

**Japan's Livestock Sector:
Consumption, production, policies and trade**

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Abstract

The paper reviews trends in the production, consumption and trade in livestock products in Japan. Production has been trending downwards, while high consumer prices relative to other countries have not generally encouraged consumption. The livestock sector is still heavily protected by OECD standards, and despite such protection livestock product imports have been rising; therefore the self-sufficiency ratio has fallen. Increasingly, the trend is towards increased imports of meats, rather than of feedstuffs for domestic meat production. Some policy reforms have occurred recently, most notably for beef, and resultant lower consumer prices have boosted consumption. Further such reforms may be the principal cause of future consumption growth. Domestic fiscal constraints and international pressure point to further reductions in support which could be managed so as to enhance consumer welfare whilst achieving domestic objectives regarding the rural sector and environment.

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Consumption trends

The transformation of diets as economic development proceeds, from a reliance on cereals diets in which non-traditional and value-added products are more dominant, is now well understood. Typically, consumption of traditional cereals and starchy rootcrops increases in the first phase, followed by a second phase in which consumption of non-traditional staple foods such as wheat-based products increases, cereals consumption reaches a peak and starchy rootcrop consumption declines. In the third phase consumption of cereals consumption declines and consumption shifts towards higher-value and higher-protein foods such as animal-based products and other processed foods and fruits.

As economic development proceeds through time average per capita incomes and expenditures exhibit a rising trend. But other changes occur through time as well, such as migration from rural to urban regions, changes in the country's demographic structure, and improvements in transportation, communications and marketing infrastructure. Recently there has been heightened interest in the impact of structural variables on food consumption patterns particularly because of the rapid growth and dietary transformations that are taking place in parts of Asia. Urbanisation has been shown to have significantly reduced demand for rice and coarse grains in several Asian countries, to have consistently increased the demand for wheat, and to have increased the consumption of animal products (Huang and David 1993, Rae 1998).

The two decades following WWII, in particular, were periods of rapid growth in income, urbanisation and infrastructure development in Japan. Thus, as Table 1 suggests, the transformation of Japanese diets from cereals to increased emphasis on animal products was substantially more rapid prior to the mid-1970s than after. The long-term decline in cereal consumption appears to be bottoming out, while the growth in animal products consumption has slowed considerably in recent times. What growth continues in the latter food group is primarily to still-increasing consumption of certain dairy products and beef.

Table 1 Dietary Transformation Slowing Down in Japan

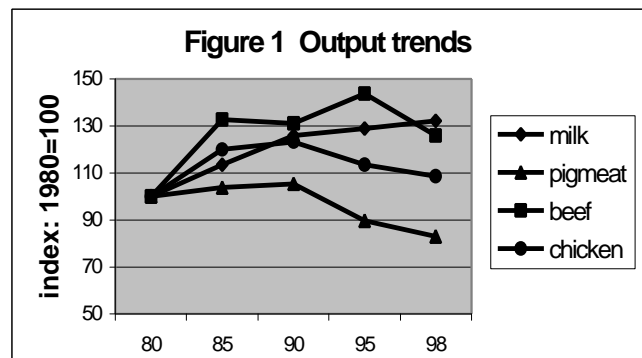
	Average Consumption (kcalories/person/day)				% change from:		
	1965-67	1975-77	1985-87	1995-97	65-67 to 75-77	75-77 to 85-87	85-87 to 95-97
Cereals	1417	1251	1182	1193	-11.7	-5.5	0.9
Animal products	337	478	567	603	41.8	18.6	6.3
- meat	48	95	134	161	97.9	41.0	20.0
- dairy	55	93	113	124	69.0	21.5	9.7
- fish	130	179	195	193	37.7	8.9	-1.0

Source: FAOSTAT

While per person consumption of animal products in Japan currently exceeds that in other E Asian regions (with the exception of HongKong), it is only 50% - 60% of the consumption level in Australasia and North America. While cultural differences no doubt influence consumption, there does appear to be further scope for increased consumption of animal products in Japan towards those in Western societies, should factors such as prices and incomes be favourable. The return to faster economic growth, and the lowering of food prices as a result of future trade reforms, could be important contributors. However, Japan was essentially an urbanised society by 1970, so this factor is not likely to contribute to further substantial growth in demand for animal products, as it will in developing Asian economies.

