-1</sup> day <sup>-1</sup> )	100.6	74.9	131.6	130.1	57.5	66	137.7	101.6



food to Ali Prefecture under government subsidies so that nomads can meet their basic energy requirements<sup>[2]</sup>.

In general, there has been a remarkable increase of calories and protein production over the last 30 years. It is now important to put efforts into adequate redistribution of food, particularly from areas of surplus to areas with deficiencies. Trends of the increase of calories and protein are similar to the food grain curve compared to other food items. Co-efficiencies of correlation between per capita food production and energy and protein show significant correlation between food grain and both calories and protein, with correlation coefficients of 0.97 and 0.91, respectively (Table 3.8). Nearly 86% of energy and 56% of protein were provided by cereals in 1995.

The fluctuation index of availability of calories and protein was calculated using the same method as their stability from year to year. The general pattern of the fluctuation index was the same as total food production (Figure 3.3). In general, about half of the increase in agricultural output during 1978-84 can be attributed to the improvement of incentives arising from changes of farming institutions from the collective system to the household responsibility system (FAO 1996). Since 1987, the overall situation of food production has stabilised. Food production in Tibet is generally affected by biophysical conditions, especially climatic conditions. It is still not possible to alleviate the loss of food production to natural disasters such as snowstorms and drought.

Constant and stable increases in food production may not be attained unless there is continuing prioritisation of production from both livestock-based food and cereals. With rapid population growth and a decrease of per capita land-resource availability as well as increasing demand for food, food production needs to be stable and increasing.

Table 3.8: Correlation between per capita food production, calories and protein

	Grain	Rape seed	Meat	Milk	Calories	Protein
Grain	1					
Rape seed	0.64	1				
Meat	0.33	0.77	1			
Milk	0.16	0.30	0.58	1		
Calories	0.97	0.79	0.53	0.30	1	
Protein	0.91	0.63	0.67	0.44	0.98	1

Note: Calculation of the co-efficiency of correlation was based on data of per capita food grain, oilseed, meat, milk and vegetable production over 20 years.

### Food Consumption

Food consumption and demand have increased with the growth of population and the increase in food consumption attributed to increased per capita income. Per capita food consumption is determined by age, sex, occupation, income, and health condition. It is also affected by the structure of food consumption, which depends on nationality, social status, age, food habits, and environmental conditions. Unavailability and imprecision of data on food consumption do not allow elaboration of these aspects. However, dividing the population into three groups — urban, rural, and poor — allows the examination of status of food consumption and implications for food security.

Calculation of calories and protein were based on eight main food items (cereals,

<sup>[2]</sup> Personal communication with people from these prefectures. No exact data were available, but 3-4 million tonnes of food grain are deficient in Ali Prefecture. Out of that, 2 million tonnes are provided by Xingjiang Autonomous Region and 1-2 million tonnes by Shigatse Prefecture. Naqu has a much greater deficit of cereals and much more is provided from Qinghai Province.

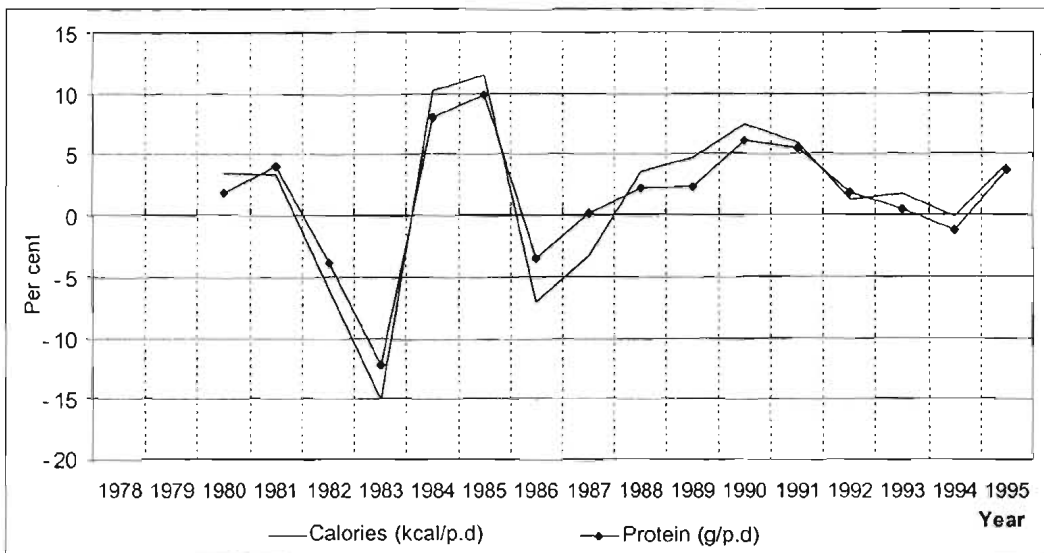


Figure 3.3: Fluctuation index of major food items expressed in calories and protein

oilseed, meat, milk, vegetables, eggs, sugar, and wine).

