



# food demand-supply variations

- Background: Post harvesting of crops near  
Lhasa  
- *Nyima Tashi*
- Top Inset: Nomad settlements  
- *Nyima Tashi*
- Bottom inset: Fast-growing nomad town  
(Dangxiang town)  
- *Nyima Tashi*



*Nomad girls - Nyima Tashi*

## Chapter 8

# Food Demand-Supply Variations

This chapter focuses on food demand-supply gaps and their variations, the structure of food consumption, and the inter-regional balance between food production and food demand.

### Total Food Production and Food Demand

The total demand for cereals over the last 40 years was calculated based on the minimum requirement of per capita annual food grain consumption, 210 kg/person, and total population. It was assumed that, for the last 40 years, the majority of the population has been self-sufficient in food grain and consuming cereals at a minimum level. Comparing the food grain demand derived from this calculation with total production, there was a shortage of cereals during the 1950s and

1960s, a reasonable balance during the late 1970s, and a drastic shortfall in the early 1980s, followed by a rapid increase in production, which led to the present considerable surplus (Figure 8.1).

Figure 8.1 also illustrates that, although there was a deficit of cereals before 1965, that deficit was constantly being reduced. The 50% increase in production was attributed to expansion of cultivated land at a growth rate of 3.3% during that period. By 1966, the balance between total demand and production had been basically attained. However, during the early Cultural Revolution (1967-72), food grain production stagnated and the balance between production and demand was unstable. It was a time of severe food grain shortage, particularly during 1970-71

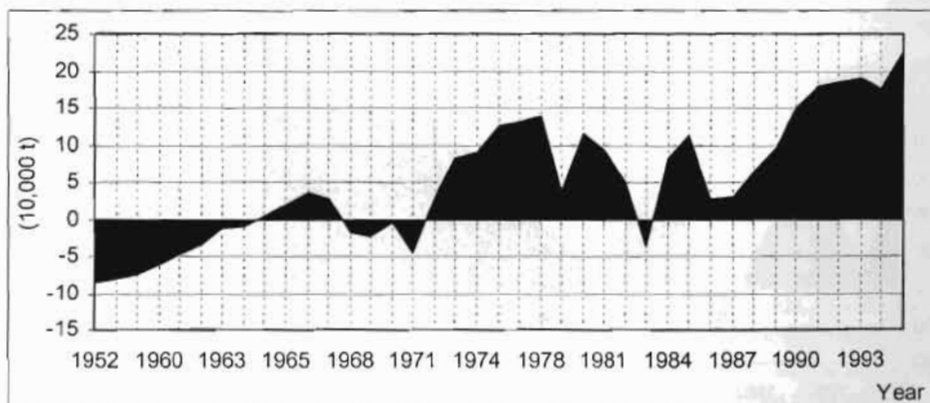


Figure 8.1: Gaps between food grain production and demand on the basis of minimum requirement for food grain

food shortage, which was one of the worst during the last 40 years. During 1972-80, the balance improved. Production of cereals increased quickly and reached its highest level in 1978. There was tremendous effort to improve the irrigation system, introduce new crops and new technology, change cropping systems, expand cultivated land, and introduce new cultivation techniques. During the 1980s, the overall policy of food grain production was favourable and there were incentives for farmers to produce more cereals. However, the drought of the early 1980s upset the balance and there was a shortage in 1981-83. If we use 210 kg of per capita food grain requirement per year as our definition of need, then Tibet should have had food grain surpluses since 1984.

The balance of total food demand and production was analysed for the last 20 years. Figure 8.2 shows that there have been occasional years of severe food shortages — such as during the drought of the early 1980s.

The balance between total food production and demand, based on actual consumption, was estimated by converting all the main food items into calorie equivalents. The surplus and deficit were estimated using two separate assumptions. One was that all food produced in Tibet was consumed by its

people (surplus/deficit-1). The other was that a minimum of 30% of food produced was either used as seed or feed, or wasted during redistribution, processing, and consumption (deficit/surplus-2). The food balance sheet deriving from these two assumptions is illustrated in Table 8.1. Both food production and consumption have increased significantly since 1988. There has been a slight decrease in per capita calorie intake by the urban population while calorie intake by the rural population has increased. If all food produced in Tibet were eaten (surplus/deficit-1), there would be more than 1,000 kcal day<sup>-1</sup> surplus per capita calories. If 30% of food were either used as seed and feed or wasted (surplus/deficit-2), there would be a surplus of less than 400 kcal day<sup>-1</sup>. At present, in Tibet as a whole, the total per capita calorie production is just about self-sufficient. Further increases in food production are needed if living standards are to improve; also, population growth must be controlled. In pastoral zones, where cereals are not produced and there is rapid population increase, effective redistribution and control of population growth should be considered as strategic approaches to achieving food security and improving the well-being of people.

### Production and Demand Balance of Main Food Items

Cereals, oilseed, meat, milk, eggs, and vegetables are the main food items. Estimates of the growth in demand for each food item were based on population growth rates, income, and food consumption. The growth rate of food production was based on previous food production growth trends. The food consumption structure is changing and demand is increasing rapidly, at a rate of 3% a year in Tibet as a whole.

