Food Consumption Trends in China

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Executive Summary

China has experienced remarkable economic growth in the past three decades. This has resulted in sustained increase in consumer income, which in turn has led to important changes in food consumption. Notable changes include higher demand for food, demand for a more diverse range of food, demand for higher quality food, and the growth of away-from-home food consumption. Constrained by limited and degrading agricultural resources, China's ability to meet the changing and increasing demand from domestic production has been a concern for many. It has been generally held that China's domestic supply will not be able to meet the rising demand for food in the future. Not surprisingly, its future demand for food imports has interested many traders and government officials around the globe.

This report examines the recent trends in China's food consumption, with a focus on the period of 2000-2010. Insights into such trends should be most valuable in understanding this potentially enormous food consumption market. Such insights will help both China and food exporting countries like Australia to better understand how food consumption may evolve in the coming years and how they can work collaboratively to meet the rising needs for food in China.

Data collected by China's State Statistical Bureau (SSB) from household surveys are used to examine China's food consumption trends. It must be noted that the SSB data does not include away-from-home consumption, which is a major phenomenon in China today. Without away-from-home consumption, the SSB data underestimates food consumption for China. Keeping this limitation in mind, important food consumption trends include:

- During 2000-2010, total expenditure on foods continued to increase but the proportion of food expenditure out of total living expenditure continued to decline.
- The per capita consumption of staple foods, chiefly rice and wheat, continued to decline. There is likely to be further declines in the per capita consumption of such staple foods.
- While per capita direct consumption of grains has declined, the indirect consumption of grains has increased, chiefly, maize.
- The consumption of higher-value foods, especially foods of animal origin, is increasing. The foods with higher rates of growth include milk and dairy products, aquatic products, poultry meats, and fruits.
- Due to income differences, rural consumption is significantly behind urban consumption. Animal product consumption in rural China is about 30 years behind urban areas.
- The consumption level of some food items by the highest income rural group was even below that of the lowest income urban group in 2010.
- There is a significant gap in the level of consumption between the rich and the poor in both rural and urban areas. For some foods of higher value, the gap is several times larger.
- Food consumption patterns and levels differ between regions mainly due to differences in local income levels, food availability, and ethnic background. Consumption convergence is taking place, but slowly.

- Demand for safe foods of high quality is increasing. Foods of dubious quality have to a small extent negatively affected consumer demand for those foods.
- Chinese consumers, particularly the wealthy, are demanding foods of superior quality. Some of them consume mainly imported foods due to concerns over safety of foods produced in China.

Major factors identified as driving these trends are: rising real income, rapid urbanisation, changes in lifestyle, availability of new cooking methods, changes in consumer tastes and preferences, better organisation of food production and marketing, and changes in population structure. Among them, growth in income and urbanisation are key drivers. All these factors will continue to drive consumption higher, with the impact of urbanisation becoming even stronger.

Food balance sheets of the Food and Agricultural Organization (FAO) are used as a starting point to look into China's likely future demand and possible import needs. We then evaluate existing projections of China's food demand and supply provided by several other institutions, namely, the Organisation for Economic Cooperation and Development (OECD), the United States Department of Agriculture (USDA), and the Food and Agricultural Policy Research Institute (FAPRI). Based on these evaluations and coupled with our own research experience, this report makes predictions about the likely direction and size of China's future food trade.

It is our view that China's needs for food imports will increase in years to come. However, this demand for imports is not uniform across all commodities. Some food items may even have a small surplus for net exports. We expect that:

- By 2020, China is expected to be largely self-sufficient in wheat and rice, though a small amount of net wheat import is possible.
- Maize imports will increase but by how much is uncertain depending on China's choice of options in increasing its meat supply.
- Soybean imports may slightly increase above current imports. The imports of other oil-bearing grains such as rapeseed may vary depending on the amount of oil imported such as rapeseed oil and palm oil.
- China has limited capacity to boost its sugar production and sugar imports will continue.
- China will continue to be a net barley importer but no major growth is expected over current quantities.
- Imports of high quality beef and mutton/lamb are expected to increase to meet the demands of high-end hospitality industries, foreigners (expatriates and tourists), and wealthy local consumers. The quantity will be small.
- Pork imports are likely to rise but this is unlikely to have major impacts on China's pork market given that China's domestic output is so high, being about 50 per cent of the world's total production.
- It is also likely that China will increase poultry meat imports. However, China is expected to be self-sufficient in its egg supply.
- China will need to import dairy products, chiefly, milk powder and whey.
- In value terms, China will have a surplus in the trade of aquatic products. In volume terms, China will import more aquatic products than it exports. This is

due to the exports of aquatic products of higher value but imports of large quantity of low value products, chiefly for feed use.

- In the foreseeable future, China will have sufficient protein feeds, particularly if China continues to import large amounts of soybeans. China will have to import energy feeds such as maize if it chooses to produce more animal products domestically.

The sheer size of China's population, and the huge gap in consumption between the poor and the rich, and between rural and urban consumers, indicate that the potential for the Chinese food market to expand is significant, should the income level of the poor move towards the rich and that of the rural move towards the urban. China's inability to meet all the increased demand from domestic production renders exciting opportunities to food exporting countries such as Australia.

Australia is well placed to meet some of China's future food needs and will benefit, directly and indirectly, from China's rising demand for foods. Directly, it is expected that Australia will have opportunities to export more foods to China, particularly foods of premium quality. Indirectly, China's increased imports from the world market will create opportunities for Australia to increase its food exports to other markets.

Food Consumption Trends in China

1. Introduction

China is the world's largest food producer as well as the largest food consumer in volume terms. In addition to its domestic production, in order to meet growing demand, China has been importing more food, a trend which is likely to continue into the future. Growing imports of food to China have attracted the attention of the commercial world and governments alike in China and elsewhere around the globe. Insights into trends in China's food consumption are important in helping to understand future opportunities. Such insights will help both China and food exporting countries to better understand how food consumption may develop in the coming years and how they can work collaboratively to meet the rising needs for food in China. This report examines the recent trends in food consumption by Chinese consumers and undertakes some analysis of how these trends may develop into the future.

A number of studies have shown that the increase in consumer income in fast-growing developing countries, such as China, India and Malaysia, tends to induce important changes in the amount and composition of food consumption (Garnaut and Ma 1992, Cranfield *et al.* 1998, Coyle *et al.* 1998, Regmi *et al.* 2001, Jones *et al.* 2003, Ishida *et al.* 2003, Liu *et al.* 2009, and Gandhi and Zhou 2010).

Because of the significant implications of changes in China's food consumption, researchers from both within and outside China have paid increasing attention to examining this issue from various perspectives (see, for example, Halbrendt *et al.* 994, Fan *et al.* 1995, Brown 1995, Wu and Li 1995, Huang and Rozelle 1998, Wan 1998, Wu 1999, Guo *et al.* 2000, Gould 2002, Ma *et al.* 2004, and Liu *et al.* 2009). These studies have not been uniform in their findings[1].

Despite such challenges, earlier studies have nonetheless made important contributions to understanding food consumption patterns in China including parameters such as income and price elasticities of demand for various food items. Useful observations include:

(1) demand is price-inelastic for most of the commonly consumed food items (that is, changes in the price of foods will not result in as large a change in food consumption);
(2) there is a tendency to shift away from coarse grains to fine grains and in some regions, from rice to wheat consumption or vice versa as income increases;
(3) Chinese consumers will consume more meats as their income increases; and
(4) away-from-home food consumption is increasing as a result of changes in lifestyle and income.

It is noted, however, that the findings of earlier studies may be somewhat "outdated". In recent years, food consumption has experienced some rapid changes, driven chiefly

[1] This report does not cover in any detail the possible reasons behind these differences. Fan and Agcaoili-Sombilla (1997) and Zhou *et al.* (2008) provide some details about the causes for discrepancies in projecting China's future food and feed demand.

by increased consumer income. As such, researchers have argued that parameters derived using "old" data is less adequate for understanding China's *current* food consumption and new estimates using more recent data is essential (He and Tian 2000, Zhou *et al.* 2003).

Several other recent developments have also had significant impacts on food consumption in China and point to the need to examine China's food consumption using the latest data and information. These developments include:

(1) **Quality and safety of foods.** Quality and food safety concerns can affect the demand of domestically produced foods and lead to the substitution of domestically produced food by imported foods.
(2) **Changes in supply chains.** More advanced supply chains will make foods available in locations and at times that would have otherwise not been possible, particularly perishable foods. This also affects the quantity of food consumed.
(3) **Rural migration and urbanisation**. Each year a large number of rural people move into the urban system, which results in changes in where foods are consumed. Composition of food consumption and manners of consumption (e.g., methods of cooking) will also change.
(4) **The ageing population.** China's population is ageing and the absolute number of aged citizens is increasing rapidly. The demand for food, in terms of quantity, quality and variety, by older people is different from people of other age groups.
(5) **The tastes of younger consumers.** Younger generations, with increased levels of education and more exposure to foreign cultures, tend to be more prepared to try foreign foods and the food consumption styles of other cultures.
(6) **Increasing demand for foods of premium quality.** Increased disposable income coupled with small family size leads to increased demand for foods of premium quality. Foreigners in China (tourists and expatriates) also demand higher quality food.

This report examines food consumption in China using the latest available data and information. Its main objective is to assess China's current food consumption and the outlook for the near future. Specific objectives include:

(1) To examine the overall developments in food consumption in China since 2000.
(2) To evaluate changes in food consumption between urban and rural areas, between the rich and poor, and between consumers of different regions, and identify key drivers behind such changes.
(3) To analyse the consumption trends of major food items consumed in China.
(4) To provide an outlook for China's food consumption, production and trade to 2020, with a particular focus on food items that are of greater interest to Australia.

When reading this report, it is imperative to keep in mind that the SSB food consumption data from household surveys, on which this report is primarily based, does not include away-from-home consumption. This means the SSB data underestimates food consumption in China, particularly for foods of animal origin.

2. Developments in Food Consumption in China (2000-2010)

Changes in food consumption in China since the 1980s have been significant, both in terms of the amount of food consumed and in the composition of foods consumed (Table 2.1). Overall, there has been a marked decline in per capita direct consumption of food grains and vegetables, while the consumption of aquatic products (seafood) and animal products such as meat, eggs and dairy products has increased steadily.

Table 2.1 Per Capita Food Consumption in China (1978-2010, yuan, kg)

a) Rural

Year	Per capita income	Food grains	Vegetables	Cooking oil	Meats	Poultry	Poultry Eggs	Aquatic products	Sugar	Alcoholic drinks	Milk and dairy products
1978	134	248	142	1.96	5.76	0.25	0.80	0.84	0.73	1.22	n.a.
1980	191	257	127	2.49	7.75	0.66	1.20	1.10	1.06	1.89	n.a.
1985	398	257	131	4.04	10.97	1.03	2.05	1.64	1.46	4.37	n.a.
1990	686	262	135	5.17	11.34	1.26	2.41	2.13	1.50	6.14	n.a.
1995	1578	259	105	5.80	11.29	1.83	3.22	3.36	1.28	6.53	0.64
2000	2253	250	107	5.45	14.41	2.81	4.77	3.92	1.28	7.02	1.06
2001	2366	239	109	5.51	14.50	2.87	4.72	4.12	1.43	7.10	1.20
2002	2476	237	111	5.77	14.87	2.91	4.66	4.36	1.64	7.49	1.19
2003	2622	222	107	5.31	15.04	3.20	4.81	4.65	1.24	7.67	1.71
2004	2936	218	107	4.31	14.76	3.13	4.59	4.49	1.11	7.84	1.98
2005	3255	209	102	4.90	17.09	3.67	4.71	4.94	1.13	9.59	2.86
2006	3587	206	101	5.84	17.03	3.51	5.00	5.01	1.09	9.97	3.15
2007	4140	199	99	5.96	14.88	3.86	4.72	5.36	1.07	10.18	3.52
2008	4761	199	100	6.25	13.94	4.36	5.43	5.25	1.11	9.67	3.43
2009	5153	189	98	6.25	15.33	4.25	5.32	5.27	1.07	10.08	3.60
2010	5919	181	93	6.31	15.80	4.17	5.12	5.15	1.03	9.74	3.55

b) Urban

Year	Per capita income	Food grains	Vegetables	Cooking oil	Meats	Poultry	Poultry Eggs	Aquatic products	Sugar	Alcoholic drinks	Milk and dairy products
1982	535	145	159	5.78	18.67	2.26	5.88	7.67	2.80	4.48	n.a.
1985	739	135	144	5.76	19.32	3.24	6.84	7.08	2.52	7.80	n.a.
1990	1510	131	139	6.40	21.74	3.42	7.25	7.69	2.14	9.25	4.6
1995	4283	97	116	7.11	19.68	3.97	9.74	9.20	1.68	9.93	4.6
2000	6280	82	115	8.16	20.06	5.44	11.21	11.74	1.70	10.01	11.55
2001	6860	80	116	8.08	19.12	5.30	10.41	10.33	1.67	9.68	13.76
2002	7703	78	117	8.52	23.28	9.24	10.56	13.20	n.a.	9.12	18.12
2003	8472	80	118	9.20	23.74	9.20	11.19	13.35	n.a.	9.39	21.71
2004	9422	78	122	9.29	22.85	6.37	10.35	12.48	n.a.	8.94	22.19
2005	10493	77	119	9.25	23.86	8.97	10.40	12.55	n.a.	8.85	21.67
2006	11760	76	118	9.38	23.78	8.34	10.41	12.95	n.a.	9.12	22.54
2007	13786	78	118	9.63	22.14	9.66	10.33	14.20	n.a.	9.14	22.17
2008	15781	n.a.	123	10.27	22.70	8.00	10.74	14.00	n.a.	n.a.	19.30
2009	17175	81	120	9.67	24.20	10.47	10.57	14.30	n.a.	n.a.	19.27
2010	19109	82	116	8.84	24.51	10.21	10.00	n.a.	n.a.	7.02	18.10

Meats include pork, beef and mutton/lamb.
Source: SSBa, various issues.

According to Table 2.1, the direct consumption of grains per person has dropped from 257 kg in 1985 to 189 kg in 2009 (a decrease of 36 per cent) for rural areas (un-milled grains) and from 135 kg to 81 kg (a decrease of 67 per cent) in urban areas (milled grains) (see Box 1 for further details about grain statistics in China). The consumption of meat (including pork, beef and mutton) and poultry has increased from 12 kg in total in 1985 to 19.6 kg in 2009 (an increase of 63 per cent) in rural areas and from 22.5 kg in 1985 to 34.7 kg in 2009 (an increase of 54 per cent) in urban areas. While the percentage increase was larger for rural consumers, the actual increase in volume terms was significantly larger for urban consumers (12.2 kg for urban compared to 7.6 kg for rural). The consumption of aquatic products, eggs, milk and dairy products has more than doubled in both rural and urban areas.

Box 1. Grain Definition Used in China

Grain in China includes cereals (rice, wheat, corn, sorghum, millet and other miscellaneous grains), tuber crops (sweet potatoes and potatoes only, not including taro and cassava), as well as pulses (including mainly soybeans, red bean, and mung bean). The output of tuber crops (sweet potatoes and potatoes) was converted on a 4:1 ratio, i.e., four kilograms of fresh tubers were equivalent to one kilogram of grain, up to 1963. Since 1964, the ratio has been 5:1. The output of beans refers to dry beans without pods. The term "grain" generally includes all these "grains" when used in the context of China's grain statistics.

Despite the fact that grain also includes tubers and pulses, cereals account for a much larger proportion of all grains produced. Separate statistics for cereals were not collected until 1991. Among cereals, rice, wheat and maize are the three major crops. The proportion of maize used for direct human consumption is very small. However, a large proportion rice and wheat are used for direct human consumption, with rice being consumed mainly in southern China and wheat in northern China. Security of supply for these two cereals is of uttermost importance in China and therefore food security in China often refers to "grain security". Not surprisingly, China pays much attention to ensuring a high-level of self-sufficiency in these two crops.

As noted above, tubers were initially converted to a grains equivalent on a 4:1 ratio and then on a 5:1 ratio. This reflects the fact that in the 1950s and 1960s, tubers were regarded of being inferior to rice and wheat as staple foods. Today, rice and wheat are no longer the major sources of nutrition. Higher income has enabled consumers to buy many other foods of high nutrition. As a result, consumers have started to regard tubers, especially, sweet potatoes, as healthy food. The value of tubers relative to rice and wheat has improved. Because of such changes, there have been discussions as to whether the ratio should be changed, say, to 1:1 to reflect the increasing value of tubers. It is yet to be seen if any changes to the ratio are made; or, if tubers, together with pulses, are treated separately and no longer included in grain statistics.

When China's State Statistical Bureau publishes grain consumption data, the amount of raw grain is reported for rural residents but for urban residents, the quantity reported is milled grain. This makes the consumption levels between rural and urban areas not directly comparable; however, rural consumption of grain can be converted to milled grain. Generally 1kg of wheat is equivalent to 0.75-0.85 kg of flour; similarly, 1 kg of paddy rice to 0.65-0.70 kg of rice.

Between 2000 and 2010, nominal expenditure on food more than doubled in both rural and urban areas (Table 2.2). In the meantime, the share of food expenditure out of total consumption continued to decline, from 49 per cent in 2000 to 41 per cent in 2010 in rural areas; for urban areas, the corresponding shares were 39 per cent and 36 per cent, respectively. Interestingly, given that expenditure on food was increasing while the consumption of food grains was declining in the last decade, higher levels of income must have been spent on foods other than food grains.

Table 2.2 Per Capita Annual Consumption Expenditure in China (1978-2010)

a) Rural

Item	Value (yuan)							Share (%)		
	1978	1985	1990	1995	2000	2005	2010	1978	2000	2010
Food total	79	183	344	768	821	1162	1801	67.7	49.2	41.0
Non-food total	37	134	241	542	850	1393	2581	32.3	50.8	59.0
Total cons. exp.	116	317	585	1310	1670	2555	4382	100	100	100

b) Urban

Item	Value (yuan)							Share (%)		
	1978	1985	1990	1995	2000	2005	2010	1978	2000	2010
Food total	311	673	694	1766	1958	2914	4805	57.5	39.2	35.7
Non-food total	230	590	586	1772	3040	5028	8667	42.5	60.8	64.3
Total cons. exp.	541	1263	1280	3538	4998	7943	13471	100	100	100

Source: SSBa, various issues.

In the rest of this section, food consumption developments in China during 2000-2010 are discussed in greater detail, focussing on the differences in the level and composition of food consumption between China's urban and rural residents, between high and low income households, and between consumers in different regions.

Food grains

According to Table 2.3, for rural areas the consumption of each of the food grains listed in Table 2.3 is declining.

Table 2.3 Per Capita Grain Consumption in China (2000-10, yuan, kg)

a) Rural

Year	Per capita income	Paddy Rice	Wheat	Maize	Tuber	Beans and Processed Products	Of Which: Soybean
2000	2253	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2001	2366	123	77	18.67	8.44	5.65	2.46
2002	2476	123	76	17.79	8.43	5.76	2.20
2003	2622	119	73	16.40	3.30	3.30	2.10
2004	2936	117	72	15.60	3.20	3.00	1.90
2005	3255	113	68	14.20	3.00	3.30	1.90
2006	3587	112	66	14.60	2.80	3.50	2.10
2007	4140	109	64	13.40	2.90	3.00	1.70
2008	4761	111	63	13.30	2.70	3.00	1.80
2009	5153	106	60	12.00	2.50	3.20	1.70
2010	5919	102	58	n.a.	n.a.	n.a.	1.61

b) Urban

Year	Per capita income	Rice	Wheat Flour	Other Grains	Processed Grains	Starch and Tubers
2000	6280	46	16.52	2.85	16.32	13.43
2001	6860	44	15.05	2.93	16.60	13.09
2002	7703	44	12.12	2.88	19.68	9.00
2003	8472	44	12.95	3.00	19.80	10.14
2004	9422	42	12.08	3.04	20.32	9.60

Year	Per capita income	Rice	Wheat Flour	Other Grains	Processed Grains	Starch and Tubers
2005	10493	42	12.25	3.08	19.83	12.37
2006	11760	41	11.87	3.21	20.08	11.25
2007	13786	42	11.97	n.a.	n.a.	n.a.
2008	15781	45	13.43	n.a.	n.a.	n.a.
2009	17175	43	12.47	n.a.	n.a.	n.a.
2010	19110	40	11.37	n.a.	n.a.	n.a.

Sources: Per capita income data is from SSBa (2011). Per capita rural consumption data is from SSBb, various issues. Per capita urban consumption data is from SSBc, various issues.

This includes the two staple food grains – rice and wheat. In urban areas the consumption of rice and wheat flour seems to have stabilised with relatively small changes in consumption of all the food grains listed. The column of "other grains" includes coarse cereals (such as maize, millet and sorghum) but shows a relatively small amount. Despite showing an upward trend, the increase in consumption of such coarse cereals seems to be negligible.

The continuing declining consumption of rice and flour in rural areas is understandable. However, the flat consumption of flour by urban consumers does not seem to lend support to claims by earlier studies that consumers, even in developing countries, may consume more wheat-based products (Bouis 1991, Huang and David 1993). It may be argued that the data here refers to the quantity purchased only and does not include away-from-home consumption (Box 2). Earlier studies also often claim that consumers will demand more processed cereal foods when their income increases (Ito *et al.* 1989, Huang and Bouis 2001). Available data (2000-2006; such data became unavailable from 2007 onwards) lends some support to this claim. Further efforts are warranted to look into the demand for processed cereal foods.

The declining direct consumption of grains by rural residents provides a strong indication that any reduction in human consumption of grains will take place in rural areas. In 2000, maize and tuber consumption was 19 kg and 8 kg, respectively. By 2009, consumption of these products, especially tubers, dropped sharply. Increased income would be responsible for the substitution away from foods of low nutrition.

In addition to the consumption differences between rural and urban residents, it is useful to examine how the consumption level of food grains and various other food items varies when consumer income changes. Income is considered to be the most important factor affecting per capita food consumption (Cranfield *et al.* 1998; Guo *et al.* 2000; Gould 2002; Zhou *et al.* 2003; Wang and Zhou 2005). Data on the consumption of major food items by income groups are made available by China's SSB based on household surveys. Both rural and urban residents are divided into five income groups. For urban residents, the first quintile (bottom 20 per cent) is further divided into two deciles. Separate statistics for the bottom 5 per cent of the first decile are also given. The last quintile (top 20 per cent) is also divided into two deciles.

Between the bottom and top income groups, huge income differences exist. In rural areas, the available income of the bottom 20 per cent is not even enough to cover the total expenditure each year between 2002 and 2010 (Table 2.4, Panel a; for rural residents, total expenditure includes both total production expenditure and total living expenditure; total food expenditure is part of total living expenditure). For the second quintile, after deducting total expenditure, the leftover is very minimal. On the other hand, food expenditure by the top 20 per cent of rural consumers is double that by the

bottom 20 per cent and both total income and total living expenditure are several times higher than those of the bottom 20 per cent. Savings alone by the top 20 per cent group are higher than the annual income of the bottom 20 per cent. A similar pattern exists for urban residents (see Table 2.4, Panel b). However, the urban bottom 20 per cent fare better than their rural counterparts as they still have some money left over after living expenses are met (for urban residents, production expenditure is irrelevant).

Box 2. Food Consumption Data for China

China's State Statistical Bureau (SSB) publishes data on per capita consumption of major foods by both rural and urban residents. Such consumption data is based on household surveys.

Aggregated household survey data is made available through a number of publications by SSB. Preliminary and limited data about household consumption covering the previous year are made available in around June each year in the *China Statistics Highlights*. Then, by about October, further data is made available in the *China Statistical Yearbook*. By the end of each year, more detailed data is published in the two publications: *Yearbook of Rural Household Surveys in China* and *Statistical Yearbook of Price and Urban Income and Expenditure in China*. In these two publications, data on consumption of individual food items at various income levels are made available.

Data available from SSB for urban food consumption (in quantity terms) include only *the quantity of foods purchased* by consumers for consumption at home and do not include *away-from-home consumption*. For rural areas, consumption data (in quantity terms) include both purchased food and food produced and consumed by the household on farm. But, again, *away-from-home consumption* is not included.

Away-from-home consumption, however, is a major phenomenon in China today, especially in urban areas. Non-inclusion of away-from-home consumption by urban dwellers makes the reported quantity purchased a significant underestimate of food consumption for urban consumers. Though away-from-home consumption in rural areas would be significantly lower than that in urban areas, it is also increasing fast. Thus, when reading consumption data published by SSB, it is imperative to keep in mind that they are underestimates of food consumption by the Chinese, with the problem of understatement being more acute for urban consumption.

SSB also publishes food consumption expenditure data for urban areas. It is claimed that the expenditure data includes away-from-home consumption. However, such data is of minimal use for gauging the quantity consumed of a food item due to the complication caused by different prices and quality of the food. Further, such data is unlikely to be accurate because those who have consumed foods paid for by public money are unlikely to report such consumption in the surveys.

The underestimation problem with SSB data could be overcome by undertaking a separate survey to measure away-from-home consumption. This, however, would be a very expensive exercise considering the size of China and SSB is probably the only institution capable of doing it. It is also not realistic to only survey one region in China as consumption in different parts of China varies considerably. A survey in one region would likely only be good for explaining food consumption in that region and could not be considered representative of China.

Separate surveys to collect away-from-home consumption data is also unlikely to happen in the future as it is not realistic to ask respondents to recall and report accurate information about their away-from-home consumption quantity. A dish will have several ingredients and when several dishes are eaten, it is difficult to obtain an accurate calculation of the quantity of each of the ingredients consumed.

Another large-scale survey that collects consumption information is the China Health and Nutrition Survey (CHNS). This is an ongoing international collaborative project between the University of North Carolina and the National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and Prevention. The survey was designed to examine the effects of health, nutrition, and family planning policies and programs implemented by national and local governments and to see how the social and economic transformation of Chinese society is affecting the health and nutritional status of its population. The first survey was conducted in 1989. It is carried out every two to three years. The survey takes place over a 3-day period using a multistage, random cluster process to draw a sample of about 4,400 households with a total of 26,000 individuals in nine provinces that vary substantially in geography, economic development, public resources, and health indicators. The latest CHNS 2009 data is available for public use. Because the survey collects food consumption data of individuals by age, sex, education, and various other information, useful analyses can be carried out about food

consumption trends. However, due to the fact that the data only cover three days, it is of limited use in inferring the exact consumption levels of individuals over a year.

Table 2.4 Per Capita Food Expenditure in China by Income Group (2002-10, yuan)

(a) Rural

	Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
Quintile 1	TI *	1552	1573	1779	2090	2245	2555	3072	3152	3566
	TE	1725	1803	2050	2647	2771	3170	3839	4137	4394
	TI − TE	-174	-230	-271	-557	-527	-616	-767	-985	-828
	TLE	1006	1065	1248	1548	1625	1851	2145	2355	2535
	TFE	562	576	694	796	805	932	1088	1107	1237
	EC (%)	55.88	54.07	55.63	51.43	49.57	50.37	50.75	47.00	48.78
Quintile 2	TI	2288	2328	2667	3024	3249	3718	4264	4431	5102
	TE	2094	2149	2464	3036	3173	3625	4167	4396	4933
	TI − TE	195	179	204	-12	76	93	97	36	169
	TLE	1310	1378	1581	1913	2039	2358	2653	2871	3219
	TFE	687	714	841	950	980	1129	1294	1317	1465
	EC (%)	52.41	51.84	53.20	49.66	48.05	47.86	48.77	45.88	45.49
Quintile 3	TI	3025	3123	3535	4023	4347	5042	5765	6057	6986
	TE	2581	2668	3005	3653	3942	4526	5099	5392	6046
	TI − TE	444	455	530	370	405	516	666	665	941
	TLE	1645	1733	1951	2328	2568	2938	3286	3546	3964
	TFE	809	841	986	1121	1155	1327	1527	1550	1718
	EC (%)	49.18	48.52	50.53	48.15	44.97	45.15	46.46	43.70	43.34
Quintile 4	TI	4076	4220	4785	5454	6003	6798	7931	8488	9702
	TE	3259	3336	3807	4561	5068	5637	6563	7038	7761
	TI − TE	816	883	978	892	935	1161	1368	1450	1941
	TLE	2087	2189	2460	2879	3230	3683	4191	4592	5026
	TFE	950	999	1168	1297	1368	1572	1816	1862	2048
	EC (%)	45.51	45.64	47.47	45.06	42.34	42.69	43.32	40.54	40.74
Quintile 5	TI	7567	7999	8890	10211	11066	12927	14895	16007	18327
	TE	5534	5764	6505	7515	8369	9812	11216	12091	13483
	TI − TE	2034	2236	2385	2696	2698	3115	3680	3915	4844
	TLE	3500	3756	4129	4593	5277	5994	6854	7486	8190
	TFE	1354	1429	1615	1808	1966	2203	2522	2602	2828
	EC (%)	38.69	38.05	39.11	39.36	37.25	36.75	36.79	34.76	34.53

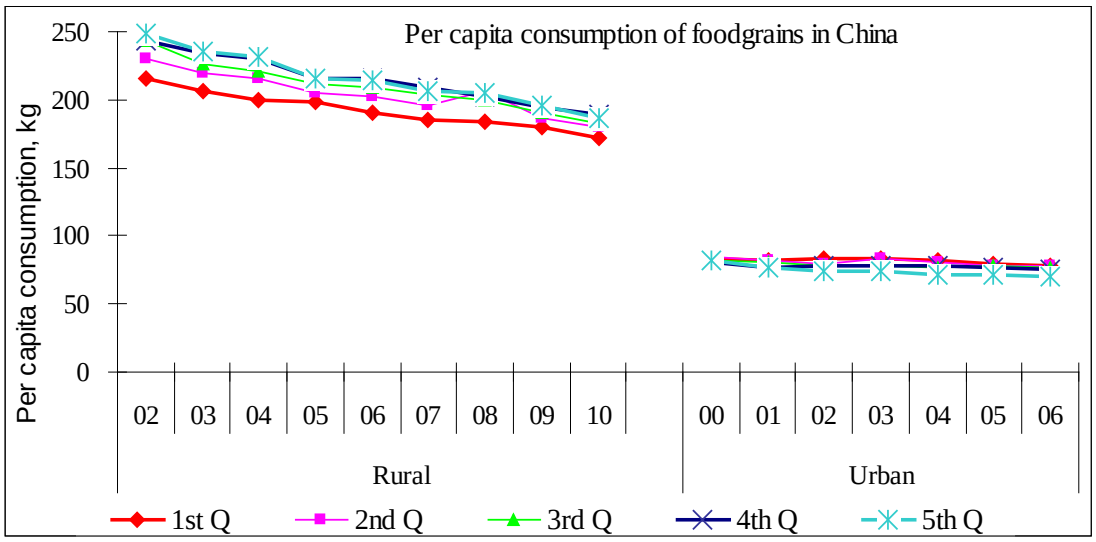
(b) Urban

	Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
Quintile 1	TI	3029	3280	3646	4010	4555	5357	6058	6708	8080
	TLE	2824	3056	3399	3703	4094	4835	5364	5822	6416
	TI − TLE	205	224	247	307	460	522	694	886	1664
	TFE	1293	1409	1623	1701	1830	2178	2514	2652	2886
	EC (%)	42.68	42.95	44.51	42.41	40.17	40.65	41.50	39.53	35.72
Quintile 2	TI	3649	5377	6024	6711	7554	8901	10196	11244	12388
	TLE	3260	4558	5096	5574	6108	7124	7994	8739	9649
	TI − TLE	390	819	928	1136	1446	1777	2202	2505	2739
	TFE	1773	1926	2202	2336	2484	2943	3429	3640	3946
	EC (%)	48.58	35.82	36.55	34.82	32.89	33.06	33.63	32.38	31.85
Quintile 3	TI	4932	7279	8167	9190	10270	12042	13984	15400	16693
	TLE	4206	5848	6498	7308	7905	9097	10345	11310	12609
	TI − TLE	726	1431	1668	1882	2364	2945	3640	4090	4084
	TFE	2140	2294	2581	2839	3019	3538	4181	4410	4774
	EC (%)	43.40	31.52	31.61	30.89	29.40	29.38	29.90	28.64	28.60
Quintile 4	TI	6657	9763	11051	12603	14049	16386	19254	21018	21667
	TLE	5453	7547	8346	9411	10218	11570	13317	14964	16140
	TI − TLE	1204	2216	2705	3193	3831	4815	5937	6054	5527
	TFE	2597	2763	3131	3426	3648	4230	5044	5367	5710
	EC (%)	39.01	28.30	28.33	27.18	25.97	25.81	26.20	25.54	26.35
Quintile 5	TI	15384	17480	20174	22988	25518	29509	34932	37606	38207
	TLE	10980	12072	13796	15628	17116	19318	22435	24134	26381
	TI − TLE	4404	5409	6378	7360	8402	10192	12497	13472	11826
	TFE	3636	3835	4328	4759	5070	5751	6981	7248	7646
	EC (%)	23.63	21.94	21.45	20.70	19.87	19.49	19.98	19.27	20.01

*: TI: Total income; TE: Total expenditure; TLE: total living expenditure; TFE: Total food expenditure; EC: Engel coefficient. Engel coefficient = total food expenditure / total living expenditure. In rural China, total expenditure includes total living expenditure plus expenses for production purpose; while in urban China, there is only living expense and no expenses for production purpose involved.
Source: SSBa, various issues.

Given the income differentials, it would be expected that consumers with higher disposable income would proportionally consume less food grain. Data on per capita consumption by income group from SSB largely confirms such expectations for urban residents (see Figure 2.1). Consumers in higher income groups consume proportionally less food grains compared to bottom groups but the difference is relatively small. Over time, the consumption level for all income groups has been declining, which is consistent with the analysis given above.

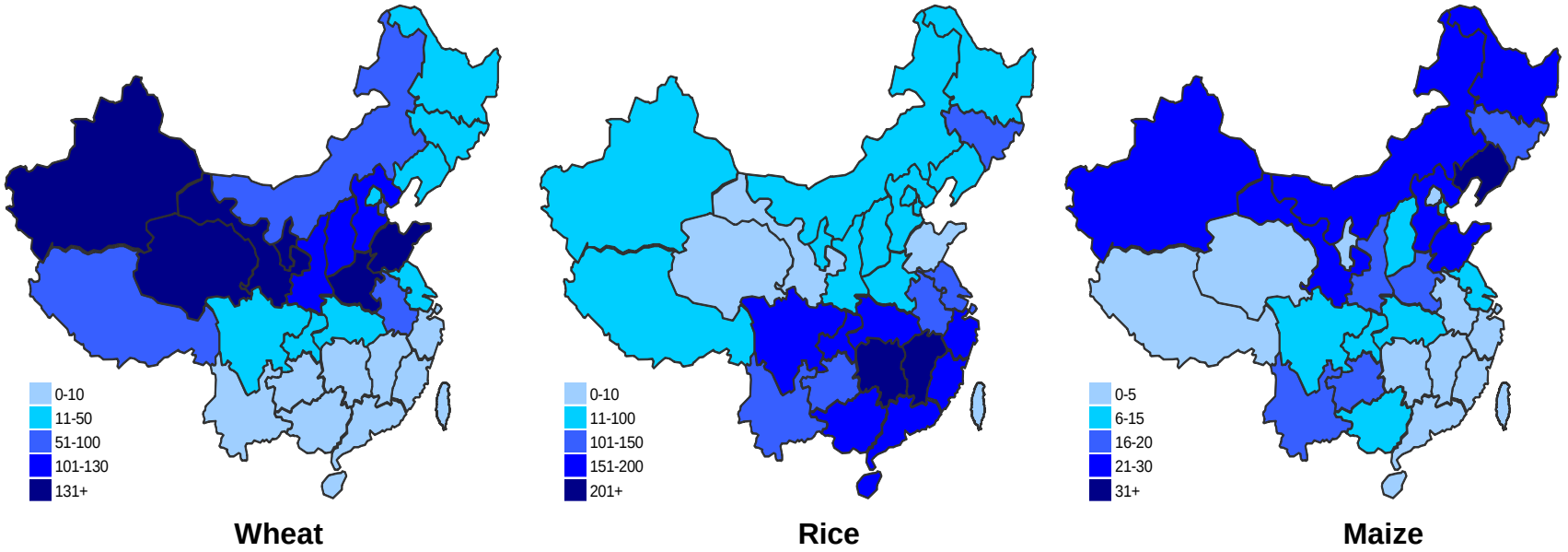
Figure 2.1 Per Capita Direct Consumption of Food Grains by Income Group in China, 2000-10



Note: Food grains in rural areas are unprocessed, while processed in urban areas.
Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

For rural residents, the level of direct consumption of grains for all income groups has also been declining (Figure 2.1). However, higher-income rural residents tend to consume more food grains than those with lower income. This goes against intuition. It would have been expected that lower income people would have consumed more food grains due to their lower cost. One explanation could be that lower income people did not have enough income to consume the amount of food grains they need. This explanation, however, is contradicted by the decline over time in their food grain consumption. If the above explanation were to hold, their consumption level of food grains would have increased when their income increased over time. Another possible explanation is that low income rural people are highly concentrated in northwest China and southwest China. Wheat and coarse grains are their staple foods (see Map 2.1). When milled, they produce a higher consumable proportion than does processed paddy rice. Hence, when expressed in un-milled raw grains, the per capita direct consumption by lower-income people is lower. Another possible explanation is that low income groups have fewer members with jobs. Rural labourers with a higher physical workload require higher energy than older and younger ones. This difference in household demographic structure may be partially responsible for different per capita consumption.