#### *Food access and consumption in urban areas of Tibet*

The total population of urban areas in 1995 was about 420,000, of which around 47% derived a certain portion of their livelihood from agriculture. The total expenditure of this population in 1995 was 3,912 yuan person<sup>-1</sup> yr<sup>-1</sup>, and 2,254 yuan person<sup>-1</sup> yr<sup>-1</sup> was spent on food. This is 57%, a considerable amount. This is probably because many foods such as fine wheat flour, poultry, and vegetables, which are the main food items for urban dwellers, are imported from other parts of China and some from Nepal. The market price of this food is high because of transportation costs. The urban population spends

more than half of its livelihood expenditure on food, although actual food consumption is not high. Total consumption of food grain is about 143.7 kg person<sup>-1</sup>, and meat and milk consumption are 25.1 kg person<sup>-1</sup> and 102.3 kg person<sup>-1</sup>, respectively (Table 3.9). The total amount of per capita calorie and protein intake is 2104 kcal day<sup>-1</sup> and 66g day<sup>-1</sup>, respectively. Comparing this with the basic requirement of calories and protein for people in central China (2,400 kcal day<sup>-1</sup> and 70g day<sup>-1</sup>; Lu Liangsu 1993), it is inadequate.

Almost all the urban population lives between 2,600 and 4,700m. In 1990, the FAO examined the energy requirement of the body at different elevations, for different exercises, and for different age groups. It

Table 3.9: Food consumption in urban areas (1995)

	Food grain	Vegetables	Oil	Meat	Milk	Eggs	Sugar	Wine	Total
Urban (1995)	143.7	94.1	8.6	25.1	102.3	8.5	3.8	14.6	
Calorie (kcal day <sup>-1</sup> )	1,405.5	98	208.3	113.5	185	36.8	40	17.2	2,104.3
Protein (g day <sup>-1</sup> )	37	4	0	12.7	9.2	3	0	0.2	66.3
Fat (g day <sup>-1</sup> )	7.8	0.3	23.6	6.5	10.4	2.6	0	0	51.2
Carbohydrate (g day <sup>-1</sup> )	296.8	21.9	0	0	13.1	0.3	10.4	1.4	343.9

found that the higher the elevation, the more calories the human body requires (FAO 1990). Assuming that the estimate of the basic requirement of energy and protein (2,400 kcal day<sup>-1</sup> and 70g day<sup>-1</sup>) for people in central China is acceptable, then the basic requirement of calories and protein for people in Tibet should be at least 2,500 kcal day<sup>-1</sup> and 80g day<sup>-1</sup>. Based on this assumption, the urban population's ratio of calorie intake to basic requirement is about 84%, which is close to critical.

### *Food access and consumption in rural Tibet*

The majority of the population is rural, 86% of 2.4 million people. In 1995, the total expenditure of farmers was about 896.6 yuan person<sup>-1</sup> yr<sup>-1</sup>, of which 667 yuan person<sup>-1</sup> yr<sup>-1</sup> was spent on food, about 74%. In 1997, the total expenditure decreased to 830.68 yuan person<sup>-1</sup> yr<sup>-1</sup> and expenditure on food to 533.25 yuan person<sup>-1</sup> yr<sup>-1</sup>. The proportion of expenditure devoted to food was reduced to 64%. Rural farmers consumed about 2941 kcal person<sup>-1</sup> day<sup>-1</sup> of calories and 78.26g person<sup>-1</sup> day<sup>-1</sup> of protein in 1995, which was derived from 264 kg person<sup>-1</sup> of food grain, 12.17 kg person<sup>-1</sup> of meat, and 14.04 kg person<sup>-1</sup> of milk (Table 3.10). Comparing the structure of food consumption of rural farmers and urban

the urban population as a result of taking much less milk, meat, and eggs in their diet.