Domestic production trends

Encouraged by consumer demand growth and government policies, production of livestock products in Japan grew rapidly throughout the 1960s and 1970s. This led to a parallel growth in demand for feedstuffs which the domestic cropping sector could not satisfy. Thus imports of coarse grains grew from 4 million tonnes in the mid-1960s to 17 million tonnes 20 years later. Physical and economic constraints have tempered, and in some cases reversed, these production trends in recent times. Beef production was static over the late-1980s and has shown recent declines. Growth in poultry output slowed during the 1980s and declined over the following decade. Pig production, which had stabilised during the 1980s, has shown a substantial decline in recent times – output has fallen 17% between 1990 and 1997. While the domestic production of milk does not appear to have entered a declining phase, output stabilised during the 1990s (Figure 1).



Livestock production has undergone substantial structural change over the past two decades, with the trend to large scale intensive units (Table 2). This trend is especially apparent in poultry and pig production: since 1975, the number of pig farm households has fallen from 223,000 to 14,000 and the average size of operation rose from 34 to over 700 pigs. There have also been large increases in the average size of broiler and layer operations.

Table 2 Rapid Structural Change has Taken Place in the Livestock Sector ('000s)

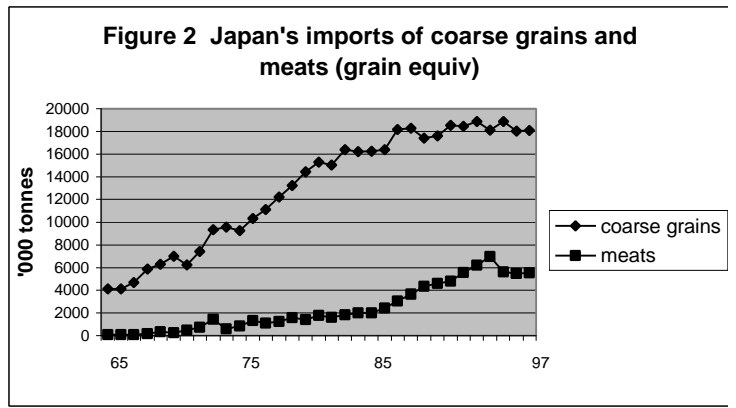
	1975		1985		1997	
	Number of farms	Livestock/farm	Number of farms	Livestock/farm	Number of farms	Livestock/farm
Dairy	160	11	82	26	39	49
Beef	474	4	298	9	143	20
Pigs	223	34	83	129	14	702
Broilers	12	7,305	7	21,459	4	28,579
Layers	507	230	123	1,037	7	20,879

Source: <http://www.maff.go.jp>

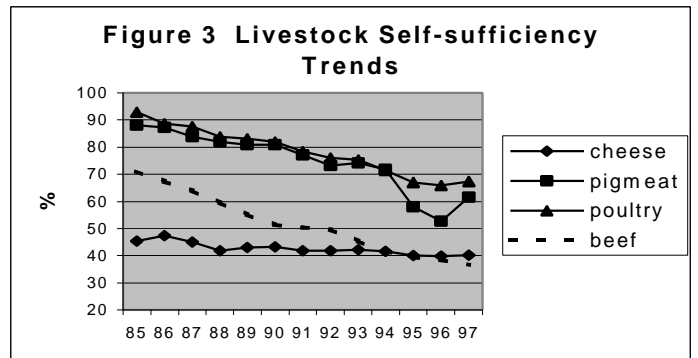
The intensification of livestock production in Japan, as elsewhere, has brought with it increased environmental problems such as water pollution, bad smells and insect problems. The large production units, in particular, are claimed to be a major cause of such problems. Recent serious problems have included water pollution disputes between livestock farmers and fishers in the dairy farming area of Hokkaido. While the amount of nitrogen produced annually from livestock manure is about equal to the crop sector's total demand for N fertiliser, the location of livestock production in remote areas means an N-balance cannot easily be achieved, and farmers face the problem of manure disposal (Sakurada et al 1997). Small producers are leaving the livestock sector, and larger producers wrestle with non-profitability of investments required to manage manure disposal according to environmental regulations (Taha 1992).