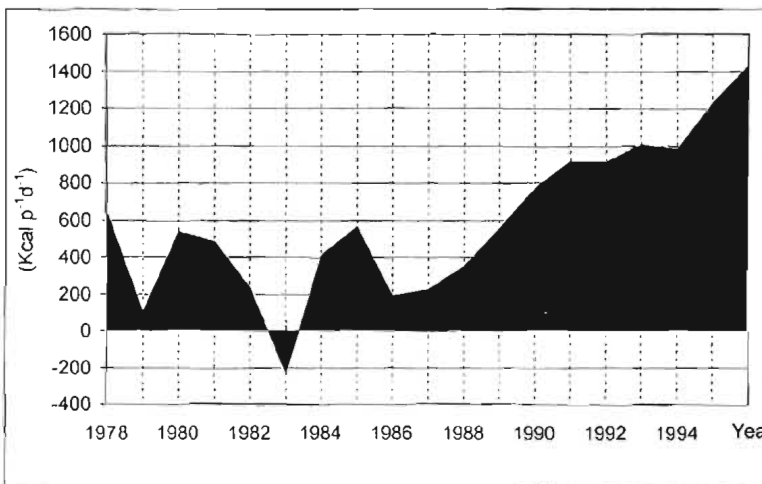


Figure 8.2: Gaps between food production and demand

Demand for meat, milk, vegetables, and eggs has been increasing rapidly, and the demand for milk, meat, and eggs now exceeds production (Table 8.2).

A dynamic food balance sheet was created by using the growth rates in Table 8.2. By 2000, total production of cereals will reach 877,200t. By 2005, total

Table 8.1: Gaps between total per capita calorie supply and demand

Year	Total demand			Total calorie supply	Surplus/deficit (1)	Surplus/deficit (2)
	Urban	Rural	Average			
1988	2,039.7	2,314.6	2,177	2,851.7	674.6	(-180.9)
1989	2,005.7	2,289.8	2,147.8	3,057.2	909.4	(-7.7)
1990	1,889.1	2,189.8	2,039.5	3,274.3	1,234.9	252.6
1991	2,173.4	2,475.8	2,324.6	3,419.9	1,095.3	69.4
1992	1,904	2,477.5	2,190.8	3,414.9	1,224.2	199.7
1993	2,096.5	2,812.7	2,454.6	3,507.6	1,052.9	0.7
1994	1,748	2,986.7	2,367.4	3,482.4	1,115	70.3
1995	1,858.4	2,947.1	2,402.7	3,728.6	1,325.9	207.3
1996	1,928.4	2,938	2,433.2	3,932.1	1,498.9	319.3

Table 8.2: Growth rate in per capita food production and demand (%)

	Food grain	Rape seed	Vegetables	Meat	Milk	Eggs	Sugar	Alcohol
Per capita consumption (1990-96)	3.01	9.58	10.53	6.94	14.86	18.34	18.66	1.47
Per capita production (1990-96)	3.07	9.77	14.36	5.33	5.32	7.24	/	/

food grain, oilseed, meat, milk, and vegetable production will be 1.02 million tonnes; 81,200t; 184,200t; 265,000t; and 412,500t, respectively. The demand for cereals, oilseed, meat, milk, and vegetables will have reached 581,900t; 9,000t; 110,040t; 642,100t; and 370,800t, respectively. The balance sheet of vegetable production and demand indicates improvement by 2005. Gaps between production and demand for milk and eggs will increase under present growth rates. There will be considerable surplus of cereals, oilseed, and meat at current levels of consumption and production (Table 8.3).

However, 20% of cereals produced are either used as seed or animal feed or lost during storage and distribution. About 10% of meat, milk, vegetables, and other food items is lost during redistribution, storage, and processing. If these amounts are deducted, then Tibet is currently in food deficit. Although there has been tremendous increase in food production over the past decades, demand is still ahead of production growth, and the balance between food production and demand is not secure. Many kinds of food items are cur-

rently imported. For example, although there was no food grain deficit in Tibet during 1990-95, about 382,000t of cereals were imported from other parts of China. At present, there is more than a 200,000t surplus of cereals produced each year. However, due to its low quality, the urban population does not use locally produced winter wheat to make bread and noodles, preferring to consume imported rice and wheat. There is currently a 6,800t deficit of butter. Meat (mainly pork and poultry), vegetables, and fruit are also imported.

With the further opening up of the food market, market-oriented demand will play a greater role in food availability. The conventional way of improving availability, by subsidising food for consumption while neglecting the quality of the food produced, will put increased financial pressure on both government and individuals. It will also restrict the increase in calorie intake by the local population because of the high price of imported food. For remote and poor populations, it will make it more difficult to access food not only physically but also

Table 8.3: Dynamics of food balance

Year	1996	1997	1998	1999	2000	2005	2010	2015	2020	
Total supply ('000 t)	Food grain	77.72	80.11	82.57	85.11	87.72	102.04	118.69	138.07	160.61
	Rape seed	3.51	3.85	4.23	4.64	5.10	8.12	12.94	20.62	32.85
	Vegetables	12.33	14.10	16.13	18.44	21.09	41.25	80.69	157.83	308.72
	Meat	11.54	12.16	12.80	13.49	14.20	18.42	23.88	30.95	40.13
	Milk	16.62	17.50	18.43	19.42	20.45	26.50	34.33	44.49	57.64
	Eggs	0.15	0.17	0.18	0.19	0.20	0.29	0.41	0.58	0.83
Total demand ('000 t)	Food grain	44.57	45.91	47.29	48.71	50.18	58.19	67.49	78.27	90.78
	Rape seed	1.71	1.87	2.05	2.25	2.47	3.90	6.16	9.73	15.38
	Vegetables	15.05	16.64	18.39	20.33	22.47	37.08	61.17	100.93	166.52
	Meat	6.04	6.45	6.90	7.38	7.89	11.04	15.44	21.59	30.19
	Milk	18.48	21.22	24.37	27.98	32.14	64.21	128.27	256.27	511.98
	Eggs	1.13	1.34	1.58	1.87	2.21	5.14	11.92	27.68	64.24
Surplus/deficit ('000 t)	Food grain	33.16	34.20	35.28	36.40	37.54	43.84	51.20	59.80	69.83
	Rape seed	1.80	1.98	2.17	2.39	2.63	4.22	6.78	10.88	17.47
	Vegetable	(-2.72)	(-2.54)	(-2.27)	(-1.89)	(-1.38)	4.18	19.52	56.90	142.20
	Meat	5.50	5.70	5.90	6.11	6.31	7.38	8.44	9.37	9.94
	Milk	(-1.86)	(-3.71)	(-5.93)	(-8.57)	(-11.69)	(-37.71)	(-93.94)	(-211.78)	(-454.33)
	Eggs	(-0.97)	(-1.17)	(-1.40)	(-1.68)	(-2.01)	(-4.85)	(-11.51)	(-27.09)	(-63.42)

economically. It will be more difficult to maintain a good balance between supply and demand.