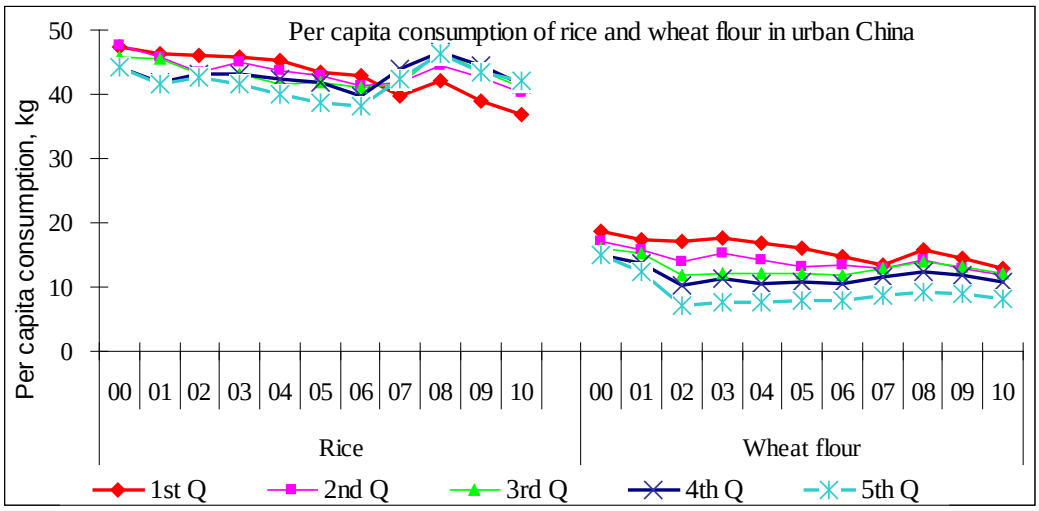
Map 2.1 Per Capita Consumption of Wheat, Rice and Maize in Rural China by Region (kg, 2009)



Source: based on data from SSBb, various issues.

Data on the consumption of food grains by income group for urban consumers ceased to be available from 2007. Data available (2000-2006) show that per capita urban direct consumption of grains was marginally declining (Figure 2.1). Increases in consumer income may lead to a further decline in demand. Separate rice and wheat flour consumption data is available for urban areas. In terms of rice, per capita consumption has largely stabilised at a level around 42-44 kg per year for consumers in the second quintile and above (Figure 2.2). Consumption by lower income consumers used to be higher than those on higher incomes, but now has become much lower, as is the case in rural areas. Changing geographic distribution of people in different income groups could be a reason. Lower income people tend to be increasingly concentrated in the northwest and southwest, where wheat consumption is more dominant.

Figure 2.2 Per Capita Consumption of Rice and Wheat Flour by Income Group in Urban China, 2000-10



Source: Based on data from SSBc, various issues.

Consumption of wheat flour by the poorest residents is higher than that by richer ones. Over time, the consumption level tends to fall for all groups (Figure 2.2). It would have been expected that richer people would consume more wheat-based foods. This is likely due to the fact that preparing flour-based foods takes much longer and richer consumers instead buy processed flour-based foods.

Further reductions in per capita direct consumption of grains could be expected over time. Figure 2.1 suggests that all groups in rural areas will reduce food grain consumption as their income increases. If average current urban rice consumption (Figure 2.2) is used as a reference, there will be further overall reductions in rice consumption. The picture for wheat is less clear; higher income urban consumers may have consumed more retail processed wheat-based foods but no data on away-from-home consumption is available to support this claim. Our judgement is that urban lower income consumers are likely to consume less wheat in the future and hence, overall, China's per capita direct wheat consumption may decrease to some extent. However, it must be noted that while per capita direct consumption of grains is anticipated to continue to decline, the per capita total consumption (or utilisation) of grains is expected to remain relatively stable or even slightly increase, due to increased indirect consumption of grains that are used to produce animal feed. The per

capita utilisation of wheat, rice and maize (combined) as given in Tables B1-B3 Appendix B clearly supports this expectation.

Not only are there distinct differences in the levels of food grain consumption between rural and urban residents and between different income groups, but there are also remarkable variations in the level of consumption between regions. China's SSB collects and publishes data on the quantity of food grain consumption and various other major foods at the provincial level for rural residents. For urban areas, only the expenditure of consumption is published by SSB. The 2009 consumption data for rural areas and the 2001 expenditure data for urban areas (after 2001 disaggregated data were no longer available for urban residents and many consumption items have been merged into one, e.g. pork, beef and mutton are merged to be meat), is used to indicate the variations in consumption levels between different regions.

In terms of food grains, wheat is consumed mostly in China's north, especially in the northwest region such as Xinjiang, Gansu and Qinghai (Map 2.1, a). Little wheat is consumed in China's south and southeast (e.g., Hainan, Guangxi and Guangdong). On the other hand, rice is the dominant staple food in China's south and southeast (Hunan, Jiangxi and Hainan) but little is consumed in China's north and northwest (Qinghai, Shandong and Gansu) (Map 2.1, b). Maize consumption is also concentrated in China's north and northwest (Map 2.1, c). Map 2.1 is based on rural consumption. Disaggregated data for wheat, rice and maize consumption at the provincial level for urban areas are not available (only fine grain – including rice and wheat – and coarse grain data is available). We expect the patterns of consumption for food grains in urban areas would be largely similar to those for rural areas.

Pork

In rural areas, the consumption of all animal products increased during the 2000s (Table 2.5). In urban areas, while the consumption of most animal products increased, that of eggs and egg products slightly decreased. During 2000-2010, pork consumption showed an increasing trend but fluctuated over the years, partly due to big variations in pork prices and partly due to the widespread diseases in pigs. The increase in rural areas was marginal, being less than 1 kg. The increase in urban areas was about 3 kg. Nonetheless, pork consumption accounted for a large share of meat consumption in both rural and urban areas.

Table 2.5 Per Capita Consumption of Animal Products in China (2000-10, kg)

a) Rural

Year	Pork	Beef	Mutton	Poultry meats	Other meats and processed meats	Egg and egg products	Milk and dairy products	Aquatic products
2000	13.28	0.52	0.61	2.81	n.a.	4.77	1.06	3.92
2001	13.35	0.55	0.60	2.87	0.68	4.72	1.20	4.12
2002	13.70	0.52	0.65	2.91	0.64	4.66	1.19	4.36
2003	13.80	0.50	0.80	3.20	1.43	4.81	1.71	4.65
2004	13.50	0.50	0.80	3.10	1.40	4.60	2.00	4.50
2005	15.60	0.60	0.80	3.70	1.70	4.70	2.90	4.90
2006	15.50	0.70	0.90	3.50	1.80	5.00	3.20	5.00
2007	13.40	0.70	0.80	3.90	1.80	4.70	3.50	5.40
2008	12.60	0.60	0.70	4.40	1.80	5.40	3.40	5.20
2009	13.96	0.56	0.81	4.25	1.95	5.32	3.60	5.27
2010	14.40	0.63	0.80	4.17	2.14	5.12	3.55	5.15

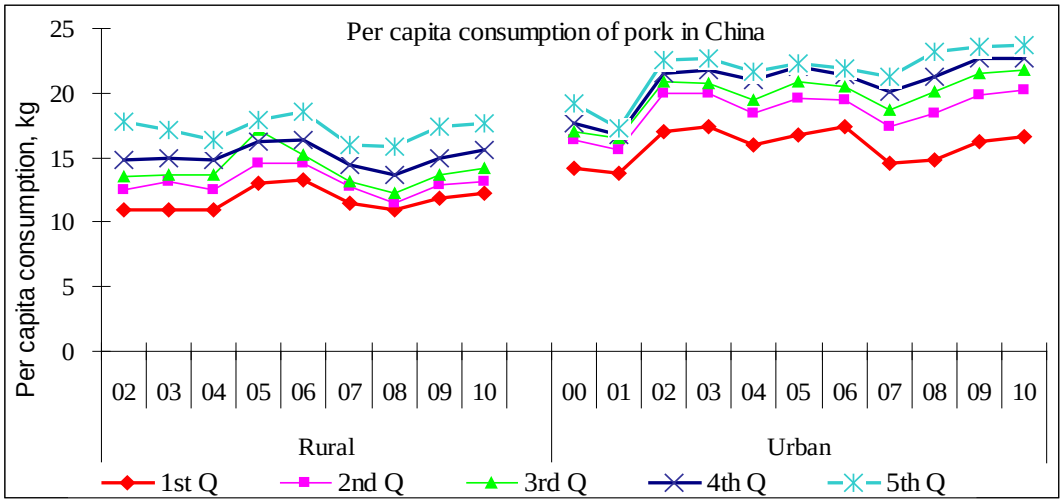
b) Urban

Year	Pork	Beef	Mutton	Poultry meats	Other meats and processed meats	Egg and egg products	Milk and dairy products	Aquatic products
2000	16.73	1.98	1.35	7.38	2.41	11.89	11.55	11.74
2001	15.95	1.92	1.25	7.31	2.51	11.10	13.76	10.33
2002	20.28	1.93	1.08	9.22	3.72	10.56	18.12	13.20
2003	20.43	1.98	1.33	9.20	3.84	11.19	21.71	13.35
2004	19.52	2.42	1.50	8.42	3.86	10.61	22.19	12.04
2005	20.15	2.28	1.43	8.97	3.80	10.40	21.67	12.55
2006	20.00	2.41	1.37	8.34	3.80	10.41	22.54	12.95
2007	18.21	2.59	1.34	n.a.	n.a.	10.33	22.17	14.20
2008	19.26	2.22	1.22	n.a.	n.a.	10.74	19.30	14.00
2009	20.50	2.38	1.32	n.a.	n.a.	10.57	19.27	14.30
2010	20.73	2.53	1.25	n.a.	n.a.	10.00	18.10	n.a.

Sources: Per capita rural consumption data is from SSBb, various issues. Per capita urban consumption data is from SSBc, various issues.

We expected that consumers with higher disposable income would consume more foods of higher value such as meats, dairy products and aquatic products. Figure 2.3 clearly shows that as income increases, the consumption of pork increases.

Figure 2.3 Per Capita Consumption of Pork by Income Group in China, 2000-10



Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

The top income urban dwellers consumed the highest amount of pork in recent years and it continues to increase. In both rural and urban areas, pork consumption by the top income group is about 50 per cent higher than that by the bottom income group. In the past decade, consumers in the bottom income groups in both rural and urban areas first experienced an increase and then a decline in pork consumption. Changes in their income and in the prices of pork relative to substitutes (e.g., mutton, beef, and poultry) may be responsible for such changes.

Note that urban data only shows the amount purchased for consumption at home and does not include away-from-home consumption. Should away-from-home consumption be included, the urban consumption level would be higher. As such, pork consumption by consumers in each of the rural quintiles could be significantly behind those in corresponding quintiles in urban areas. This implies that there is still sizeable potential for pork consumption to increase in China when rural income further increases.

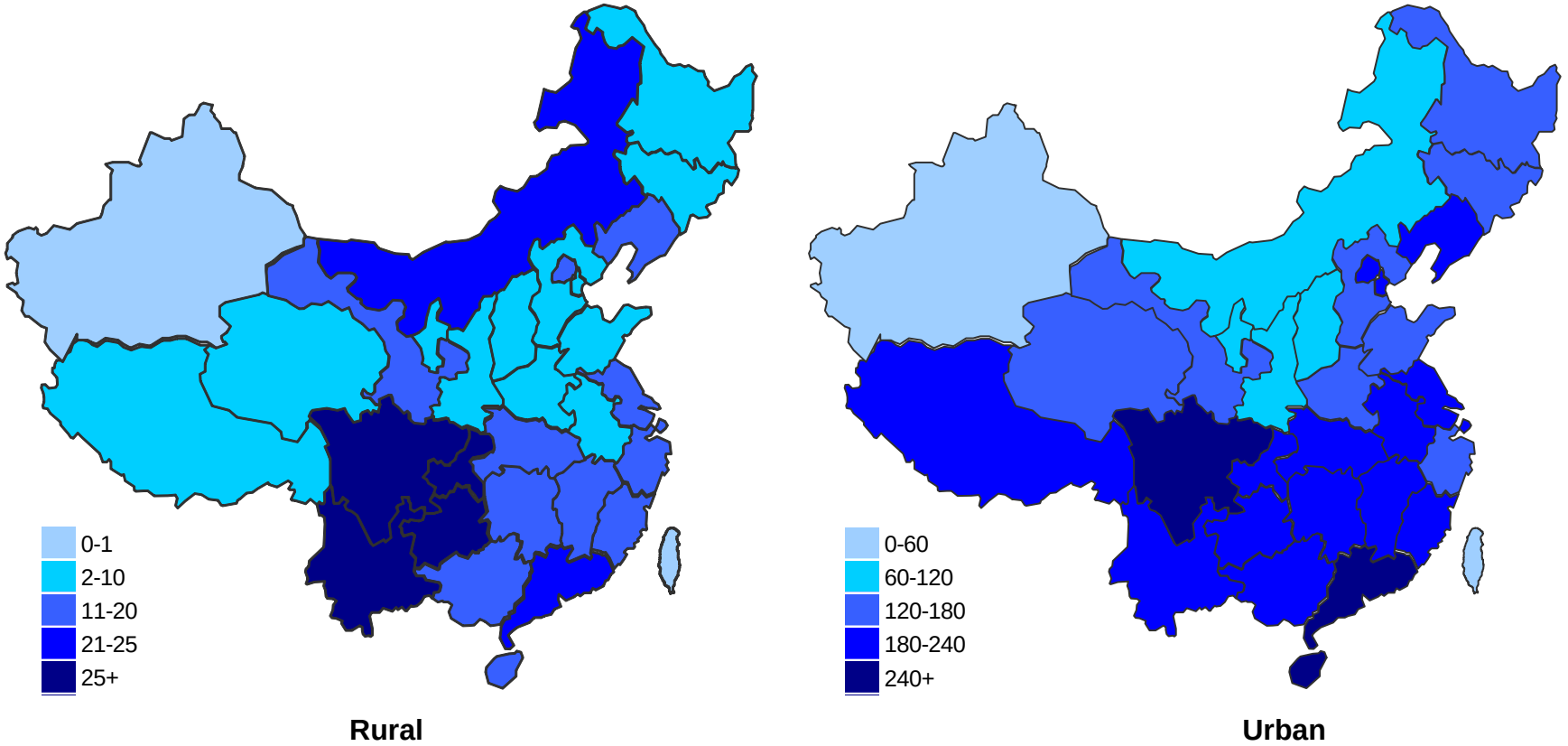
Pork is consumed widely in China. Major consumers are in the country's south and southwest (Map 2.2), e.g., Yunnan, Sichuan, Guizhou and Guangdong, which are all major pork producing regions. Xinjiang, where Muslim ethnic groups account for a large portion of the population, has the lowest per capita consumption of pork.

Beef

Table 2.5 shows that although beef consumption is increasing, the amount is very small in both rural areas (about 0.6 kg per capita per annum) and urban areas (about 2.4 kg per capita per annum). However, a significant amount of beef consumption would have taken place on away-from-home occasions. Many Chinese consumers are reluctant to cook beef dishes at home due to their unfamiliarity with cooking with beef. Consuming beef away from home in restaurants is popular. Hence, the quantity consumed as reported in Table 2.5 based on SSB survey data does not reflect the true level of consumption.

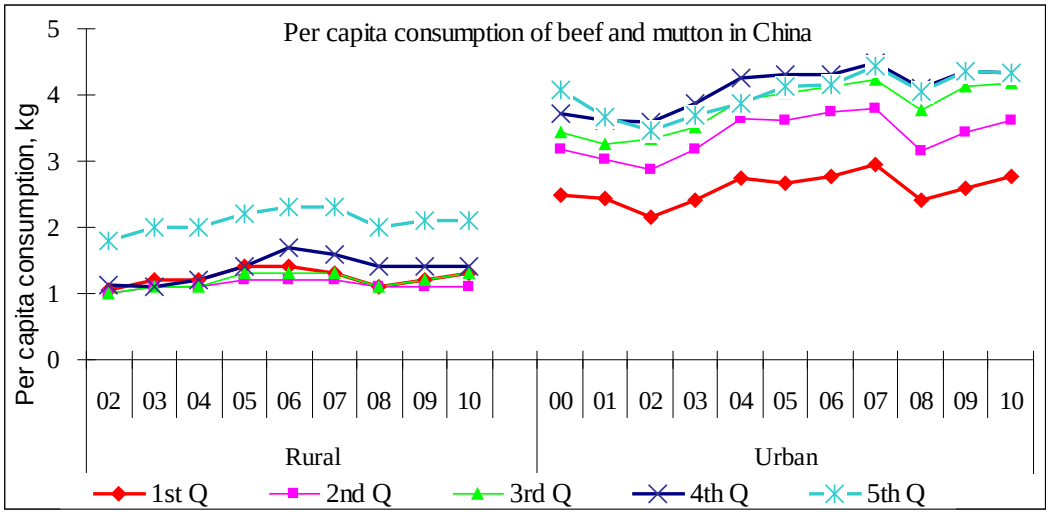
The consumption of beef is much higher for consumers with higher incomes (Figures 2.4-2.5; data with separate beef and mutton consumption is not available for rural China). Similar to pork, the consumption of beef by the top income group is about 50 per cent higher than that by the bottom income group in both rural and urban areas. The consumption of beef remained low and increased very slowly for all income groups as shown in Figures 2.4-2.5. However, as noted earlier, away-from-home consumption is not included in the data. It is more than likely that the actual consumption of beef is much higher than what the data demonstrates.

Map 2.2 Per Capita Consumption of Pork in China by Region (kg in rural, yuan in urban, 2009)



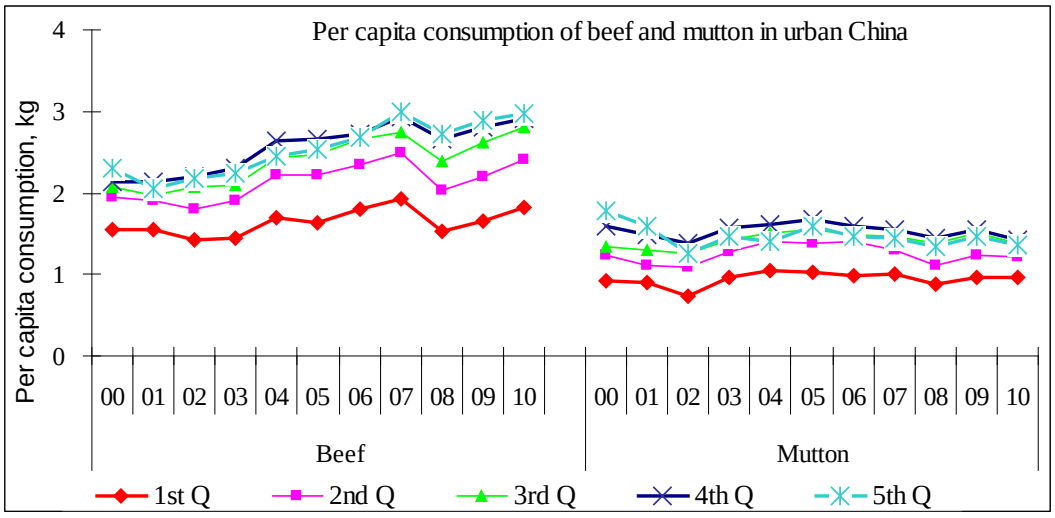
Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

Figure 2.4 Per Capita Consumption of Beef and Mutton by Income Group in China, 2000-10



Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

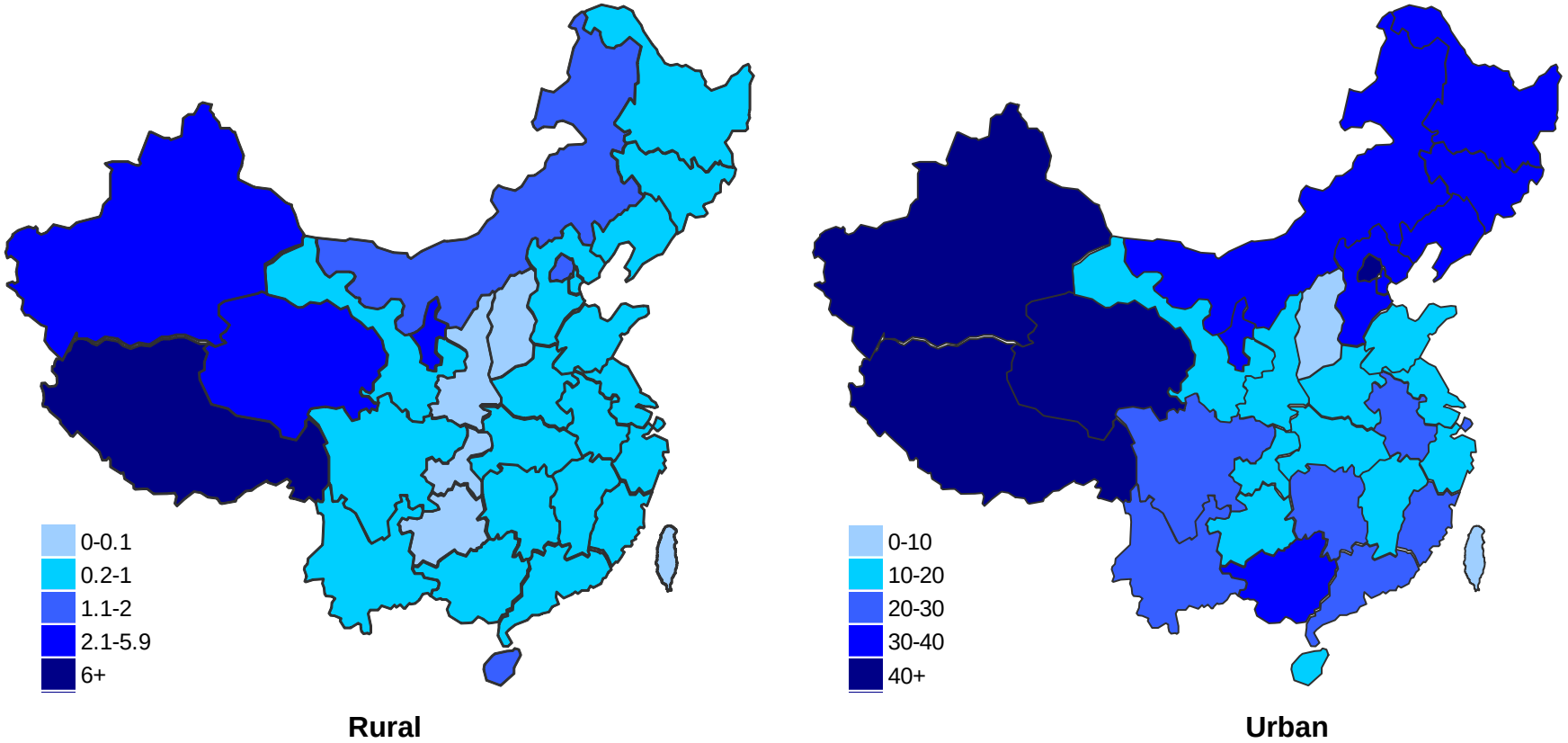
Figure 2.5 Per Capita Consumption of Beef and Mutton by Income Group in Urban China, 2000-10



Source: based on data from SSBc, various issues.

Beef is chiefly consumed in China's north and northwest (i.e., Tibet, Xinjiang, Ningxia and Inner Mongolia). Consumption in China's south is very low (Map 2.3).

Map 2.3 Per Capita Consumption of Beef in China by Region (kg in rural, yuan in urban, 2009)



Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

Mutton

During the past decade, there was little increase in mutton consumption according to the data from SSB (Table 2.5). The amount of consumption was very small, being about 0.8 kg per capita per annum in rural areas in 2010 and 1.3 kg per capita per annum in urban areas. However, as in the case of beef, a significant amount of mutton consumption takes place away from home. The quantity consumed of mutton as reported in Table 2.5 would be much higher if away-from-home consumption could be adequately included.

For consumers with higher incomes, consumption of mutton was much higher (Figures 2.4-2.5). The consumption of mutton by the top income group was about 50 per cent higher than that by the bottom income group in both rural and urban areas. The consumption of lamb in absolute amounts remained very low and increased very slowly. Again, the actual consumption level as shown in Figures 2.4-2.5 would be much higher had away-from-home consumption been included.

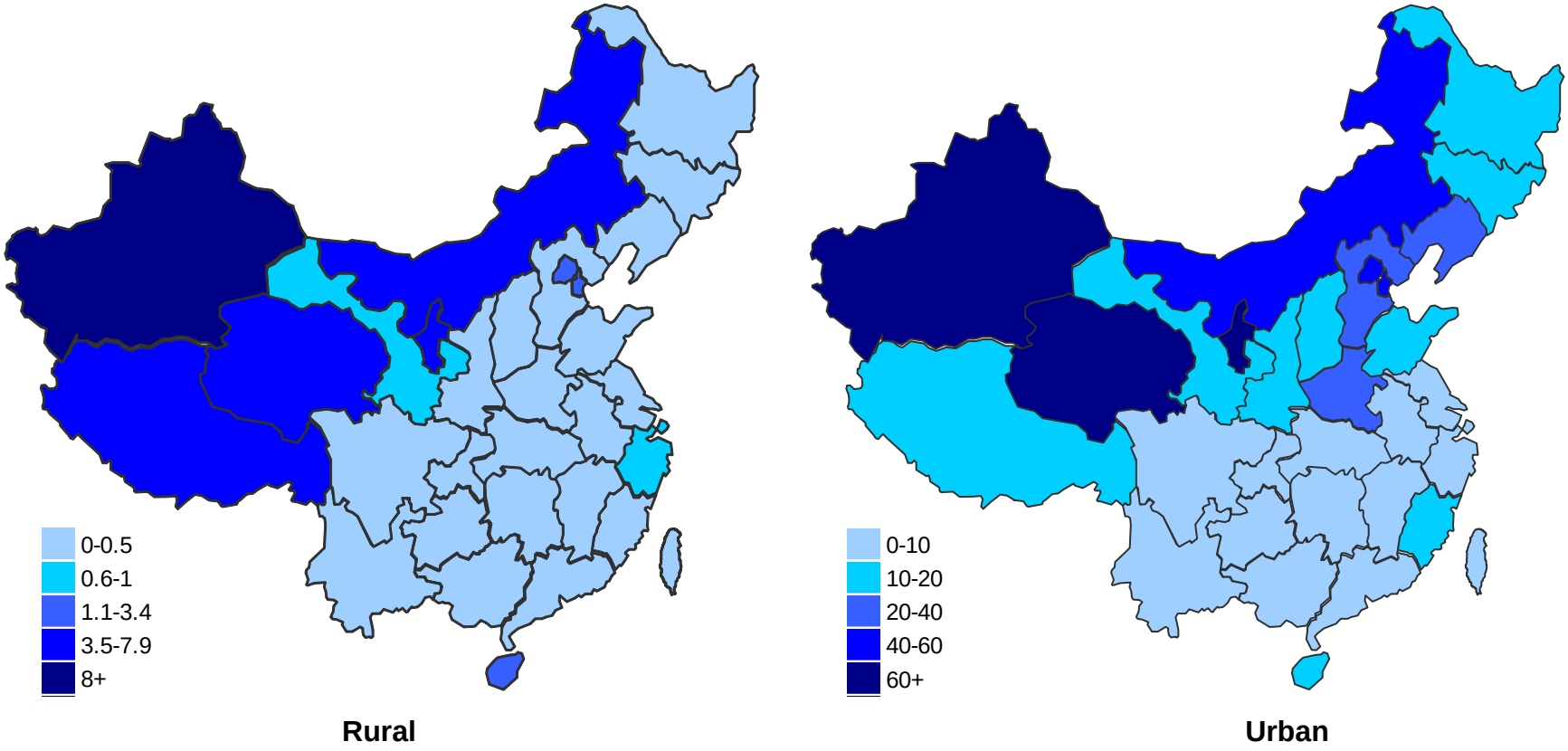
As with beef, mutton is chiefly consumed in China's north and northwest (i.e., Tibet, Xinjiang, Ningxia and Inner Mongolia). Consumption in China's south is much lower (Map 2.4).

Poultry meat

In terms of quantity consumed, poultry meat, chiefly, chicken meat, was the second most popular meat after pork (Table 2.5). Urban consumption was about twice that of rural consumption at the end of the 2000s. Rural consumption of poultry meat registered a steady increase. Urban consumption did not show a consistent upward pattern, perhaps due to more consumption away from home (restaurants like Kentuky Fried Chiken are popular in urban China).

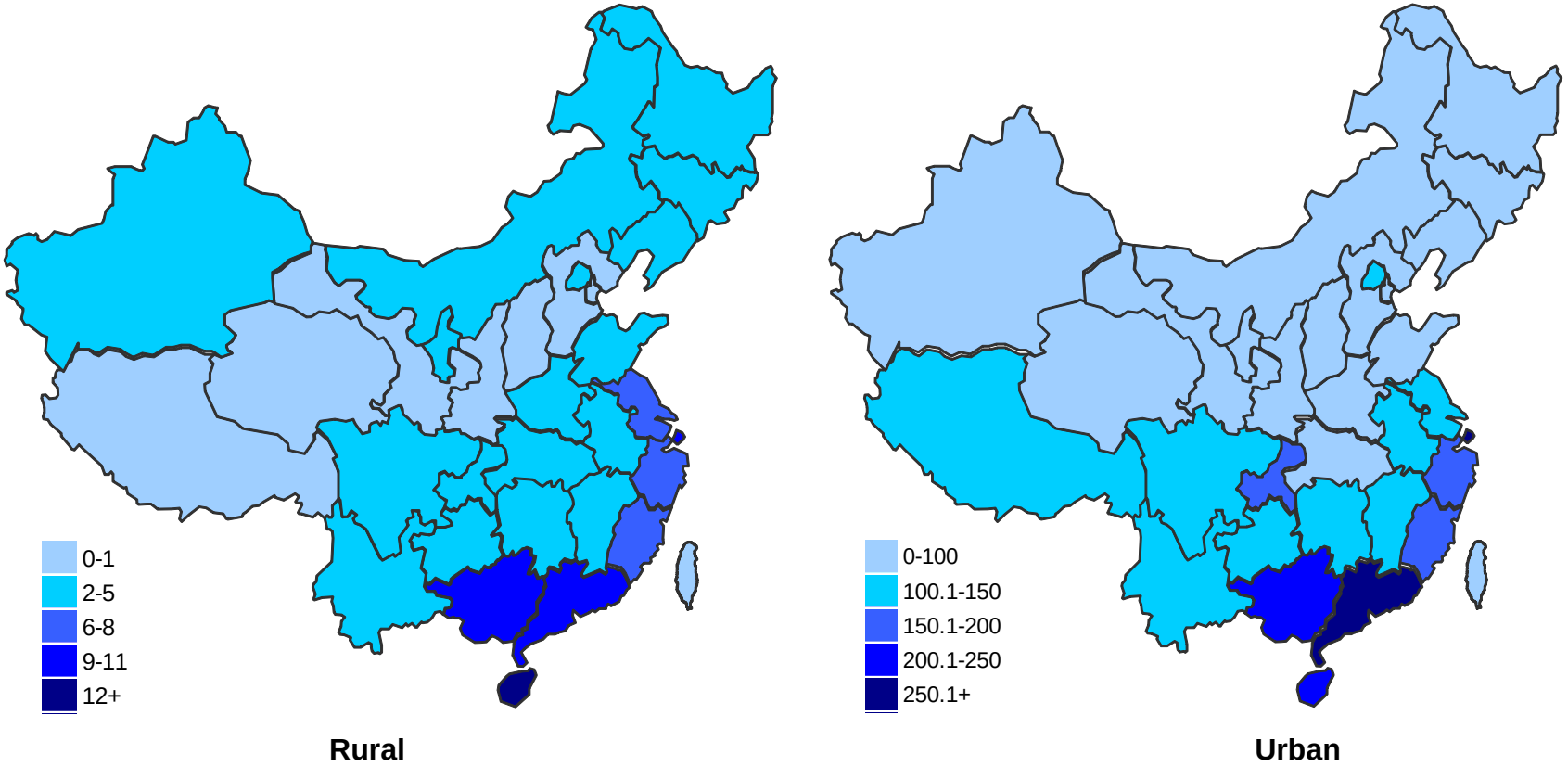
The consumption of poultry meat was also much higher for consumers with higher incomes (Figure 2.6). Figure 2.6 shows that as consumer income increases, per capita consumption of poultry meat increased rapidly in both rural and urban areas. The drop in consumption in 2006 was related to an outbreak of avian influenza. Poultry meat is more preferred by people in the south (Hainan, Guangdong and Guangxi) (Map 2.5).