Trade and self-sufficiency trends

Converting meat imports to their grain equivalents and adding to actual grain imports reveal a linear growth in total coarse grain imports from 4 million tonnes in 1965 to about 24 million tonnes in 1997. However, since the early 1980s, corresponding to the slowdown in domestic livestock production, grains have been increasingly imported as livestock products (Figure 2). Till between 1985 and 1997, Japan's imports of beef and pigmeat increased fourfold, that of poultry by a factor of six, and cheese imports doubled. Domestic production difficulties, policy reform and increases in consumption all contributed to this situation.

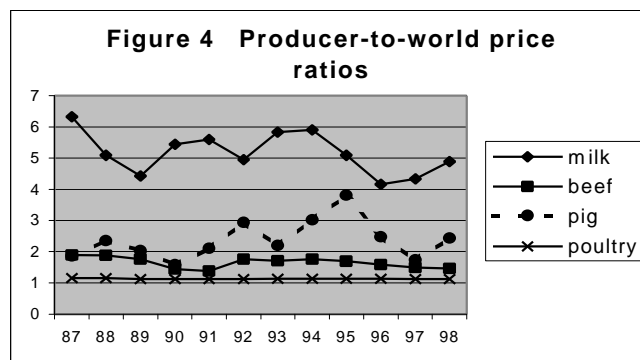


Needless to say, the self-sufficiency ratio has fallen for all these products (Figure 3). By the 1990s, these ratios were 56% for meats as a group, and for individual items were 39% (beef), 59% (pigmeat) and 65% (poultry). For dairy products as a whole, self sufficiency had fallen 72% by the late 1990s, including a ratio of 40% for cheese. These are all substantially less than the self-sufficiency rates 15 years earlier – the Japanese livestock sector is clearly losing share of its market for livestock products to foreign supplies.



Livestock sector policies

The Japanese government provides support to the livestock sector primarily through border measures and administered prices. Producers operate a national milk quota, and deficiency payments bring producer milk prices up to the guaranteed level. A deficiency payment system also operates for calves, and has been triggered in most years since it was introduced in 1990. While the trend has been for these guaranteed prices, and the stabilisation price of butter, to decrease in recent years, producer prices are still well above world levels – by factors of almost 2 and 1.5 for milk and beef respectively (Figure 4). Thus a substantial gap still exists between producer and world prices. A state agency, the Agricultural and Livestock Industries Corporation (formerly the LIPC) operates price stabilisation schemes for beef and pigment, and plays a major role in the importation of dairy products.



Source: OECD

Border measures include tariffs which underwent reforms as a result of the Uruguay Round GATT trade negotiations. Among the most noteworthy were those tariff reductions agreed for beef and continuation of the earlier reductions in the case of beef, which are contributing to lower consumer prices and increasing consumption of these products. However, import barriers remain substantial in the case of skim milk powder – the tariff rate quota imposes with quota tariffs and markups that are equivalent to a tariff in excess of 200%, and the out-of-quota tariff is even higher and prohibitive to further trade.

As a result of these trade interventions, consumer prices of livestock products are generally considerably in excess of world prices. Consumers pay prices for milk products, beef, pigment, poultry and eggs that are respectively 245%, 42%, 140%, 12% and 18% above world prices (OECD 1999).

Despite reductions in border protection and administered prices, the livestock sector in Japan remains heavily supported when compared with other OECD countries. Taken across the livestock sector as a whole, policy transfers to producers amount to around 45% of total producer revenues. This compares with just over 40% in the case of the European Union, which is acknowledged as a heavy subsidiser of livestock production. For the dairy sector in Japan, transfers are equivalent to 80% of producer revenue.