Thus, it will be desirable to upgrade the quality of locally produced food, improve per unit yield of cereals and livestock, optimise cropping and the livestock population structure, promote rangeland development, increase the off-take rate of livestock, enhance greenhouse vegetable cultivation, and control population growth. It is necessary to develop a strong, local food-supply system before intervening in the people's economic access to food.

### Food Supply and Demand between Farming Systems and Food Production Systems

Zonal/regional variations in food production, demand, and consumption in Tibet are affected by the differences in biophysical conditions, economic development, and

social background. Better understanding of the inter-zonal/regional balance of food production and demand in Tibet will be important for ensuring food security in all zones and regions.

### Zonal variations in food production

Of the total production of food grain, 57.5% is produced in the crop-dominated zone and only 0.7% in the pastoral zone. More than 70% of oilseed is produced in the crop-dominated zone. The total production of cereals and oilseed in the agro-pastoral zone comprises 28.7 and 22.3%, respectively (Table 8.4). It is obvious that both cereals and oilseed are, by and large, produced by the crop-dominated zone and supplied to other areas of Tibet. This regional variation in food grain and oilseed production is created by differences in biophysical conditions among the four food-production system zones of Tibet.

Table 8.4: Comparison of food grain and oilseed production among production systems (tonnes)

Foods	Total Tibet	Crop-dominated zone		Agro-pastoral zone		Pastoral zone		Agro-forestry-pastoral mixed zone	
		1995	% of total	1995	% of total	1995	% of total	1995	% of total
Food grain production (t)	717,583.2	413,284.7	57.59	206,492.4	28.78	5,120.2	0.71	92,685.9	12.92
Grain	667,056.3	386,480.7	57.94	184,550.7	27.67	5,067.5	0.76	90,957.5	13.64
Pulse	45,931.5	22,710.4	49.44	21,446.6	46.69	52.7	0.11	1,721.8	3.75
Rape seed	33,578.3	23,946.9	71.32	7,505.5	22.35	12.8	0.04	2,113.0	6.29
Cultivated land (ha)	221,617.7	102,735.7	46.36	83,434.5	37.65	9,199.0	4.15	26,248.5	11.84
Dry land (ha)	219,607.9	102,736.7	46.78	83,434.5	37.99	9,199.0	4.19	24,237.7	11.04
Irrigated land (ha)	172,850.1	74,158	42.90	78,734.3	45.55	1,728.2	1.00	18,229.6	10.55
Cropping area (ha)	218,371.7	99,520.4	45.57	81,865.3	37.49	7,221.6	3.31	29,764.4	13.63
Food grain crops (ha)	187,616.8	85,389.6	45.51	71,516.0	38.12	4,514.8	2.41	26,196.4	13.96
Grain (ha)	169,883.5	77,604.9	45.68	62,377.1	36.72	4,467.1	2.63	25,434.3	14.97
Pulse (ha)	16,481.2	6,617.8	40.15	9,060.4	54.97	47.7	0.29	755.3	4.58
Rape seed (ha)	18,383.9	11,437.7	62.22	5,309.5	28.88	14.2	0.08	1,622.4	8.83

Note: Food grain includes cereals, pulses, and tuber crops.

As there are differences in biophysical conditions and socioeconomic development among the prefectures, food grain and oilseed production vary from one to another. In 1995, out of 717,600t of cereals and 33,500t of oilseed produced, 39.6% and 49.2%, respectively, were produced in Shigatse Prefecture, followed by Lhasa with 18.8% and 28.5%, respectively. These prefectures currently produce more than half of the total food grain and more than 70% of the oilseed (Table 8.5).

The agro-pastoral zone is the dominant producer of meat and milk. In 1995, the total production of meat and milk was 112,100t and 176,100t, respectively; and the agro-pastoral zone accounted for 37.8 and 40.3%, respectively, of this. In 1997, total production of meat and milk was 121,500t and 180,600t, respectively, of which the agro-pastoral zone accounted for more than 40%.

The pastoral zone produces 36 and 24.4% of meat and milk, respectively. There is also considerable meat and milk production in the crop-dominated zone; 16% of meat and 21.7% of milk. The regional variation in meat and milk is much smaller than for food grain and oilseed production. All four farming/production systems produce a certain

Table 8.5: Total food grain and oilseed production in each prefecture (1995)

Items	Food grain (t)	Grain (t)	Pulse (t)	Rape seed (t)	
Tibet	1995	717,583	667,056	45,931	33,578
Lhasa	1995	135,165	126,442	4,967	9,581
	%	18.8	19.0	10.8	28.5
Changdu	1995	100,200	96,680	3,512	502
	%	14.0	14.5	7.6	1.5
Shannan	1995	125,318	118,784	6,533	4,873
	%	17.5	17.8	14.2	14.5
Shigatse	1995	284,207	254,411	28,964	16,527
	%	39.6	38.1	63.1	49.2
Naqu	1995	2,747	2,723	24.7	12
	%	0.4	0.4	0.1	0.0
Ali	1995	5,171	4,692	479	16
	%	0.7	0.7	1.0	0.0
Linzi	1995	64,771	6,3321	1,449	2,063
	%	9.0	9.5	3.2	6.1

Slight differences in total sums can be accounted for by a slight difference in central (see Table 8.4) and prefecture level statistics.

amount of meat and milk (Table 8.6). Comparing prefectures, in 1997, out of 23.1 million head of small and large livestock, Naqu and Shigatse prefectures had more than 50%. Naqu and Changdu prefectures had nearly half of meat production, accounting for 27.8 and 26.7%, respectively. Naqu Prefecture produced more sheep and goat meat, while Changdu Prefecture produced more yak meat. Nearly 50% of all milk was produced by Shigatse and Changdu prefectures, while Naqu Prefecture produced 17%. Ali and Linzhi prefectures are smaller produc-

Most vegetables, fruit, and eggs are produced in central Tibet.