Map 2.4 Per Capita Consumption of Mutton in China by Region (kg in rural, yuan in urban, 2009)



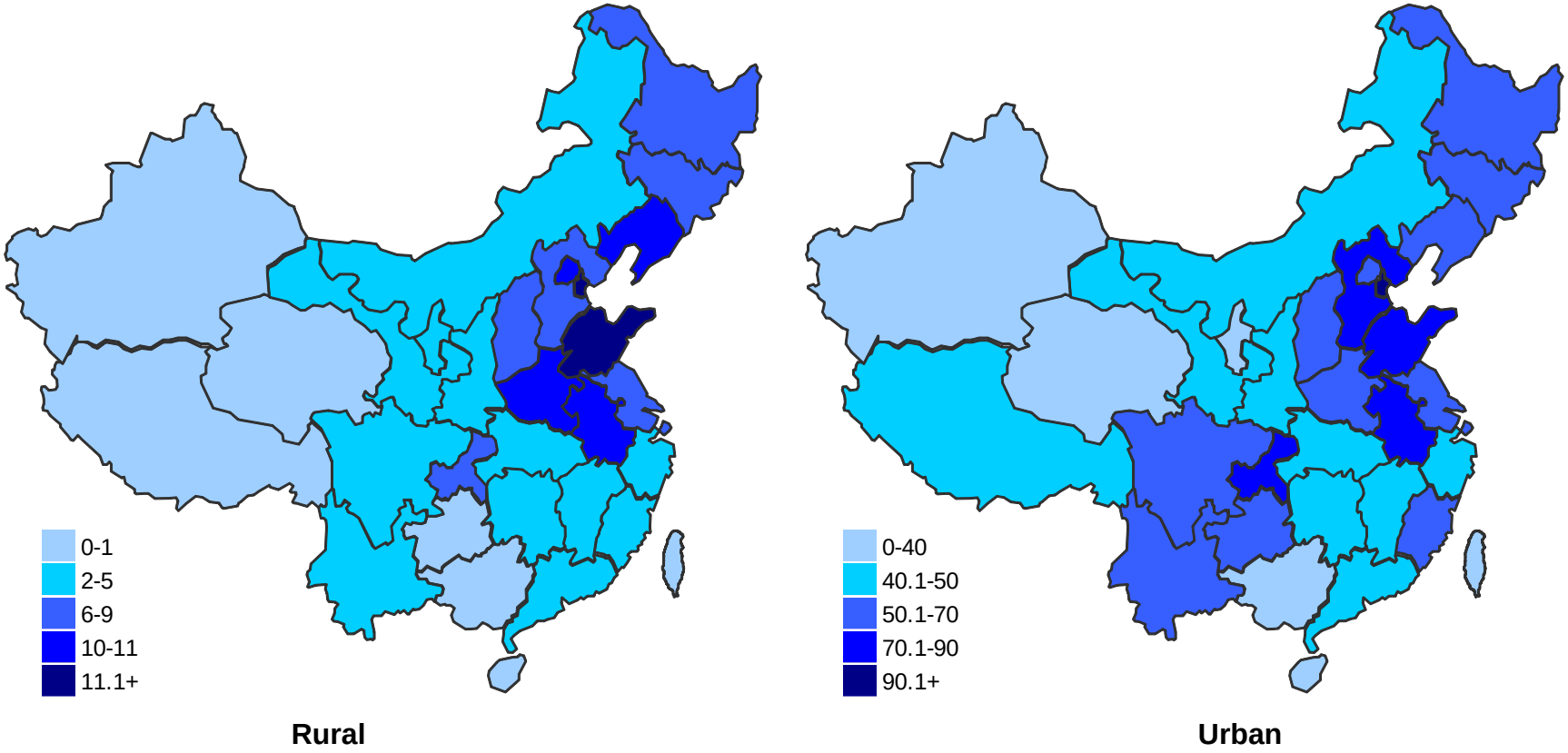
Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

Map 2.5 Per Capita Consumption of Poultry in China by Region (kg in rural, yuan in urban, 2009)



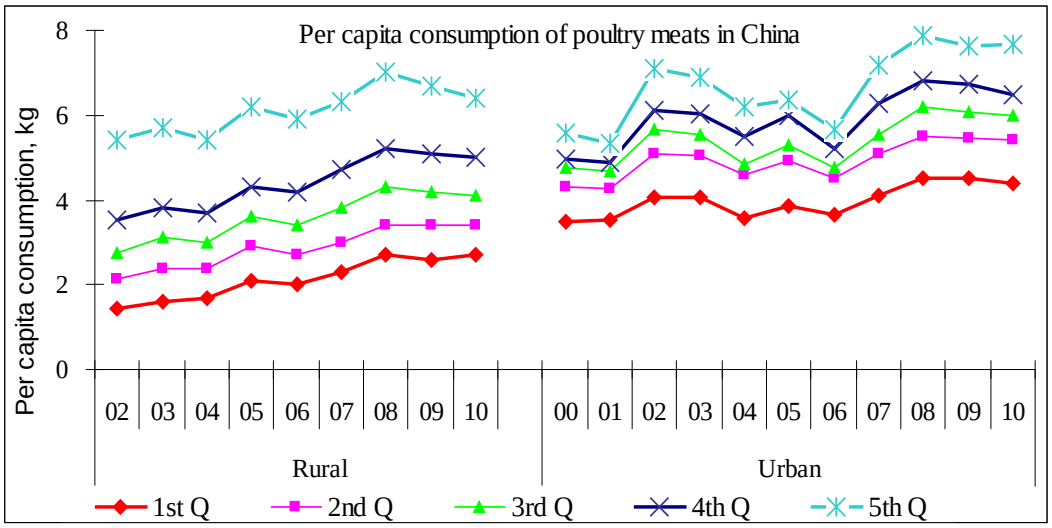
Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

Map 2.6 Per Capita Consumption of Poultry Eggs in China by Region (kg in rural, yuan in urban, 2009)



Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

Figure 2.6 Per Capita Consumption of Poultry Meat by Income Group in China, 2000-10



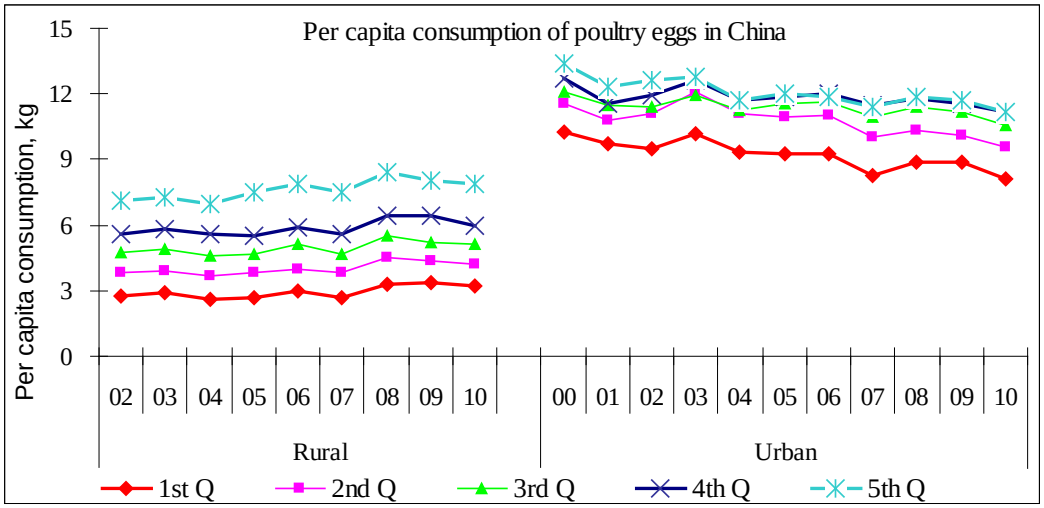
Note: Poultry data in urban China refer to chicken only.
Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

Poultry eggs

The quantity of eggs purchased dropped slightly in urban areas, perhaps due to health concerns (we do not expect a significant amount of away-from-home consumption of egg products, and hence these figures are likely to be close to actual consumption). In rural areas, the increase in per capita consumption has been slow in the past ten years. Rural per capita consumption of poultry eggs was only about half that of urban consumers (Table 2.5).

Figure 2.7 shows that consumers with higher incomes consumed more eggs. Top income residents in rural China consumed twice as many eggs as the bottom income residents. In 2010, per capita consumption by the top income group was 8 kg while the bottom income group consumed only 3.4 kg. In urban areas, consumers with higher incomes also consumed more eggs than consumers with lower incomes; however, the difference (around 30 per cent) was much smaller than that for rural areas. Figure 2.7 also shows there was a small increase in egg consumption by rural residents of all income groups. In urban areas, the consumption has tended to decrease for all income groups. This should be an interesting trend to observe. In Figure 2.7, it is clear that for corresponding quintiles, rural consumption was much lower than urban consumption. For example, egg consumption by the richest 20 per cent of rural residents in 2010 was even below that by the poorest 20 per cent of urban residents. This suggests there is further space for increased egg consumption in rural China should rural incomes increase. Poultry eggs are more preferred by people in China's northeast (e.g., Tianjin, Shandong, Henan and Liaoning) (Map 2.6).

Figure 2.7 Per Capita Consumption of Poultry Eggs by Income Group in China, 2000-10



Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

Dairy products

Table 2.5 shows that the consumption of dairy products increased significantly during the past ten years. Further details about the composition of the consumption are given in Table 2.6. In 2010, rural consumption of dairy products was approximately only one quarter of urban consumption. It is noted, however, that the percentage increase in dairy consumption is much greater in rural areas; the consumption of dairy products increased three-fold from 2000-2010 in rural areas. The corresponding increase in urban areas was 67 per cent but with a much larger absolute increase (7 kg compared with less than 4 kg in rural areas).

Fresh milk consumption dropped in both rural and urban areas in the past few years. It is believed that this drop is related to consumers' concerns regarding milk quality and food safety, particularly regarding melamine contamination.

Table 2.6 Per Capita Consumption of Dairy Products in China (2000-10, kg)

a) Rural

Year	Total	Milk	Other dairy products
2000	1.06	0.16	0.90
2001	1.20	0.27	0.93
2002	1.19	0.33	0.86
2003	1.71	0.60	1.11
2004	1.98	0.78	1.20
2005	2.86	1.22	1.64
2006	3.15	1.42	1.73
2007	3.52	1.62	1.90
2008	3.43	1.38	2.05
2009	3.60	1.39	2.21
2010	3.55	n.a.	n.a.

b) Urban

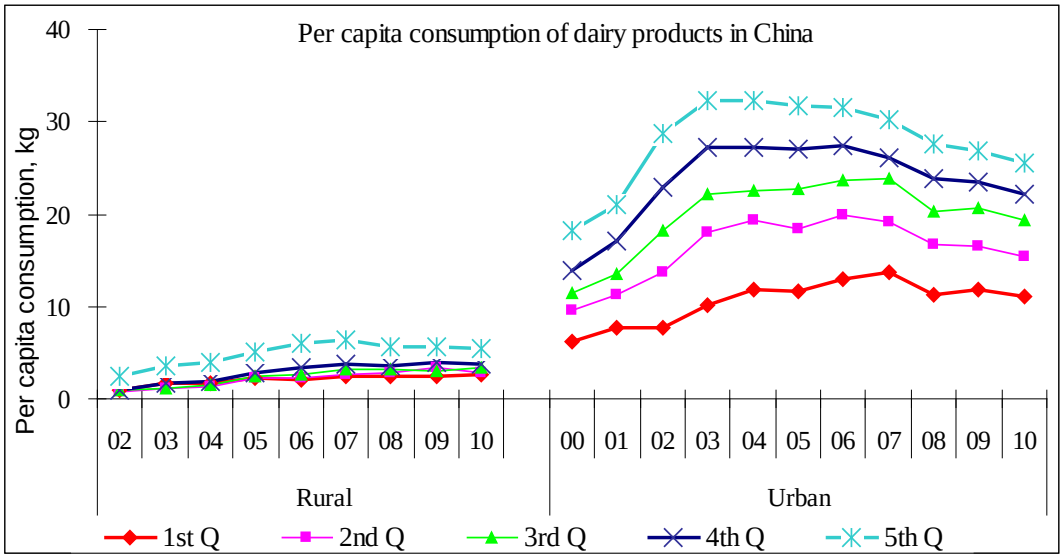
Year	Total	Milk	Milk powder	Yoghurt
2000	11.55	9.94	0.49	1.12
2001	13.76	11.90	0.50	1.36
2002	18.12	15.72	0.60	1.80
2003	21.71	18.62	0.56	2.53
2004	22.19	18.83	0.51	2.85
2005	21.67	17.92	0.52	3.23
2006	22.54	18.32	0.50	3.72
2007	22.17	17.75	0.45	3.97
2008	19.30	15.19	0.57	3.54
2009	19.27	14.91	0.48	3.88
2010	18.10	13.98	0.45	3.67

Sources: Per capita rural consumption data is from China Dairy Industry Yearbook, various issues. Per capita urban consumption data is from SSBc, various issues.

Urban areas did not record any increase in the consumption of milk powder, possibly reflecting a perception that milk powder is an "inferior" product and consumers prefer to consume more liquid milk and other "higher quality" dairy products when their income improves (Zhou 2001, Zhou *et al.* 2002) (It is noted that because of the lack of confidence in domestically produced milk powder, foreign milk powder, chiefly for baby use, is being imported into China through mail or travellers and such consumption is not included in the statistics). Yoghurt consumption registered a significant increase in urban areas (by 246 per cent between 2000 and 2010, from 1.12 kg to 3.67 kg).

In rural areas, the consumption of dairy products by the top income residents increased from 2.47 kg in 2002 to 5.7 kg in 2010, which was more than double that of the bottom income residents (0.97 kg in 2002 and 2.4 kg in 2010) (Figure 2.8). In urban areas, consumption of dairy products (chiefly, liquid milk, milk powder and yoghurt) consumed by the top income group consumers increased from 18.3 kg in 2000 to 26 kg in 2010. As in rural China, this was more than double that of the bottom income group (6.2 kg in 2000 and 12 kg in 2010) (Figure 2.8).

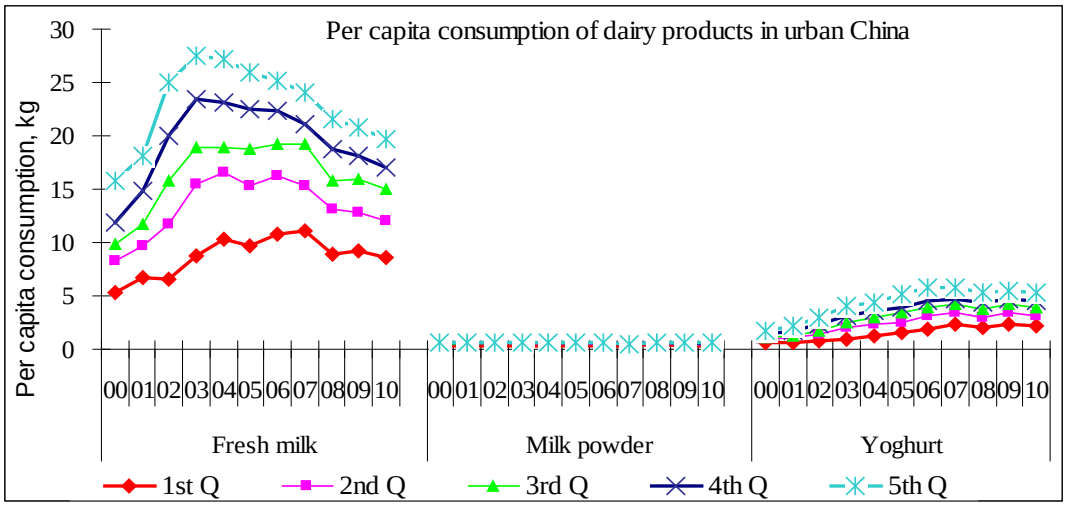
Figure 2.8 Per Capita Consumption of Dairy Products by Income Group in China, 2000-10



Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

The amount of milk powder purchased by all urban income groups was small, being less than 1 kg in all years during 2000-2010 (Figure 2.9, disaggregated consumption data for different kinds of dairy products for rural income groups is not available). On the other hand, the amount of yoghurt consumption increased rapidly for all income groups.

Figure 2.9 Per Capita Consumption of Dairy Products by Income Group in Urban China, 2000-10



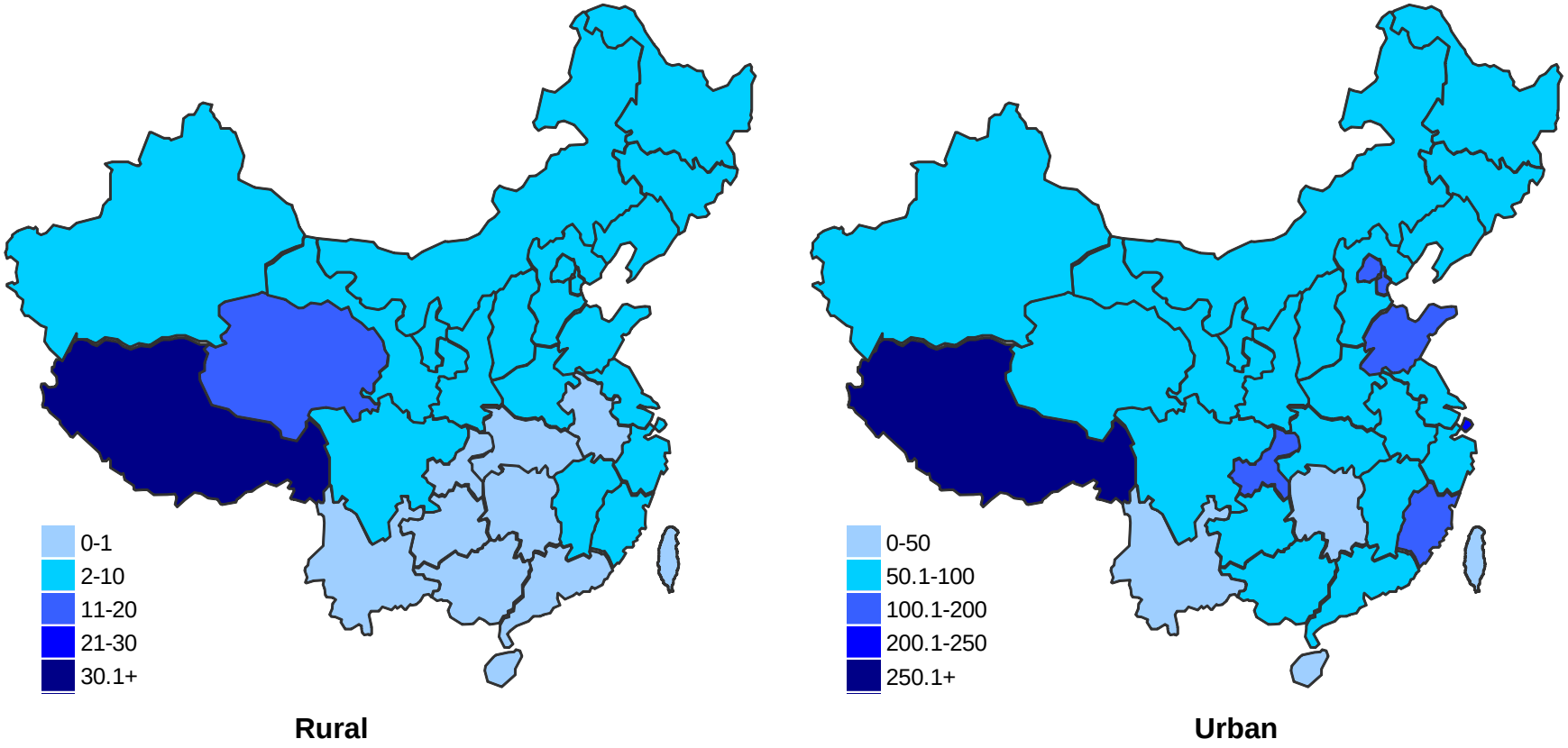
Source: based on data from SSBc, various issues.

In urban areas, the consumption of fresh milk accounts for a major portion of dairy products consumed. However, in recent years, it declined in all income groups, with the drop being greatest in the higher income groups. During 2000-2010, the consumption of milk initially increased and peaked in 2003 to 2004 for various income groups, and then started to decline. Till 2010, this decline had not stopped. As

noted earlier, this decline may be associated with consumer concerns about the safety of dairy products, which may have led to more consumption of yoghurt than liquid milk, resulting in faster increase in yoghurt consumption during the same time period.

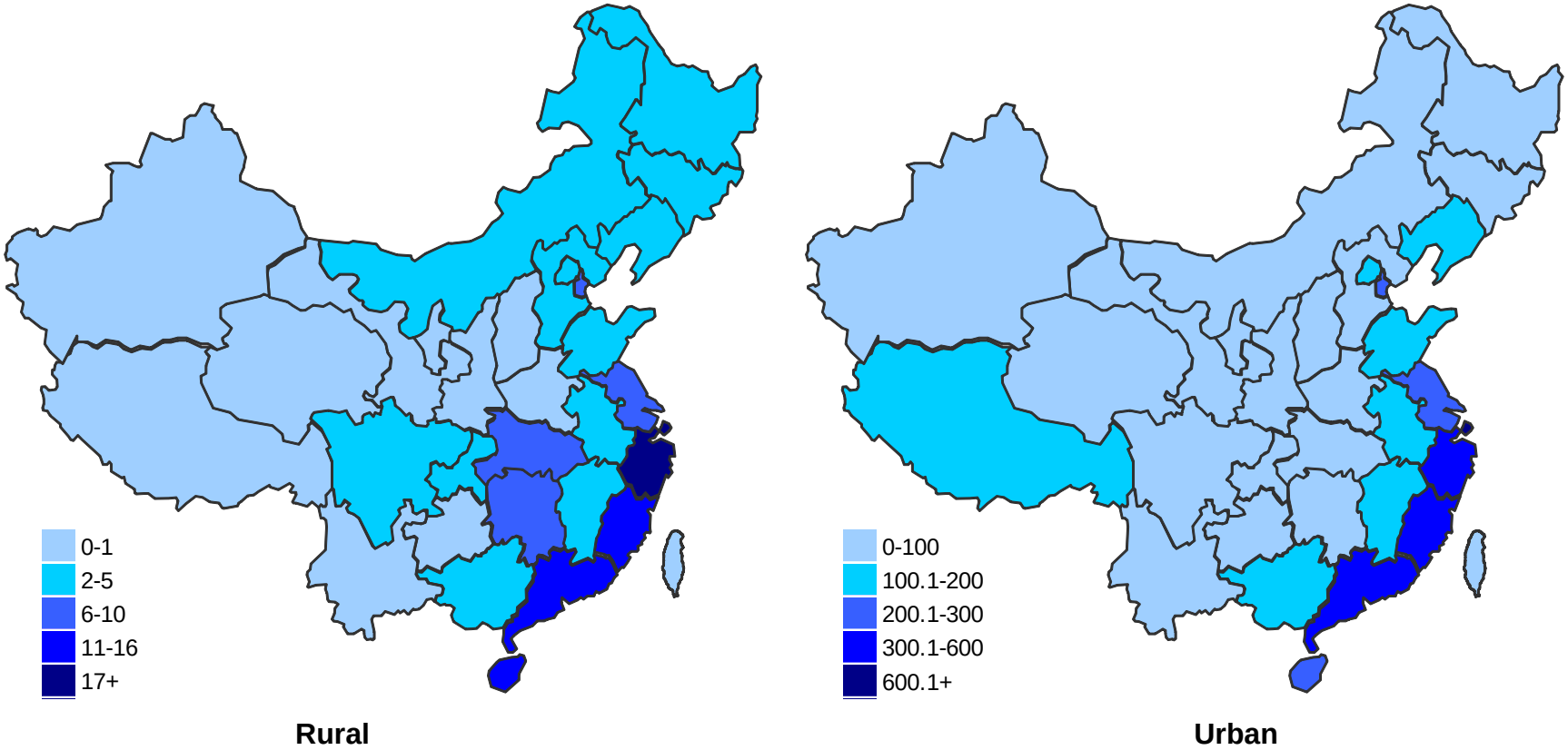
Tibet and Qinghai, where dairy products have traditionally formed a large part of the diet for ethnic minority groups, have the highest level of consumption of dairy products, followed by Beijing and Shanghai, two regions with high per capita income (Map 2.7). Dairy products are not widely consumed in China’s south, especially in rural areas.

Map 2.7 Per Capita Consumption of Milk in China by Region (kg in rural, yuan in urban, 2009)



Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

Map 2.8 Per Capita Consumption of Aquatic Products in China by Region (kg in rural, yuan in urban, 2009)



Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

Aquatic products

The consumption of aquatic products also increased significantly in the past ten years. The tremendous growth in China's aquacultural output contributed to this consumption increase. Fish was the major aquatic food consumed in both rural and urban areas (Table 2.7). The consumption of shrimp and prawns was relatively low (no separate data is available for rural areas). Fish accounted for an overwhelming proportion of aquatic product consumption, perhaps due to the ease of cooking fish at home. Perhaps there was little change in the amounts of "shrimp and prawns" and "other aquatic products" purchased by urban residents because more of these products were consumed away from home as incomes increased.

Table 2.7 Per Capita Consumption of Aquatic Products in China (2000-10, kg)

a) Rural

Year	Total aquatic products	Fish
2000	3.92	n.a.
2001	4.12	3.42
2002	4.36	3.64
2003	4.65	3.89
2004	4.50	3.70
2005	4.90	4.10
2006	5.00	4.10
2007	5.40	4.50
2008	5.20	4.30
2009	5.30	4.30
2010	5.15	n.a.

a) Urban

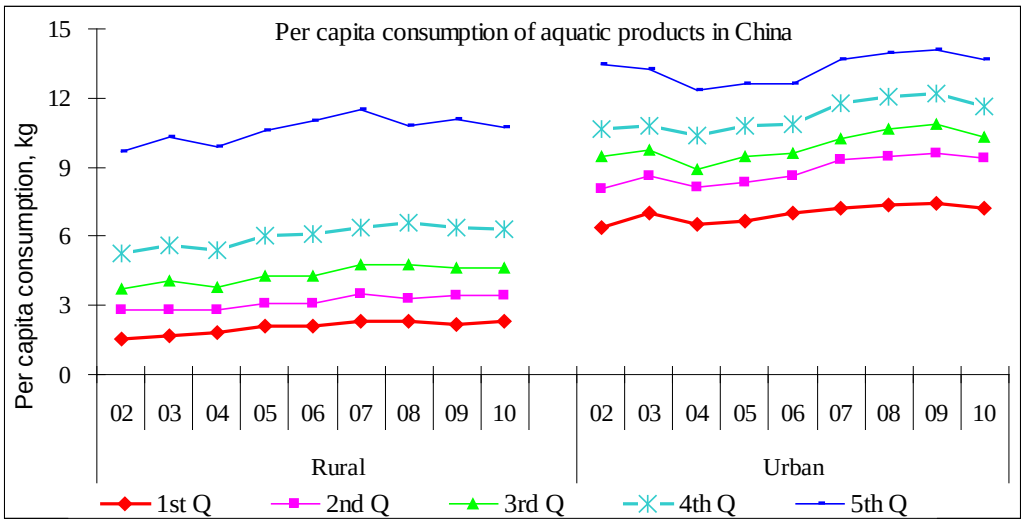
Year	Total aquatic products	Fish	Shrimp and prawns	Other aquatic products
2000	11.74	4.30	0.96	6.48
2001	10.33	4.45	1.13	4.75
2002	13.20	9.60	1.32	2.28
2003	13.35	9.79	1.33	2.23
2004	12.04	8.88	1.26	1.90
2005	12.55	9.37	1.21	1.97
2006	12.95	9.56	1.29	2.10
2007	14.20	10.24	1.59	2.37
2008	14.00	10.44	1.45	2.11
2009	14.30	10.58	1.59	2.13
2010	n.a.	10.21	1.47	n.a.

Sources: Per capita rural consumption data is from SSBb, various issues. Per capita urban consumption data is from SSBc, various issues.

In 2010, the consumption of aquatic products by the top rural income consumers (11.10 kg) was about five times higher than that of bottom income consumers (2.20 kg) (Figure 2.10). In urban areas, the top income consumers consumed 13.6 kg, about two times higher than that of bottom income consumers (7.45 kg) (Figure 2.10). The increase in consumption within each income group was small. It is likely that Chinese consumers opted to consume aquatic products on away-from-home occasions, especially those with higher incomes. However, when consumer incomes increase, the increase in consumption is significant (Figure 2.10).

There are very distinct patterns in the consumption of aquatic products between regions. Major consumers are in China's coastal south and southeast provinces. Aquatic products are consumed less in China's western provinces, especially in the northwest (Map 2.8).

Figure 2.10 Per Capita Consumption of Aquatic Products by Income Group in China, 2002-10



Note: Aquatic products in urban China refer to fish only.
Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

Cooking oil

In recent years, China imported large quantities of rapeseed (1.6 mt in 2010), soybeans (55 mt in 2010), and cooking oils (8.3 mt in 2010). Table 2.8 shows, however, that there is no marked increase in cooking oil use at home in both rural and urban areas. It is likely that imported cooking oil has been used in catering industries and food processing industries rather than consumed directly at home. Table 2.8 also shows that the consumption of animal oil is decreasing and is clearly less popular than vegetable oils. In urban areas, the quantity of animal oil consumed is very low and declining. In rural areas, the consumption is slightly higher but decreasing rapidly.

Table 2.8 Per Capita Consumption of Cooking Oil in China (2000-10, kg)

a) Rural

Year	Total	Vegetable Oil	Animal Oil
2000	7.06	5.45	1.61
2001	7.03	5.51	1.52
2002	7.53	5.77	1.76
2003	6.30	5.30	1.00
2004	5.30	4.30	1.00
2005	6.00	4.90	1.10
2006	5.80	4.70	1.10
2007	6.00	5.10	0.90
2008	6.20	5.40	0.90
2009	6.25	5.42	0.83
2010	6.31	5.52	0.79

b) Urban

Year	Total	Vegetable Oil	Animal Oil
2000	8.61	8.16	0.45
2001	8.47	8.08	0.39
2002	9.00	8.52	0.48
2003	9.59	9.20	0.39
2004	9.70	9.40	0.30
2005	9.61	9.25	0.36
2006	9.67	9.38	0.29
2007	9.63	9.63	n.a.
2008	10.27	10.27	n.a.
2009	9.67	9.67	n.a.
2010	8.84	8.84	n.a.

Vegetable oil only in urban China from 2007 to 2010.
Sources: Per capita rural consumption data is from SSBb, various issues. Per capita urban consumption data is from SSBc, various issues.

Alcoholic drinks

By volume, China has become the world's largest beer market. Beer consumption is generally expected to increase when consumers' income increases. This is clearly the case for rural residents (Table 2.9). However, the data for urban dwellers goes against this understanding. The reason may be that urban residents consumed more beer away from home. China's total beer output has increased rapidly from 22.3 billion litres in 2000 to 44.9 billion litres in 2010 (SSBa 2002, p. 478; SSBa 2011, p. 499). In 2010, its total beer exports were 0.194 billion litres (beer import data is not available). SSB beer consumption data cannot explain the gap between production and consumption, implying that much beer is consumed away from home.

Table 2.9 Per Capita Consumption of Alcoholic Drinks in China (2000-10, kg)

a) Rural

Year	Total	Chinese Liquor	Beer
2000	7.02	n.a.	n.a.
2001	7.10	3.43	n.a.
2002	7.50	n.a.	n.a.
2003	7.10	3.43	4.00
2004	7.80	3.10	4.30
2005	9.60	3.50	5.50
2006	10.00	3.40	6.10
2007	10.20	3.30	6.30
2008	9.70	3.10	6.00
2009	10.08	3.20	6.40
2010	9.74	n.a.	n.a.

b) Urban

Year	Total	Chinese Liquor	Beer	Wine	Other Alcoholic Drinks
2000	10.01	2.66	6.51	0.18	0.66
2001	9.69	2.57	6.29	0.20	0.63
2002	9.14	2.40	5.90	0.24	0.60
2003	9.39	2.40	6.12	0.29	0.58
2004	8.94	2.25	5.91	0.26	0.52

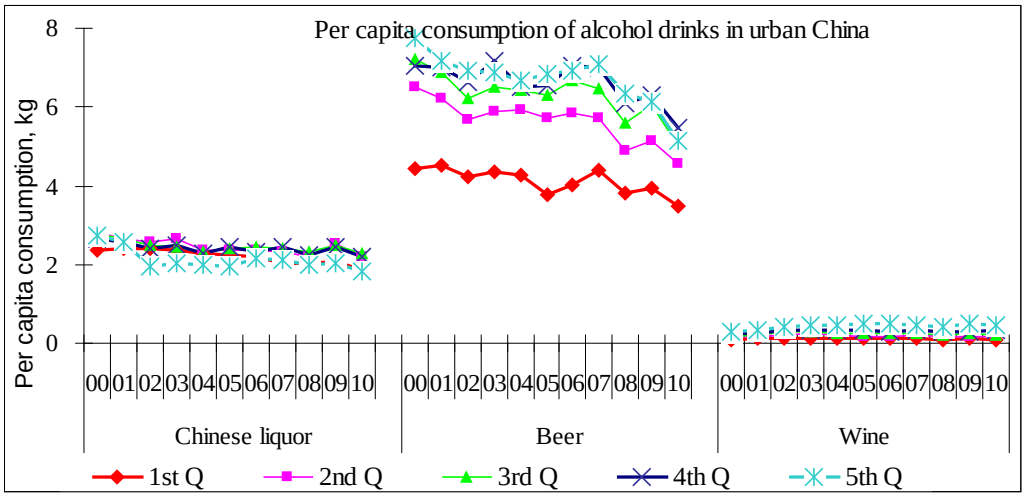
Year	Total	Chinese Liquor	Beer	Wine	Other Alcoholic Drinks
2005	8.85	2.28	5.75	0.26	0.56
2006	9.12	2.29	6.01	0.25	0.56
2007	n.a.	2.27	6.05	0.25	n.a.
2008	n.a.	2.15	5.25	0.22	n.a.
2009	n.a.	2.31	5.43	0.25	n.a.
2010	7.02	2.08	4.66	0.24	0.04

Sources: Per capita rural consumption data is from SSBb, various issues. Per capita urban consumption data is from SSBc, various issues.

The consumption of Chinese liquor (with high alcohol volumes, ranging between 36 per cent to 65 per cent) seems to have been steadily declining in both rural and urban areas, reflecting changes in people's tastes and preferences – moving away from high- to low-volume alcohol drinks. The consumption of wine is comparatively low but on the increase (and would likely be higher if away-from-home consumption is included). If consumers continue to move away from high volume Chinese liquor to other alcoholic beverages, the potential market for wine is substantial (Table 2.9).

In urban China, the purchase of Chinese liquor declined among all income groups (Figure 2.11), suggesting changes in tastes and preferences for lower alcohol drinks. Between income groups, higher income consumers bought more beer and wine for consumption at home. Within the same income group, it is interesting to note that the amount of beer purchased declined for all income groups over time. As noted earlier, given that the supply of beer has been increasing in the past decade, the likely explanation would be that urban Chinese consumed more beer at away-from-home occasions. The only alcoholic drink that experienced an increase within the same income group over time is wine (Figure 2.11). Although the increase in the amount of wine consumed was small, it shows the potential for wine sales in China. Wine is seen as a premium beverage and is increasingly preferred by wealthier consumers.

Figure 2.11 Per Capita Consumption of Alcohol Drinks by Income Group in Urban China, 2000-10



Source: based on data from SSBc, various issues.

Data on the consumption of alcoholic drinks by income groups is not available for rural areas. Per capita consumption of Chinese liquor could be higher in rural areas as

generally lower income consumers tend to drink higher alcoholic drinks. While the consumption of beer may also be increasing in rural China, the consumption of wine would be very low due to its cost.

Vegetables and fruits

There have been no dramatic changes in terms of consumption of vegetables, fruits, melons and their processed products. The quantity consumed seems to be quite stable in both rural and urban areas. The difference in the level of vegetable consumption between rural and urban areas is relatively small. However, fresh fruit consumption in urban areas is twice that in rural areas (see Table 2.10).

The consumption of vegetables (not including potatoes and sweet potatoes) increases from low income to high income groups (Figure 2.12). The level of vegetable consumption between rural and urban rich was largely comparable, around 130 kg per person per annum. This level, however, was about 30-40 kg higher than that of the bottom income consumers. This somewhat goes against intuition. It would be expected that because vegetables are relatively low value foods compared to animal products that lower income people would consume more. There are a couple of explanations as to why this might be the case. It may be that some of those poor do not have refrigerators and when they are not close to markets, they may not buy vegetables every day. Further, vegetable production requires water but water is scarce in the North-West region. Thus, vegetables may have to be imported from other regions, increasing the price and reducing affordability for lower income groups (Zhang, L.X, per. comm. 1 December 2011).

Table 2.10 Per Capita Consumption of Vegetables, Fruits and Melons in China (2000-10, kg)

a) Rural

Year	Vegetables	Fruits
2000	112	18.31
2001	109	20.33
2002	111	18.77
2003	107	17.50
2004	107	17.00
2005	102	17.10
2006	101	19.10
2007	99	19.50
2008	100	19.40
2009	98	20.54
2010	93	19.64

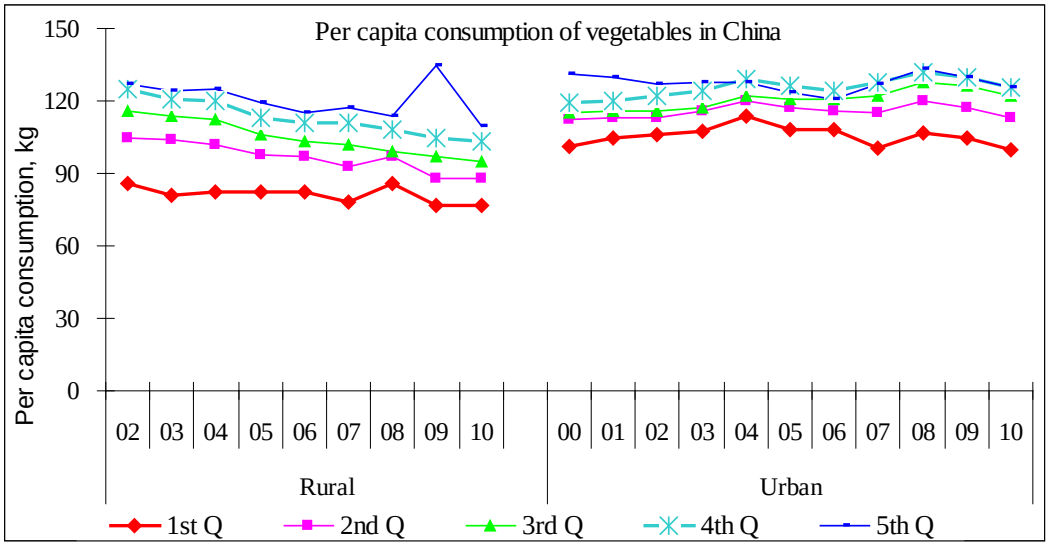
b) Urban

Year	Vegetables	Fresh Fruits	Fresh Melons	Dried Fruits	Processed Fruits and Melons	Nuts
2000	117	36.90	20.57	0.57	8.35	3.30
2001	118	37.26	22.63	0.54	9.02	3.37
2002	117	37.80	18.72	0.72	0.48	2.76
2003	118	37.99	18.58	0.78	0.44	2.70
2004	122	38.81	17.64	0.72	0.42	2.94
2005	119	37.50	19.19	0.71	0.42	2.97
2006	118	38.01	22.16	0.75	0.44	3.03

Year	Vegetables	Fresh Fruits	Fresh Melons	Dried Fruits	Processed Fruits and Melons	Nuts
2007	118	41.10	18.44	n.a.	n.a.	n.a.
2008	123	38.19	16.29	n.a.	n.a.	n.a.
2009	120	38.94	17.61	n.a.	n.a.	n.a.
2010	116	36.93	17.30	n.a.	n.a.	n.a.