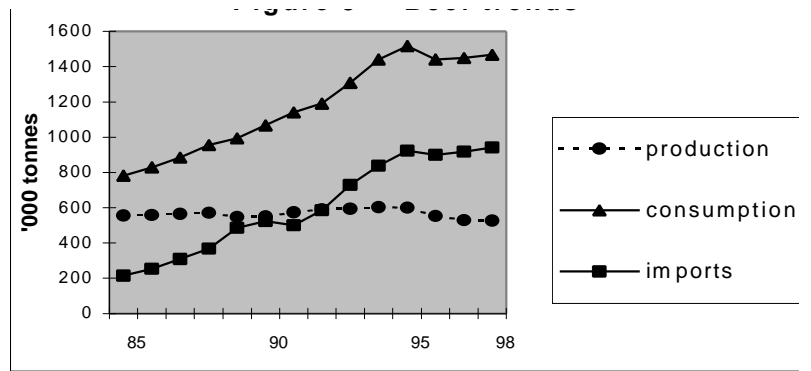
Support has been declining somewhat over recent years for beef (in particular) and the dairy sector, but not in the pig sector (Table 3). It should also be noted that whereas the EU has moved over recent years from use of price supports to less-distortive direct payments as a means of supporting farmers, this has not been the case in Japan. In 1997, 84% of farmer support in Japan came from price support (compared with 85% in 1986-88) - for the EU these proportions were 55% in 1997 and 75% in 1986-88.

Table 3 **Producer subsidy equivalents in Japanese livestock sector**

Commodity	1986-88	1991-93	1996-98
Milk	84	82	78
Beef	44	35	33
Pigmeat	42	50	51
Poultry	12	11	11

Source: OECD

Special mention should be made of the liberalisation of Japan's beef imports, as this preceded UR negotiations and anticipated the GATT's tariffication approach to increased market access. Up until the 1980s, Japan's beef imports were regulated by quotas and tariffs. Following negotiations among the governments of Japan, the USA and Australia, an agreement over reform was reached in 1988. Import quotas were to be expanded over the initial years of the agreement. Import quotas were then to be abandoned and replaced by tariff-only protection, with the level of the tariff to be reduced from 70% in 1991 to 50% two years later. The Japanese government still assists beef farmers but in less trade-distorting ways - domestic production has changed little. The removal of quotas and reductions in tariffs have lowered domestic consumer prices, and both imports and consumption have increased - the latter has doubled since 1985 with consequent improvements in consumer welfare (Figure 5).



A projection to 2005

Projections of macro variables and productivity growth are incorporated into a slightly modified version of the GTAP applied general equilibrium model (Hertel 1997) to project national and regional production, consumption and trade flows between 1995 and 2005. This is a relatively standard, multi-region model that distinguishes sectors by their intensities in five primary production factors: land (agricultural sectors only), natural resources (extractive sectors on capital, and skilled and unskilled labour. In trade, products are differentiated by country of origin allowing bilateral trade to be modeled.

The 50 commodities in the version 4 GTAP database have been aggregated up to 14 commodity groups, of which 6 commodities (rice, wheat, other grains, oil crops, other crops and processed food) compete for use in the feedstuffs composite. Livestock farming is represented by three aggregates: beef cattle (i.e. ruminant livestock), other livestock (i.e. non-ruminants) and raw milk production. These farming sectors provide inputs to the beef processing (ruminant meat), other meat (non-ruminant meat) and dairy products industries in each region. All remaining product sectors are aggregated into manufactures and services, or other natural resource based commodities.

Projections are made through exogenous shocks to each region's endowments of physical capital, skilled and unskilled labor, population, and technology. Appendix Table 1 reports the shock population, endowments and productivity that are assumed. Forecasts for population, investment (capital stock), and labor force are based on the latest forecasts from the World Bank as of spring 1999. Projected changes in skilled labor are based on expected increases in the stock of tertiary educated labor and are taken from Ahuja and Filmer for developing countries. Projections for OECD countries are based on inputs developed for the World Bank's Global Economic Prospects (1997). The stock of farmland in each region is simply held constant.

Relative cross-country changes in livestock productivity are measured and incorporated into the projections. It is noted that, relative to North America, Japan's livestock sectors approached and in some cases surpassed North American productivity levels prior to the 1980s. Since then, relative

productivity has been maintained in beef and milk production, but not in non-ruminant production.

To forecast non-livestock productivity growth a rather simple approach is adopted which is transparent and which can be easily modified. First of all, based on the work of Bernard and Jones (1996), we observe that productivity growth tends to be more rapid in agriculture than in manufacturing, which in turn has a higher productivity growth rate than services. Based on the averages for the OECD as a whole (Bernard and Jones, 1996, Table 1), we obtain the following multiples of the manufacturing productivity growth rate for the other sectors: (non-livestock agriculture = 1.4 * manufacturing, services = 0.5 * manufacturing, and mining = 0 * manufacturing). In this way, we are able to link productivity growth in each sector of the economy to a common metric -- namely the rate of manufacturing's productivity growth.