### *Zonal variation in food consumption and demand*

In crop-dominated and agro-pastoral zones, cereals are the dominant source of calorie intake, accounting for more than 80% in rural areas and nearly 70% in urban areas. Most farmers in these zones currently consume little meat, milk, vegetables, or fruits. Richer households consume more rice, wheat, and vegetables. Meat and butter tea

**Table 8.6: Livestock production among production systems (1995)**

	Total Tibet	Crop-dominated zone		Agro-pastoral zone		Pastoral zone		Agro-forestry-pastoral mixed zone	
	N	N	%	N	%	N	%	N	%
Livestock population (10,000 head)	2,379.2	379.8	15.96	720.0	30.26	1,131.4	47.55	148.0	6.22
Large animals	712.4	101.4	14.23	336.8	47.28	212.3	29.80	61.9	8.69
Sheep and goats	1,769.9	274.2	15.49	504.0	28.47	919.1	51.93	72.6	4.10
Meat production (t)	111,853.2	17,987.4	16.08	42,311.1	37.83	40,314.9	36.04	11,239.8	10.05
Beef	60,260.9	8,477.3	14.07	27,246.2	45.21	18,551.1	30.78	5,986.4	9.93
Lamb and mutton	46,093.5	7,933.4	17.21	14,460.9	31.37	21,762.3	47.21	1,936.9	4.20
Milk production (t)	176,782.9	38,504.4	21.78	71,385.7	40.38	43,155.8	24.41	23,737.0	13.43
Yak and cattle milk (t)	140,642.6	35,862.2	25.50	57,027.3	40.55	24,617.1	17.50	23,136.0	16.45
Wool production (t)	9,213.4	1,485	16.12	2,295.2	24.91	5,178.3	56.20	255.0	2.77
Sheep wool	8,253.2	1,187.1	14.38	1,974.0	23.92	4,914.0	59.54	178.0	2.16
Sheep & goat leather (10,000 pieces)	371.6	67.3	18.12	141.7	38.14	150.7	40.55	11.9	3.19
Yak & cattle leather (10,000 pieces)	68.9	9.9	14.40	34.2	49.63	19.1	27.73	5.7	8.25

ers of meat and milk compared to the other prefectures (Table 8.7).

To sum up, there are considerable intra-zonal/regional variations in Tibet's food production. It is clearly marked by four farming/food production system zones. Cereals and oilseed are produced in central Tibet, where large amounts of meat and milk are also produced. Northern and north-western Tibet produce meat and milk, but less food grain and oilseed; south and south-eastern Tibet produce many kinds of food, but in smaller quantities than other parts.

are common for them. In some households in Gyantse County, more than 40% of food grain is now rice and wheat instead of barley. However, in the same county, middle-income households depend on barley for more than 95% of their food grain. Once farmers become rich and have the economic capacity to access imported cereals, which are more palatable, locally produced barley and wheat are replaced. The majority of farmers still eat barley as the staple food. There are hardly any vegetables in a farmer's diet. In some rich families, radishes and potatoes are eaten almost all year round. However, in the poor



Table 8.7: Livestock production in Tibet (1995)

Prefectures	Animals (10,000 head)			Meat production (t)			Total dairy production (t)		
	Total	Large animals	Sheep & goats	Total	Beef	Lamb and mutton	Total	Yak and cattle milk	
Tibet	2,379.2	712.4	1,769.9	111,853.2	60,260.9	46,093.5	176,782.9	140,642.6	
Lhasa	1995	168.2	66.5	99.0	10,173.4	6,408.5	3,013.9	13,181.3	11,775.7
	%	7.1	9.3	5.6	9.1	10.6	6.5	7.5	8.4
Changdu	1995	354.8	241.6	197.8	29,910.5	22,355.2	6,241.7	39,204.3	35,950.7
	%	14.9	33.9	11.2	26.7	37.1	13.5	22.2	25.6
Shannan	1995	216.2	86.5	161.3	13,209.5	6,573.2	5,396.5	30,881.7	26,616.7
	%	9.1	12.1	9.1	11.8	10.9	11.7	17.5	18.9
Shigatse	1995	563.8	98.4	465.1	17,269.9	5,518.2	11,646.3	39,854.9	27,040.7
	%	23.7	13.8	26.3	15.4	9.2	25.3	22.5	19.2
Naqu	1995	742.7	169.3	573.4	31,048.1	16,305.3	14,741.7	31,003.0	21,669.9
	%	31.2	23.8	32.4	27.8	27.1	32.0	17.5	15.4
Ali	1995	271.1	16.4	254.7	5,547.7	672.9	4,874.8	6,142.3	1,084.8
	%	11.4	2.3	14.4	5.0	1.1	10.6	3.5	0.8
Linzhi	1995	62.3	33.7	18.6	4,694.1	2,427.6	178.5	16,515.5	16,504.0
	%	2.62	4.73	1.05	4.20	4.03	0.39	9.34	11.73

families, there is only tsampa and a few spices. Barley is made into different foods and cooked with meat in different ways. In this area, tsampa is the staple food grain, butter tea and chang are the drinks, dried (or cooked) sheep or yak is the meat, and potatoes and radishes are the vegetables.

The urban population now hardly uses tsampa as a staple. Most people consume rice and wheat as food grains. Many kinds of vegetables are available. The lifestyle and food preferences in urban areas of Tibet are now similar to other provinces of China. Butter tea is now the only distinctly Tibetan food consumed in most households.