Sources: Per capita rural consumption data is from SSBb, various issues. Per capita urban consumption data is from SSBc, various issues.

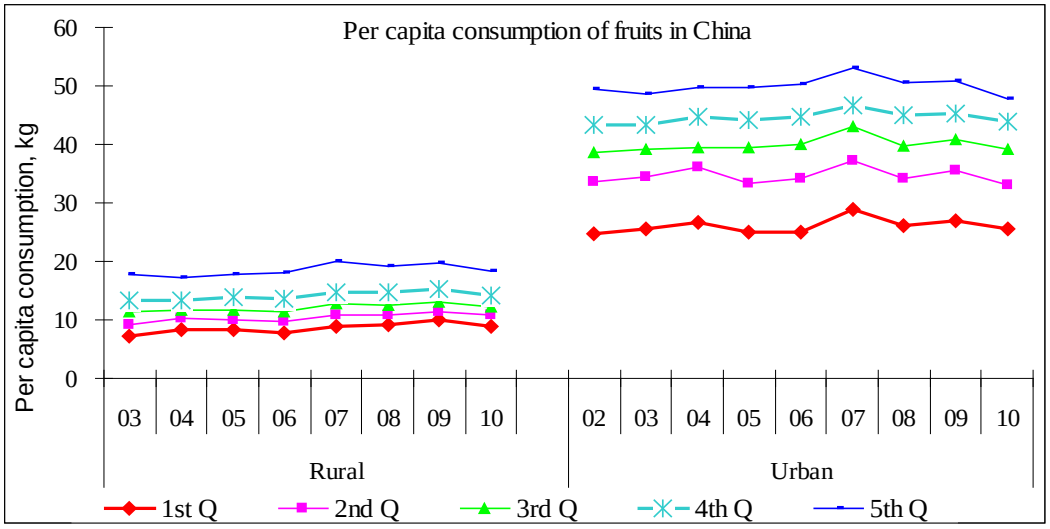
Figure 2.12 Per Capita Consumption of Vegetables by Income Group in China, 2000-10



Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

During the past decade, the increase in fruit consumption in rural areas was small, but relatively large in urban areas. Higher income groups consumed twice as much fruit as lower income groups in both rural and urban areas (Figure 2.13). However, rural consumption of fruits was much lower compared to their urban counterparts. For example, the amount of fruits consumed by the top rural income group was lower than that by the urban bottom income group. In 2010, the top rural income group consumed just below 20 kg per person while the bottom urban income group purchased 27 kg. On the other hand, the top urban income group consumed over 52 kg of fruits. The large gap between rural-urban fruit consumption points to significant scope for increased rural consumption as rural income increases.

Figure 2.13 Per Capita Consumption of Fruits by Income Group in China, 2000-10



Sources: rural: based on data from SSBb, various issues; urban: based on data from SSBc, various issues.

The examination of food consumption developments in China during 2000-2010, recognising the limitations of the SSB data, reveals the following important findings:

Rural-urban consumption differences:

- During the past decade, per capita direct consumption of food grains declined, while that of animal products increased in both rural and urban areas.
- Food grain consumption by rural residents was significantly higher than that by urban residents. In terms of the amount of processed grains, the consumption by rural residents in 2010 was roughly comparable to that by urban residents in 1982.
- The consumption of meats (including pork, beef, mutton and poultry) by rural residents is lagging behind that of urban residents by about 30 years. In 2010, per capita consumption by rural residents was almost 20 kg, lower than the corresponding consumption by urban residents in 1982, being just over 21 kg.
- The difference in consumption between rural and urban consumers for pork and poultry meat was relatively small, but was much larger for beef and mutton. Per capita consumption of beef and mutton by rural top income consumers has been below that of the urban bottom group.
- Significant gaps also existed between rural and urban consumers in the consumption of poultry eggs, aquatic products and dairy products. Rural per capita consumption in 2010 was about one half, one third, and one quarter of that by urban residents in 2010, respectively, and was lower than the consumption level of urban residents in 1982; thus also lagging behind that of urban residents by about 30 years.
- When rural residents' income further improves, there is the potential for further reduction in direct human consumption of grains in China. At the same time, there will be huge potential for the increased consumption of animal products.

Consumption differences between the rich and poor:

- There were significant differences between lower income and higher income consumers for almost all of the food products examined, with the only exception being the consumption of food grains and milk powder in urban areas.
- Generally, higher income residents consumed higher amounts of foods, with two exceptions: food grains and Chinese liquor.
- With higher income, the consumption of pork, beef, mutton and poultry meats was higher than the amount consumed by low income consumers. The difference was 50 per cent or greater.
- Higher income dwellers consumed significantly more dairy products and aquatic products.
- In the past decade, egg consumption by all urban income groups tended to decline as incomes increased.
- Except for the consumption of food grains and Chinese liquor in urban areas, the consumption of all other foods examined in this study will increase when consumer income increases, suggesting huge potential for consumption of various foods in China.

Regional consumption differences:

- For food grain consumption, all major wheat-consuming provinces are in the country's north. Wheat and other coarse grains are the staple foods for people in northern China.
- Rice is predominantly consumed in southern China and is the staple food for many people in China's south.
- Pork is widely consumed in different parts of the country, with southern provinces consuming comparatively the most. North-west China has a higher per capita consumption of beef and mutton. Poultry meats and eggs are more preferred by people in central and eastern China.
- Aquatic product consumption is typically concentrated in China's coastal south-east provinces, which is the base of most aquacultural production.
- Per capita consumption of dairy products is higher in regions (1) where ethnic minorities are more prevalent and dairy products form a major part of their diet or (2) where consumers have much higher incomes.
- The different levels and patterns of food consumption between regions seem to be largely affected by three factors: local income level; food availability; and ethnic background.
- The convergence in food tastes and preferences between people in different parts of China in the past decade has been slow. Nonetheless, such convergence is expected to accelerate in the years to come due to the following three major reasons.
  (1) The improved availability of chilled transportation facilities, where some foods (such as aquatic products, beef and mutton, dairy products) will become more widely available across the country. Improved home refrigeration facilities will also enable and encourage people to buy such foods.

(2) Travelling between different parts of the country has become much easier, enabling regional cuisines to be enjoyed across China.
(3) A large number of workers, mainly from rural areas, seek employment in other provinces and are exposed to, and influenced by, different foods which could affect the foods that are consumed in their own homes.

3. Identification and Analysis of Key Drivers

Our analysis shows that the level and composition of food consumption in China has experienced some major changes between 2000 and 2010. Per capita direct consumption of grains dropped while the consumption of foods of higher value increased, especially foods of animal origin. Admittedly, the consumption of animal foods in China in absolute terms is still low, particularly when compared with many developed countries. However, the speed of the increase has been impressive.

Important questions to ask include: what has led to such a fast increase in the consumption of animal products and other foods of higher value? Will this trend continue into the near future, and if so what are the key factors that will drive this trend? Identification of such factors is valuable not only for understanding China's demand for such foods in the past and present, but also for analysing future trends and likely changing patterns of food consumption. This part of the report focuses on the identification and analysis of key drivers responsible for food consumption developments as discussed in Section 2.

Rising income

Fast economic growth and moderate population growth rates have resulted in increased consumer income. As income increased, the amount of income spent on food increased although the actual proportion of income spent on food declined as shown in Tables 2.2 and 2.4. Lower value food grains were substituted with foods of higher value, such as foods of animal origin. This led to a steady increase in the consumption of animal products (as we have shown in the previous section). A number of recent studies confirm that rising income is the major driving force leading to increased consumption of animal products (see, for example, Huang and Rozelle 1998, Ma *et al.* 2004, Fuller *et al.* 2000, Zhou *et al.* 2003).

How will the income factor affect future consumption of animal products? This is largely determined by the income growth rate and the income elasticity of demand for animal products. All things being equal, the greater the income elasticity, the greater the demand for animal products when income rises. So far, there is little agreement about the likely size of income elasticities of demand for various animal products for China, although there is no shortage of such estimates (for a summary of some of these estimates, see Table A1 in Appendix A). Nonetheless, it is generally claimed that: (1) income elasticities of demand for most foods are declining over time as incomes rise; (2) the income elasticities for animal products are relatively large compared to those of staple foods; and (3) rural income elasticities are greater than urban income elasticities. Income elasticities derived by different studies for a variety of foods collated in Table A1 support the above assertions. However, income elasticities that take into consideration consumption changes in the 2000s are limited. As for income growth, it is widely held that China's economy will continue to grow at

a high speed (around 8-9 per cent), and thus consumer income is expected to continue to increase.

Analysis in Section 2 shows that not only will the demand for foods of animal origin by Chinese consumers increase when their incomes increase, their demand for various foods of plant origin such as fruits will also increase. But this is not the case for staple food grains (i.e., wheat and rice). Hence, our analysis indicates that there exists the potential for increased food demand in China if the bottom income groups can increase their income toward the higher income groups, and if rural incomes increase toward urban income levels.

Rapid urbanisation

Urbanisation generally brings about a higher income to new residents. These residents are also readily exposed to urban lifestyles, including consumption behaviours. This tends to influence and change their dietary behaviours. According to Huang and Rozelle (1998, p. 18), urbanisation affects not only the consumption level of different foods, but also the composition of what food is consumed. When a rural resident moves to a city, the consumption of food grains and vegetables tends to decrease but that of other foods including animal products tends to increase. For example, depending on whether the city is small, medium or large, the consumption of animal products by new urban residents in China will increase in the range of 4.2 to 7.2 kg, and that of aquatic products, 1.5 to 1.7 kg.

China's urbanisation level was very low at the end of the 1970s, being less than 20 per cent. Economic reforms have led to accelerated industrialisation and urbanisation. By 2003, the urbanisation level had doubled that of 1980, reaching 40 per cent. In 2010, it reached almost 50 per cent; that is, about half of China's population now lives in urban areas. China's accelerated urbanisation must have contributed to the increase in the consumption of animal products and other foods of higher value. Urbanisation has been promoted in recent years by both China's central and local governments and its level is expected to continue to increase. Hence, urbanisation is likely to continue to stimulate changes in the level and composition of food consumption, and its impact is likely to become even stronger.

Changing lifestyle

Increases in income and urbanisation promote changes in lifestyle. More and more Chinese have started to take holidays and consume foods that require less or no time to prepare. The increase in the number of Chinese people taking inter-city, inter-province, and international holidays has been increasing rapidly in recent years. For lifestyle, convenience and time saving, more and more people dine out and buy processed or semi-processed foods. Many are also keen to try out Western-style fast foods, e.g. Kentucky Fried Chicken and McDonald's.

The number of consumers dining out (away-from-home consumption) deserves special attention. The number of people that dine out is very large and still increasing. SSB household survey data does not include away-from-home consumption (quantity) and this is an important reason why per capita consumption data is underestimated.

Based on the SSB data, the ratio of away-from-home food expenditure out of total food expenditure becomes higher when consumer income increases. The ratio is much higher for high-income consumers than for low-income consumers. For example, in 1995, urban consumers spent a little less than 10 per cent of their food expenditure on away-from-home consumption. By 2000, this ratio increased to 15 per cent. It further increased to 22 per cent in 2009 (see Table 3.1). In 2000, the lowest income group of urban residents spent less than 9 per cent on away-from-home consumption and this ratio increased by about two percentage points by 2009. For the highest income group, this ratio was already over 20 per cent in 2000 and jumped further to over 35 per cent in 2009, an increase by almost 15 percentage points. In absolute terms, the highest income group spent 2,684 yuan on average on away-from-home food in 2009; the lowest income group spent 255 yuan (in 2009, 1A$=5.46¥). Expenditure on away-from-home food by the highest income group in 2009 (2,684 yuan) was higher than the total food expenditure of the lowest urban income group, which was 2,294 yuan (Table 3.1). Empirical studies that address food-away-from-home consumption have generated similar observations (Wang and Fan 1999; Ma *et al*. 2001).

Table 3.1 Food-Away-From-Home (FAFH) Expenditure in Urban China by Income Group (2000-09, yuan, %)

	Food exp.	FAFH exp.	Ratio*	Food exp.	FAFH exp.	Ratio*	Food exp.	FAFH exp.	Ratio*	Food exp.	FAFH exp.	Ratio*
	Average			The first decile			The second decile			The second quintile		
2000	1958	288	15	1257	110	9	1524	165	11	1749	202	12
2001	2014	314	16	1301	119	9	1570	175	11	1791	228	13
2002	2272	414	18	1127	99	9	1458	153	10	1773	234	13
2003	2417	438	18	1223	103	8	1595	171	11	1926	249	13
2004	2710	533	20	1418	129	9	1827	214	12	2202	317	14
2005	2914	607	21	1476	144	10	1926	246	13	2336	361	15
2006	3112	691	22	1586	177	11	2073	289	14	2484	404	16
2007	3628	761	21	1904	213	11	2451	319	13	2493	458	18
2008	4260	878	21	2182	221	10	2846	346	12	3429	509	15
2009	4479	976	22	2294	255	11	3009	396	13	3640	597	16

* Ratio = FAFH expenditure / Food expenditure.
Source: SSBc, various issues.

	Food exp.	FAFH exp.	Ratio*	Food exp.	FAFH exp.	Ratio*	Food exp.	FAFH exp.	Ratio*	Food exp.	FAFH exp.	Ratio*
	The third quintile			The fourth quintile			The ninth decile			The tenth decile		
2000	1961	273	14	2216	357	16	2459	452	18	2847	588	21
2001	2033	293	14	2272	387	17	2510	484	19	2921	658	23
2002	2140	333	16	2597	476	18	3171	685	22	4101	1154	28
2003	2294	355	15	2763	506	18	3338	703	21	4333	1284	30
2004	2581	432	17	3131	630	20	3741	894	24	4915	1594	32
2005	2839	513	18	3426	727	21	4151	1042	25	5367	1834	34
2006	3019	582	19	3648	835	23	4392	1168	27	5747	2050	36
2007	3538	647	18	4230	900	21	5062	1305	26	6440	2156	33
2008	4181	748	18	5044	1080	21	6087	1539	25	7874	2706	34
2009	4410	831	19	5367	1226	23	6360	1732	27	8135	2864	35

* Ratio = FAFH expenditure / Food expenditure.
Source: SSBc, various issues.

Changes in tastes and preferences

In China, as in many other countries, trying foods from other cultures is popular. Three major factors may have facilitated changes in Chinese consumers' tastes and preferences, leading to their increased interests in trying new foods: (1) increased income; (2) improved availability of different kinds of foods in local markets due to better transportation networks; and (3) increased international cultural exchanges and exposure to different foods and eating habits. In China, dairy products were traditionally not a part of the diet for many consumers, especially in rural areas. Today, it is common to see urban consumers, as well as wealthy rural consumers, consuming milk and other kinds of dairy products such as yoghurt and ice-cream.

Better organisation of food production and marketing

Food production and marketing have become better organised. For example, the rapid development of China's animal feed industry has contributed significantly to improving the output of China's animal production industries. Chilled facilities for perishable foods and for long-distance transportation have increased and improved. This means that consumers have access to more and different foods than before.

The concept of supply chains has now become accepted by China's food industries and is encouraged by the government. Foreign food retailers are allowed to operate in China. The entry of some major foreign food retailers such as Carrefour and Wal-Mart has further boosted competition in an already competitive market, leading to increased food varieties and branded food products.

Changes in population structure

It is estimated that China's population will continue to increase till about the mid-2030s. Given the size of its population, every small increase or decrease in per capita demand for food products will translate into a large sum at the national level. However, in future, it may be that the impact from the size of the population on food consumption may not be as important as the impact from structural changes in the population. The proportion of aged people in the population is increasing much faster than the proportion of younger people. The composition of foods demanded by aged, middle-aged and younger populations is different. A relatively higher proportion of the aged population is likely to have a major impact on the composition and amount of foods demanded in China. For example, there may be reduced consumption of meats, especially red meats, but increased consumption of other foods. Such an impact is yet to emerge or be seen, but is an area that deserves close attention in the future.

4. Outlook for China's Food Consumption and Import Demand by 2020

With the exception of rice and wheat, the per capita consumption of foods by Chinese consumers has increased during the last decade. Those factors that have driven these increases will continue to drive higher consumption, with the impact of urbanisation potentially becoming the most influential factor. Consequently, it will be beneficial to know: how China's consumption of various foods will increase in the future; whether

China can produce enough to meet such rising demand; and if imports are needed, how much China must import.

Projecting China's future food production, consumption and trade in food products requires reliable data and forecasting. While there is no shortage of sound forecasting approaches, data of acceptable quality is generally not available. Various individual researchers, governments and international organisations have attempted to conduct such forecasts by using freely available data, mostly from Chinese government publications, plus data obtained from field work, and in some cases self-generated estimates or assumptions. However, food consumption projections vary widely; see, for example, Huang *et al.* (1999), Chen (2004), FAPRI, USDA, OECD-FAO. The discrepancies in such forecasting work arise from several factors including differences in assumptions that underlie any projection work.

Constrained by data, it was not feasible for this study to carry out sophisticated econometric forecasting. Indeed, given the data deficiencies, any new modelling efforts are unlikely to produce results that are any more reliable than those from the USDA (USDA Agricultural Projections), FAPRI (FAPRI World Agricultural Outlook), OECD-FAO (OECD-FAO Agricultural Outlook), for example. In this study, we focus on analysing and evaluating the reliability of previous forecasts based on our understanding of China's current market.

The approach adopted in this study to provide an outlook of China's food consumption and food import needs by 2020 is summarised below.

1) Determine per capita food consumption to help understand evolving trends.
2) Derive income elasticities of demand for various foods to identify how the demand for various foods may change when consumer income increases.
3) Collate and compare existing forecasts of production and consumption of various foods for China.
4) Provide an analysis of the likely trends in China's demand for food imports.

4.1 Methodological Considerations

Deriving per capita utilisation

Per capita food consumption data available from SSB, as used in Section 2, is valuable in examining the trends of food consumption in China. The data, however, has limited value for understanding China's future total demand for two reasons: (1) it does not include consumers' away-from-home consumption; and (2) it only includes direct human consumption. To better understand future total demand, we need to know current food use on a per capita basis including all uses of a given food item (such as for direct human consumption, feed use, processing etc.). Food balance sheets, such as those produced by the FAO, offer a useful alternative to derive per capita food consumption or utilisation.

Food balance sheets show the quantity of food available (supply) in a country and where the food supply goes (utilisation). Annual food balance sheets tabulated regularly over a period of years are also useful to: (1) show the trends in the overall national food supply; (2) reveal changes that may have taken place in the types of

food consumed (i.e. the pattern of the diet); and (3) reveal the extent to which the food supply of the country as a whole is adequate in relation to nutritional requirements (FAO 2001, p. 3). Many countries compile their food balance sheets regularly, e.g. the Australian Bureau of Statistics compiles the Apparent Consumption of Foodstuffs data (ABS 2007, Cat No. 4306.0) based on the food balance sheet principle.

Food balance sheets by the Chinese government, however, are not publicly available. To work out China's per capita food consumption, we used the food balance sheets compiled by the FAO (Food Balance Sheets) and USDA (PSD). These organisations compile food balance sheets for various countries including China. Following careful examinations of these balance sheets, FAO's food balance sheets were chosen for producing per capita food consumption for this study for three major reasons:

1. They cover more food items than others.
2. FAO balance sheets are based on official data from each country.
3. FAO balance sheets are based on calendar years. Most of China's data, which this study uses such as for income, price, population, are based on calendar years.

However, there are several issues associated with the use of FAO balance sheets:

1. Data for China also include Taiwan, Hong Kong and Macau. This will skew the data to a certain extent, though mainland China accounts for an overwhelming share.
2. If there are any inaccuracies in China's official statistics, then FAO's data will be inaccurate.
3. The latest year included in the FAO food balance sheets is 2007. We used SSB data reported in Section 2 to remedy this problem.

FAO food balance sheets show for each food item the sources of supply and its utilisation. We derived per capita consumption of various food items as follows. The total quantity of a food item produced in China minus the total *net* export quantity, and adjusted for any change in stocks that occurred since the beginning of the year, gives the total supply available during that year. In the FAO balance sheets, total supply is also equal to total consumption (or utilisation). For total utilisation, where appropriate, a distinction is made between the quantities used for other purposes (e.g. animal feed and seed), losses during storage and transportation, processes for food use and non-food use, food supplies available for human consumption at the retail level, and any other utilisation. Finally, the per capita consumption of each food item is obtained by dividing the total consumption quantity by China's population. This per capita consumption includes both direct and indirect consumption.

The food items for which per capita consumption has been calculated in this way include: wheat, rice, maize, barley, soybean, rapeseed, sugarcane, vegetables, fruits, pig meat, beef, mutton and goat meat, poultry, poultry eggs, milk, fish and other seafoods. The balance sheet for each of these food items is presented in Appendix B.

Calculating income elasticities

To understand China's future food demand, knowledge about the patterns of changes in income elasticities is valuable. Earlier studies have attempted to estimate income elasticities of demand for various foods (see Table A1 in Appendix A). Few, however, have made attempts to calculate income elasticities through time, which help to reveal the patterns of change. Our earlier analysis in Section 2 strongly suggests that income elasticities of demand for various foods are most likely to vary over time in China as income has grown. We estimated income elasticities on an annual basis from 1978 to 2010. An abbreviated version of the estimates is given in Table 4.1 and a full version containing all yearly estimates are given in Appendix A, Table A3.

Table 4.1 Income Elasticity of Main Food Items in China (1978 to 2010)

Year	1978	1980	1985	1990	1995	2000	2005	2010
Barley	1.3205	1.1497	0.6836	0.4638	0.2113	0.0971	0.0066	-0.0596
Wheat	0.8877	0.7461	0.3597	0.1775	-0.0319	-0.1266	-0.2016	-0.2565
Rice	-0.0084	-0.0328	-0.0994	-0.1308	-0.1669	-0.1833	-0.1962	-0.2057
Maize	0.3866	0.3862	0.3850	0.3845	0.3839	0.3837	0.3834	0.3833
Soybeans	-0.2968	-0.1384	0.2935	0.4972	0.7313	0.8371	0.9209	0.9823
Sugarcane	0.9374	0.8524	0.6207	0.5114	0.3858	0.3290	0.2840	0.2511
Vegetables	0.8612	0.8275	0.7357	0.6924	0.6426	0.6202	0.6023	0.5893
Fruits	1.4657	1.3667	1.0966	0.9693	0.8229	0.7568	0.7043	0.6660
Rapeseed	1.9336	1.6886	1.0203	0.7051	0.3429	0.1792	0.0494	-0.0455
Pig meat	1.5429	1.3812	0.9400	0.7320	0.4930	0.3849	0.2992	0.2366
Beef	3.1949	2.8760	2.0058	1.5955	1.1240	0.9108	0.7419	0.6183
Mutton	1.8491	1.7381	1.4353	1.2925	1.1284	1.0542	0.9954	0.9524
Poultry	2.1630	1.9830	1.4919	1.2603	0.9942	0.8739	0.7785	0.7088
Eggs	2.1048	1.8628	1.2027	0.8914	0.5337	0.3720	0.2438	0.1501
Milk	-1.4291	-1.0474	-0.0064	0.4845	1.0486	1.3037	1.5058	1.6536
Fish	2.1678	1.9168	1.2321	0.9092	0.5382	0.3705	0.2375	0.1403

Source: authors' own calculation.

The trends shown by the calculated elasticities in Table A3 are largely in accordance with expectations. For example, the income elasticities of demand for wheat and rice have declined over years. The income elasticities for animal products are greater than those of food grains.

We have not used the most rigorous econometric methods to estimate income elasticities over time but our estimates do provide a picture of the relationships between consumer food demand and income change.

Comparing existing forecasts

Several institutions, employing various models with different assumptions, have forecast China's production and consumption of various foods. We also provided consumption forecasts using three simple methods. A brief description of the methods and evaluation of the forecasting results are given in Box 3.

Our forecast results using the three simple methods are reported in Appendix C together with other available forecasts provided by FAPRI, OECD-FAO and USDA. These simpler methods are capable of providing reasonable forecasts for the near future but not for the longer term. In fact, few models, no matter how sophisticated,

can forecast longer-term food demand or supply for China with great confidence. For example, in their 2001 projections of China's 2010 soybean imports, FAPRI's forecast was 16.3 mt (World Oilseeds and Products: FAPRI 2001 Agricultural Outlook, p. 223) and USDA's was 11.2 mt (USDA Baseline Projections, 2001, p. 136). No models predicted that China would import over 50 mt of soybean in 2010.

Box 3. Forecasting Methods Used in This Study

(1) **Simple trend extrapolation**. This method is based on per capita consumption growth rate (2000-07). The per capita consumption is calculated based on the FAO food balance sheets. This same per capita consumption is used in all the three forecasting methods in this study. For this method, the growth rate from 2000-07, which may have been positive or negative, was used to extrapolate per capita consumption for 2009-2020. Total food consumption for any of the year between 2009 and 2020 was derived using the forecast per capita consumption that year multiplied by the forecast total population of the same year. When extrapolating linearly till 2020, the change in per capita consumption for some food items became very large. Consequently the risk of error is larger. However, the forecasts for the immediate future years seemed reasonable.

(2) **Simple regression against time**. With this method, time is the major explanatory variable. The per capita consumption is specified as a function of (1) time and time squared, (2) time only, and (3) time squared only and the models estimated over the 2000-07 period. The calculation of total food consumption involved the same process as in Method 1. Again, the change in per capita consumption for some food items became very large when projecting for years close to 2020.

(3) **Forecasts using income elasticities**. The per capita consumption was specified as a function of per capita GDP, the price of the food item, the prices of substitutes and complements. Based on the parameters obtained, income elasticities of demand for various food items were derived (see Appendix A for more details). Then, we assumed three GDP growth scenarios, 6%, 8% and 10%. We also assumed that there will be no variations in the stock level of each of the food items concerned from 2007 and future real prices will remain at the 2007 level. Per capita consumption for future years was then simulated based on the above information. We used a partial equilibrium approach which did not take account for likely adjustments in other markets, leading to changes in relative prices, which in turn will lead to further 'second' round changes in supply and demand. As a consequence, this method also led to continuous increase or decrease in per capita consumption.

We point out that the above simple methods we used for demand forecasting are, by no means, perfect or ideal but they were within resource constraints. Further, to predict future food import demand by China, reliable information about future food supply prospects is also essential. Again, limited by resources, in-depth study of this issue was not pursued. Nonetheless, it is useful to note the following important factors that will affect China's future food supply:

- Arable land area is declining and the potential to develop new arable land is very limited.
- Water availability is very limited and water quality is deteriorating. If a water market is established, how competitive the agricultural sector will be in this market is not yet clear.
- As non-agricultural employment increases, labour costs for agricultural production increase.
- Scale economies from larger farms and mechanization improve land productivity but hard to achieve, limited by the current land system and land terrain in some areas. The impact of possible climate change is unknown; food output fluctuations caused by weather-related disasters may increase.

The need for environmental protection is likely to affect the way some foods are produced, leading to reduced food output or higher costs.

4.2 China's Food Import Needs by 2020

An overview of China's production, consumption and import needs of major food items is presented in Table 4.2. The table has three parts. The first part contains the actual production, consumption and net imports of various food items in 2010 based on the PSD database of the USDA and also imports, exports, and net imports based on UN Comtrade database. These statistics serve as references. In the second part, projections of China's food production, consumption and net imports for 2020 by three organisations are provided. Finally, the judgements derived from this study about the likely trade position in 2020 for each of the major food items are shown. In the rest of this section, more detailed elaborations about China's food import needs by 2020 are given for each of the major food items.

Table 4.2 Summary of China's Food Production, Consumption and Net Imports in 2010 and Forecasts in 2020

Actual production, consumption and trade in 2010 according to:

		Wheat	Rice	Maize	Barley	Soybean	Rapeseed	Sugarcane	Pork	Beef	Mutton	Poultry	Milk
USDA	TP*	114.50	136.00	168.00	2.40	14.40			50.00	5.55		12.56	
	TC	107.80	135.00	162.00	4.60	68.85			50.05	5.53		12.53	
	NI	-6.70	-1.00	-6.00	2.20	54.45			0.05	-0.02		-0.03	
UN Comtrade	Import	1.22	0.37	1.57	2.37	54.80	1.60	n.a	0.20	0.02	0.06	0.54	0.75
	Export	0.00	0.62	0.13	0.01	0.16	0.00	n.a	0.11	0.02	0.01	0.21	0.03
	NI	1.22	-0.25	1.45	2.35	54.63	1.60	n.a	0.09	0.00	0.04	0.34	0.71

Forecast production, consumption and trade in 2020 according to:

		Wheat	Rice	Maize	Barley	Soybean	Rapeseed	Sugarcane	Pork	Beef	Mutton	Poultry	Milk
USDA	TP	114.31	136.30	198.83	3.09	16.65			61.39	6.56		16.47	
	TC	112.65	135.66	210.38	6.07	104.42			61.40	6.54		16.33	
	NI	-1.66	-0.65	11.55	2.99	87.77			0.01	-0.02		-0.14	
FAPRI	TP	114.64		201.80	2.93	15.00	14.05		65.78	7.08			47.2
	TC	109.03		203.94	5.62	88.08	16.33		66.24	7.36			47.4
	NI	-5.62		2.15	2.69	73.09	2.28		0.46	0.29			0.16
OECD -FAO	TP	115.70	125.83	210.31		64.96		17.89	61.48	7.18	4.80	20.85	59.0
	TC	114.18	125.86	213.61		127.34		23.07	61.20	7.18	4.88	20.92	56.9
	NI	-1.52	0.03	3.30		62.38		5.19	-0.28	0.00	0.08	0.07	-2.09

Net import needs in 2020 according to:

		Wheat	Rice	Maize	Barley	Soybean	Rapeseed	Sugarcane	Pork	Beef	Mutton	Poultry	Milk
This study	**NI**	2.00	0.00	5.00	2.00	70.00	2.00	3.00	1.00	0.50	0.30	0.50	1.50

* TP: total production; TC: total consumption; NI: net imports.

Notes: Maize: OECD-FAO data is for coarse grains. Soybeans: OECD-FAO data is for oilseeds. Sugarcane: OECD-FAO data is for sugar.

Sources: FAO food balance, www.fao.org; USDA 2011 baseline projections, http://www.ers.usda.gov/data/internationalbaseline/sutabs11.htm; OECD-FAO agricultural outlook, http://stats.oecd.org/index.aspx; and FAPRI international agricultural outlook: http://www.fapri.iastate.edu/tools/outlook.aspx; trade data: UN Comtrade.

Wheat

Per capita direct human wheat consumption experienced a steady increase from 1978 until 1993. In 1993, the per capita consumption started to decline. Consumers had more choice and could afford other foods of higher value and nutrition such as animal products. Consequently, the consumption of cereal foods including wheat started to decline. This decline in per capita wheat consumption has been continuous and steady (see Table B1 in Appendix B). The income elasticities of demand for wheat in Table A3 also reveal that the demand for wheat declines when income increases.

Since 2005, the decline in per capita consumption of wheat seems to have significantly slowed down and stabilised at a rate of about 80 kg per annum. While FAO's data is only available until 2007, our analysis using SSB data in Section 2 also clearly confirms this trend. Hence, in China, per capita direct consumption of wheat is unlikely to increase in future while further decline may be possible. This decline will likely come from reduced direct wheat consumption by urban poor but more so from reduced consumption by rural residents when their income increases.

Wheat is mainly for human consumption, accounting for 86-88 per cent. Historically, using wheat as animal feed in China was negligible. However, during 2000-2010, it increased, ranging from 4-6 per cent of total use. This is chiefly attributable to surplus production in the good harvests during 1995-98. The use of wheat for feed, and to some extent, for bio-fuel production, during 2000-2010 was to dispose of deteriorating wheat stocks built up in these earlier years. In the future, the use of wheat for feed purpose may decline but will depend on the prices of wheat and other animal feeds. Wheat seed use (for next season's plantings) has declined from about 7 per cent in 1978 to about 4 per cent in 2007. The amount of wheat used for processing is negligible. This structure of wheat utilisation is likely to exist for some time.

China's wheat production reached its highest level in 1997, being 123.3 mt. It had since dropped to a low of 86.5 mt in 2003. With government intervention, wheat output started to recover from 2004 and has since increased every year, reaching 115.2 mt in 2010. The increased output is a result of both increased area sown and yield improvement with the latter's contribution greater. Further increases in the area sown will be difficult. Table D1 in Appendix D indicates that any further significant increase in the area sown to wheat can only be achieved by reducing the area sown to other crops. In 2010, China's wheat yield was 4,748 kg per hectare, well above the world average. Further, most of China's wheat production is based on irrigation. Future water availability and cost can have a major impact on wheat production.

Despite the fact that future significant increases in wheat output may be difficult, the government is unlikely to allow the production level to drop too much given that wheat is one of the two major staple cereals consumed in China. In its 'Outlines of medium- and long-term national grain security plan (2008-2020)', the Chinese government planned to achieve self-sufficiency in wheat and rice, and 95 per cent of self-sufficiency in maize (Government of China 2008).

Table C1 shows the projections by several institutions of wheat production and consumption until 2020. In terms of per capita consumption, all predicted that it will first increase slightly and then start to decline. The level of the per capita consumption,

however, is quite comparable between studies. Any future increased demand for wheat will mainly come from population increases.

Given that China's current wheat output is about 115 mt and this is more than the total demand for 2020 as projected by the three organisations, all things being equal China would be able to achieve self-sufficiency in wheat even with a small surplus by 2020. However, the current level of wheat output was achieved with strong government intervention in the previous years. During those years, wheat exports were also encouraged by the government. Whether the strong government support can be sustained is questionable. Further, China's comparative advantage in wheat production is declining. We anticipate that in 2020, it is likely that China may need to net import around 2 mt of wheat.

Rice

Rice is the other major staple cereal food for many Chinese. Since 1978 consumption increased and reached its highest level in 1983 (108.7 kg). The decline in rice consumption (or utilisation) started 10 years ahead of wheat. The income elasticity estimates in Table A3, which suggest rice is regarded as an inferior food, explain why per capita rice consumption started to decline when consumer incomes increased. Since 2004, per capita rice consumption stabilised at around 90-92 kg (see Table B2) per annum. Our earlier analysis in Section 2 confirms this trend. Thus, per capita rice consumption in China is unlikely to increase in the future unless a significant amount of paddy rice is used for animal feed purposes.

In southern China, farmers regularly use paddy rice to feed animals (Zhou and Tian 2003, pp. 64-65). As seen in Table B2, even when food was very short in the late 1970s, about 8 per cent of rice was used for animal feed. The proportion of animal feed use of rice has fluctuated between 8 and 12 per cent. In recent years, this proportion has stayed at around 8 per cent. The use of rice for animal feed is linked to output and price levels. The majority of rice in China is used for food purposes, being around 80-82 per cent. Seed use was about 5-6 per cent in the late 1970s but has now fallen to 3.5-4 per cent. Seed use is expected to further reduce as new seed-saving farming methods become widely used.