### *Food access and consumption in poor areas of Tibet*

The total number of officially registered poor was about 480,000 in 1995. They were distributed in 18 counties, of which five were national-level poverty counties. Most of the poor live in areas with a frigid climate, rugged topography, poor natural resources, poor technical options, frequent natural disasters, and backward infrastructure. By 1997, 270,000 people were lifted above the poverty threshold in nine counties. The livelihood and food security of this population are limited by the relatively poor endowment of natural resources, level of agricultural productivity, and the condition of socioeconomic infrastructure as well as the availability of technical and physical capital. For example, in Dingri County in 1998, expenditure on livelihood was around 330 yuan person<sup>-1</sup> and in Sajia County, in 1997, it was 266 yuan person<sup>-1</sup>. In both counties, over 89% of income was spent on food consumption. On average in Tibet, the total per capita consumption of cereals, meat, and milk in one year was 176 kg, 8 kg and 12 kg, respectively. In 1995, total per capita calorie and protein intake were 1956 kcal day<sup>-1</sup> and 52g day<sup>-1</sup>, respectively (Table

Table 3.10: Food consumption in rural areas (1995)

	Food grain	Vegetables	Oil	Meat	Milk	Eggs	Sugar	Wine	Total
Rural (1995)	264.6	23.3	4.6	12.2	14	1	2.4	91.4	
Calories (kcal day <sup>-1</sup> )	2,587.6	24.3	111.2	55	25.4	4.6	25.6	107.6	2,941.3
Protein (g day <sup>-1</sup> )	68.1	1	0	6.2	1.3	0.4	0	1.3	78.3
Fat (g day <sup>-1</sup> )	14.5	0.	12.6	3.1	1.4	0.3	0	0	32
Carbohydrate (g day <sup>-1</sup> )	546.5	5.4	0	0	1.8	0	6.6	8.8	569.2

dwellers, rural farmers consume more food grain but less vegetables, eggs, meat, and milk. The proportion of rural farmers' energy intake to the basic energy requirement was about 117%; much higher than that of the urban population. This is attributed to the large consumption of cereals. Protein intake for the rural population was lower than for

3.11). The calorie intake of this population was much lower than the basic per capita requirement of 2,500 kcal day<sup>-1</sup>. This population certainly falls in the category of undernourished.

Using the food inadequacy (FA) index, the FA value for Tibet in 1995 was 4.2%. In

Table 3.11: Food consumption in poor areas (1995)

	Food grain	Vegetables	Oil	Meat	Milk	Eggs	Sugar	Wine	Total
Poor areas (1995)	176.3	10.2	3	8.5	12.3	0.7	1.6	56.6	
Calorie (kcal day <sup>-1</sup> )	1724.6	10.6	74.1	38.4	22.2	2.9	16.5	66.7	1956.1
Protein (g day <sup>-1</sup> )	45.4	0.4	0	4.4	1.1	0.2	0	0.8	52.3
Fat (g day <sup>-1</sup> )	9.7	0	8.4	2.2	1.3	0.2	0	0	21.7
Carbohydrate(g day <sup>-1</sup> )	364.3	2.4	0	0	1.6	0	4.3	5.4	377.9

1997, the FA index decreased to 2.2% mainly due to strong and effective emphasis on poverty alleviation since 1995. However, the calorie intake for those who are still poor remained at the same level, while per capita calorie availability in Tibet increased to 2794 kcal day<sup>-1</sup> in 1997.

### Discussion and Conclusions

Overall, Tibet has a low level of food security. Per capita food production and food trading in rural areas is low; food production not only has great regional variation, but also has strong instability from year to year; and per capita calorie intake, particularly in poor rural areas, is still low.

Three stages of a region's development of food security were considered: food self-sufficiency, well-off livelihood, and affluence (Lu Liangsu 1993). Per capita availability of cereals, the percentage of food cost in total livelihood cost (Engel's law), the ratio of calorie availability to basic calorie requirement, and per capita GDP were selected as the main indicators of food security status (Table 3.12). In the food self-sufficiency stage, per capita food production is about 500 kg year<sup>-1</sup> and Engel's law is less than 60%. People focus on food quantity for

survival. If per capita food availability falls below this, food inadequacy and even hunger may occur. In the well-off livelihood stage, per capita income is high; people look for quality of food with food adequacy. In the affluent-livelihood stage, per capita food availability is sufficient and there is surplus, per capita income is high, and people look for nutritious and healthy food.

The stage of food security in Tibet is that of food self-sufficiency. In 1995, the per capita food grain availability was 305 kg, Engel's law was 62%, average per capita calorie availability was 2522 kcal day<sup>-1</sup>, and the ratio of per capita calorie availability to basic calorie requirement was 83%. The per capita protein availability was 72.3g day<sup>-1</sup> and the per capita net income was 1,691 yuan. Broadly speaking the urban population of Tibet is in the transition stage from the food self-sufficiency stage to the well-off livelihood stage. Similarly, the rural population is in transition from poverty to the food self-sufficiency stage. A few farmers reached the well-off livelihood stage. Most of the poor are in transition from food inadequacy to food self-sufficiency. There remains a small number of poor who are hungry and under-nourished (4.6%).