In the agro-forestry-pastoral mixed zone of the south-east, many foods are produced. Food grain, mainly wheat, makes up more than 75% of the total food intake. There is little production or consumption of barley as a staple food. A household survey in Linzhi County showed that 80% of the meat consumed is pork and 58% of the food grain is wheat. Milk is consumed in different ways. Butter tea still is the most common item. In the pastoral zone of the north and north-

west, consumption of meat and milk is much higher than in other areas. Nomads consume considerable amounts of cereals. Food grain, particularly barley, is exchanged for livestock products. Tsampa is processed locally. Nomads also receive subsidised cereals from the government, often as wheat or rice. People in the pastoral zone consume more wheat and rice than people in cropping areas. A household survey in Damshung and Naqu counties suggested that nomads worry more about food grain stock, particularly tsampa, than people from other areas of Tibet. On average, more than 77% of per capita calorie intake is food grain, and the richer the nomads, the greater the consumption of barley, wheat, and rice. Areas that are accessible by road or near to markets often have greater stocks of food grain, particularly when the people have settled down. For example, in Damshung County, which is close to Lhasa and on the Qinghai-Tibet highway, many nomad families keep more than 250 kg of barley as a reserve. More than 47% of livestock products are exchanged for cereals. Some poor families had 4-8 yaks or 20-30 sheep, over 60% of livestock products being exchanged for cereals. It seems that when there are no subsidies of

food grain given to nomads, they must exchange more than 40% of off-taken animals for cereals. However, when there are subsidies, nomads do not need to exchange livestock products, and, to some extent, the number of off-taken animals is reduced. Not realising this, outsiders often complain about the low off-take rate of livestock in nomadic areas. With reducing subsidies, more nomads are going to cropping areas with their animals and exchanging animals or livestock products for cereals. For many nomads in remote areas, exchanging livestock for cereals is imperative; cash and other products come after cereals.

On the basis of total population and minimum per capita requirement of calories, it was estimated that, in 1995, total food demand in food grain equivalent in the crop-dominated and pastoral zones was about 220,000t for each area. In the agro-pastoral and agro-pastoral-forestry mixed zones, total food demand in food grain equivalent was 107,000t and 62,400t, respectively. The total demand for Tibet was 569,900t. On the basis of minimum requirement of per capita food grain (210 kg), per capita meat (23 kg), and per capita milk (72 kg), and the total population in 1995, the total demand for cereals was 176,300t in the crop-dominated zone and 93,000t in the pastoral zone.

### *Inter-zonal food balancing pattern in Tibet*

The surplus and deficit of per capita calories and protein were calculated based on the minimum requirement of per capita calories (2,500 kcal day<sup>-1</sup>) and protein (70g day<sup>-1</sup>) and the conversion of all food production in 1995. The gaps between per capita production and the minimum requirement were mapped.

There is a larger deficit of per capita calories in northern and north-western Tibet than in other areas. Almost the entire Naqu Prefecture and the eastern parts of Ali Prefecture are highly deficient in per capita calories. The calories produced in the counties of this

region meet only half of the minimum required intake. Along the Yalongzangpo River, particularly in areas of the Nyachu River and Lhasa River in central Tibet, there is a large surplus of per capita calories; 2,000 kcal day<sup>-1</sup> (Figure 8.3). The distribution and pattern of surplus and deficit of per capita protein is similar. Generally, there is a deficit in northern Tibet and a surplus in the southern and central parts (Figure 8.4).

The shortfall of per capita calories in Naqu and Ali prefectures was 1385 kcal day<sup>-1</sup> on average. Naqu Prefecture produced less than 30% of its minimum requirement. More surprisingly, as in a pastoral zone more meat and milk are generally produced, there was also 15.6% deficit of per capita protein in Naqu Prefecture. Lhasa, Shannan, Shigatse and Linzhi prefectures have high per capita surpluses of about 2,100 kcal day<sup>-1</sup>. They produce 50% more than their minimum requirements. These prefectures also produced surpluses of per capita protein, exceeding their minimum requirements by over 80%. Changdu Prefecture is a big producer of livestock and there is also considerable food grain production. However, when all food is translated into per capita calorie and protein equivalents and compared with the basic requirement of the population, this prefecture appears to be just about self-sufficient, mainly because of the large population. Comparing food-production systems, there was 75.4% deficit per capita in calories and 5.4% protein deficit in the pastoral zone. In the crop-dominated zone, there was 124.1% surplus in per capita calories and a 95.5% surplus of per capita protein. Overall in Tibet, both per capita calories and protein were in surplus: 41.1% for calories and 58.2% for protein (Table 8.8).

An overall inter-zonal balance of food production and demand in Tibet shows that there is more production than the minimum requirement of food. However, because of the long distances and limitations of transportation, and the large quantities of food that need to be moved across zones, there are