Similar to wheat, rice output first experienced an increase and then decrease. It increased from 96 mt in 1978 to the peak of 141 mt in 1997. It then decreased to a low of 112 mt in 2003. Since 2004, it has increased steadily to 137 mt in 2010. Increases in both area and yield contributed to the recovery of rice output. Since 2004, the area sown to rice increased every year except for a small decrease in 2007 by 19100 ha (Table D1). During 2004-2010, the total increase in area sown to rice was 3.37 m ha. Paddy yield also improved significantly. Average yield over the past three years (2008-2010) was over 6.5 t per ha, which was 0.5 t higher than that in 2003 (Table D2). China's paddy yield of 6.5 t per ha is well above world average of 4.3 t per ha, but about 3 t lower than that achieved in Australia (9.8 t per ha in 2006). Rice paddy production is relatively labour-intensive and it is difficult to raise the level of mechanisation due to the tendency for small land blocks in China. Further improving rice paddy yield is also constrained by the increasing cost of labour.

If China can maintain its current rice output level, which is likely, then, based on the current per capita rice consumption level, by 2020 China will have sufficient rice from domestic sources, even with a small surplus for export. The projections by USDA support this scenario (Table C2). The OECD-FAO supply projections are likely on the low side because rice is considered a staple crop by the Chinese government. Hence, it is our judgement that by 2020 China will be largely self-sufficient in rice.

Maize

Around 80 per cent of China's maize output is used for animal feed. Direct human consumption has traditionally been around 6-8 per cent. In 1997, "other utilisation" of maize suddenly jumped to about 7 per cent from a consistent low of less than 1 per cent. This proportion has continued to rise and was a little over 17 per cent in 2007. This may reflect China's increased use of maize for producing ethanol, maize starch, the sweetener HFCS (high fructose corn syrup, used for food and beverage manufacturing), and Chinese liquor (although since 2004, bio-fuel production using maize has been limited). In the meantime, the share of maize used for animal feed dropped in the past few years, being 68.5 per cent in 2007 (Table B3). Given that the Chinese government has started to limit the use of cereal foods to produce ethanol, the use of maize for producing ethanol is unlikely to increase much and may decline. A higher proportion of maize is likely to be used for animal feed.

Being one of the three major cereal crops in China, maize output has increased steadily over the past three decades, with only a few occasional drops. Total maize output has increased strongly, from 106 mt in 2000 to 177 mt in 2010. Among the three major cereal crops, maize occupied the largest share in area sown in 2010, being 20.2 per cent, which was also the highest share ever in area sown to maize. It has enjoyed an expansion both in absolute area terms and in its share of total area sown in China.

The area sown to maize and its total output are unlikely to decrease in the foreseeable future due to China's strong demand for maize as animal feed. Yield is high and has been around 5.2-5.5 tonnes per hectare. Further increase in yield is unlikely. Unlike in North America and Western Europe where maize production is one single crop per year, the land for maize production in China is cropped more than once per year (except in China's northeast), which results in lower yields.

Looking at the projections by the three institutions (Table C3), USDA and FAPRI predict that China will have a surplus till 2015 (USDA) or 2016 (FAPRI). After that, the net imports will increase at a fast pace. On the other hand, OECD-FAO forecasts that the shortage would emerge in 2010 and imports continue through to 2020. For 2020, all the projections for per capita utilisation of maize were similar but there were some large discrepancies in years leading up to 2020.

Despite the differences in these projections, it is clear that China will import more maize. In 2010, China had already imported about 1 mt maize and 3 mt maize DDGS (distillers dried grains with solubles, which is a by-product of ethanol production) for animal feed. The 2011 imports were even higher. However, because the demand for maize is chiefly a derived demand (linked to the demand for animal products), the

level of imports will mainly depend on China's choice of policies as to whether it will: (1) increase domestic production of animal products; (2) import live animals; and (3) import animal products. If the first option is chosen, China will definitely need to import more maize for feed purposes. If the third one is chosen, then the net imports of maize may be much smaller. For the second option, maize imports may also rise as more maize is used in feedlots to prepare animals for slaughter.

Depending on the options that China will use to increase its meat supply, there is greater uncertainty in predicting the amount of maize that China may net import. Assuming China will largely rely on producing more domestically to meet the increasing demand, we anticipate that China's net maize imports by 2020 would be around 5 mt.

Barley

Barley is a relatively minor crop in China. In the 1970s when food was short, only a small proportion, about 10-15 per cent, was used for animal feed. Processing use (e.g. for beer) was also very low, being about 3.5-4 per cent. The structure of consumption is now very different. In 2007, food use of barley accounted for only 6.5 per cent and animal feed use has also dropped significantly to 3.4 per cent. Processing use rose to 82 per cent, chiefly for beer brewing. Per capita consumption of barley has been low and was only 3 kg in 2007 (see Table B4).

Both USDA and FAPRI project that per capita consumption of barley will increase and production will fall short of demand, leading to increased imports. Imports by 2020 are forecasted to be in the vicinity of 2.5 to 3 mt (Table C4). Our judgement is that by 2020 China's barley import will be around 2 mt.

Soybean

Owing to a rise in soybean consumption but a slight drop in production, China has increased its soybean imports in recent years. Per capita consumption of soybean has increased by about 400 per cent over the past three decades. It was 8.8 kg in 1978 and increased to 33.5 kg in 2007 (Table B5). The increase is expected to continue as reflected by the positive and large size of the income elasticities given in Table A3. This increase will not last forever and at some point of time the income elasticity will start to decrease. However, in the near future, per capita consumption of soybean may continue to increase. Soybeans are chiefly used for cooking oil and as animal feed. Soybeans are also used to produce soybean-based foods such as tofu (bean curd), which is popular in China.

While China's consumption of soybeans has increased dramatically, increasing from 8.65 mt in 1978 to over 55 mt in 2010, production has not kept pace. It reached a peak in 2004 of 17.4 mt and has since dropped and stagnated at a little over 15 mt (Table D3). Both the decline in area sown and the stagnant yield contributed to the drop in output level. The area sown to soybeans was around 9.5 m ha in the early 2000s. It has dropped gradually and was a little over 9 m ha by 2010 (Table D1). The yield was high in 2004 being 1,815 kg per ha, and had been around 1,700 kg in the past few years (Table D2). It is not expected that soybean will compete strongly in coming years with other crops for available arable land.

With the increase in consumption significantly outpacing the output growth, imports are required to meet demand. In 2004, China imported 24.92 mt of soybeans. Since then, soybean imports have increased, reaching 55 mt in 2010. All three institutions' projections point to further increased imports in the coming years (Table C5). The projection by OECD-FAO is for all oil-crops and hence not comparable to USDA and FAPRI's. Both USDA and FAPRI suggest that the total imports of soybeans by China will reach in the order of 70-80 mt by 2020. However, we believe that the rate of increase in total net imports is likely to slow down in the future and the net imports will not be more than 70 mt.

Rapeseed

Rapeseed together with other oil-bearing crops (such as peanuts and soybean) is a major source of cooking oil in China. Animal fats and oils from pigs, cattle and sheep provide other sources of cooking oil. Cooking oil was in serious shortage in the 1970s and was rationed for urban dwellers (3 kg per person per year) and for rural residents who did not produce oil crops (2.4 kg per person per year). Since the early 1980s, rapeseed allowed an increase in cooking oil consumption. Its output level increased from 1.87 mt in 1978 to 13.1 mt in 2010 (Table B6). The output increase is attributed to both area and yield increases.

Despite the fast increase in rapeseed production (and increase in the production of other oils), growth could not keep pace with the increase in demand. From the early 1990s, China started to increase its imports of cooking oil and rapeseed (Table 4.3). Rapeseed imports experienced two peak periods. One was during 1998-2001 and the other 2008-10. Average annual imports in these two periods were about 2 mt. In 2010, the imports were 1.6 mt. Rapeseed imports and rapeseed oil imports may be substituted with each other to some extent. Indeed, the imports of all the oil commodities may substitute each other to some extent, depending on relative prices. Soybean oil imports were above 1 mt during 1994-97 and 2003-10. The highest imports occurred in 2007, being 2.82 mt. We anticipate that China's net rapeseed imports will be around 2 mt in 2020 which is comparable to FAPRI's net import projection (Table C6).

Sugarcane

China's sugar consumption has steadily increased, though consumption data is not available. Sugarcane and sugar beets are the two basic sugar crops in China. In 1980, each accounted for almost half of the total area sown to sugar crops (sugarcane: 480,000 ha; sugar beets: 440,000 ha). Since then, the area sown to sugar beets at first increased but has recently declined and by 2010, it was 220,000 ha. On the other hand, the area sown to sugarcane continued to increase and has been around 1.7 m ha in recent years. Sugarcane is one of the few crops in China whose area sown has increased.

Table 4.3 Import and Export of Oilseeds and Edible Oil in China (1996-2010, Tonnes)

Year	Soybeans		
	Import	Export	Net import
1996	1107539	191744	915795
1997	2875907	185719	2690188
1998	3192490	169874	3022616
1999	4318634	204366	4114268
2000	10419057	210840	10208216
2001	13939479	248399	13691080
2002	11314372	275863	11038509
2003	20741006	267470	20473537
2004	20229966	334560	19895406
2005	26589957	396454	26193503
2006	28236901	379024	27857877
2007	30816562	456452	30360110
2008	37436262	465143	36971119
2009	42551649	346557	42205092
2010	54797749	163598	54634152

Year	Rapeseed		
	Import	Export	Net import
1996	413	6042	-5629
1997	55134	42	55092
1998	1386413	1114	1385299
1999	2595305	153	2595153
2000	2968936	1131	2967806
2001	1724251	65	1724186
2002	618170	2335	615836
2003	166714	2913	163801
2004	424014	269	423745
2005	296236	147	296089
2006	737997	144	737853
2007	833105	849	832255
2008	1303023	55	1302968
2009	3285852	221	3285631
2010	1599848	110	1599738

Year	Ground nuts		
	Import	Export	Net import
1996	346	351068	-350722
1997	4758	171473	-166714
1998	3546	214860	-211314
1999	943	340558	-339615
2000	447	399968	-399521
2001	342	493454	-493112
2002	1506	520616	-519110
2003	392	490170	-489778
2004	1333	402996	-401663
2005	326	454083	-453757
2006	5171	324281	-319110
2007	3358	291680	-288322
2008	9682	231512	-221830
2009	2387	236943	-234556
2010	14233	191172	-176939

Year	Soybean oil		
	Import	Export	Net import
1996	1295396	127093	1168303
1997	1225160	555770	669390
1998	831689	185891	645798
1999	803691	53394	750297
2000	307619	35284	272335
2001	69888	60007	9881
2002	870275	47298	822977
2003	1884320	10650	1873670
2004	2516495	19442	2497053
2005	1694327	63034	1631292
2006	1542635	117709	1424927
2007	2822787	65717	2757070
2008	2585604	133912	2451693
2009	2391222	69246	2321977
2010	1340717	59297	1281420

Table 4.3 (continued)

Year	Ground nut oil		
	Import	Export	Net import
1996	5218	5887	-669
1997	10670	8602	2068
1998	8723	10059	-1336
1999	9616	12978	-3362
2000	9954	14738	-4785
2001	8612	13572	-4960
2002	3992	11039	-7047
2003	6633	25303	-18669
2004	419	14201	-13783
2005	381	20242	-19861
2006	312	12961	-12649
2007	11163	10288	876
2008	5896	10703	-4807
2009	20726	9798	10928
2010	68458	7789	60668

Year	Rapeseeds oil		
	Import	Export	Net import
1996	316047	174155	141892
1997	350634	141287	209347
1998	284706	73333	211373
1999	69184	25977	43207
2000	74663	54147	20516
2001	49423	54326	-4904
2002	77830	18349	59481
2003	151578	5419	146158
2004	352933	5455	347478
2005	177558	30637	146922
2006	43995	144763	-100768
2007	374767	21692	353075
2008	269777	7104	262673
2009	467526	9135	458391
2010	985309	3804	981505

Source: UNcomtrade Database, http://comtrade.un.org.

Year	Olive oil		
	Import	Export	Net import
1996	3028	n.a	n.a
1997	7	52	-45
1998	73	n.a	n.a
1999	120	26	94
2000	228	51	177
2001	302	8	295
2002	454	30	425
2003	763	29	734
2004	2296	14	2282
2005	3826	120	3706
2006	4518	4	4514
2007	7124	160	6964
2008	10179	113	10067
2009	12504	188	12316
2010	21253	70	21183

Year	Palm oil		
	Import	Export	Net import
1996	1009184	160444	848739
1997	1156455	109023	1047431
1998	929908	34544	895364
1999	1193510	261	1193248
2000	1390701	334	1390367
2001	1517352	132	1517220
2002	2220617	10395	2210221
2003	3324757	16	3324741
2004	3857223	20	3857203
2005	4330056	1203	4328852
2006	5068792	758	5068034
2007	5094752	601	5094151
2008	5282069	1130	5280940
2009	6441284	473	6440811
2010	5695939	1548	5694391

Despite the increase in the area sown to sugar crops, domestic production of sugar is not sufficient to meet the fast-increasing demand, chiefly from industrial food processing. To meet demand China imports sugar at an increasing rate. From 2005 to 2010, average annual imports were 1.25 mt and imports were highest in 2010, reaching 1.78 mt. Sugarcane production is not likely to increase. It is only produced in a few southern provinces and further arable land for more sugarcane is limited. Over the past five years, average sugarcane yield was close to be 70 tonnes per ha in China. In Australia, the average yield was about 87 tonnes per ha with world average being 67 tonnes per ha. Further increase in yield in China will be difficult in the near future because: (1) farms are generally small scale operations; (2) it can be difficult to mechanise due to the terrain, and (3) it is unlikely that new and better varieties will be developed in the near future.

China's sugarcane production reached 114 mt in 2007 (Table B7). In 2008, it increased to 124 mt. But in 2009 and 2010, it dropped to 116 and 111 mt, respectively (Table D3). FAPRI predicts China's sugarcane output will increase in the near future but this projection may be optimistic (Table C7).

Unless the sugar price is very high relative to the price of the sweetener HFCS, we do not anticipate that the deviation of maize to the production of the latter will be very large. Hence, China is likely to continue to import sugar and the level of imports is expected to increase. Chinese companies are also actively looking for opportunities to invest in sugar mills overseas as evidenced by COFCO's recent acquisition of Tully Sugar Limited in Queensland in 2011. By 2020, China's sugar imports are likely to be in the vicinity of 3 mt.

Vegetables

According to Table B8, the Chinese used to have a low level of vegetable consumption (not including potatoes and sweet potatoes) at around 57 kg per capita in 1978. However, consumption jumped to 324 kg in 2007. It is suspected that either the statistics submitted to FAO by SSB are inaccurate, or this per capita consumption is based on the weight of vegetables produced including a significant amount of wastage. In Table 2.1, we showed that the per capita consumption of vegetables in both rural and urban areas is around 100 kg per capita in 2010.

The area sown to vegetables has increased dramatically, from 3.3 m ha in 1978 to 19 m ha in 2010. China imports a small quantity of vegetables but exports far more. (Table B8). It will likely remain a net exporter for some time to come. By 2020, China's net exports of vegetables may reach 12 mt.

Fruits

Per capita consumption of fruits has also increased remarkably in China, from less than 8 kg in 1978 to about 74 kg in 2007, according to Table B9. This consumption level is much higher than that given in Table 2.1, which is based on SSB data. Nonetheless, the land area allocated to fruit trees has increased sharply in China, from 1.65 m ha in 1978 to 11.54 m ha in 2010 (Table D1). Given that China's net exports of fruits are fairly small, per capita consumption of fruits in China must have increased quite significantly, although the level of 74 kg per person may have overstated this.

From 1978 to 1984, China both imported and exported fruits, though in small quantities, and was a net exporter. From 1985 to 2002, it became a net importer of fruits, though again the quantity was very small. Since 2003, fruit exports have increased much faster than imports (see Table B9). In the future, China is likely to both import and export fruits in much larger quantities. China will increase its imports of fruits - especially tropical fruits - to meet consumer demand for different varieties and for seasonal fruits all year round. In the meantime, China will increase its export of temperate fruits. In balance, China will remain a net fruit exporter in the years to come. By 2020, its net export of fruits may be up to 5 mt.

Pork

Per capita pork consumption was low in 1978, at about 9 kg. It has since steadily increased to about 33 kg by 2007. Our analysis in Section 2 shows that consumer demand for pork is still increasing, though perhaps at a slower rate than in the past. Demand is coming mainly from low-income urban consumers and rural consumers, though per capita pork consumption by higher income consumers is still increasing (Figures 2.5 and 2.6).

The increase in per capita consumption of pork is largely attributed to the expansion of pork production in China. In the late 1970s, China's total pork output was a little over 10 mt. It has since expanded rapidly and by 2010, the total output was over
50 mt.

Although pork output has been increasing, the increase has sometimes been uneven between years (Table D4). This was caused by two major reasons: pig diseases and poor price transmission. During 2006-07, the outbreak of Blue Ear diseases had a large impact on pork production. Poor price transmission between the market and the producers is another major cause that contributed to pork output fluctuation. Further, much of the pork is produced by many small-scale operations that tend to respond to price changes in a similar direction and simultaneously. The problem was aggravated by the government's arbitrary interventions in the production and marketing of pork: when the price was increasing, measures to encourage production were used, leading to oversupply and thus lower prices and lower output. There is evidence that some small-scale pig-producing farmers are quitting the industry (Rae and Zhang 2009). On the other hand, intensive pig farming is increasing, and will be increasingly dependent upon the supply of industrial processed animal feeds in which maize is the major ingredient.

Over the past three decades, China had been a net exporter of pork in most years except 2007 (Table B10). FAPRI, USDA and OECD-FAO all forecast that China's per capita pork consumption will continue to increase and will reach around 43-48 kg by 2020 (Table C10). They also predict that China will be able to produce enough pork to meet the rising demand.

Given the importance of pork in the Chinese diet, it is most likely that the Chinese government will try to ensure that it is largely self-sufficient in pork production and, therefore, the level of imports is unlikely to be large. By 2020, net imports of pork will be around 1 mt.

Beef

Beef is not a traditional meat item for the majority of Chinese consumers and per capita consumption of beef has historically been low. In recent years, as diets and preferences have changed, beef consumption has increased rapidly. According to the food balance sheets by the FAO, in 1978, per capita consumption of beef was negligible, being a mere 0.32 kg. By 2007, however, it increased to over 4 kg (see Table B11). In absolute terms, per capita consumption of beef in China is still very low. However, given the size of the population and changing tastes, further increase in consumption in both total quantity and per capita is likely, though a fast increase should not be expected.

So far, China's increased demand for beef has been largely met by domestic supplies. China both exports and imports beef but in small quantities and, on balance, it is a net importer. FAPRI, USDA and OECD-FAO predict that per capita consumption of beef will have a modest yearly increase from now until 2020. Their projections on total consumption and total production differ quite substantially, as do the projected import needs (see Table C11). China's beef production has already exceeded 6.5 mt, a level predicted to be reached in 2020 by USDA, in 2017 by FAPRI, and in 2015 by OECD-FAO.

The appetite for increased beef consumption is growing and beef imports are likely to increase much faster than each of the three institutions have predicted. By 2020, we anticipate that China's net beef imports will be in the vicinity of 0.5 mt. The majority of imported beef will be high quality and used in hospitality industries (such as upmarket hotels) and purchased by high-income Chinese consumers, expatriates and tourists.

Mutton and goat meats

Like beef, mutton (and lamb) and goat are not traditional types of meat consumed by the Chinese. Per capita consumption of these meats has been low. In 1978, it was 0.33 kg. By 2007, it increased to 2.83 kg (Table B12). Compared to beef, the rate of increase was slightly lower. This per capita consumption level is nonetheless still higher than that reported by SSB, reflecting likely underestimation by SSB. Based on the income elasticities we derived (Table A3) and the trends hown in Section 2, the consumption of these meats will probably continue to increase in China. In the past three decades, people in the country's south particularly, have increased their consumption of mutton.

The total output of mutton and goat meat is still low. In 1979, it was 0.38 mt and by 2010 it increased to 3.99 mt. China's potential to increase the output of these meats is also limited. If the price of these meats relative to wool in particular becomes more attractive, then more may be produced.

China imports and exports a small amount of mutton and goat meat and overall is a net importer (Table B12). OECD-FAO predicts that per capita consumption of these meats will continue to rise at a modest rate. Total production will continue to fall behind total consumption, leading to continued net imports (Table C12). While their projection on total consumption seems realistic, their projection on China's ability to increase output seems to be a little over optimistic. Hence, we believe the amount of net imports required by China in 2020 may be slightly larger than 0.08 mt, as projected by OECD-FAO, to be 0.30 mt.

Poultry

In the late 1970s, per capita consumption of poultry meat was about 1.5 kg and it increased quickly to about 11 kg in 2007 (Table B13). According to the positive and still high income elasticities, poultry meat consumption is expected to continue to rise at an impressive rate. The increase in demand will largely come from urban poor and rural consumers as analysed in Section 2.

Poultry meat output experienced a very rapid expansion in the past three decades. In 1985, it was 1.6 mt. By 2010, it jumped to 16.34 mt (Table B13). Compared to raising pigs, cattle and sheep, producing more chickens is relatively easy, assuming that feed is available. China can increase its poultry output levels in the future to meet increasing demand but will probably require increased imports of feed.

In volume terms, imports and exports of poultry meat have been increasing in the past three decades, with imports roughly being twice that of exports, making China a net importer (see Table B13). USDA's projection on production and consumption is likely to be on the low side as China's production level in 2010 had already reached the level predicted to be reached in 2020 by USDA. Also, USDA predicts that China will be a net exporter until 2019. On the other hand, OECD-FAO's projection suggests that China's production and consumption of poultry will rise to a much higher level and China will remain a net importer (Table C13). Our judgement is that China will be a net importer in 2020 and its imports will be around 0.5 mt or slightly higher.

Poultry eggs

Per capita egg consumption increased from 2.7 kg in 1978 to 19 kg in 2007 (Table B14). The increase in its consumption will in all likelihood slow down as suggested by the income elasticities in Table A3. The trends shown in Figure 2.13 also confirm that egg consumption will become flat when consumer income increases.

Total egg production increased from 2.6 mt in 1978 to 25.7 mt in 2007 and further increased to 27.6 mt in 2010 (Table B14). China both imports and exports eggs but has been a net exporter of eggs overall. In the future, China will most likely be self-sufficient in egg production, though it may import some egg powder for industrial food processing purposes.

Dairy products

In the past, milk was mainly consumed by some minority ethnic groups. Not surprisingly, per capita consumption of milk was extremely low in China in the 1970s, being about 3.5 kg (in Chinese statistics, milk is measured in weight rather than in litres). Today, milk has been accepted by many Chinese, especially in urban areas. It is common for many urban residents to consume liquid milk or other dairy products on a regular basis. Even in rural areas, particularly in those wealthier rural areas, residents have also started to consume milk (Table 2.1). By 2007, per capita consumption of milk increased to a little over 30 kg (Table B15). Chinese consumers' demand for milk will continue to rise as suggested by the positive and increasing income elasticities shown in Table A3 and the trends in milk consumption as income increases (Figures 2.16 and 2.17).

In the past three decades, China's milk output has also expanded at an impressive rate. In 1978, it was below 1 mt. It increased from 9.19 mt in 2000 to 37.82 mt in 2008 but then fell to 37.48 mt in 2010. This drop seems to be due to: (1) resource constraints on production; and (2) temporarily reduced consumption due to concerns over milk quality.

China has been importing more milk (or, more precisely, milk-equivalent dairy products) than it exports. FAPRI and OECD-FAO provide quite different projections about China's total milk production and consumption for the years until 2020 (Table C15). While FAPRI's 2020 per capita consumption and the total output levels seem reasonable, its projections for the immediate future years are inconsistent with current data (for example, the projection of output in 2010 is about 8 mt below the actual). OECD-FAO's production and surplus levels seem to be overly optimistic.

China's ability to produce more milk is limited, though there have been recent imports of breeder cattle to improve genetic stock and increase herd numbers. Hence, China will need to import dairy products (such as milk powder and whey). By 2020, China's net imports of milk powder and whey are expected to increase to around 1.5 mt.

Aquatic products

Fish and other seafood are popular in China. In the late 1970s, per capita consumption was a little over 6 kg. It increased to about 36 kg in 2007 (Table B16). Increases in income have led to the rapid increase in the consumption of aquatic products as suggested by the high income elasticities and the stronger preferences for such foods by higher income consumers (see Figures 2.14 and 2.15). The per capita consumption calculated from the FAO balance sheet is much higher than what the SSB data suggests, and this may reflect more away-from-home consumption by higher-income consumers as suggested in Section 2. The demand for aquatic products will continue to increase as consumer income increases but at slower rates, according to the income elasticities shown in Table A3.

The rapid increase in demand for aquatic products has been mainly met by domestic supplies. China's aquacultural output has grown at an annual rate of about 8.5 per cent, and China has become by far the world's largest aquacultural producer. Fish farming, rather than wild-catch product, contributed more significantly to the output expansion. Future expansion in farming seafood is likely while wild-catch product is not expected to increase much.

In terms of quantity, China has been importing more aquatic products than it exports, including whole wild-catch fish imported for processing and re-export. Moreover, in terms of the value of trade, China has been in surplus. This is because imports have included low-value products such as fish feed and fish powder. Both imports and exports have been increasing but the increase in exports has been greater (Table B16), reducing the size of net imports. In the future, the current patterns of trade in aquatic products are expected to continue. That is, in quantity terms, China will continue to import more (most being low-valued products for feed purposes) than it exports (products with higher value); in value term, China will remain in surplus. How China's future soybean imports may affect its needs to import low-value aquatic products for feed purpose is yet to be seen. Soybean imports increase protein feed and reduce the need to import fish and seafood meals (see Table 4.4). By 2020, we anticipate that China's net imports of aquatic products will be around 2 mt.

Table 4.4 Import and Export of Protein Feed in China (1996-2010, tonnes)

Year	Fish and seafood meal		
	Import	Export	Net import
1996	884478	1494	882985
1997	988455	2401	986053
1998	420035	2288	417747
1999	634298	1898	632400
2000	1189251	2712	1186539
2001	904130	4121	900009
2002	960524	8327	952197
2003	802843	8560	794282
2004	1127883	7037	1120846
2005	1582747	5927	1576821
2006	983211	17973	965238
2007	969832	12298	957535
2008	1351353	5407	1345947
2009	1310528	6229	1304299
2010	1042377	3767	1038610

Year	Soybean meal		
	Import	Export	Net import
1996	1876478	68418	1808060
1997	3469508	19677	3449830
1998	3722302	18493	3703809
1999	571821	13490	558331
2000	505310	29002	476308
2001	53666	315120	-261454
2002	690	1013161	-1012471
2003	1788	770633	-768845
2004	55451	657958	-602508
2005	202562	552952	-350390
2006	674177	381543	292635
2007	104912	849980	-745068
2008	220296	534885	-314589
2009	132834	1123212	-990378
2010	187743	1016007	-828264

Year	Rapeseed meal		
	Import	Export	Net import
1996	252	582001	-581749
1997	53366	162689	-109322
1998	107246	6881	100365
1999	29498	339034	-309536
2000	55724	978357	-922633
2001	8	475663	-475655
2002	n.a.	259867	n.a.
2003	14300	182262	-167962
2004	93612	124904	-31292
2005	71562	84932	-13370
2006	253553	48519	205034
2007	289596	93716	195880
2008	308435	49837	258598
2009	247669	335013	-87344
2010	1216219	56308	1159911

Source: UNcomtrade Database, http://comtrade.un.org.

4.3 Competing Agricultural Products

There is a range of other non-food agricultural products that compete with food production for limited resources, such as cotton, jute and tobacco. Both jute and tobacco are minor crops, accounting for 0.1 and 0.8 per cent of total area sown respectively in 2010. Cotton production is the major competitor with food production. Its share of total area sown has been around 3-4 per cent in the past three decades. The average share in the past 5 years was 3.5 per cent with an average area sown to cotton being 5.5 m ha (Table D1).

Cotton competes with summer crops, in particular maize and soybeans. In the past 5 years, the area sown to cotton declined by about 1 m ha (It was 5.82 m ha in 2006 and 5.93 m ha in 2007 but dropped to 4.95 m ha in 2009 and 4.85 in 2010) and China's cotton imports have increased (especially after China joined the World Trade Organization in 2001). Imports of cotton were the highest in 2006; being 3.81 mt. Average annual imports between 2007 and 2010 were about 2.4 mt. China is a major cotton textile exporter and partly relies on imported cotton for processing. To ensure there is adequate cotton, China has adopted a less restrictive policy for cotton imports and has refrained from applying higher tariffs to imports that are in excess of the cotton tariff-rate quota (TRQ). The global economic environment affects China's exports of cotton textile and thus the need for cotton imports.

In the future, if the supply of grain becomes tight and land is allocated to grain production then it is likely that the current less restrictive import policy will remain in place for cotton. This will encourage processing firms to import cotton; thus sparing land for food production. However, it must be noted that cotton is regarded as a commodity of strategic significance in China and therefore it is unlikely that the government will allow the self-sufficiency rate of cotton to drop too low. In 2010, the cotton self-sufficiency rate was 65 per cent and was at its lowest level in recent history. Further reduction in this self-sufficiency rate is likely to be met by a policy response from the Chinese Government to increase production. The maximum scope for increasing the area sown to cotton is about 1 m ha. In 2010, China's total area sown to grain crops was 110 m ha. Hence, any potential impact on grain supply resulting from variations in area sown to cotton is unlikely to be greater than 1 per cent.

Another product whose production may affect China's food supply is wool. Changes in wool production will not directly affect grain supply as the competition from wool for arable land is not that strong. However, the supply of mutton/lamb may be affected. In the past few decades the wool price was relatively low and the relative price of mutton and lamb has become more attractive. Many producers have moved away from wool production to raise sheep for meat or for both wool and meats. This has led to an increase in mutton output in the past few years. It is likely this trend will continue unless the wool price significantly improves relative to prices for mutton and lamb.

China is the largest importer of wool from Australia. Subsequently, changes in wool production in Australia will also affect China's wool production. Some Australian wool growers are shifting to produce sheep meat and this could affect the price of wool imported to China. If this price increase is relatively large, then more Chinese sheep producers will remain in wool production. If this price does not increase much or becomes even lower, then Chinese processors will choose to use more imported wool rather than domestically produced wool (Liu *et al.* 2011). This of course will encourage more Chinese wool growers to shift to produce meats, increasing China's supply of mutton and lamb. Regardless of which scenario

occurs, the potential effect on China's total sheep meat supply is likely to be small and China will still need to import lamb and mutton to meet rising demand.

4.4 Further Discussion

Based on the above analyses, a number of useful observations can be drawn.

(1) An overwhelming majority of the available arable land is used for producing food in China. In 2010, the total area sown to all crops in the nation was 161 m ha. Of this, 96 per cent was devoted to food production. This suggests that the room for China to reduce land used for non-food crop production in order to produce more food crops is very minimal. Within food crops, an increase in area sown to a particular crop has to be at the expense of the area sown to another crop or crops. An increase in total food output in the future can only be achieved through yield improvement or claiming new land for crops.
(2) China's capacity to produce more animal products is stretched. More pork output will require more feed, chiefly, maize. China's ability to substantially increase its maize output is very limited. Small-scale pig production is declining and pig farming is becoming more intensified. Imports of maize are likely to increase; the quantity imported and the speed of this increase depend on China's needs for animal feed for pork production.
(3) Small increases in beef and sheep meat production are possible. The production of these meats will not directly compete for limited arable land as such. In agricultural areas they eat crop residuals with little reliance on high valued grains. Their production in agricultural areas has now become more important than that in pastoral areas. If we roughly treat those west and north-west provinces as pastoral regions (including Tibet, Qinghai, Xinjiang, Gansu, Shaanxi, Ningxia and Inner Mongolia), these regions together only produce about 20 per cent of China's total beef and 45 per cent of China's total lamb. Cattle and sheep farming are also intensifying. The impact of increased production of cattle and sheep in both agricultural and pastoral areas on the environment is a cause for concern.
(4) China has managed to produce a large amount of food to meet the rising demand by Chinese consumers. Looking into the future, China's ability to provide staple cereal foods, (rice and wheat) from domestic sources is quite promising. However, China's high level grain self-sufficiency tends to place a major downward pressure on the income prospects for farmers in major grain-producing regions who may have to forego more profitable alternatives.
(5) China's future imports of soybean and rapeseed will remain sizeable. It will continue to be a net importer of other edible oils such as palm oil. Sugar imports are expected to further increase. Both imports and exports of fruits will expand. China will export more temperate fruits and import more tropical fruits and out of season temperate fruits.
(6) The size of food imports of plant origin will depend on two important factors. One is whether the Chinese government can effectively avoid the further decline of available arable land. The demand for land for non-agricultural use is strong; e.g. for road construction and urban expansion. The other is whether the Chinese government can effectively boost R&D investment, thus improving crop yields.
(7) Meat consumption is expected to increase strongly as income further increases. How China is going to supply more animal products to its consumers is not yet clear. There

are three major options available for the Chinese government: (1) produce more at home; (2) import live animals; and (3) import animal products. For pork, if China wants to produce more at home, then more maize imports will be needed. It is most likely that China will increase its poultry meat imports.

(8) The large amount of soybean imports has helped China to "create" over 30 m ha new land. This is substantial, considering China's total annual area sown to crops is 160 m ha. Should China need to import more maize, which is most likely, more land can then be "created". This is an attractive strategy for China to ensure its food security (or more precisely, grain security) as this helps China to devote limited arable land for production of the key food grains such as paddy rice and wheat.

Our analysis of China's food consumption trends and its likely import needs should be read in light of the following:

(1) A systematic approach is needed to assess China's future food supply. Assessing the supply of one particular food item without due attention to the supply of other foods is inadequate because of the very tight resource availability. The increase in the production of one food item domestically is likely to affect the output level of other foods, especially among crops.

(2) Interpreting projections of China's future food supply must be done with caution. Any projections require reliable data and information as inputs. The quality of data and information from China is often a concern. This is partly related to possible inflation or deflation in statistics reporting. It is also partly related to the fast changes in the economy which often lead to changes in statistical indicators. When changes are made to indicators, their definition and scope of coverage could all differ from existing ones, making data incomparable and reducing the usefulness of a time series. Data unreliability may have also been related to the fact that little attention has been paid to some key parameters such as government food buffer stock levels. Of most concern regarding forecasting accuracy are the abrupt changes in policy made possible by China's centralised government. The timing and the scale of the changes are generally hard to predict and incorporate into forecast models. Hence, caution should be always exercised when interpreting any forecasts on China's food supply. Generally, the forecasts for immediate coming years will have some accuracy but the accuracy declines rapidly for those beyond 4 or 5 years, although they may still provide useful information about likely directions of change.

4.5 Prospects of Food Trade between Australia and China

Given the sheer size of China's population, the huge gap in consumption between the poor and the rich, and that between rural and urban consumers, the potential for the Chinese food market to expand is immense should the income level of the poor move towards the rich, and that of the rural move towards urban. The analysis in this study shows that China will not be able to meet all the increased demand with domestic supplies. Imports will be required, which renders exciting opportunities to food exporting countries such as Australia.

Australia is better positioned than most to benefit from China's needs for increased food imports, due to the strong complementarity in the trade of agricultural products between Australia and China, as discovered by Zhou *et al.* (2007). Currently, the volume of trade between the two countries is still relatively small. Yet the scope of commodities already

traded is relatively extensive. Further expansion in food trade between the two countries will render huge benefits to both partners.

China offers a potentially huge market for Australian food exports. As shown in this study, its demand for food products will continue to rise. This is driven by several important factors such as: (1) limited land and other natural resources; (2) increased demand as a result of rising income, and to some extent, by population increase; and (3) the increasing demand for higher quality and diverse products as consumer tastes and preferences change. Australia's reputation for producing good quality products is advantageous to increasing its food exports to China.

China is competitive in the production of labour-intensive food products and processed foods such as some Asian vegetables, horticultural products, and aquatic products. There is also great potential for China to increase its exports of many speciality foods to Australia such as dried lily flower and dried fungi, due to both the number of people of Asian descent living in Australia and the changing tastes of local Australians willing to try Asian foods.

Australia's competitiveness lies in the production of land-intensive food products, such as grains (e.g., barley and wheat), and animal foods (meats and dairy products). However, in the near future, China is unlikely to import large amounts of wheat or animal products except for speciality, niche or high quality products. It will, however, need to import oilseeds (such as rapeseed), coarse grains (particularly barley and perhaps maize), and dairy products.