Table 3.12: Indicators of food security

Indicator	Self-sufficient	Well-off	Affluent	Tibet
Grain possessed (kg person <sup>-1</sup> )	< 500	500-5,000	> 5,000	305.2
Engel's law (%)	> 60	60-30	< 30	62.4
Ratio of energy supply to requirement (%)	< 80	80-100	> 100	83.3
Average per capita income (Yuan person <sup>-1</sup> yr <sup>-1</sup> )	< 400	400-4,000	> 4,000	1,691.6

The problem of low per capita food production and food trading is mainly attributed to low-quality food products and lack of competitiveness in the market. The incentives for producing more and better-quality food and the desire by rural farmers to sell food products will only be developed when there is a market for them and farmers benefit from such activity. The market for local food products is only Tibet itself. For local farmers, exporting food products is currently not possible. The food market in rural areas is still small because almost every household produces its own food. There is a subsistence food-production system with hardly any surplus food items exchanged among farmers.

There is little possibility for formation of rural food markets except barter trade with herders in small quantities. In addition, in most rural areas, difficult topography and low population density mean that local farmers depend upon a subsistence food-production system to sustain their livelihoods. Also, the economic level of local farmers is still too low to enable them to purchase food and other necessities from outside.

Nonetheless, there is a demand and a market in urban areas for food produced in rural areas. Almost half a million permanent urban dwellers and a large temporary population depend on food supplied from rural areas. They are not producers of food. Unfortunately, the food required by this urban population is, by and large, imported. Over 70% of the food required by the urban population comes from neighbouring provinces of China. A small portion of the population purchases tsampa and locally produced wheat flour. However, because of the small demand, there is no large-scale marketing of these products. There is great demand for meat and butter, but with inadequate processing, storing, and sanitation, most of the urban population, particularly the Chinese, prefer imported meat, pork, and butter from central China. Thus, there is obvious disjunction between food demand in urban

areas and food production in rural areas. The urban Tibetan market for local food products is not accessible to the Tibetan farmers. The main reasons for this are as follow.

- The varieties of food produced by Tibetan farmers are not suited to the demands of the urban population of Tibet. Many Tibetans still do not realise that Han Chinese will not eat tsampa as a staple food. Even many Tibetans, who now have a higher standard of living, no longer eat tsampa as a staple food. However, barley cultivation still accounts for over 50% of the cropland area and production of food grain. The structure of food consumption in urban areas is changing towards rice and wheat flour as staple foods, along with vegetables, fruit, pork, and poultry. However, local farmers are not yet ready to produce these food products. More surprising is that many farmers, who have become rich, themselves purchase rice, imported wheat flour, vegetables, and pork. This flow of food from urban areas even to those rural areas that otherwise produce enough is surprising.
- Poor options and technology for processing high-quality, local food products, particularly food grains such as barley and wheat, mean that local food does not suit the demands of the urban population. Barley has its own unique nutritional quality for people who consume relatively more butter and meat and less vegetables and fruit — such as those living in the highlands. Barley has a high content of beta-glucan that reduces cholesterol and the risk of heart disease from high fat in the diet. Despite this, tsampa is not liked by city people and the well-off. This limits the market for tsampa. Wheat is produced by most farmers in the lower valleys, and there is great demand in the urban market. Unfortunately, the average protein content of locally produced wheat is about 11%, which is too low for processing into bread and noodles. Therefore, despite adequate production, wheat is imported from either Nepal or other parts of China. Meat and milk, theoretically, have a great

potential market but, owing to lack of well-processed products, external and exotic meat and dairy products have taken over the market. Vegetables have a promising market. Products produced in rural areas can be sold in urban areas. However, this is being done by farmers from other parts of China such as Sichuan and Henan provinces. Local farmers are yet to benefit from greenhouse vegetable production.

- Subsidies used to make locally produced food grain attractive to the urban population. However, such subsidies on food grain have now been banned.

It is clear that these problems are restricting the commercialisation of Tibetan food products in the urban market. Without sufficient market incentives, farmers may not even attempt to commercialise their food products. When products cannot be sold at a profit, farmers will not have the incentive to produce more food. Thus, farmers are trapped in a vicious cycle of low food production and low food trading. To improve this situation, the quality and palatability of local food products must be made suitable to the demands of the urban population. Second, farmers should be mobilised and trained to restructure food production according to demands from urban areas. Third, the food-production system should be specialised and intensified so that farmers benefit from it. Fourth, market facilities and food-distribution centres should be developed in rural and urban areas. Finally, subsidies on imported food products should be ended so that local products have an equal chance in the market. The rights of farmers to have access to the urban market should be respected. Farmers should be supported to establish a food-production base that has market competitiveness.