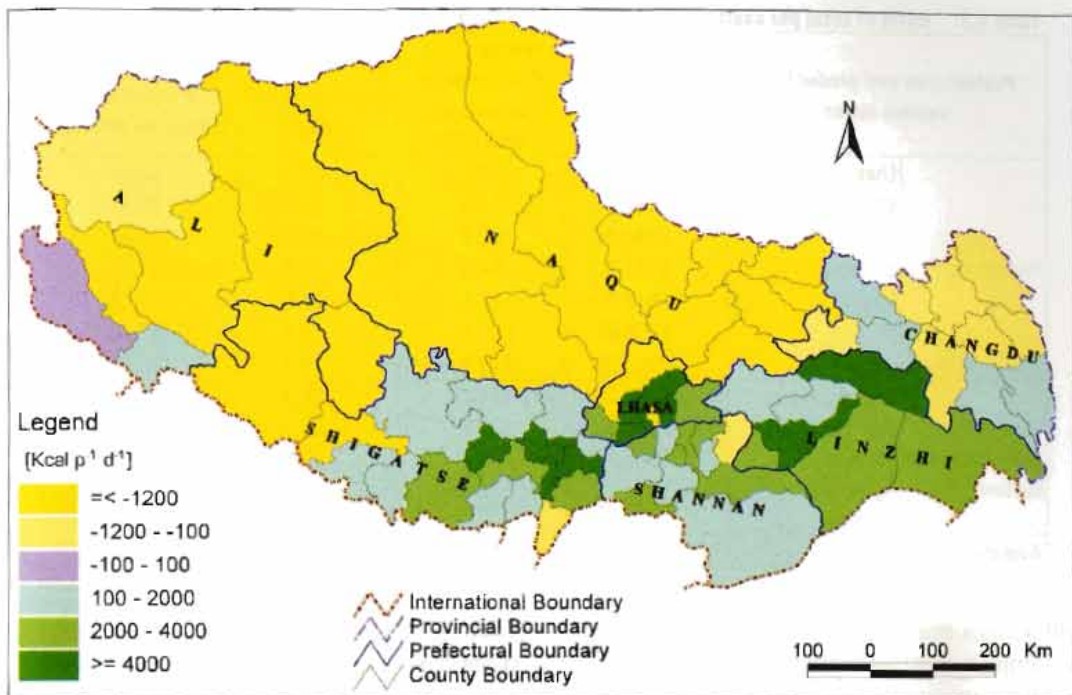


Figure 8.3: Gap between supply and demand of energy by county

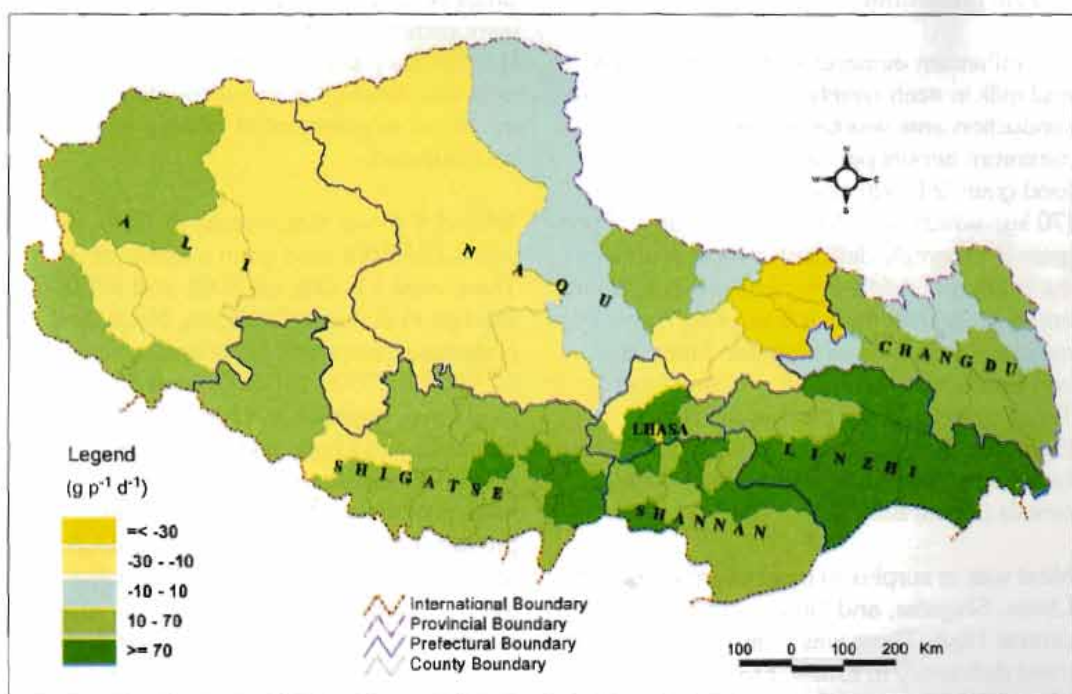


Figure 8.4: Gap between supply and demand of protein by county

Table 8.8: Ratio of total per capita energy and protein supply to basic needs in Tibet

Prefectures and production system zones		Per capita energy		Per capita protein	
		Surplus /deficit (kcal day <sup>-1</sup> )	Proportion of surplus or deficit (%)	Surplus / deficit (g day <sup>-1</sup> )	Proportion of surplus or deficit (%)
Prefecture	Lhasa	2995.22	119.8	69	98.61
	Changdu	(-185.71)	(-7.4)	14.8	21.11
	Shannan	2244.45	89.8	68.2	97.42
	Shigatse	2114.36	84.6	56.8	81.20
	Naqu	(-1819.99)	(-72.8)	(-10.9)	(-15.68)
	Ali	(-909.97)	(-36.4)	8.8	12.58
	Linzi	2756.35	110.3	77.4	110.60
Food production system	Crop-dominated	3104.28	124.2	66.9	95.53
	Agro-pastoral	942.88	37.7	39	55.76
	Pastoral	(-1885.78)	(-75.4)	(-3.8)	(-5.43)
	Agro-pastoral-forestry	1949.37	78	60.9	87.00
Average Tibet		1027.69	41.1	40.6	58.21

difficulties and high costs involved. Consequently, it may be most practical for food-deficit counties to try to become self-sufficient. Already a policy promoting food grain self-sufficiency is in place. It promotes expansion of cultivated land and improving irrigation systems in many counties of Naqu and Ali prefectures.

The minimum demand for food grain, meat, and milk in each county, prefecture, and food-production area was calculated using a minimum annual per capita consumption of food grain (210 kg), meat (23 kg) and milk (70 kg), which provides 2,288 kcal day<sup>-1</sup>. Food grain is extremely deficient in most counties in the north and north-west, whereas in southern and central Tibet there is a surplus. The majority of counties in Shigatse, Shannan, and Lhasa prefectures had sufficient food. Three counties along the Nyachu River (Shigatse, Bailang, and Gyantse counties) had heavy surpluses of more than 20,000t of cereals (Figure 8.5).