According to the study by Zhou *et al.* (2007), total food trade between Australia and China is expected to further increase. While Australia's exports to China are expected to grow, so are imports from China. However, Australia will continue to export more to China than it imports from China. More importantly, they concluded that increased exports from Australia to China are unlikely to generate any shock to China's domestic production. This is mainly due to the fact that imports from Australia are chiefly for niche markets. Australian products, because of their higher quality or scarcity in China, are not competing with locally produced low-cost products. Likewise, increased imports from China will not generate large negative impacts on the Australian agricultural sector, although producers in some industries, such as the horticultural sector, parts of the fisheries industries and the food processing sector, may face increased competition.

An important complementarity, attractive to food traders in both countries, is the opportunity to import and export products based on seasonal differences.

Australia will benefit, directly and indirectly, from China's rising demand for foods. Directly, Australia will be able to export more foods to China. Indirectly, China's increased imports from the world market will push up overall global demand, creating opportunities for Australia to increase its food exports to other parts of the world. Resulting higher global food prices will also bring benefits to Australia.

5. Conclusions and Implications

This report examined China's food consumption trends since 2000 and assessed China's likely food import needs by 2020. In making our assessments we used data from the SSB, food balance sheets from FAO and projections of production and consumption trends from FAPRI, USDA, OECD-FAO and some less sophisticated modelling of our own.

Based on our analyses, China's food consumption since 2000 has exhibited the following trends:

- Total expenditure on foods continued to increase as income rose. However, the proportion of food expenditure out of total living expenditure continued to decline.
- The per capita direct consumption of staple foods, chiefly, rice and wheat, continued to decline. The per capita consumption of such foods by high-income urban consumers has largely stabilised. On a per capita basis, there will be further decline in the consumption of staple foods. The decline will come from lower-income urban residents but chiefly from all rural residents, both rich and poor, if their income continues to increase.
- The consumption of higher value foods, especially animal products, is increasing. The foods with higher rates of growth include milk and dairy products, aquatic products, poultry meats and fruits.
- Rural consumption is significantly behind urban consumption. In terms of the level of animal product consumption, rural China is at least 30 years behind urban areas. In 2010, the consumption level of several food items by high income rural residents (top 20 per cent) was below that of the bottom 20 per cent of residents in urban areas.
- There is a significant gap in the level of consumption between the rich and poor consumers in both rural and urban areas. For some foods of higher value such as aquatic and dairy products, the gap is several times larger.
- Both food consumption levels and patterns differ between regions. Consumption convergence is taking place but slowly.
- Chinese consumers have started to demand safe and high quality foods. Instances of foods of dubious quality have negatively affected consumer demand for foods. Foods with health-damaging ingredients, such as milk/milk powder with melamine, have led to reduced consumption of such foods.
- Some very wealthy Chinese consumers demand foods of superior quality. Some of them mainly consume imported foods due to concerns over safety of foods produced in China.
- Food diversity has increased rapidly in recent years and consumers have more choice.
- In response to consumer needs for convenience, retail-processed foods have also increased rapidly.
- Some more educated consumers have increasingly paid attention to food nutrition.
- Younger consumers more readily try foods from different cultures.

In the future, the scope and size of food imports by China will depend on whether the foods are plant origin or animal origin and whether the foods are staples.

- By 2020, China is expected to be largely self-sufficient in wheat and rice; a small amount of net wheat imports is possible.

- Maize imports are to increase but the amount is uncertain depending on China's choice of options in increasing its meat supply.
- Soybean imports may slightly increase above the current 55 mt imported. The imports of other oil-bearing crops such as rapeseed may vary depending on the amount of oil imported such as rapeseed oil and palm oil.
- China has limited capacity to boost its sugar production and sugar imports will continue.
- China will continue to be a net barley importer but the size of imports will be comparable to current levels.
- The imports of high quality beef and mutton/lamb are expected to increase to meet the demands of high-end hospitality industries, foreigners (expatriates and tourists) and rich local consumers.
- China is likely to be less restrictive on pork imports. Pork imports are unlikely to have a major impact on the domestic market given that domestic output is so high, being about 50 per cent of world's total production.
- It is also highly possible that China will increase poultry meat imports. However, China is expected to be self-sufficient in egg supply.
- China will need to import dairy products, chiefly milk powder and whey.
- In the foreseeable future, China seems to have sufficient protein feed assuming China continues to import a large amount of soybean. But it will be short of energy feed supplies such as maize. China's imports of energy feed will increase if it chooses to produce more animal products at home.

Given the size of the population, increased disposable income is turning China into a huge food market. In view of the huge gap in consumption levels between the poor and rich consumers and between rural and urban residents, the potential for the Chinese food market to expand is considerable as incomes rise and these gaps close. China's inability to meet all the increased demand with domestic supplies renders significant opportunities to food exporting countries such as Australia.

Australia will benefit, directly and indirectly, from China's rising demand for foods. Directly, it is expected that Australia will be able to export more foods to China. Indirectly, China's increased imports from the world market will put pressure on supplies from elsewhere, creating opportunities for Australia to increase its exports to other parts of the world.

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Appendix

Appendix A. Income Elasticity Estimates

Numerous efforts have been made to estimate income elasticities of demand for food for China. Fan and Agcaoili-Sombilla (1997), Chen (2004, pp. 12-15) and Zhou and Tian (2005, p. 132), provide summaries of earlier estimates. ERS of USDA and FAPRI at their websites also collate such estimates from diverse sources. The differences in such estimates between foods and over time can be seen in Table A1.

Few existing studies have made attempts to calculate yearly income elasticities, which help to reveal the patterns of change. Income elasticities of demand for various foods, however, are most likely to vary over time in China. Further, elasticities calculated using data from the 2000s are rare. Such 2000s data is available and an attempt was made in this study to estimate income elasticities on an annual basis.

It must be noted that we do not imply that our estimates of income elasticities are superior or more accurate. Our sole objective is to disclose the patterns of relationships between consumer food demand and income change through time.

Quantity demanded (in this study, per capita food utilisation) was specified as a function of income and related prices, taking the general form:

$$\ln Q_{it} = \alpha_{0i} + \alpha_{1i} \ln GDPPC_t + \alpha_{2i} / GDPPC_t \sum \beta_{ij} \ln P_{jt} + \mu_i$$

where:

Q_{it}: the quantity of demand/utilisation for commodity *i* in year *t*;
GDPPC: per capita GDP in year *t*; and
P_{jt}: price of commodity *j* in year *t*.

The time-varying income elasticity for commodity *i* is then calculated as:

$$e_{it} = \hat{\alpha}_{1i} - \hat{\alpha}_{2i} / GDPPC_t$$

It can be seen from the formulae that the income elasticity may increase ($\hat{\alpha}_{2i}$>0), constant ($\hat{\alpha}_{2i}$=0), or decrease ($\hat{\alpha}_{2i}$<0). When GDPPC grows large, the income elasticities will converge to $\hat{\alpha}_{1i}$.

Data from Chinese government sources, FAO, USDA and other publications were gathered, examined and compared. It was found that the data were not always consistent in terms of commodity definitions and coverage. Particularly, some of the price series were incomplete. Proxies for some missing price series were used in this study as control variables. Given that our primary focus was to estimate income elasticities and examine their patterns, the use of proxies is unlikely to cause serious problems. The estimated parameters of income variables are shown in Table A2.

Out of the 16 food products covered, 13 have negative α_2, indicating declining income elasticities as per capita income rises. Maize demand has constant income elasticity, and

soybean and milk have increasing income elasticities. The parameter α_1 was negative for wheat, rice, barley and rapeseed, suggesting that these products tend to become inferior food items in the long run. The derived income elasticities for all the food items are given in Table A3.

The trends shown in these elasticities are largely in accordance with our assertions as shown in Section 2. For example, the income elasticities of demand for wheat and rice have declined over years. The income elasticities for animal products are greater compared to those of cereal foods. However, due to data limitations, it was not possible to estimate elasticities for direct and indirect consumption of some foods, and to derive the elasticities for rural and urban areas separately.

Caution needs to be exercised in explaining the size of the elasticities. The reliability of any estimated income elasticities depends largely on the appropriateness of the econometric models used and the quality of the data. While we believe the models used to estimate those elasticities in Table A3 are largely appropriate for the purpose of this study, it should be kept in mind that the quality and availability of some data is less than desirable and in some cases proxies had to be used, particularly for prices. Further, the functional form we used was not flexible enough to fully reflect direction changes in income elasticities, which might have occurred for some food items as income rose. As such, the elasticities for some food items needed to be read with extreme caution, especially for soybean and milk. In the longer term, demand behavior will change as a result of the changes in other forces. From the mid-1990s, the demand for soybean and dairy products (chiefly, milk) has increased remarkably. Such fast increases on a per capital basis are unlikely to continue for long and their income elasticities are expected to reach a high point and then start to decrease.

Table A1. Expenditure/Income Elasticities from Earlier Studies

Study	Data time period	Area	Food grains	Meats*	Pork	Beef	Mutton	Poultry	Dairy products	Eggs	Aquatic products
Lewis and Andrews (1989)	1982-85	Average	0.34								
Tian (1990)	1984-88	Urban			1.040	1.190	1.190	1.620		1.180	1.510
		Rural			1.410	0.610	0.610	1.990		1.140	
Ma (2003)	1980s	Urban			0.682	1.684	1.293	1.954	1.589	1.245	
		Rural			0.795	1.085	0.454	1.694		1.643	
Yan (2002)	1981-93	Urban	-0.490	0.350							
		Rural	0.010	0.630							
Fan and Wailes (1994)	1993	Rural		0.550				0.540			
Shen (1995)	1980-94	Urban	0.310								
Liu and Chern (2001)	1992-96	Average	$1.30^{a}/1.04^{b}/0.20^{c}/0.32^{d}$								
Mei (2001)	1996	Rural	0.009	0.126				1.481		1.131	3.010
Ma (2003)	1990s	Urban			0.659	1.411	1.246	1.412	1.488	1.334	
		Rural			0.764	1.121	0.749	1.389		1.697	
FAO		Average	0.25(Rice)/0.3(Wheat)		0.45	1.16	0.45	0.60	0.75		
IFPRI		Average	0(Rice) /0.3(Wheat)		0.40	1.20		0.60	0.50		
FAPRI		Urban			0.10	0.45		0.45			
		Rural			0.12	0.46		0.46			

* Meats include pork, beef and mutton; a-d: elasticity calculated by LA/AIDS, AIDS, LES, and QES, respectively.
Sources: Fan and Agcaoili-Sombilla (1997), Chen (2004, pp. 12-15), Zhou and Tian (2005, p. 132), ERS of USDA (www.ers.usda.gov/Data/Elasticities/app/), FAPRI (www.fapri.iastate.edu/tools/elasticity.aspx).

Table A2. Results of Regression

	Constant	LOG(GDPPC)	1/GDPPC	LOG(GRP/CPI)	LOG(LPP/CPI)	LOG(VEP/CPI)	LOG(MTP/CPI)	LOG(FPP/CPI)	R^2
Barley	3.7100	-0.1602	-564.1416	0.7844	-0.5282	-0.9698			0.7659
	(4.8834)	(-1.4644)	(-6.3972)	(6.2976)	(-2.8633)	(-4.2818)			
Wheat	7.4039	-0.3399	-467.7449	0.0291	0.0181	-0.1113			0.9687
	(41.4016)	(-14.0595)	(-22.2506)	(0.9577)	(0.4058)	(-2.8061)			
Rice	6.1145	-0.2200	-80.6396	0.0031	-0.1263	0.2891			0.5823
	(19.8876)	(-5.0759)	(-2.2498)	(-0.0605)	(-1.6749)	(3.4579)			
Maize	1.9439	0.3830	-1.3436	0.4403	-0.4238	-0.3728			0.9458
	(3.8216)	(5.1422)	(-0.0228)	(5.3285)	(-3.4526)	(-2.3469)			
Soybean	-5.4575	1.0755	522.8380	0.1060	0.0005	-0.4794			0.9677
	(-7.0137)	(11.0106)	(5.9255)	(0.6967)	(0.0023)	(-3.4280)			
Sugarcane	2.9732	0.2011	-280.5175	-0.2604	0.3104	-0.2724			0.9010
	(3.7432)	(1.7658)	(-3.0401)	(-1.9944)	(1.6101)	(-1.1806)			
Vegetables	0.9055	0.5695	-111.1578	-0.0134	-0.6372	0.4677			0.9953
	(2.3242)	(10.3269)	(-2.4489)	(-0.2075)	(-6.6816)	(4.3453)			
Fruits	-0.7489	0.6077	-326.9144	0.4701	-0.5396	0.1360			0.9949
	(-1.4942)	(8.8265)	(-5.5642)	(5.5591)	(-4.3444)	(1.1247)			
Rapeseed	4.1324	-0.1898	-809.0096	0.1846	-0.3983	-0.4055			0.9332
	(3.8683)	(-1.4284)	(-6.5233)	(0.9193)	(-1.4696)	(-2.8183)			
Pork	2.8679	0.1413	-533.9836	0.1020		-0.2333	-0.2440		0.9905
	(7.5003)	(2.5467)	(-12.0028)	(1.6133)		(-2.0070)	(-2.6279)		
Beef	-1.0701	0.4305	-1053.2720	1.0919		-0.5216	-1.0433		0.9830
	(-0.9044)	(2.7040)	(-7.5662)	(5.3410)		(-2.0610)	(-3.5182)		
Mutton	-5.2825	0.8870	-366.5691	0.0822		-0.6730	-0.2953		0.9892
	(-7.8458)	(9.1220)	(-4.6752)	(0.7361)		(-3.3492)	(-1.8016)		
Poultry	-1.6362	0.6028	-594.4680	0.7335		-0.5313	-0.8478		0.9810
	(-1.7402)	(4.7476)	(-5.3716)	(4.5287)		(-2.5517)	(-3.6057)		
Eggs	2.9362	0.0076	-799.0402	0.7072		0.1758	-0.6611		0.9889
	(4.3279)	(0.0830)	(-10.0082)	(6.1112)		(1.2013)	(-3.8990)		
Milk	-13.1568	1.8784	1260.1460	-0.2251	-0.2933			1.2320	0.9842
	(-17.5469)	(21.0479)	(13.2311)	(-1.8103)	(-1.5067)			(12.5272)	
Fish	3.8421	-0.0075	-828.8138	0.5225	-0.2606			-0.0967	0.9861
	(5.0892)	(-0.0841)	(-8.6038)	(4.1995)	(-1.3292)			(-0.9403)	

t-value in brackets.
Source: authors' own calculation.

Table A3. Income Elasticities of Main Food Items in China (1978 to 2010)

Year	Barley	Wheat	Rice	Maize	Soybean	Sugarcane	Vegetables	Fruits	Rapeseed	Pig meat	Beef	Mutton	Poultry	Eggs	Milk	Fish
1978	1.3205	0.8877	-0.0084	0.3866	-0.2968	0.9374	0.8612	1.4657	1.9336	1.5429	3.1949	1.8491	2.1630	2.1048	-1.4291	2.1678
1979	1.2348	0.8166	-0.0206	0.3864	-0.2173	0.8947	0.8443	1.4160	1.8106	1.4617	3.0348	1.7934	2.0727	1.9833	-1.2375	2.0418
1980	1.1497	0.7461	-0.0328	0.3862	-0.1384	0.8524	0.8275	1.3667	1.6886	1.3812	2.8760	1.7381	1.9830	1.8628	-1.0474	1.9168
1981	1.1004	0.7053	-0.0398	0.3860	-0.0928	0.8279	0.8178	1.3382	1.6180	1.3346	2.7841	1.7061	1.9311	1.7931	-0.9375	1.8445
1982	1.0129	0.6327	-0.0524	0.3858	-0.0117	0.7844	0.8006	1.2874	1.4925	1.2517	2.6206	1.6493	1.8389	1.6691	-0.7419	1.7159
1983	0.9135	0.5502	-0.0666	0.3856	0.0805	0.7350	0.7810	1.2298	1.3499	1.1576	2.4350	1.5846	1.7341	1.5282	-0.5198	1.5698
1984	0.7843	0.4432	-0.0850	0.3853	0.2002	0.6707	0.7556	1.1550	1.1647	1.0353	2.1938	1.5007	1.5980	1.3453	-0.2313	1.3801
1985	0.6836	0.3597	-0.0994	0.3850	0.2935	0.6207	0.7357	1.0966	1.0203	0.9400	2.0058	1.4353	1.4919	1.2027	-0.0064	1.2321
1986	0.6267	0.3125	-0.1076	0.3849	0.3463	0.5923	0.7245	1.0636	0.9386	0.8861	1.8995	1.3983	1.4319	1.1220	0.1208	1.1484
1987	0.5564	0.2542	-0.1176	0.3847	0.4114	0.5574	0.7106	1.0229	0.8378	0.8196	1.7683	1.3526	1.3578	1.0225	0.2778	1.0452
1988	0.4942	0.2026	-0.1265	0.3846	0.4691	0.5265	0.6984	0.9869	0.7486	0.7607	1.6522	1.3122	1.2923	0.9344	0.4167	0.9538
1989	0.4784	0.1895	-0.1288	0.3846	0.4837	0.5186	0.6953	0.9777	0.7259	0.7457	1.6226	1.3019	1.2756	0.9120	0.4521	0.9306
1990	0.4638	0.1775	-0.1308	0.3845	0.4972	0.5114	0.6924	0.9693	0.7051	0.7320	1.5955	1.2925	1.2603	0.8914	0.4845	0.9092
1991	0.4192	0.1405	-0.1372	0.3844	0.5385	0.4892	0.6836	0.9434	0.6411	0.6898	1.5122	1.2635	1.2133	0.8282	0.5842	0.8437
1992	0.3533	0.0858	-0.1467	0.3843	0.5997	0.4564	0.6706	0.9052	0.5465	0.6273	1.3890	1.2206	1.1438	0.7348	0.7315	0.7468
1993	0.2956	0.0379	-0.1549	0.3841	0.6532	0.4277	0.6593	0.8718	0.4638	0.5727	1.2813	1.1831	1.0830	0.6531	0.8604	0.6620
1994	0.2474	-0.0020	-0.1618	0.3840	0.6978	0.4038	0.6498	0.8439	0.3947	0.5272	1.1914	1.1519	1.0323	0.5849	0.9679	0.5913
1995	0.2113	-0.0319	-0.1669	0.3839	0.7313	0.3858	0.6426	0.8229	0.3429	0.4930	1.1240	1.1284	0.9942	0.5337	1.0486	0.5382
1996	0.1811	-0.0570	-0.1713	0.3839	0.7593	0.3708	0.6367	0.8054	0.2996	0.4643	1.0675	1.1087	0.9623	0.4909	1.1162	0.4938
1997	0.1552	-0.0784	-0.1750	0.3838	0.7832	0.3579	0.6316	0.7904	0.2626	0.4399	1.0193	1.0920	0.9351	0.4543	1.1738	0.4559
1998	0.1351	-0.0951	-0.1778	0.3837	0.8018	0.3479	0.6276	0.7788	0.2337	0.4209	0.9818	1.0789	0.9139	0.4259	1.2187	0.4263
1999	0.1166	-0.1104	-0.1805	0.3837	0.8190	0.3387	0.6240	0.7681	0.2072	0.4033	0.9472	1.0669	0.8944	0.3996	1.2601	0.3991
2000	0.0971	-0.1266	-0.1833	0.3837	0.8371	0.3290	0.6202	0.7568	0.1792	0.3849	0.9108	1.0542	0.8739	0.3720	1.3037	0.3705
2001	0.0791	-0.1415	-0.1858	0.3836	0.8537	0.3201	0.6166	0.7463	0.1534	0.3679	0.8772	1.0425	0.8549	0.3465	1.3438	0.3440
2002	0.0607	-0.1568	-0.1885	0.3836	0.8708	0.3109	0.6130	0.7356	0.1270	0.3504	0.8428	1.0305	0.8355	0.3204	1.3851	0.3169
2003	0.0418	-0.1725	-0.1912	0.3835	0.8883	0.3015	0.6093	0.7247	0.0999	0.3325	0.8076	1.0183	0.8156	0.2937	1.4272	0.2892
2004	0.0244	-0.1869	-0.1937	0.3835	0.9045	0.2929	0.6058	0.7146	0.0749	0.3161	0.7751	1.0069	0.7972	0.2690	1.4661	0.2636

Year	Barley	Wheat	Rice	Maize	Soybean	Sugarcane	Vegetables	Fruits	Rapeseed	Pig meat	Beef	Mutton	Poultry	Eggs	Milk	Fish
2005	0.0066	-0.2016	-0.1962	0.3834	0.9209	0.2840	0.6023	0.7043	0.0494	0.2992	0.7419	0.9954	0.7785	0.2438	1.5058	0.2375
2006	-0.0113	-0.2165	-0.1988	0.3834	0.9376	0.2751	0.5988	0.6939	0.0237	0.2823	0.7084	0.9837	0.7596	0.2184	1.5459	0.2112
2007	-0.0291	-0.2313	-0.2013	0.3834	0.9540	0.2663	0.5953	0.6836	-0.0018	0.2654	0.6752	0.9722	0.7409	0.1932	1.5856	0.1850
2008	-0.0400	-0.2403	-0.2029	0.3833	0.9642	0.2609	0.5931	0.6773	-0.0174	0.2551	0.6548	0.9651	0.7294	0.1778	1.6100	0.1690
2009	-0.0496	-0.2482	-0.2042	0.3833	0.9730	0.2561	0.5912	0.6717	-0.0312	0.2460	0.6369	0.9589	0.7193	0.1642	1.6314	0.1549
2010	-0.0596	-0.2565	-0.2057	0.3833	0.9823	0.2511	0.5893	0.6660	-0.0455	0.2366	0.6183	0.9524	0.7088	0.1501	1.6536	0.1403

Source: authors' own calculation.

Appendix B. Food Balance Sheets

Notes:

1. Per capita consumption in kg. All other quantities are in thousand tonnes. Annual growth rates are in percentages (%).
2. The food balance sheets are compiled from the FAOSTAT database, supplemented by data from other sources, e.g., SSBa.
3. FAOSTAT database is located at http://faostat.fao.org/site/617/DesktopDefault.aspx?PageID=617#ancor.
4. FAO data include statistics from mainland China, Hong Kong, Macau, and Taiwan. No separate data for the mainland only are available. Hong Kong, Macau, and Taiwan account for about 2% of the total population of China. Some of the agricultural products are not produced in these three regions. Indeed, while Taiwan produces some of the agricultural products, few are produced in Hong Kong and Macau. Nonetheless, because of the inclusion of these three regions, data from FAO food balance sheet are not the exact statistics for mainland China. However, given that mainland accounts for an overwhelming majority, the discrepancy is likely very small for most products.
5. FAO food balance sheets are available till 2007. Production and trade statistics from 2008 to 2010 for some products (where data available) are included in the balance sheets to show the trends. Production data is from SSBa, export and import data is from UN Comtrade. Because of different data sources, annual growth rates were calculated for 2000-2007, not 2000-2010.

Table B1. Wheat

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization						Per capita consumption
							Feed	Food	Seed	Waste	Processing	Other Util	
1978	53842	8576	61	-8514	-2310	60047	452	50575	4250	4220	0.1	550	61.3
1980	55213	11910	82	-11828	374	67415	462	58875	3950	3583	0.1	545	67.0
1985	85807	6586	146	-6439	-1027	91220	181	80765	4500	4926	0.1	848	84.3
1990	98232	13970	240	-13731	-7412	104550	204	92052	4650	6393	0.1	1252	89.2
1995	102211	13211	621	-12590	-972	113829	700	99075	5120	7258	4.4	1672	91.7
2000	99636	2615	488	-2126	11195	112958	4000	95927	5000	5624	4.4	2402	87.0
2001	93873	2281	1032	-1249	16914	112036	5500	94767	4800	4277	3.5	2688	85.7
2002	90290	2312	1328	-984	18570	109844	6000	92733	4400	4033	5.1	2673	83.5
2003	86488	2220	2911	691	22290	108087	5500	91559	4500	3870	11.1	2647	81.7
2004	91952	8913	1559	-7354	5903	105209	2500	91354	4800	3657	21.3	2877	79.1
2005	97445	5414	1106	-4309	3398	105152	3800	91034	4600	3803	35.0	1880	78.6
2006	108466	2187	2046	-140	-2735	105872	5600	91159	4130	2682	35.0	2266	78.7
2007	109298	2061	3759	1699	-1486	106114	6800	90141	4100	2511	31.2	2531	78.5
2008	112464	32	126	94									
2009	115115	894	8	-885									
2010	115181	1219	0	-1219									

Growth Rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization						Per capita consumption
							Feed	Food	Seed	Waste	Processing	Other Util	
1980-90	5.9	1.6	11.3			4.5	-7.8	4.6	1.6	6.0	4.8	8.7	2.9
1990-00	0.1	-15.4	7.4			0.8	35	0.4	0.7	-1.3	43.5	6.7	-0.3
2000-07	1.3	-3.3	33.9			-0.9	7.9	-0.9	-2.8	-11.0	32.1	0.7	-1.5

There is no wheat production in Hong Kong, Macau, and Taiwan. FAO and SSB wheat production statistics are identical.

Table B2. Rice

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization						Per capita consumption
							Feed	Food	Seed	Waste	Processing	Other Util	
1978	93396	533	1680	1147	-28	92221	7354	74061	5264	5250	4.8	288	94.1
1980	95299	534	1383	848	2098	96549	8450	76255	5240	6303	5.0	295	95.9
1985	114270	626	1059	433	2856	116693	10963	92675	5079	7618	5.3	353	107.9
1990	127807	498	457	-40	-8064	119783	10170	96899	4940	7368	10.0	395	102.2
1995	124928	2063	309	-1754	-3727	122955	12412	96830	5134	7990	10.2	584	99.0
2000	126606	630	3102	2472	4503	128637	13353	102032	4613	7357	8.2	1275	99.1
2001	119596	691	2060	1369	12635	130862	15354	102071	4546	7351	68.1	1476	100.1
2002	117620	739	2097	1359	13857	130119	14740	102006	4478	7352	72.3	1475	98.9
2003	108257	794	2605	1811	20269	126715	12096	101387	4744	6684	131.9	1677	95.8
2004	120409	1309	989	-320	2687	123415	10126	101456	4811	5337	12.4	1678	92.8
2005	121431	986	689	-297	-407	121321	8042	102074	4678	4673	112.0	1747	90.7
2006	122245	1225	1304	79	2638	124804	10082	102741	4411	5814	12.4	1749	92.8
2007	124994	1000	1312	312	172	124854	10140	102640	4411	5851	132.1	1683	92.4
2008	134327	296	969	674									
2009	136572	338	784	446									
2010	137033	366	619	253									

Growth Rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization						Per capita consumption
							Feed	Food	Seed	Waste	Processing	Other Util	
1980-90	3.0	-0.7	-10.5			2.2	1.9	2.4	-0.6	1.6	7.2	3.0	0.6
1990-00	-0.1	2.4	21.1			0.7	2.8	0.5	-0.7	0.0	-1.9	12.4	-0.3
2000-07	-0.2	6.8	-11.6			-0.4	-3.9	0.1	-0.6	-3.2	48.6	4.0	-1.0

FAO rice production statistics are lower than those of SSBa and USDA (PSD) by about 5%. SSB and USDA statistics are similar.

Table B3. Maize

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization						Per capita consumption
							Feed	Food	Seed	Waste	Processing	Other Util	
1978	56057	3230	34	-3196	55	59308	46939	4626	1331	4696	50	1667	60.5
1980	62715	4712	117	-4595	463	67773	54443	4885	1261	5304	54	1827	67.4
1985	64102	3439	6360	2921	-112	61069	46764	4932	1331	4766	65	3213	56.5
1990	97214	5586	3408	-2179	-25946	73447	57974	5153	1452	7819	114	935	62.7
1995	112362	12029	162	-11867	-16091	108138	87637	8713	1602	9562	179	445	87.1
2000	106178	5059	10593	5533	22482	123127	93931	8406	1741	9728	615	8705	94.8
2001	114254	5391	6133	742	9814	123326	92212	8694	1901	9238	599	10682	94.3
2002	121497	5195	11875	6679	12843	127661	94079	8950	1801	9240	814	12776	97.0
2003	115998	5204	16684	11480	24520	129038	95002	9190	1901	8246	1515	13184	97.5
2004	130434	4996	2519	-2476	1425	134336	96853	9169	2001	6244	1971	18097	101.0
2005	139498	5186	8949	3762	2392	138128	99470	9480	1151	6253	1766	20009	103.3
2006	151731	5310	3443	-1867	-13558	140040	97572	8926	1201	5951	2585	23805	104.1
2007	152419	4656	5591	935	-4989	146496	100332	8994	1301	6331	4210	25328	108.4
2008	165914	49	253	203									
2009	163974	84	130	46									
2010	177245	1572	127	-1445									

Growth rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization						Per capita consumption
							Feed	Food	Seed	Waste	Processing	Other Util	
1980-90	4.5	1.7	40.1			0.8	0.6	0.5	1.4	4.0	7.8	-6.5	-0.7
1990-00	0.9	-1.0	12.0			5.3	4.9	5.0	1.8	2.2	18.4	25.0	4.2
2000-07	5.3	-1.2	-8.7			2.5	0.9	1.0	-4.1	-6.0	31.6	16.5	1.9

FAO maize data is consistent with those of SSBa.

Table B4. Barley

Year	Production	Import	Export	Net export	Stock variation	Domestic supply quantity /consumption	Utilization						Per capita consumption
							Feed	Food	Seed	Waste	Processing	Other Util	
1978	3401	351	1	-350	-25	3726	356	2913	152	169	125	10	3.8
1980	2700	426	1	-425	487	3612	514	2591	126	159	205	16	3.6
1985	2700	394	1	-393	149	3241	405	1746	116	144	756	76	3.0
1990	3000	930	3	-928	9	3937	490	1495	173	179	1599	1	3.4
1995	4420	1524	55	-1469	-299	5590	647	1055	168	275	3444	1	4.5
2000	2646	2174	87	-2087	248	4980	226	324	81	239	4107	3	3.8
2001	2893	2611	95	-2517	-23	5387	236	562	96	261	4217	15	4.1
2002	3324	2126	109	-2017	-238	5103	204	468	81	257	4088	5	3.9
2003	2717	1482	133	-1350	282	4348	193	452	83	211	3409	1	3.3
2004	3222	1925	157	-1768	-4	4986	214	533	87	244	3905	3	3.7
2005	3444	2400	189	-2211	-15	5640	175	524	91	279	4569	3	4.2
2006	3369	2339	207	-2132	0	5501	148	456	97	273	4519	9	4.1
2007	3451	1056	598	-459	49	3959	136	256	105	214	3240	7	2.9
2008	2823	1076	15	-1062									
2009	2318	1738	14	-1724									
2010	2500	2367	13	-2354									

Growth Rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply quantity /consumption	Utilization						Per capita consumption
							Feed	Food	Seed	Waste	Processing	Other Util	
1980-90	1.1	8.1	5.8			0.9	-0.5	-5.4	3.2	1.2	22.8	-24.3	-0.7
1990-00	-1.2	8.9	41.9			2.4	-7.4	-14.2	-7.3	2.9	9.9	12.4	1.3
2000-07	3.9	-9.8	31.8			-3.2	-7.0	-3.3	3.8	-1.5	-3.3	11.1	-3.8

Large difference exists between SSBa, FAO and USDA (PSD) statistics for barley before 2000. After 2000, difference between different sources remained but became smaller.

Table B5. Soybeans

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization						Per capita consumption
							Feed	Food	Seed	Waste	Processing	Other Util	
1978	7611	1174	116.5	-1058	-21.3	8647	233	3943	762.1	258.1	3450	0.5	8.8
1980	7966	1541	142.2	-1399	85.2	9450	260	4161	842.8	263.7	3922	0.4	9.4
1985	10512	1502	1148.4	-353	-292.1	10573	700	4046	871.7	130.0	4825	0.5	9.8
1990	11008	2031	970.5	-1060	-386.7	11682	250	4556	902.3	266.6	5707	0.6	10.0
1995	13511	2921	413.7	-2507	236.9	16255	450	6013	1108.0	773.1	7911	0.7	13.1
2000	15411	12776	279.0	-12497	-896.7	27012	2009	5396	1393.2	432.3	17780	0.8	20.8
2001	15407	16440	322.3	-16118	-753.0	30772	2655	5345	1317.1	507.0	20947	0.8	23.5
2002	16505	13896	362.2	-13534	1514.2	31554	1907	4776	1354.4	614.9	22901	0.7	24.0
2003	15393	23242	350.5	-22891	-1160.6	37124	2911	4995	1344.0	481.3	27392	0.7	28.1
2004	17404	22303	402.8	-21900	220.3	39525	3594	5097	1354.7	650.5	28828	0.7	29.7
2005	16350	29083	468.1	-28615	-1740.6	43224	3014	5520	1275.7	612.6	32802	0.7	32.3
2006	15500	30702	449.4	-30253	14.2	45767	3216	5426	1237.0	557.8	35330	0.7	34.0
2007	12725	33198	532.9	-32665	-90.8	45299	1708	5298	1260.1	549.5	36482	0.7	33.5
2008	15540	37436	465.1	-36971									
2009	14980	42552	346.6	-42205									
2010	15100	54798	163.6	-54634									

Growth rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization						Per capita consumption
							Feed	Food	Seed	Waste	Processing	Other Util	
1980-90	3.3	2.8	21.2			2.1	-0.4	0.9	0.7	0.1	3.8	3.3	0.6
1990-00	3.4	20.2	-11.7			8.7	23.2	1.7	4.4	5.0	12.0	2.7	7.6
2000-07	-2.7	14.6	9.7			7.7	-2.3	-0.3	-1.4	3.5	10.8	-2.2	7.0

FAO soybean data is consistent with SSBa data.

Table B6. Rapeseed

Year	Production	Import	Export	Net export	Stock variation	Domestic supply quantity /consumption	Utilization						Per capita consumption
							Feed	Seed	Waste	Processing	Food	Other Util	
1978	1871	0.0	0.2	0.2	0.0	1871	3.0	97	75	1642	0.0	55	1.9
1980	2386	0.0	0.6	0.5	200.2	2586	2.0	133	103	2298	0.0	49	2.6
1985	5607	0.3	18.0	17.7	0.0	5590	300.5	172	224	4500	0.2	393	5.2
1990	6962	1.3	5.9	4.6	0.0	6958	303.8	215	279	6100	0.7	60	5.9
1995	9797	94.2	2.1	-92.1	-800.0	9089	618.8	236	396	7800	1.5	37	7.3
2000	11406	2973.2	2.5	-2970.7	-1250.0	13126	2023.4	249	575	10200	2.9	76	10.1
2001	11344	1728.6	1.1	-1727.4	0.0	13072	1762.1	250	523	10500	3.2	33	10.0
2002	10565	621.8	3.0	-618.9	750.0	11934	1112.0	253	477	10000	3.0	89	9.1
2003	11435	170.3	3.5	-166.9	0.0	11602	1513.9	255	464	9300	3.0	66	8.8
2004	13197	427.8	1.0	-426.7	-1200.0	12424	1414.0	255	545	10100	2.8	107	9.3
2005	13068	300.3	0.7	-299.6	-504.4	12864	964.9	210	535	11050	3.1	101	9.6
2006	10981	742.4	1.2	-741.2	1254.1	12976	914.1	198	519	11287	3.2	55	9.6
2007	10589	837.6	2.2	-835.4	500.3	11925	765.4	231	477	10353	3.4	95	8.8
2008	12102	1303.0	0.1	-1303.0									
2009	13657	3285.9	0.2	-3285.6									
2010	13082	1599.8	0.1	-1599.7									

Growth rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply quantity /consumption	Utilization						Per capita consumption
							Feed	Seed	Waste	Processing	Food	Other Util	
1980-90	11.3	39.3	26.2			10.4	65.3	4.9	10.4	10.3	32.7	1.9	8.7
1990-00	5.1	116.8	-8.1			6.6	20.9	1.5	7.5	5.3	15.2	2.5	5.5
2000-07	-1.1	-16.6	-2.0			-1.4	-13.0	-1.0	-2.6	0.2	2.3	3.2	-1.9

FAO statistics are lower than those of SSBa.