Compared with other parts of China, per capita calorie intake in Tibet is low. The main reasons are lower income and higher prices of food. The average price of commodities in Lhasa is 60% higher than in Chengdu and 40% higher than in Beijing. The price of food is 70% and 45% higher than in Chengdu and

Beijing, respectively. The proportion of total livelihood expenditure on food is about 62%, whereas in central China it is 58%. For poor people, who have lower incomes and greater costs, the ultimate result is that people take fewer calories. Low per capita calorie intake also results from low digestibility of food such as tsampa and dry meat, especially in poor areas. People may psychologically feel full after eating these foods, but physiologically they lack energy. This results in people resting or undertaking only light activity, rather than doing intensive, laborious work. Without intensive labour, the output of agricultural activity remains low. A vicious cycle of 'hidden hunger' is created (Figure 3.4).

Therefore it is critical to produce adequate food in Tibet so that it can sustain itself. The long-distance distribution of food has been not only a great financial pressure on the local economy, but has also put the local population at greater risk from natural disasters. Self-sufficiency in cereals and other food items is needed because of the huge cost of distributing food from other parts of China. It is imperative to increase the income of local people and improve food quality and palatability. Most importantly, promotion of market competitiveness for local food products would financially benefit farmers and improve the well-being of rural Tibet. It is also very important to adopt a good policy for agricultural development. Agricultural development in Tibet has been uneven. At some stages it was rapid, while at others it stagnated. Whenever a policy was rational and fitted the reality of agricultural development, it ensured local food security and the well-being of the local people. Under the backdrop of the hidden hunger scenario, the long-distance transportation of food to meet this demand increased costs and the poverty prevalent among the people. A new agricultural development policy announced for the Tibet Autonomous Region in 1993 was aimed at food grain, meat, and oil (milk and oilseed) self-sufficiency (the three self-sufficiencies). It was an integrated approach to developing agriculture and was intended

emphasises both agricultural and livestock development. There has been constant growth of agricultural production during the last seven years.

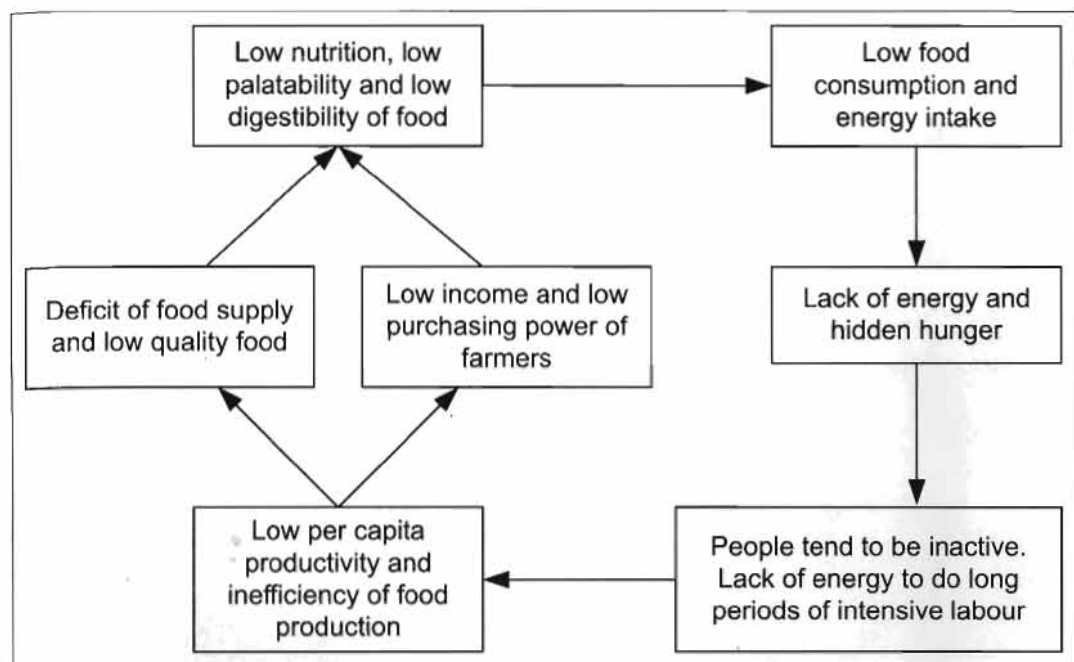


Figure 3.4: Vicious cycle of hidden hunger in poor areas



*Duilong valley near Lhasa - Nyima Tashi*