Meat was in surplus in most counties except Lhasa, Shigatse, and Gyantse counties of central Tibet. There was more than 1,000t of meat deficiency in Lhasa. Five counties in Naqu Prefecture and three counties in

Changdu Prefecture had surplus meat of more than 2,000t each (Figure 8.6).

In general, Tibet is self-sufficient in milk. However, milk surpluses and deficits are distributed haphazardly (Figure 8.7). Densely populated counties such as Lhasa City, Shigatse City, and Gyantse and Dazi counties were extremely deficient by more than 40%. Even in the pastoral zone in Naqu Prefecture, milk was deficient in some counties if the minimum requirement of 72 kg person<sup>-1</sup> yr<sup>-1</sup> is considered.

Table 8.9 shows that, overall in 1995, there was a 222,800t food grain surplus, or 34.8%. There were 11,300t; 68,800t; and 9300t of food grain deficit in Changdu, Naqu, and Ali prefectures, respectively, whereas there were 54,700t; 61,700t; 160,500t; and 35,300t of food grain surpluses in Lhasa, Shannan, Shigatse, and Linzi prefectures, respectively. All prefectures are more or less surplus in meat production; Changdu and Naqu prefectures produced 17,700t and 23,200t, respectively. There was a large deficit of milk in Lhasa and Shigatse; 52.2% more milk was needed in Lhasa to meet minimum demand and 6% more in Shigatse Prefecture. Linzi Prefecture had the highest surplus of milk

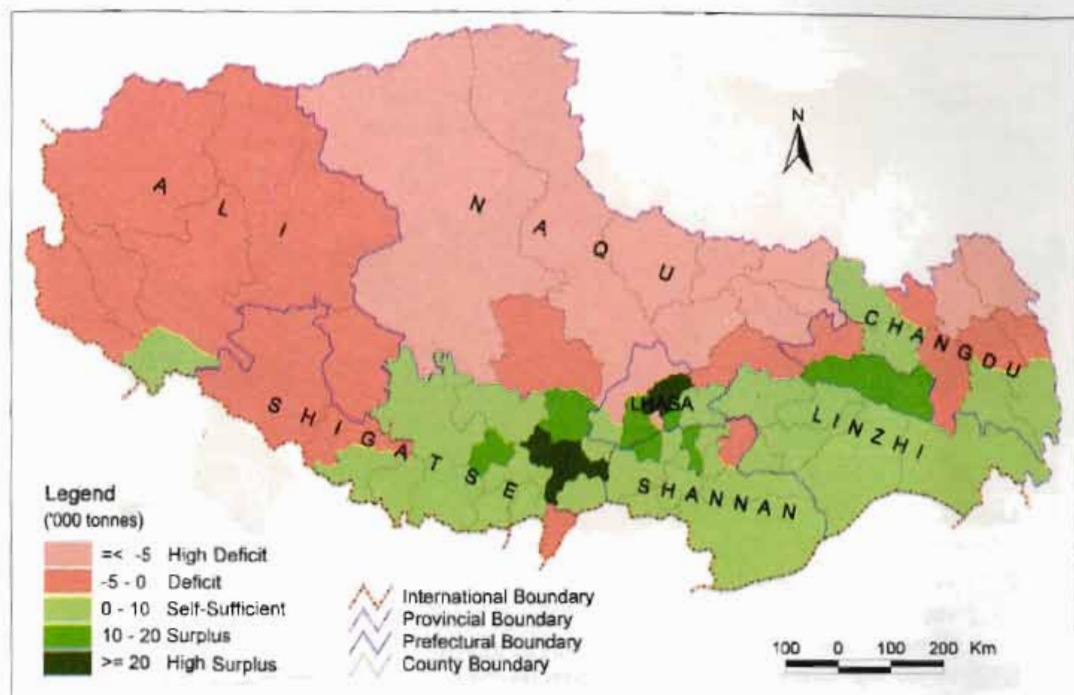


Figure 8.5: Food grain production and requirements by county (1995)

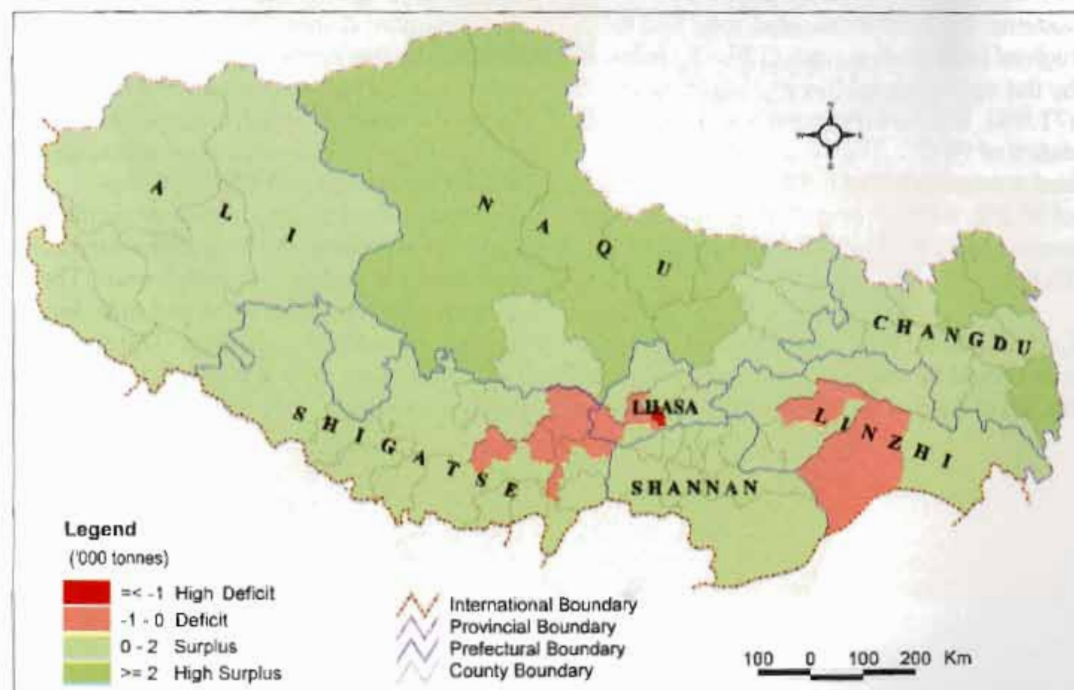


Figure 8.6: Gap between meat production and requirements by county (1995)