Table B7. Sugarcane

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization			Per capita consumption
							Feed	Processing	Food	
1978	29394	0.1	4.7	4.6	-600.0	28790	517.0	27936	33.6	29.4
1980	31978	6.5	3.5	-3.0	0.0	31981	207.0	31448	32.6	31.8
1985	58711	4.3	0.2	-4.0	-2700.0	56015	4049.2	51623	34.3	51.8
1990	63451	2.3	4.7	2.4	-1500.0	61949	4740.7	56956	25.2	52.9
1995	70279	1.7	4.8	3.2	2000.0	72276	11512.2	60561	20.2	58.2
2000	69299	3.0	2.1	-0.9	0.0	69300	6327.9	62844	12.8	53.4
2001	77966	282.1	3.5	-278.6	4000.0	82244	4258.6	77860	12.5	62.9
2002	92203	1.9	0.0	-1.9	0.0	92204	3021.9	89058	12.5	70.1
2003	92039	1.8	0.0	-1.8	0.0	92041	2000.0	89931	11.0	69.6
2004	91044	1.3	0.0	-1.3	-1500.0	89546	1249.4	88229	6.7	67.3
2005	87578	1.2	0.0	-1.2	-1500.0	86079	621.0	85392	6.6	64.4
2006	93306	1.0	0.0	-1.0	3000.0	96307	392.0	95851	6.4	71.6
2007	113732	1.0	0.0	-1.0	0.0	113733	7451.0	106221	6.1	84.1
2008	124152	526	4.3	-522						
2009	115587	607	3.2	-604						
2010	110789	n.a	n.a	n.a						

Growth rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization			Per capita consumption
							Feed	Processing	Food	
1980-90	7.1	-10.0	2.9			6.8	36.8	6.1	-2.5	5.2
1990-00	0.9	2.8	-7.8			1.1	2.9	1.0	-6.6	0.1
2000-07	7.3	-14.6	-100.0			7.3	2.4	7.8	-10.0	6.7

Prior to 1996, production by FAO is higher than that of SSB, around 5-40%. Between 1997 and 2000, the gaps are within 5%. After 2000, the gap became further closed.

Table B8. Vegetables

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization					Per capita consumption
							Feed	Food	Waste	Processing	Other Util	
1978	56546	374	930	556	30	56020	792	50899	4316	0	13	57.2
1980	55405	488	1193	705	3	54703	782	49661	4244	0	16	54.4
1985	94409	535	1290	755	-6	93647	1338	84589	7720	0	16	86.6
1990	128382	736	2077	1340	0	127042	1418	114958	10664	0	15	108.4
1995	202698	810	3008	2198	4	200503	2494	181540	16510	0	14	161.5
1996	226364	762	3056	2294	15	224085	2984	202905	18255	0	13	178.7
1997	242678	760	3173	2413	33	240298	3553	217138	19652	0	13	189.8
1998	251434	927	3645	2717	37	248754	3693	224795	20337	0	14	194.7
1999	280155	1062	3919	2858	-5	277292	4409	250309	22755	0	15	215.2
2000	328801	1122	4153	3031	5	325775	13099	285983	26725	0	17	250.9
2001	356515	1128	5283	4155	-4	352357	17798	305483	29076	0	17	269.5
2002	389244	1163	6052	4888	-9	384347	19360	333491	31486	0	17	292.2
2003	400619	1139	6985	5847	-12	394760	22350	340406	31987	0	17	298.4
2004	410615	1181	7702	6521	-40	404054	23473	347930	32633	0	18	303.7
2005	423392	1287	8896	7610	21	415803	24758	357418	33609	0	18	310.9
2006	438381	1304	9497	8192	32	430221	26541	368902	34764	0	14	319.9
2007	447701	1380	11083	9702	23	438022	27654	374089	35357	900	22	324.0

Growth rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization					Per capita consumption
							Feed	Food	Waste	Processing	Other Util	
1980-90	8.8	4.2	5.7			8.8	6.1	8.8	9.7		-0.8	7.1
1990-00	9.9	4.3	7.2			9.9	24.9	9.5	9.6		1.0	8.8
2000-07	4.5	3.0	15.1			4.3	11.3	3.9	4.1		4.1	3.7

FAO data is lower than those reported by SSB (around 10-30%).

Table B9. Fruits

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization				Per capita consumption
							Waste	Processing	Food	Other Util	
1978	7824	549	687	138	13	7699	641	146	6903	10	7.9
1980	8416	629	758	129	7	8295	666	280	7339	10	8.2
1985	13502	665	652	-13	0	13515	1012	583	11909	11	12.5
1990	20952	1009	838	-171	-7	21115	1405	701	19189	15	18.0
1995	44423	1720	1317	-403	-1	44825	3239	2398	39169	19	36.1
1996	48778	2279	1508	-771	0	49549	3658	2570	43300	20	39.5
1997	53326	2538	1707	-831	0	54157	3869	2959	47306	23	42.8
1998	56687	2342	1755	-586	0	57273	4201	4334	48716	22	44.8
1999	64826	2362	1892	-470	0	65296	4642	4642	55992	20	50.7
2000	64491	2718	2143	-575	-1	65065	4762	5035	55247	21	50.1
2001	68941	2753	2339	-414	-3	69352	4884	4889	59557	22	53.1
2002	72003	3011	2973	-38	3	72043	5036	5212	61771	24	54.8
2003	78152	3039	3823	784	-5	77363	5435	5524	66380	24	58.5
2004	86340	3016	4352	1336	0	85004	5967	5827	73187	23	63.9
2005	90399	3131	4930	1799	0	88600	6237	5997	76342	23	66.2
2006	96772	3268	5059	1791	0	94981	6648	6189	82120	25	70.6
2007	102430	3437	6443	3007	3	99426	6989	6326	86094	24	73.5

Growth rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization				Per capita consumption
							Waste	Processing	Food	Other Util	
1980-90	9.5	4.8	1.0			9.8	7.7	9.6	10.1	3.8	8.1
1990-00	11.9	10.4	9.8			11.9	13.0	21.8	11.2	3.8	10.8
2000-07	6.8	3.4	17.0			6.2	5.6	3.3	6.5	1.5	5.6

Before 2003, FAO data is slightly higher than SSB (around 5%). In 2003, SSB adjusted its statistical criteria, and since then FAO data is much lower than SSB (around 44%).

Table B10. Pork

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization			Per capita consumption
							Processing	Food	Other Util	
1978	8772.2	29.5	101.6	72.0	0.0	8700.2	1.1	8692.5	6.6	8.9
1980	12125.4	43.4	143.9	100.5	0.0	12024.9	1.6	12015.6	7.7	11.9
1985	17567.0	91.8	300.2	208.4	0.0	17358.5	2.3	17346.0	10.2	16.1
1990	24015.7	138.7	444.0	305.3	0.1	23710.5	3.2	23695.9	11.4	20.2
1995	33401.3	180.6	662.3	481.7	15.2	32934.8	4.5	32918.1	12.2	26.5
2000	40751.6	512.0	197.6	-314.4	0.0	41066.0	5.6	41047.1	13.3	31.6
2001	41654.3	438.5	293.2	-145.3	0.0	41799.6	5.7	41779.9	14.0	32.0
2002	42322.8	536.0	384.6	-151.5	0.0	42474.2	5.8	42454.6	13.9	32.3
2003	43433.5	607.6	510.0	-97.6	0.0	43531.1	5.9	43510.3	14.8	32.9
2004	44478.8	535.8	672.3	136.5	0.0	44342.3	12.2	44299.4	30.8	33.3
2005	46621.9	416.9	607.4	190.5	0.0	46431.4	12.8	46403.8	14.9	34.7
2006	47591.0	436.0	669.6	233.7	0.0	47357.3	13.0	47328.7	15.6	35.2
2007	43933.0	619.6	505.0	-114.6	0.0	44047.7	12.0	44017.1	18.6	32.6
2008	46205.0	373.3	82.2	-291.1						
2009	48907.6	135.0	87.4	-47.6						
2010	50712.4	201.3	110.1	-91.2						

Growth rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization			Per capita consumption
							Processing	Food	Other Util	
1980-90	7.1	12.3	11.9			7.0	7.2	7.0	3.9	5.4
1990-00	5.4	14.0	-7.8			5.6	5.7	5.6	1.6	4.6
2000-07	1.1	2.8	14.3			1.0	11.7	1.0	4.9	0.4

Taiwan accounts for 2.5% of pork production. 99% of pork is used for food.

Table B11. Beef

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization			Per capita consumption
							Processing	Food	Other Util	
1978	282.1	37.8	10.2	-27.6	-0.7	309.0	0.0	307.8	1.2	0.32
1980	342.1	36.5	18.2	-18.2	0.7	361.0	0.0	359.8	1.2	0.36
1985	511.1	71.2	58.0	-13.2	0.0	524.3	0.0	522.7	1.6	0.48
1990	1301.9	106.7	226.6	119.8	0.5	1182.6	0.0	1180.8	1.8	1.01
1995	3597.7	159.1	159.7	0.6	0.0	3597.1	0.0	3595.4	1.7	2.90
2000	5155.7	170.2	72.2	-98.0	0.0	5253.7	0.0	5251.9	1.8	4.05
2001	5107.8	164.4	82.9	-81.5	0.0	5189.4	0.0	5187.6	1.7	3.97
2002	5239.9	194.9	85.3	-109.6	0.0	5349.5	0.0	5347.7	1.9	4.07
2003	5445.1	204.8	80.0	-124.7	0.0	5569.8	0.0	5567.9	1.9	4.21
2004	5624.7	182.8	93.3	-89.6	0.0	5714.3	0.0	5712.4	1.9	4.30
2005	5702.6	200.5	129.5	-71.0	0.0	5773.6	0.0	5771.6	2.0	4.32
2006	5788.3	222.8	150.5	-72.4	0.0	5860.7	0.0	5858.6	2.1	4.36
2007	6153.5	257.1	172.3	-84.9	0.0	6238.3	0.0	6236.1	2.3	4.61
2008	6131.7	4.2	22.7	18.5						
2009	6355.4	14.2	13.4	-0.8						
2010	6530.6	23.6	22.1	-1.5						

Growth Rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization			Per capita consumption
							Processing	Food	Other Util	
1980-90	14.3	11.3	28.7			12.6		12.6	4.2	10.9
1990-00	14.8	4.8	-10.8			16.1		16.1	-0.1	14.9
2000-07	2.6	6.1	13.2			2.5		2.5	3.7	1.9

Before 1996, FAO data is higher than SSB data, especially before 1985, around 40%. After 1996, the gaps are around 1%. 99.5% of beef is used for food.

Table B12. Mutton and Goat Meat

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization	
							Food	Per capita consumption
1978	321	3	1	-3	0	323	323	0.33
1980	451	7	4	-3	0	454	454	0.45
1985	594	10	2	-8	0	601	601	0.55
1990	1069	16	4	-12	0	1081	1081	0.91
1995	1749	21	2	-19	0	1768	1768	1.41
2000	2690	46	5	-42	0	2731	2731	2.07
2001	2721	53	4	-49	0	2770	2770	2.08
2002	2838	69	5	-63	0	2902	2902	2.16
2003	3090	64	13	-51	0	3141	3141	2.34
2004	3332	67	24	-43	0	3375	3375	2.50
2005	3504	77	30	-47	0	3552	3552	2.62
2006	3642	73	34	-39	0	3681	3681	2.71
2007	3830	81	23	-58	0	3888	3888	2.83
2008	3803	55	15	-41				
2009	3894	66	10	-57				
2010	3989	57	13	-43				

Growth rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization	
							Food	Per capita consumption
1980-90	9.0	8.0	-1.2			9.1	9.1	7.4
1990-00	9.7	11.2	3.1			9.7	9.7	8.6
2000-07	5.2	8.3	24.9			5.2	5.2	4.6

FAO data is consistent with USDA (PSD) data. 100% of mutton and goat meat are used for food.

Table B13. Poultry

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization			Per capita consumption
							Processing	Food	Other Util	
1978	1531.5	53.5	36.5	-17.0	0.0	1548.5	0.0	1546.6	1.9	1.58
1980	1662.9	70.3	45.8	-24.6	0.0	1687.5	0.0	1685.2	2.3	1.68
1985	2016.6	82.8	18.3	-64.6	0.0	2081.2	0.0	2078.3	2.8	1.92
1990	3739.8	250.0	129.7	-120.3	0.0	3860.1	1.0	3854.1	5.0	3.29
1995	8673.8	966.5	640.6	-325.8	-65.0	8934.6	1.0	8919.4	14.2	7.20
2000	12688.6	1971.0	1343.5	-627.5	40.0	13356.1	1.5	13332.4	22.3	10.29
2001	12523.8	1696.7	1250.5	-446.2	0.0	12970.0	10.5	12940.4	19.1	9.92
2002	12732.0	1447.8	1135.2	-312.6	30.0	13074.5	1.5	13056.2	16.9	9.94
2003	13135.1	1473.3	1017.1	-456.2	45.0	13636.3	1.5	13611.2	23.7	10.31
2004	13236.5	817.0	440.0	-377.0	-70.0	13543.5	1.5	13488.6	53.4	10.18
2005	14055.2	1011.2	609.7	-401.5	-15.0	14441.6	1.5	14429.9	10.2	10.80
2006	14285.7	1288.8	706.4	-582.5	20.0	14888.1	1.5	14875.4	11.2	11.07
2007	15039.3	1559.8	817.8	-742.0	65.0	15846.3	1.5	15829.3	15.5	11.72
2008	15337.0	833.0	168.0	-665.0						
2009	n.a	749.7	173.8	-575.9						
2010	n.a	542.0	205.9	-336.1						

Growth rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization			Per capita consumption
							Processing	Food	Other Util	
1980-90	8.4	13.5	11.0			8.6		8.6	8.1	7.0
1990-00	13.0	22.9	26.3			13.2		13.2	16.1	12.1
2000-07	2.5	-3.3	-6.8			2.5		2.5	-5.0	1.9

FAO data is higher than SSB data. Before 1994, the difference was around 10-20%. After 1994, it was around 5%. 99.9% of poultry are used for food.

Table B14. Eggs

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization				Per capita consumption
							Seed	Waste	Food	Other Util	
1978	2644	64	49	-15	0	2660	87	141	2390	41	2.7
1980	2935	73	64	-8	0	2943	95	157	2645	46	2.9
1985	5545	75	57	-19	0	5563	130	291	5055	87	5.1
1990	8175	89	46	-44	0	8219	203	424	7463	129	7.0
1995	17085	93	31	-62	0	17146	421	874	15581	270	13.8
2000	22213	89	69	-20	0	22233	550	1134	20176	373	17.1
2001	22497	91	65	-26	0	22523	554	1149	20442	378	17.2
2002	23039	91	90	-1	0	23041	538	1175	20939	388	17.5
2003	23711	92	102	10	0	23700	553	1209	21540	398	17.9
2004	24081	94	97	3	0	24078	570	1227	21876	405	18.1
2005	24726	95	93	-2	0	24728	599	1258	22454	416	18.5
2006	24598	95	92	-3	0	24601	592	1252	22343	414	18.3
2007	25654	100	135	34	0	25620	618	1306	23264	432	19.0
2008	27022	0.00	84	84							
2009	27425	0.00	78	78							
2010	27627	0.02	100	100							

Growth rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization				Per capita consumption
							Seed	Waste	Food	Other Util	
1980-90	10.8	2.1	-3.4			10.8	7.9	10.5	10.9	10.8	9.1
1990-00	10.5	0.0	4.2			10.5	10.5	10.3	10.5	11.2	9.3
2000-07	2.1	1.7	10.1			2.0	1.7	2.0	2.1	2.1	1.5

FAO data is consistent with SSB data. Around 90% of eggs are used for food. 2-3% of eggs are used as seed, around 2% are for other use, and 5% are losses.

Table B15. Milk

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization					Per capita consumption
							Feed	Food	Waste	Processing	Other Util	
1978	2811	746	15	-732	0	3543	395	2981	148	15	4	3.6
1980	2928	748	21	-726	-1	3653	461	3000	164	17	11	3.6
1985	4758	1132	58	-1074	0	5832	667	4847	257	27	34	5.4
1990	7037	1211	102	-1109	0	8146	833	6905	360	34	16	7.0
1995	9458	1844	502	-1342	0	10799	926	9405	453	0	18	8.7
2000	12374	2109	545	-1565	5	13943	989	12376	563	0	19	10.7
2001	14515	1900	370	-1530	5	16050	1102	14283	629	0	40	12.3
2002	17335	2233	362	-1870	0	19206	1136	17334	723	0	14	14.6
2003	21871	2283	397	-1886	-1	23757	1158	21720	868	1	11	18.0
2004	27023	2432	464	-1968	-1	28989	1114	26834	1030	1	12	21.8
2005	32023	2090	508	-1582	3	33607	1187	31219	1189	1	13	25.1
2006	36472	2465	530	-1935	1	38408	1221	35848	1329	1	11	28.6
2007	39824	2266	1009	-1257	2	41083	1273	38354	1435	1	21	30.4
2008	37815	351	121	-230								
2009	36777	597	37	-560								
2010	37480	745	34	-712								

Growth rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization					Per capita consumption
							Feed	Food	Waste	Processing	Other Util	
1980-90	9.2	4.9	17.1			8.3	6.1	8.7	8.2	7.2	3.4	6.7
1990-00	5.8	5.7	18.2			5.5	1.7	6.0	4.6	-36.2	2.0	4.4
2000-07	18.2	1.0	9.2			16.7	3.7	17.5	14.3	13.9	0.8	16.0

Major differences exist between statistics from different providers.

Table B16. Aquatic Products

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization				Per capita consumption
							Feed	Food	Seed	Other Util	
1978	5653	891	430	-461	0	6115	759	5333	1	21	6.2
1980	5571	1004	511	-493	-19	6045	840	5173	2	30	6.0
1985	8501	2900	739	-2161	-4	10658	2830	7826	2	0	9.9
1990	14779	3982	1522	-2459	4	17242	3742	13228	1	270	14.7
1995	29720	7031	2188	-4843	-6	34557	6871	25324	1	2360	27.8
1996	33020	7547	2289	-5257	-11	38266	8186	27599	1	2480	30.5
1997	33657	7826	2446	-5380	5	39042	8955	28485	1	1601	30.8
1998	35121	4267	2623	-1645	-15	36751	5499	29750	1	1500	28.8
1999	36224	5911	3126	-2786	20	39029	7012	30316	1	1700	30.3
2000	37299	9578	3753	-5825	-11	43113	9882	31230	1	2000	33.2
2001	37976	8191	4413	-3778	18	41771	8486	31434	1	1850	32.0
2002	39514	8432	4789	-3644	0	43157	8726	32280	1	2150	32.8
2003	40518	7590	5219	-2371	0	42889	8203	32484	1	2200	32.4
2004	41986	9551	6059	-3492	-18	45460	9687	33272	1	2500	34.2
2005	43563	12106	6884	-5222	18	48803	12132	33869	1	2800	36.5
2006	45331	9311	7988	-1323	-1	46653	8979	34573	1	3100	34.7
2007	46841	9407	8173	-1235	-1	48075	8910	35364	1	3800	35.6

Growth rate

Year	Production	Import	Export	Net export	Stock variation	Domestic supply /consumption	Utilization				Per capita consumption
							Feed	Food	Seed	Other Util	
1980-90	10.2	14.8	11.5			11.0	16.1	9.8	-1.7	24.4	9.4
1990-00	9.7	9.2	9.4			9.6	10.2	9.0	-3.1	22.2	8.5
2000-07	3.3	-0.3	11.8			1.6	-1.5	1.8	0.0	9.6	1.0

Prior to 1995, FAO data is 20% higher than SSB. The gap has since become smaller. From 2000 onwards, FAO data were about 1% higher than those of SSB.

Appendix C. Projections on China's Food Production and Consumption by 2020

Notes:

1. There have been various attempts to project China's future food production and consumption. Only the projections from three major institutions are included in this summary; namely, USDA 2011 baseline projections; OECD-FAO agricultural outlook, and FAPRI international agricultural outlook.
2. USDA 2011 baseline projections can be found at http://www.ers.usda.gov/data/internationalbaseline/sutabs11.htm; OECD-FAO agricultural outlook can be found at http://stats.oecd.org/index.aspx, and FAPRI international agricultural outlook can be found at http://www.fapri.iastate.edu/tools/outlook.aspx.
3. Projections for some products are provided by two or even only one of the three institutions.
4. PCC: per capita consumption, TC: total consumption, PRO: production. "Gap" indicates the likely net imports or exports. All are in thousand tonnes except PCC which is in kg. PCC is calculated by the authors, which is equal to total consumption/availability divided by the projected population of China.
5. Consumption projections by this study using three simple methods are also reported in this appendix for information. The three simple methods are detailed in Box 3.

Table C1. Wheat

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
USDA	PCC	80.8	81.0	81.6	81.8	82.4	81.9	82.0	81.7	81.5	81.5	81.4	81.4
	TC	107000	107800	109027	109900	111162	111086	111677	111673	111880	112166	112443	112650
	PRO	115120	114500	115592	114375	113293	112449	113009	113027	113220	113589	114059	114314
	Gap	8120	6700	6565	4475	2131	1363	1332	1354	1340	1423	1616	1664
FAPRI	PCC	80.8	81.0	82.8	84.0	83.2	82.6	81.9	81.3	80.7	79.9	79.1	78.7
	TC	107000	107800	110721	112856	112219	111993	111560	111200	110709	110060	109219	109026
	PRO	115120	114500	113162	117365	115167	114976	114248	114563	114498	114488	113681	114641
	Gap	8120	6700	2442	4509	2947	2983	2688	3364	3788	4428	4462	5615
OECD-FAO	PCC	82.4	83.8	82.2	82.4	81.9	81.6	81.6	81.6	81.3	81.0	80.7	80.4
	TC	112590	114990	113367	114148	113824	113932	114369	114706	114577	114528	114264	114183
	PRO	115115	115100	115685	116742	115587	115873	117138	116067	115554	115426	115504	115702
	Gap	2525	110	2319	2594	1764	1942	2769	1361	978	899	1240	1518

Consumption projections using simple methods

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	PCC	76.2	75.1	74.0	72.9	71.9	70.8	69.8	68.8	67.8	66.8	65.8	64.8
	TC	104087	103060	102027	100986	99934	98865	97775	96663	95532	94383	93218	92039
Method 2	PCC	89.5	89.9	90.4	90.8	91.2	91.6	92.0	92.4	92.8	93.2	93.6	94.0
	TC	122280	123422	124550	125665	126759	127824	128853	129842	130793	131704	132577	133413
Method 3, 6%	PPC	77.1	75.3	74.2	73.0	71.9	70.8	69.6	68.5	67.4	66.3	65.2	64.1
	TC	105286	103299	102224	101116	99972	98790	97568	96307	95011	93684	92330	90953
Method 3, 8%	PPC	77.1	75.3	73.8	72.3	70.8	69.3	67.8	66.4	64.9	63.5	62.0	60.6
	TC	105286	103299	101725	100111	98460	96770	95044	93285	91498	89691	87867	86034
Method 3, 10%	PCC	77.1	75.3	73.4	71.6	69.7	67.9	66.1	64.3	62.5	60.7	59.0	57.3
	TC	105286	103299	101234	99125	96978	94796	92585	90352	88105	85851	83600	81357

Table C2. Milled Rice

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
USDA	**PCC**	102.0	102.0	102.0	102.3	101.3	100.6	100.0	99.9	99.6	99.0	98.5	98.2
	TC	134320	135000	135654	136743	136030	135825	135616	135987	136095	135905	135616	135659
	PRO	136570	136000	136989	138041	137073	136642	136574	136945	136735	136470	136188	136304
	Gap	2250	1000	1335	1298	1043	817	958	958	640	565	572	645
OECD-FAO	**PCC**	92.5	92.8	93.8	93.1	92.4	91.9	91.3	91.0	90.5	89.9	89.4	88.7
	TC	126346	127334	129278	128953	128481	128226	127929	127918	127609	127142	126659	125859
	PRO	133646	134534	133125	130597	129778	129504	128851	128359	127865	127216	126572	125832
	Gap	7300	7200	3847	1644	1296	1278	922	441	257	74	-88	-27

Consumption projections using simple methods

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	**PCC**	90.5	89.6	88.7	87.8	87.0	86.1	85.2	84.4	83.5	82.7	81.9	81.1
	TC	123617	122970	122306	121625	120920	120186	119417	118611	117771	116898	115996	115065
Method 2	**PCC**	92.2	91.6	90.9	90.3	89.6	88.9	88.2	87.4	86.7	85.9	85.1	84.3
	TC	125937	125682	125374	125012	124590	124100	123537	122898	122184	121398	120542	119618
Method 3, 6%	**PPC**	91.3	89.5	88.5	87.4	86.4	85.3	84.3	83.3	82.2	81.2	80.3	79.3
	TC	124665	122863	121959	121035	120087	119108	118093	117041	115956	114839	113694	112522
Method 3, 8%	**PPC**	91.3	89.5	88.1	86.7	85.4	84.0	82.6	81.3	80.0	78.7	77.4	76.2
	TC	124665	122863	121489	120100	118693	117260	115800	114311	112797	111261	109706	108136
Method 3, 10%	**PCC**	91.3	89.5	87.8	86.1	84.4	82.7	81.1	79.4	77.9	76.3	74.8	73.2
	TC	124665	122863	121029	119187	117335	115468	113583	111681	109765	107839	105907	103973

Table C3. Maize

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
USDA	**PCC**	120.1	121.8	124.9	128.3	131.2	133.6	136.3	139.2	142.2	145.4	148.6	151.9
	TC	159000	162000	167007	172380	177083	181178	185637	190250	195112	200128	205203	210379
	PRO	158000	168000	174378	179478	182310	184390	186566	188695	190774	192860	195574	198828
	Gap	-1000	6000	7371	7098	5227	3212	929	-1555	-4338	-7268	-9629	-11551
FAPRI	**PCC**	120.1	121.8	122.7	124.7	127.6	130.1	133.2	136.0	138.9	141.7	144.5	147.3
	TC	159000	162000	164032	167439	172217	176443	181315	185960	190529	195047	199571	203940
	PRO	158000	168000	170422	170035	174736	177481	182555	186374	190019	193606	197785	201795
	Gap	-1000	6000	6390	2596	2519	1038	1240	414	-510	-1440	-1787	-2145
OECD-FAO	**PCC**	127.8	133.0	135.2	136.7	138.5	140.0	142.0	143.5	145.3	146.9	148.8	150.5
	TC	174527	182554	186327	189283	192545	195496	198902	201693	204827	207677	210761	213610
	PRO	173149	181912	184881	188312	191855	193959	197236	199120	202496	204701	208210	210311
	Gap	-1378	-642	-1445	-971	-690	-1538	-1666	-2573	-2331	-2976	-2551	-3299

Consumption projections using simple methods

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	**PCC**	112.6	114.7	116.9	119.2	121.5	123.8	126.2	128.6	131.1	133.6	136.2	138.8
	TC	153732	157443	161214	165048	168936	172866	176829	180821	184839	188885	192958	197059
Method 2	**PCC**	119.4	123.2	127.0	131.0	135.1	139.3	143.6	148.0	152.6	157.2	162.0	166.9
	TC	163071	168990	175091	181373	187827	194437	201192	208083	215107	222259	229537	236940
Method 3, 6%	**PPC**	118.3	122.7	125.5	128.3	131.2	134.2	137.2	140.3	143.5	146.7	150.0	153.4
	TC	161603	168367	172967	177662	182445	187303	192227	197212	202257	207362	212529	217759
Method 3, 8%	**PPC**	118.3	122.7	126.4	130.2	134.1	138.1	142.2	146.5	150.8	155.4	160.0	164.8
	TC	161603	168367	174211	180226	186408	192747	199236	205872	212656	219591	226680	233927
Method 3, 10%	**PCC**	118.3	122.7	127.3	132.0	136.9	142.0	147.3	152.8	158.4	164.3	170.5	176.8
	TC	161603	168367	175440	182779	190382	198246	206365	214743	223384	232295	241486	250965

OECD-FAO data is for coarse grains.

Table C4. Barley

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
USDA	PCC	3.4	3.5	3.6	3.6	3.8	3.9	4.0	4.0	4.1	4.2	4.3	4.4
	TC	4500	4600	4855	4887	5084	5254	5405	5514	5624	5749	5911	6074
	PRO	2500	2400	2447	2592	2682	2770	2829	2867	2903	2955	3018	3086
	Gap	-2000	-2200	-2408	-2295	-2402	-2484	-2576	-2647	-2721	-2794	-2893	-2988
FAPRI	PCC	3.4	3.5	3.3	3.6	3.5	3.7	3.7	3.8	3.8	3.9	4.0	4.1
	TC	4500	4600	4358	4791	4756	4953	5031	5171	5269	5394	5519	5621
	PRO	2500	2400	2480	2703	2576	2702	2697	2767	2791	2849	2888	2929
	Gap	-2000	-2200	-1879	-2089	-2180	-2251	-2334	-2404	-2478	-2546	-2631	-2692

Consumption projections using simple methods

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	PCC	3.5	3.4	3.3	3.2	3.2	3.1	3.0	3.0	2.9	2.8	2.8	2.7
	TC	4760	4672	4585	4498	4412	4327	4242	4157	4072	3988	3904	3821
Method 2	PCC	3.7	3.6	3.5	3.4	3.4	3.3	3.2	3.1	3.0	2.8	2.7	2.6
	TC	5012	4941	4860	4770	4670	4560	4440	4310	4170	4020	3860	3690
Method 3, 6%	PPC	2.9	2.9	2.9	2.9	2.9	2.8	2.8	2.8	2.8	2.8	2.8	2.8
	TC	3972	3971	3975	3976	3976	3974	3969	3962	3953	3941	3927	3912
Method 3, 8%	PPC	2.9	2.9	2.9	2.9	2.8	2.8	2.8	2.8	2.8	2.7	2.7	2.7
	TC	3972	3971	3970	3966	3959	3949	3936	3921	3902	3882	3858	3833
Method 3, 10%	PCC	2.9	2.9	2.9	2.9	2.8	2.8	2.8	2.8	2.7	2.7	2.7	2.6
	TC	3972	3971	3965	3955	3941	3924	3902	3878	3850	3820	3786	3751

Table C5. Soybean

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
USDA	**PCC**	44.9	51.8	56.0	58.8	61.1	63.2	65.4	67.6	69.6	71.6	73.6	75.4
	TC	59430	68850	74855	78971	82404	85733	89033	92360	95445	98515	101570	104419
	PRO	14700	14400	15040	15622	16083	16221	16403	16521	16618	16668	16665	16654
	Gap	-44730	-54450	-59815	-63349	-66321	-69512	-72630	-75839	-78827	-81847	-84905	-87765
FAPRI	**PCC**	44.9	51.8	53.0	53.9	55.0	56.2	57.4	58.6	59.8	61.0	62.3	63.6
	TC	59430	68850	70842	72363	74168	76159	78088	80068	82002	83980	86005	88084
	PRO	14700	14400	14458	14404	14410	14529	14601	14684	14770	14865	14939	14997
	Gap	-44730	-54450	-56384	-57959	-59759	-61629	-63487	-65384	-67231	-69115	-71066	-73087
OECD-FAO	**PCC**	78.1	79.1	80.8	81.8	82.3	83.5	84.7	85.8	86.7	87.8	88.7	89.7
	TC	106674	108487	111451	113295	114471	116592	118614	120603	122281	124165	125705	127341
	PRO	55348	55980	57329	58079	58964	59833	60581	61494	62287	63218	64136	64958
	Gap	-51326	-52507	-54123	-55216	-55507	-56759	-58033	-59108	-59994	-60947	-61569	-62383

Consumption projections using simple methods

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	**PCC**	38.4	41.1	44.0	47.1	50.4	54.0	57.8	61.8	66.2	70.9	75.9	81.2
	TC	52435	56399	60653	65216	70106	75343	80943	86930	93328	100163	107465	115265
Method 2	**PCC**	39.9	42.5	45.3	48.1	51.0	54.1	57.2	60.5	63.8	67.3	70.9	74.5
	TC	54499	58354	62380	66577	70942	75469	80153	84989	89974	95107	100383	105802
Method 3, 6%	**PPC**	40.4	44.3	46.9	49.7	52.7	55.8	59.2	62.8	66.6	70.6	75.0	79.6
	TC	55154	60782	64671	68817	73233	77932	82926	88230	93862	99841	106190	112929
Method 3, 8%	**PPC**	40.4	44.3	47.8	51.6	55.7	60.2	65.0	70.3	76.1	82.3	89.1	96.4
	TC	55154	60782	65876	71422	77455	84010	91126	98849	107227	116313	126168	136854
Method 3, 10%	**PCC**	40.4	44.3	48.7	53.5	58.9	64.8	71.4	78.7	86.8	95.7	105.6	116.6
	TC	55154	60782	67084	74084	81854	90470	100019	110595	122307	135272	149625	165509

OECD-FAO data is for all oilseeds.

Table C6. Rapeseed

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	PCC	11.4	11.5	11.8	11.6	11.5	11.6	11.6	11.6	11.6	11.7	11.7	11.8
FAPRI	**TC**	15114	15250	15730	15554	15575	15708	15772	15851	15968	16079	16200	16330
	PRO	13657	12800	13562	13495	13567	13666	13717	13774	13857	13932	13987	14047
	Gap	-1457	-2450	-2168	-2058	-2008	-2042	-2055	-2077	-2111	-2147	-2213	-2284

Consumption projections using simple methods

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	**PCC**	8.5	8.3	8.2	8.0	7.8	7.7	7.5	7.4	7.3	7.1	7.0	6.8
	TC	11586	11417	11248	11080	10912	10744	10575	10405	10234	10063	9891	9719
Method 2	**PCC**	10.2	10.3	10.5	10.6	10.7	10.9	11.0	11.1	11.2	11.3	11.4	11.5
	TC	13895	14168	14432	14686	14929	15161	15380	15585	15778	15956	16121	16272
Method 3, 6%	**PPC**	8.8	8.8	8.7	8.7	8.7	8.6	8.6	8.6	8.5	8.5	8.4	8.4
	TC	12011	12025	12046	12060	12065	12062	12050	12030	12001	11965	11922	11871
Method 3, 8%	**PPC**	8.8	8.8	8.7	8.7	8.6	8.6	8.5	8.5	8.4	8.3	8.3	8.2
	TC	12011	12025	12034	12031	12016	11990	11953	11904	11846	11778	11701	11616
Method 3, 10%	**PCC**	8.8	8.8	8.7	8.7	8.6	8.5	8.5	8.4	8.3	8.2	8.1	8.0
	TC	12011	12025	12021	12001	11965	11914	11848	11769	11678	11577	11465	11345

Table C7. Sugarcane

Sources		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
FAPRI	**PRO**	115587	125000	129060	131129	132968	134544	136104	137699	139300	140858	142399	143884
OECD-FAO	**PCC**	11.4	11.4	11.8	12.2	12.7	13.1	13.6	14.0	14.6	15.1	15.7	16.3
	TC	15500	15600	16216	16904	17601	18302	18988	19742	20545	21356	22179	23074
	PRO	11650	12062	13331	14032	14592	15204	15659	16086	16513	16981	17442	17887
	Gap	-3850	-3538	-2885	-2873	-3009	-3099	-3328	-3656	-4032	-4376	-4737	-5187

Consumption projections using simple methods

Sources		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	**PCC**	74.9	76.8	78.6	80.5	82.5	84.5	86.6	88.7	90.9	93.1	95.4	97.7
	TC	102314	105315	108386	111528	114735	118001	121320	124690	128109	131578	135099	138672
Method 2	**PCC**	77.5	78.9	80.2	81.6	83.0	84.3	85.7	87.1	88.5	89.8	91.2	92.6
	TC	105810	108201	110594	112987	115373	117745	120094	122416	124710	126974	129208	131412
Method 3, 6%	**PPC**	88.0	90.1	91.4	92.7	94.1	95.4	96.7	98.1	99.4	100.8	102.2	103.5
	TC	120104	123607	126000	128396	130790	133171	135533	137871	140185	142475	144741	146984
Method 3, 8%	**PPC**	88.0	90.1	91.8	93.6	95.3	97.1	98.9	100.7	102.5	104.3	106.2	108.0
	TC	120104	123607	126585	129576	132576	135575	138565	141544	144511	147466	150409	153343
Method 3, 10%	**PCC**	88.0	90.1	92.2	94.4	96.6	98.8	101.0	103.3	105.6	107.9	110.2	112.5
	TC	120104	123607	127160	130738	134337	137949	141568	145190	148815	152445	156082	159726

OECD-FAO data is for sugar.

Table C8. Vegetables

Consumption projections using simple methods

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	**PCC**	348.6	361.5	375.0	388.9	403.4	418.4	434.0	450.1	466.8	484.2	502.2	520.9
	TC	476004	496083	516919	538537	560936	584101	608023	632704	658164	684421	711501	739430
Method 2	**PCC**	394.1	415.3	437.1	459.6	482.7	506.5	530.9	556.0	581.7	608.1	635.2	662.9
	TC	538144	569790	602520	636334	671197	707053	743851	781551	820131	859566	899841	940937
Method 3, 6%	**PPC**	358.4	379.0	392.2	405.8	420.0	434.5	449.6	465.2	481.2	497.8	515.0	532.7
	TC	489434	519987	540628	561956	583962	606623	629922	653857	678438	703678	729596	756211
Method 3, 8%	**PPC**	358.4	379.0	396.5	414.8	434.0	453.9	474.8	496.6	519.3	543.0	567.8	593.7
	TC	489434	519987	546603	574419	603458	633725	665235	698013	732102	767549	804409	842734
Method 3, 10%	**PCC**	358.4	379.0	400.8	423.9	448.2	473.8	500.9	529.4	559.5	591.2	624.7	660.1
	TC	489434	519987	552528	586909	623199	661456	701743	744143	788757	835690	885063	936998

Table C9. Fruits

Consumption projections using simple methods

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	**PCC**	82.1	86.7	91.6	96.7	102.2	107.9	114.0	120.4	127.2	134.4	142.0	150.0
	TC	112071	118953	126236	133942	142086	150684	159748	169300	179361	189958	201117	212867
Method 2	**PCC**	86.4	91.4	96.5	101.8	107.3	112.8	118.6	124.5	130.5	136.7	143.1	149.6
	TC	118028	125424	133076	140984	149140	157532	166147	174978	184018	193262	202706	212346
Method 3, 6%	**PPC**	82.5	87.9	91.4	95.0	98.7	102.5	106.5	110.6	114.9	119.3	123.8	128.5
	TC	112700	120627	125969	131501	137220	143124	149210	155478	161931	168573	175411	182451
Method 3, 8%	**PPC**	82.5	87.9	92.5	97.3	102.4	107.6	113.2	118.9	125.0	131.3	137.9	144.8
	TC	112700	120627	127538	134778	142356	150276	158545	167170	176167	185549	195333	205535
Method 3, 10%	**PCC**	82.5	87.9	93.6	99.7	106.1	112.9	120.1	127.6	135.7	144.1	153.1	162.6
	TC	112700	120627	129095	138066	147564	157608	168219	179423	191251	203735	216913	230821

Table C10. Pork

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
USDA	PCC	36.9	37.6	38.6	39.1	39.6	40.4	41.0	41.7	42.3	43.1	43.8	44.3
	TC	48823	50050	51590	52485	53504	54723	55834	56954	58085	59323	60441	61397
	PRO	48905	50000	51500	52470	53494	54700	55804	56931	58059	59300	60423	61390
	Gap	82	-50	-90	-15	-10	-23	-30	-23	-26	-23	-18	-7
FAPRI	PCC	36.9	37.6	38.2	39.3	40.3	41.5	42.6	43.7	44.7	45.8	46.8	47.8
	TC	48823	50050	51123	52771	54394	56238	57979	59693	61362	63033	64664	66244
	PRO	48905	50000	50931	52547	54129	55943	57657	59347	60991	62634	64231	65781
	Gap	82	-50	-192	-224	-266	-295	-321	-346	-371	-399	-434	-463
OECD-FAO	PCC	35.7	36.4	37.2	37.7	38.1	38.7	39.3	40.1	40.7	41.4	42.2	43.1
	TC	48814	49901	51290	52180	53039	54027	55065	56298	57430	58580	59808	61202
	PRO	49021	50098	51500	52390	53251	54244	55285	56541	57677	58829	60081	61482
	Gap	207	197	210	210	212	218	220	242	247	249	273	280

Consumption projections using simple methods

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	PCC	32.9	33.0	33.1	33.3	33.4	33.6	33.7	33.9	34.0	34.1	34.3	34.4
	TC	44874	45282	45685	46083	46475	46857	47227	47583	47925	48254	48570	48873
Method 2	PCC	38.8	39.7	40.7	41.6	42.5	43.5	44.4	45.4	46.3	47.3	48.2	49.2
	TC	52952	54501	56054	57610	59166	60718	62260	63790	65307	66811	68300	69775
Method 3, 6%	PPC	34.8	35.6	36.1	36.6	37.1	37.5	38.0	38.5	39.0	39.4	39.9	40.3
	TC	47545	48875	49775	50667	51550	52419	53271	54105	54921	55718	56499	57261
Method 3, 8%	PPC	34.8	35.6	36.3	36.9	37.5	38.2	38.8	39.4	40.0	40.6	41.2	41.8
	TC	47545	48875	49990	51095	52187	53264	54323	55362	56382	57383	58365	59330
Method 3, 10%	PCC	34.8	35.6	36.4	37.2	38.0	38.7	39.5	40.3	41.0	41.7	42.5	43.2
	TC	47545	48875	50200	51512	52808	54087	55346	56583	57801	58999	60179	61341

Table C11. Beef

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
USDA	PCC	4.3	4.2	4.1	4.0	4.1	4.2	4.3	4.4	4.5	4.5	4.6	4.7
	TC	5749	5528	5441	5439	5518	5641	5795	5958	6113	6256	6393	6535
	PRO	5764	5550	5450	5451	5532	5656	5812	5978	6134	6278	6415	6558
	Gap	15	22	9	12	14	15	17	20	21	22	22	23
FAPRI	PCC	4.3	4.2	4.3	4.4	4.4	4.5	4.6	4.8	4.9	5.0	5.2	5.3
	TC	5749	5528	5702	5867	6000	6159	6331	6515	6712	6925	7144	7364
	PRO	5764	5550	5711	5856	5967	6100	6244	6395	6555	6725	6900	7077
	Gap	15	22	9	-11	-33	-59	-87	-120	-157	-199	-244	-287
OECD-FAO	PCC	4.7	4.5	4.5	4.5	4.6	4.6	4.6	4.7	4.7	4.8	4.9	5.1
	TC	6366	6123	6174	6243	6344	6421	6504	6565	6690	6831	6980	7184
	PRO	6413	6174	6220	6292	6380	6442	6507	6559	6682	6820	6964	7180
	Gap	47	51	47	48	36	20	2	-6	-8	-11	-15	-3

Consumption projections using simple methods

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	PCC	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9
	TC	6543	6699	6857	7018	7182	7347	7513	7680	7849	8018	8189	8360
Method 2	PCC	5.2	5.3	5.5	5.7	5.9	6.1	6.3	6.4	6.6	6.8	7.0	7.2
	TC	7054	7336	7620	7905	8191	8477	8761	9045	9327	9608	9887	10164
Method 3, 6%	PPC	5.3	5.6	5.8	6.0	6.2	6.4	6.7	6.9	7.1	7.3	7.6	7.8
	TC	7208	7685	8001	8324	8653	8988	9328	9672	10022	10376	10736	11100
Method 3, 8%	PPC	5.3	5.6	5.9	6.1	6.4	6.7	7.0	7.3	7.6	8.0	8.3	8.6
	TC	7208	7685	8092	8511	8941	9382	9833	10294	10766	11249	11742	12247
Method 3, 10%	PCC	5.3	5.6	5.9	6.3	6.6	7.0	7.4	7.8	8.2	8.6	9.0	9.5
	TC	7208	7685	8182	8697	9229	9778	10344	10928	11530	12150	12789	13448

Table C12. Mutton and Goat Meat

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
OECD-FAO	PCC	2.9	2.9	2.9	3.0	3.1	3.1	3.2	3.2	3.3	3.3	3.4	3.4
	TC	3921	3965	4057	4149	4242	4333	4425	4516	4606	4695	4785	4876
	PRO	3865	3901	3991	4082	4173	4263	4353	4443	4532	4620	4709	4798
	Gap	-56	-64	-65	-67	-69	-70	-72	-73	-74	-75	-76	-77

Consumption projections using simple methods

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	PCC	3.1	3.3	3.4	3.6	3.8	3.9	4.1	4.3	4.5	4.7	4.9	5.1
	TC	4294	4512	4740	4979	5228	5488	5760	6043	6337	6644	6963	7296
Method 2	PCC	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.1	5.3	5.5	5.8
	TC	4631	4913	5204	5505	5815	6134	6462	6798	7141	7493	7851	8218
Method 3, 6%	PPC	3.5	3.8	4.0	4.2	4.5	4.7	5.0	5.3	5.6	5.9	6.2	6.5
	TC	4735	5207	5529	5869	6227	6603	6999	7415	7852	8310	8792	9297
Method 3, 8%	PPC	3.5	3.8	4.1	4.4	4.7	5.1	5.5	5.9	6.3	6.8	7.2	7.8
	TC	4735	5207	5628	6080	6564	7083	7638	8231	8865	9543	10268	11042
Method 3, 10%	PCC	3.5	3.8	4.2	4.5	5.0	5.4	5.9	6.5	7.1	7.7	8.4	9.2
	TC	4735	5207	5727	6293	6911	7585	8317	9114	9981	10923	11947	13060

Table C13. Poultry

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
USDA	PCC	n.a	9.5	9.8	9.9	10.1	10.4	10.6	10.9	11.2	11.4	11.7	11.9
	TC	n.a	12527	12921	13161	13557	13960	14371	14794	15239	15605	15985	16334
	PRO	n.a	12556	13006	13332	13729	14125	14543	14959	15398	15759	16134	16474
	Gap	n.a	29	85	171	172	165	172	165	159	154	149	140
OECD-FAO	PCC	11.5	11.9	12.3	12.4	12.6	12.9	13.2	13.6	13.9	14.1	14.4	14.7
	TC	16070	16524	17015	17212	17600	18060	18610	19130	19604	20017	20466	20921
	PRO	15765	16347	16940	17161	17542	18004	18540	19063	19542	19953	20419	20849
	Gap	-305	-177	-75	-51	-58	-56	-71	-67	-62	-65	-47	-72

Consumption projections using simple methods

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	PCC	12.2	12.4	12.6	12.9	13.1	13.4	13.6	13.9	14.1	14.4	14.7	14.9
	TC	16616	17010	17410	17817	18230	18646	19066	19489	19914	20341	20772	21205
Method 2	PCC	12.5	12.9	13.3	13.7	14.2	14.6	15.0	15.4	15.8	16.2	16.6	17.0
	TC	17095	17739	18385	19034	19684	20333	20981	21625	22265	22902	23534	24162
Method 3, 6%	PPC	13.6	14.5	15.1	15.8	16.4	17.1	17.8	18.5	19.2	20.0	20.8	21.6
	TC	18541	19930	20863	21828	22826	23855	24916	26007	27131	28286	29475	30698
Method 3, 8%	PPC	13.6	14.5	15.3	16.2	17.1	18.0	18.9	20.0	21.0	22.1	23.3	24.5
	TC	18541	19930	21138	22403	23726	25107	26547	28048	29612	31242	32939	34708
Method 3, 10%	PCC	13.6	14.5	15.5	16.6	17.7	18.9	20.2	21.5	22.9	24.3	25.9	27.5
	TC	18541	19930	21412	22979	24637	26387	28234	30182	32235	34400	36682	39088

Table C14. Eggs

Consumption projections using simple methods

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	**PCC**	19.5	19.8	20.1	20.4	20.7	21.0	21.3	21.6	21.9	22.2	22.5	22.9
	TC	26641	27160	27683	28213	28745	29280	29815	30349	30882	31414	31945	32476
Method 2	**PCC**	21.9	22.6	23.3	23.9	24.6	25.3	26.0	26.7	27.4	28.0	28.7	29.4
	TC	29892	30973	32058	33147	34237	35326	36411	37490	38563	39628	40687	41737
Method 3, 6%	**PPC**	20.0	20.3	20.5	20.6	20.8	20.9	21.1	21.2	21.3	21.5	21.6	21.7
	TC	27294	27835	28203	28558	28898	29222	29529	29818	30090	30344	30581	30802
Method 3, 8%	**PPC**	20.0	20.3	20.5	20.7	20.9	21.1	21.3	21.5	21.6	21.8	21.9	22.0
	TC	27294	27835	28277	28699	29100	29478	29832	30164	30472	30758	31023	31267
Method 3, 10%	**PCC**	20.0	20.3	20.6	20.8	21.1	21.3	21.5	21.7	21.9	22.0	22.2	22.3
	TC	27294	27835	28349	28834	29289	29714	30108	30473	30809	31117	31400	31659

Table C15. Milk

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
FAPRI	**PCC**	21.8	22.2	23.1	24.2	25.3	26.4	27.6	28.8	30.1	31.4	32.8	34.3
	TC	28895	29580	30922	32502	34120	35802	37577	39408	41323	43270	45319	47451
	PRO	28445	29100	30473	32087	33737	35451	37258	39120	41067	43045	45126	47290
	Gap	-450	-480	-448	-415	-383	-351	-320	-288	-256	-225	-193	-160
OECD-FAO	**PCC**	24.4	26.7	28.7	30.3	31.7	33.1	34.5	35.9	37.4	38.8	40.2	40.1
	TC	33328	36654	39583	41959	44066	46213	48362	50511	52666	54823	56974	56974
	PRO	39451	41669	43598	45630	47431	49039	50674	52327	53979	55660	57352	59064
	Gap	6124	5015	4015	3671	3366	2825	2312	1815	1313	838	379	2091

Consumption projections using simple methods

Source		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	**PCC**	40.9	47.5	55.1	63.9	74.1	86.0	99.8	115.8	134.3	155.8	180.8	209.7
	TC	55862	65123	75906	88459	103066	120050	139787	162713	189334	220237	256104	297722
Method 2	**PCC**	27.5	29.1	30.7	32.4	34.1	35.9	37.8	39.6	41.6	43.5	45.6	47.6
	TC	37543	39902	42344	44867	47470	50148	52897	55715	58600	61550	64564	67640
Method 3, 6%	**PPC**	40.0	46.7	51.4	56.7	62.5	69.0	76.2	84.2	93.1	103.0	114.0	126.2
	TC	54560	64025	70854	78455	86911	96313	106762	118370	131267	145594	161512	179197
Method 3, 8%	**PPC**	40.0	46.7	53.0	60.3	68.7	78.4	89.5	102.2	116.9	133.8	153.2	175.5
	TC	54560	64025	73099	83547	95577	109424	125358	143693	164791	189072	217018	249186
Method 3, 10%	**PCC**	40.0	46.7	54.7	64.2	75.5	88.9	104.9	123.9	146.5	173.3	205.4	243.5
	TC	54560	64025	75376	88890	104981	124139	146951	174114	206467	245007	290926	345647

The authors' projections are based on FAO STAT database for milk excluding butter.

Table C16. Aquatic Products

Consumption projections using simple methods

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Method 1	**PCC**	36.3	36.6	37.0	37.3	37.7	38.1	38.5	38.8	39.2	39.6	40.0	40.4
	TC	49524	50252	50981	51713	52443	53168	53885	54594	55293	55982	56662	57333
Method 2	**PCC**	41.3	42.5	43.8	45.0	46.3	47.5	48.7	50.0	51.2	52.4	53.7	54.9
	TC	56393	58363	60341	62326	64312	66296	68272	70236	72189	74128	76052	77961
Method 3, 6%	**PPC**	36.6	37.1	37.4	37.7	38.0	38.2	38.4	38.7	38.9	39.1	39.3	39.4
	TC	49985	50930	51573	52191	52781	53340	53865	54357	54815	55240	55634	55996
Method 3, 8%	**PPC**	36.6	37.1	37.5	37.9	38.2	38.5	38.8	39.1	39.3	39.5	39.8	39.9
	TC	49985	50930	51699	52429	53117	53761	54361	54915	55425	55893	56321	56710
Method 3, 10%	**PCC**	36.6	37.1	37.6	38.0	38.4	38.8	39.1	39.4	39.7	39.9	40.2	40.4
	TC	49985	50930	51821	52654	53429	54146	54804	55405	55950	56444	56888	57285

Appendix D. Sown Area, Yield, Crop Output and Output of Animal Products

Table D1. Area Sown to Crops and Share out of Total Area Sown in China (1978-2010, thousand hectare, %)

Year	Total sown area	Grain crops	%	Cereals	%	Rice	%	Wheat	%	Maize	%	Soybean	%
1978	150104	120587	80.3	n.a	n.a	34421	22.9	29183	19.4	19961	13.3	n.a	n.a
1980	146380	117234	80.1	n.a	n.a	33878	23.1	28844	19.7	20087	13.7	n.a	n.a
1985	143626	108845	75.8	n.a	n.a	32070	22.3	29218	20.3	17694	12.3	n.a	n.a
1990	148362	113466	76.5	n.a	n.a	33064	22.3	30753	20.7	21401	14.4	n.a	n.a
1995	149879	110060	73.4	89310	59.6	30744	20.5	28860	19.3	22776	15.2	11232	7.5
2000	156300	108463	69.4	85264	54.6	29962	19.2	26653	17.1	23056	14.8	12660	8.1
2001	155708	106080	68.1	82596	53.0	28812	18.5	24664	15.8	24282	15.6	13268	8.5
2002	154636	103891	67.2	81466	52.7	28202	18.2	23908	15.5	24634	15.9	12543	8.1
2003	152415	99410	65.2	76810	50.4	26508	17.4	21997	14.4	24068	15.8	12899	8.5
2004	153553	101606	66.2	79350	51.7	28379	18.5	21626	14.1	25446	16.6	12799	8.3
2005	155488	104278	67.1	81874	52.7	28847	18.6	22793	14.7	26358	17.0	12901	8.3
2006	152149	104958	69.0	84931	55.8	28938	19.0	23613	15.5	28463	18.7	12149	8.0
2007	153464	105638	68.8	85777	55.9	28919	18.8	23721	15.5	29478	19.2	11780	7.7
2008	156266	106793	68.3	86248	55.2	29241	18.7	23617	15.1	29864	19.1	12118	7.8
2009	158614	108986	68.7	88401	55.7	29627	18.7	24291	15.3	31183	19.7	11949	7.5
2010	160675	109876	68.4	89851	55.9	29873	18.6	24257	15.1	32500	20.2	11276	7.0
Growth rate													
Year	**Total sown area**	**Grain crops**	**%**	**Cereals**	**%**	**Rice**	**%**	**Wheat**	**%**	**Maize**	**%**	**Soybean**	**%**
80-90	0.1	-0.3		n.a		-0.2		0.6		0.6		n.a	
90-00	0.5	-0.4		n.a		-1.0		-1.4		0.7		n.a	
00-10	0.3	0.1		0.5		0.0		-0.9		3.5		-1.2	
78-10	0.7	-0.9		n.a		-1.4		-1.8		5.0		n.a	

Table D1 (continued)

Year	Tubers	%	Oil-bearing crops	%	Peanuts	%	Rapeseed	%	Cotton	%	Fiber crops	%
1978	11796	7.9	6222	4.1	1768	1.2	2600	1.7	4866	3.2	751	0.5
1980	10153	6.9	7928	5.4	2339	1.6	2844	1.9	4920	3.4	666	0.5
1985	8572	6.0	11800	8.2	3318	2.3	4494	3.1	5140	3.6	1231	0.9
1994	9121	6.1	12081	8.1	3776	2.5	5783	3.9	5528	3.7	372	0.3
1995	9519	6.4	13102	8.7	3809	2.5	6907	4.6	5422	3.6	376	0.3
2000	10538	6.7	15400	9.9	4856	3.1	7494	4.8	4041	2.6	262	0.2
2001	10217	6.6	14631	9.4	4991	3.2	7095	4.6	4810	3.1	323	0.2
2002	9881	6.4	14766	9.5	4921	3.2	7143	4.6	4184	2.7	338	0.2
2003	9702	6.4	14990	9.8	5057	3.3	7221	4.7	5111	3.4	337	0.2
2004	9457	6.2	14431	9.4	4745	3.1	7271	4.7	5693	3.7	332	0.2
2005	9503	6.1	14318	9.2	4662	3.0	7278	4.7	5062	3.3	335	0.2
2006	7877	5.2	11738	7.7	3960	2.6	5984	3.9	5816	3.8	283	0.2
2007	8082	5.3	11316	7.4	3945	2.6	5642	3.7	5926	3.9	263	0.2
2008	8427	5.4	12825	8.2	4246	2.7	6594	4.2	5754	3.7	221	0.1
2009	8636	5.4	13654	8.6	4377	2.8	7278	4.6	4949	3.1	160	0.1
2010	8750	5.4	13890	8.6	4527	2.8	7370	4.6	4849	3.0	133	0.1

Growth rate

Year	Tubers	%	Oil-bearing crops	%	Peanuts	%	Rapeseed	%	Cotton	%	Fiber crops	%
80-90	-1.1		3.2		2.2		6.8		1.3		-2.9	
90-00	1.5		3.5		5.3		3.1		-3.2		-6.2	
00-10	-1.8		-1.0		-0.7		-0.2		1.8		-6.6	
78-10	-2.9		8.4		9.9		11.0		0.0		-15.9	

Table D1 (continued)

Year	Sugar Corps	%	Sugarcane	%	Beetroot	%	Tobacco	%	Vegetables	%	Plantations	%	Orchards	%
1978	879	0.6	549	0.40	331	0.2	784	0.5	3331	2.2	1048	0.7	1657	1.1
1980	922	0.6	480	0.30	443	0.3	512	0.3	3163	2.2	1041	0.7	1783	1.2
1985	1525	1.1	965	0.70	560	0.4	1313	0.9	4753	3.3	1077	0.8	2736	1.9
1990	1755	1.2	1057	0.70	670	0.5	1593	1.1	6338	4.3	1061	0.7	5179	3.5
1995	1820	1.2	1125	0.80	695	0.5	1470	1.0	9515	6.3	1115	0.7	8098	5.4
2000	1514	1.0	1185	0.80	329	0.2	1437	0.9	15237	9.7	1089	0.7	8932	5.7
2001	1654	1.1	1248	0.80	406	0.3	1340	0.9	16402	10.5	1141	0.7	9043	5.8
2002	1872	1.2	1393	0.90	424	0.3	1328	0.9	17353	11.2	1134	0.7	9098	5.9
2003	1657	1.1	1409	0.90	248	0.2	1264	0.8	17954	11.8	1207	0.8	9437	6.2
2004	1568	1.0	1378	0.90	190	0.1	1266	0.8	17560	11.4	1262	0.8	9768	6.4
2005	1564	1.0	1354	0.90	210	0.1	1363	0.9	17721	11.4	1352	0.9	10035	6.5
2006	1567	1.0	1378	0.90	189	0.1	1189	0.8	16639	10.9	1431	0.9	10123	6.7
2007	1802	1.2	1586	1.00	216	0.1	1164	0.8	17329	11.3	1613	1.1	10471	6.8
2008	1990	1.3	1743	1.10	246	0.2	1326	0.8	17876	11.4	1719	1.1	10734	6.9
2009	1884	1.2	1697	1.10	186	0.1	1391	0.9	18390	11.6	1849	1.2	11140	7.0
2010	1905	1.2	1686	1.00	219	0.1	1345	0.8	19000	11.8	1970	1.2	11544	7.2

Growth rate

Year	Sugar Corps	%	Sugarcane	%	Beetroot	%	Tobacco	%	Vegetables	%	Plantations	%	Orchards	%
GR 80-90	6.2		7.7		4.2		12.0		7.2		0.2		11.3	
GR 90-00	-1.0		1.6		-6.9		-1.0		9.2		0.3		5.6	
GR 00-10	2.3		3.6		-4.0		-0.7		2.2		6.1		2.6	
GR 78-10	8.0		11.9		-4.1		5.5		19.0		6.5		21.4	

Source: SSBa, various issues.

Table D2 Yield of Crops in China (1978-2010, kg/ha, %)

Year	Grain	Cereal	Rice	Wheat	Corn	Beans	Soybean	Tubers	Cotton	Oil-bearing crops	Peanuts	Rapeseed	Fiber crops	Sugarcane	Beetroot
1978	2527	n.a	3978	1845	2803	n.a	1059	2691	445	839	1344	718	1800	38496	8166
1980	2734	n.a	4130	1914	3116	n.a	1099	2829	550	970	1539	838	2155	47562	14242
1985	3483	n.a	5256	2937	3607	n.a	1361	3037	807	1338	2008	1248	3614	53430	15913
1990	3933	n.a	5726	3194	4524	n.a	1455	3008	807	1480	2191	1264	2216	57118	21668
1995	4240	4659	6025	3541	4917	1591	1661	3428	879	1718	2687	1415	2386	58133	20132
2000	4261	4753	6272	3738	4597	1588	1656	3497	1093	1919	2973	1519	2023	57626	24518
2001	4267	4800	6163	3806	4698	1547	1625	3488	1107	1958	2888	1597	2109	60625	26807
2002	4399	4885	6189	3777	4924	1787	1893	3710	1175	1962	3011	1477	2853	64663	30232
2003	4332	4873	6061	3932	4813	1649	1653	3621	951	1875	2654	1582	2528	64023	24925
2004	4620	5187	6311	4252	5120	1744	1815	3762	1111	2125	3022	1813	3233	65199	30829
2005	4642	5225	6260	4275	5287	1672	1705	3650	1129	2149	3076	1793	3301	63970	37523
2006	4745	5310	6280	4593	5326	1649	1621	3429	1295	2249	3254	1833	3147	70450	39767
2007	4748	5320	6433	4608	5167	1460	1454	3474	1286	2270	3302	1874	2768	71228	41360
2008	4951	5548	6563	4762	5556	1686	1703	3537	1302	2302	3365	1835	2822	71210	40754
2009	4871	5447	6585	4739	5258	1615	1630	3469	1289	2310	3361	1877	2429	68093	38536
2010	4974	5524	6553	4748	5454	1682	n.a.	3559	1229	2326	3455	1775	2393	65700	42498

Growth rate

Year	Grain	Cereal	Rice	Wheat	Corn	Beans	Soybean	Tubers	Cotton	Oil-bearing crops	Peanuts	Rapeseed	Fiber crops	Sugarcane	Beetroot
80-90	3.7	n.a	3.3	5.3	3.8	n.a	2.8	0.6	3.9	4.3	3.6	4.2	0.3	1.8	4.3
90-00	0.8	n.a	0.9	1.6	0.2	n.a	1.3	1.5	3.1	2.6	3.1	1.8	-0.9	0.1	1.2
00-10	1.6	1.5	0.4	2.4	1.7	0.6	n.a.	0.2	1.2	1.9	1.5	1.6	1.7	1.3	5.7
78-10	2.1	n.a	1.6	3	2.1	n.a	n.a.	0.9	3.2	3.2	3	2.9	0.9	1.7	5.3

Source: SSBa, various issues.

Table D3 Output of Crops in China (1978-2010, thousand tonnes, %)

Year	Grain	Cereal	Cereal/grain	Rice	Rice/grain	Wheat	Wheat/grain	Corn	Corn/grain
1978	304765	n.a	n.a	136930	45	53840	18	55945	18
1980	320555	n.a	n.a	139905	44	55205	17	62600	20
1985	379108	n.a	n.a	168569	44	85805	23	63826	17
1990	446243	n.a	n.a	189331	42	98229	22	96819	22
1995	466618	416116	89	185226	40	102207	22	111986	24
2000	462175	405224	88	187908	41	99636	22	106000	23
2001	452637	396482	88	177580	39	93873	21	114088	25
2002	457058	397987	87	174539	38	90290	20	121308	27
2003	430695	374287	87	160656	37	86488	20	115830	27
2004	469469	411572	88	179088	38	91952	20	130287	28
2005	484022	427760	88	180588	37	97445	20	139365	29
2006	498042	450992	91	181718	36	108466	22	151603	30
2007	501603	456324	91	186034	37	109298	22	152300	30
2008	528709	478474	90	191896	36	112464	21	165914	31
2009	530821	481563	91	195103	37	115115	22	163974	31
2010	546477	496371	91	195761	36	115181	21	177245	32

Growth rate

Year	Grain	Cereal	Cereal/grain	Rice	Rice/grain	Wheat	Wheat/grain	Corn	Corn/grain
80-90	3.4	n.a		3.1		5.9		4.5	
90-00	0.4	n.a		-0.1		0.1		0.9	
00-10	1.7	2.0		0.4		1.5		5.3	
78-10	1.8	n.a		1.1		2.4		3.7	

Table D3 (continued)

Year	Beans	Soybean	Soybean/ beans	Oil-bearing crops	Peanuts	Peanuts/ oil-bearing crops	Rapeseed	Rapeseed/ oil-bearing crops	Sesame	Sesame/ oil-bearing crops
1978	n.a	7565	n.a	5218	1868	46	1868	36	322	6.2
1980	n.a	7940	n.a	7691	2384	47	2384	31	259	3.4
1985	n.a	10500	n.a	15784	5607	42	5607	36	691	4.4
1990	n.a	11000	n.a	16132	6958	39	6958	43	469	2.9
1995	17875	13502	76	22503	9777	45	9777	43	583	2.6
2000	20100	15409	77	29548	11381	49	11381	39	811	2.7
2001	20528	15406	75	28649	11331	50	11331	40	804	2.8
2002	22412	16505	74	28972	10552	51	10552	36	895	3.1
2003	21275	15393	72	28110	11420	48	11420	41	593	2.1
2004	22321	17401	78	30659	13182	47	13182	43	704	2.3
2005	21577	16348	76	30771	13052	47	13052	42	625	2.0
2006	20037	15082	75	26403	10966	49	10966	42	662	2.5
2007	17201	12725	74	25687	10573	51	10573	41	557	2.2
2008	20433	15542	76	29528	12102	48	12102	41	586	2.0
2009	19303	14982	n.a	31543	13657	47	13657	43	622	2.0
2010	18965	n.a	n.a	32301	13082	48	13082	40	587	1.8

Growth rate

Year	Beans	Soybean	Soybean/ beans	Oil-bearing crops	Peanuts	Peanuts/ oil-bearing crops	Rapeseed	Rapeseed/ oil-bearing crops	Sesame	Sesame/ oil-bearing crops
80-90	n.a	3.3		7.7	5.9		11.3		6.1	
90-00	n.a	3.4		6.2	8.5		5.0		5.6	
00-10	-0.6	n.a		0.9	0.8		1.4		-	
78-10	n.a	n.a		5.9	6.1		6.3		1.9	

Table D3 (continued)

Year	cotton	Sugar crops	Sugarcane	Sugarcane /sugar crops	Beetroot	Beetroot/ sugar crops	vegetables	Melons	Fruits
1978	2167	23819	21116	89	2702	11.3	n.a	n.a	n.a
1980	2707	29113	22807	78	6305	21.7	n.a	n.a	n.a
1985	4147	60468	51549	85	8919	14.7	n.a	n.a	n.a
1990	4508	72147	57620	80	14525	20.1	n.a	n.a	18744
1995	4768	79401	65417	82	13984	17.6	257267	n.a	42146
2000	4417	76353	68280	89	8073	10.6	n.a	n.a	62251
2001	5324	86551	75663	87	10889	12.6	484224	68436	66580
2002	4916	102927	90107	88	12820	12.5	528606	74226	69520
2003	4860	96416	90235	94	6182	6.4	540323	69659	145174
2004	6324	95707	89849	94	5857	6.1	550647	69467	153409
2005	5714	94519	86638	92	7881	8.3	564515	72846	161201
2006	7533	104600	97092	93	7508	7.2	539531	75027	171020
2007	7624	121882	112951	93	8931	7.3	564520	76160	181363
2008	7492	134196	124152	93	10044	7.5	592403	78813	192202
2009	6377	122766	115587	94	7179	5.8	n.a	n.a	203955
2010	5961	120085	110789	92	9296	7.7	n.a	n.a	214014

Growth rate

Year	cotton	Sugar crops	Sugarcane	Sugarcane /sugar crops	Beetroot	Beetroot/ sugar crops	vegetables	Melons	Fruits
80-90	5.2	9.5	9.7		8.7				n.a
90-00	-0.2	0.6	1.7		-5.7				12.8
00-10	3.0	4.6	5.0		1.4				13.1
78-10	3.2	5.2	5.3		3.9				n.a

Source: SSBa, various issues.

Table D4 Output of Animal Products in China (1978-2010, thousand tonnes, thousand head, %)

Year	Meat	Pork, beef & mutton	Pork, beef & mutton/meat	Pork	Pork/meat	Slaughtered fattened hogs	Hogs (year end)	Beef	Beef/meat	Cattle (year end)	Slaughtered cattle
1978	8563	8563	100	n.a	n.a	161095	301290	n.a	n.a	70724	2403
1980	12054	12054	100	11341	94	198607	305431	269	2.2	71676	3322
1985	19265	17607	91	16547	86	238752	331396	467	2.4	86820	4565
1990	28570	25135	88	22811	80	309910	362408	1256	4.4	102884	10883
1995	52601	42653	81	36484	69	480510	441690	4154	7.9	132060	30490
2000	60139	47432	79	39660	66	518623	416336	5131	8.5	123532	39650
2001	61058	48321	79	40517	66	532811	419505	5086	8.3	118092	41180
2002	62343	49284	79	41231	66	541439	417762	5219	8.4	115678	44010
2003	64433	50898	79	42386	66	557018	413818	5425	8.4	114344	57030
2004	66087	52343	79	43410	66	572785	421234	5604	8.5	112354	50190
2005	69389	54735	79	45553	66	603674	433191	5681	8.2	109908	41487
2006	70890	55910	79	46505	66	612073	418504	5767	8.1	104651	42220
2007	68657	52838	77	42878	62	565083	439895	6134	8.9	105948	43595
2008	72787	56140	77	46205	63	610166	462913	6132	8.4	105760	44461
2009	76497	59157	77	48908	64	645386	469960	6355	8.3	107265	n.a
2010	79258	61231	77	50712	64	666864	464600	6531	8.2	106264	n.a

Growth rate

Year	Meat	Pork, beef & mutton	Pork, beef & mutton/meat	Pork	Pork/meat	Slaughtered fattened hogs	Hogs (year end)	Beef	Beef/meat	Cattle (year end)	Slaughtered cattle
80-90	9.0	7.6	-1.3	7.2	-1.6	4.5	1.7	16.7		3.7	12.6
90-00	7.7	6.6	-1.1	5.7	-1.9	5.3	1.4	15.1		1.8	13.8
00-10	2.8	2.6	-0.3	2.5	-0.3	2.5	1.1	2.4		-1.5	n.a
78-10	7.2	6.3	-0.8	n.a	n.a	4.5	1.4	n.a		1.3	n.a

Table D4 (continued)

Year	Mutton	Mutton/meat	Slaughtered sheep& goat	Poultry	Poultry/meat	Milk	Cow milk	Cow milk/milk	Poultry eggs	Aquatic products
1978	n.a	n.a	26219	n.a	n.a	971	883	91	n.a	4590
1980	445	3.7	42419	n.a	n.a	1367	1141	83	n.a	4497
1985	593	3.1	50805	1602	8	2894	2499	86	5347	7052
1990	1068	3.7	89314	3229	11	4751	4157	87	7946	12370
1995	2015	3.8	165370	9347	18	6728	5764	86	16767	25172
2000	2641	4.4	204727	11911	20	9191	8274	90	21820	37062
2001	2718	4.5	217225	11761	19	11229	10255	91	22101	37959
2002	2835	4.5	232808	11971	19	14004	12998	93	22657	39549
2003	3087	4.8	259583	12390	19	18486	17463	94	23331	40770
2004	3329	5.0	283430	12578	19	23684	22606	95	23706	42466
2005	3501	5.0	240920	13442	19	28648	27534	96	24381	44199
2006	3638	5.1	247339	13631	19	33025	31934	97	24240	45836
2007	3826	5.6	255707	14476	21	36334	35252	97	25290	47475
2008	3803	5.2	261723	15337	21	37815	35558	94	27022	48956
2009	3894	5.1	n.a	n.a	n.a	36777	35188	96	27425	51164
2010	3989	5.0	n.a	n.a	n.a	37480	35756	95	27627	53730

Growth rate

Year	Mutton	Mutton/meat	Slaughtered sheep& goat	Poultry	Poultry/meat	Milk	Cow milk	Cow milk/milk	Poultry eggs	Aquatic products
80-90	9.1		7.7	n.a		13.3	13.8		n.a	10.6
90-00	9.5		8.6	13.9		6.8	7.1		10.6	11.6
00-10	4.2		n.a	n.a		15.1	15.8		2.4	3.8
78-10	n.a		n.a	n.a		12.1	12.3		n.a	8.0

Source: SSBa, various issues.