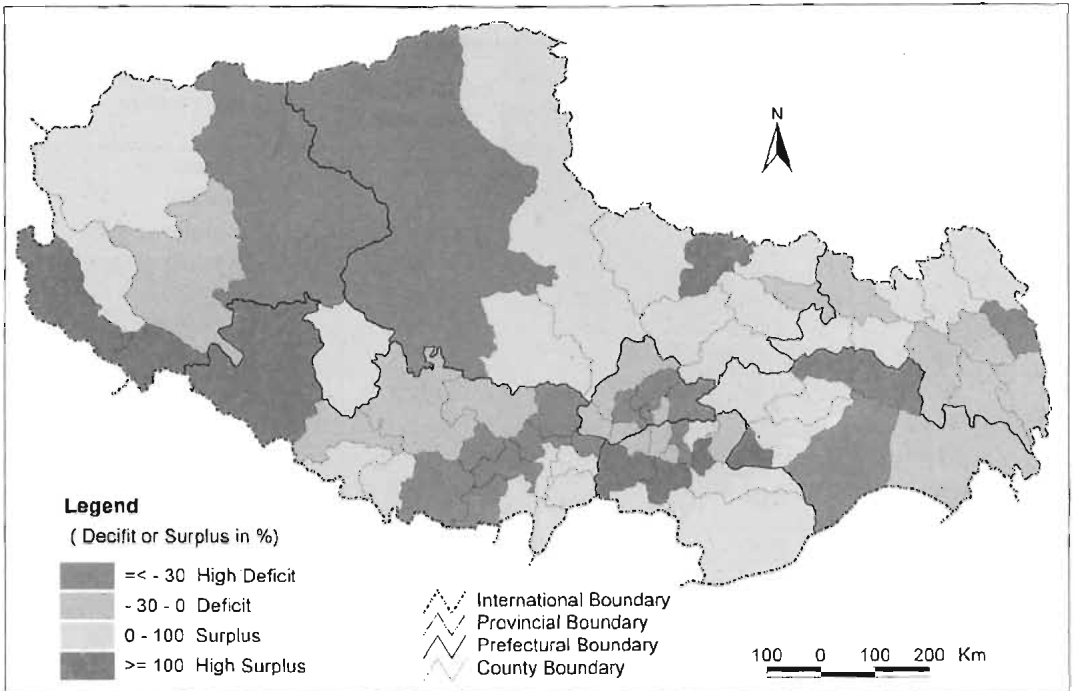


Figure 8.7: State of milk production in Tibet, 1995, surplus and deficit

(63.3%) followed by Shannan Prefecture (41.6%). Comparing food-production systems, the crop-dominated zone had the highest food grain surplus (134.4%) followed by the agro-pastoral-forestry mixed zone (71.9%). The pastoral zone had a food grain deficit of 94.6%. The crop-dominated zone had a meat deficit of 6.8% and a milk deficit of 36.2%. In Tibet overall, there was a meat surplus of 124.3% and a milk surplus of 15.8%.

Lack of precise data meant that no adjustment could be made of gross production figures of food grain, meat, and milk for seed,

feed, and losses in storage, redistribution, and processing. The gap between production and minimum demand therefore may be higher than this estimate. However, general trends in food balance among regions and within the counties and prefectures are shown. In general, cereals, vegetables, and oilseed are transported from the crop-dominated zone to other zones, while meat and milk are sent to the crop-dominated zone from pastoral and agro-pastoral zones. The pastoral zone produces meat and milk, but imports cereals and vegetables. The agro-pastoral-forestry zone is self-sufficient in these foods at present.

Table 8.9: Major food supply-demand gaps by zone and prefecture

	Food grain		Meat		Milk	
	Surplus (deficit)(t)	Proportion of surplus (deficit) (%)	Surplus (deficit) (t)	Proportion of surplus (deficit) (%)	Surplus (deficit) (t)	Proportion of surplus (deficit) (%)
Lhasa	54,671.1	67.92	1,357.4	15.40	(-14,416.9)	(-52.24)
Changdu	(-11,228.6)	(-10.08)	17,706.3	145.08	999.9	2.62
Shannan	61,737.3	97.10	6,245.7	89.69	9,082.5	41.66
Shigatse	160,476.9	129.70	3,718.4	27.44	(-2,567)	(-6.05)
Naqu	(-68,776.7)	(-96.16)	23,202.7	296.19	5,605.8	22.86
Ali	(-9,239)	(-64.11)	3,969.3	251.49	1,907.7	38.61
Linzhi	35,290	119.70	1,465.2	45.38	6,407.7	63.39
Crop-dominated zone	237,030.9	134.48	(-1,316.6)	(-6.82)	(-21,925.5)	(-36.28)
Agro-pastoral zone	37,070	21.88	23,755.4	128.02	14,004.3	24.11
Pastoral zone	(-89944.6)	(-94.61)	29891.3	287.09	9687.6	29.72
Agro-pastoral-forestry zone	38774.7	71.92	5335.2	90.36	5253.1	28.42
Total Tibet	222931	34.87	57665.3	124.38	7019.6	15.84



Farmland near a village - Nyima Tashi