We then divide economies into four groups according to their overall rate of productivity growth: low, medium, high and very high. The assumed annual growth rates of productivity in manufacturing value-added for these groups are as follows: 0.25%, 0.75%, 1.25% and 1.75%/year. The low growth group includes Japan, Southeast Asia, and New Zealand. The medium group includes the US, Sub-Saharan Africa and ROW. Higher productivity growth rates are foreseen for Australia, the EU, and South America. Finally, Korea and China's productivity growth rates are expected to remain quite high -- although somewhat lower than implied by the period prior to the Asian crisis. As a check on the plausibility of these assumptions, we compare our baseline cumulative GDP growth (second to last column) to that forecast by the World Bank in the last column of Table 3. Apart from China and Korea, all of these GDP projections are reasonably close.

Such projected income growth will tend to boost the demand for livestock products relative to grains, and in some regions there will be a strong shift away from food products altogether. On the supply side, the accumulation of skilled labor and capital in some regions can be expected to continue to promote the shift of activity away from agriculture, in favor of manufacturing services.

Finally, it should be noted that the projection holds all policies unchanged, since a comprehensive set of post-UR tariffs for the version 4 GTAP database is not yet available. For agriculture, it can be argued that the barriers to trade operational in 1995 may not be too dissimilar to those that will apply at the end of the UR implementation period, given evidence of 'dirty tariffication'. Specifically in the case of Japan though, we may be underestimating the growth in imports of beef and dairy products in particular. Liberalisation of textiles and industrial trade under Uruguay Round agreements could also further increase projected income growth rates in Japan and hence demand for livestock products. However, the projections do not incorporate adjustments due to removal of the Multifibre Agreement or planned reduction in industrial tariffs.

Over the 10-year projection period, the results reveal that the structure of the Japanese economy continues the relative decline in the contribution of agriculture. The contribution of the agricultural sectors to GDP contracts by between 4% and 8%; the contributions of the processed livestock products contract less, by between 1% and 3% for meats and dairy products. The manufacturing sector's share of GDP also declines 1%, partly due to Japan's low relative productivity growth in this sector. The major output expansion projected in Japan is in the 'other natural resource' sector (that includes forestry, fishing and minerals) whose share of GDP is projected to increase by nearly 12%. The services sector also expands.

The volume of domestic sales of beef and dairy products expands over the 10-year period by 7.5%, with the volume of imports of these commodities expanding by a similar percentage (Table 4). While domestic sales of non-ruminant meats is projected to expand by just under 6%, that of imports of this group of meats expands by nearly 7%. Japan's trade balances for beef, non-ruminant meats and dairy products all deteriorate due to the rise in both the volume and price of imports. These changes in the trade balances for beef, non-ruminant meats and dairy products are equivalent to 10%, 13% and 6% of the 1995 balances, respectively. Turning to coarse grains, the rate of growth of meat imports is projected to be faster than that of grains, continuing recent trends. Thus even without further reduction in agricultural support and trade protection, the future projected growth of the Japanese economy continues the relative decline in the contribution of the agricultural and livestock sectors, livestock product imports continue to expand, and therefore no increase occurs in self-sufficiency in livestock products.

Table 4 Projections of the Japanese livestock sector: 1995-2005

	% change in		Trade Balance (US\$ million)		
	Quantity domestic sales	Quantity imports	Initial 1995	Projected change	Final 2005
Beef	7.5	7.5	-4347	-431	-4778
Poultry & pigmeat	5.8	8.4	-6383	-815	-7198
Dairy	7.4	6.6	-845	-52	-897
Coarse grains	0.4	6.8	-3056	-311	-3367

Conclusions

The Japanese livestock sector continues to be heavily protected from international competition despite recent reforms. Economic and environmental constraints have led to a stagnation and decline in output of livestock products over recent years. Rapid structural change has also seen the emergence of large-scale intensive production units. Its reliance on imported grains has reduced Japan's overall agricultural self-sufficiency to around 40%. The 1980s saw Japanese imports of feedgrains level off, but imports of meats and dairy products grew at a faster rate than previously. Hence self-sufficiency in livestock products has declined, substantially in the case of beef and pigmeat.

When the Japanese economy recovers from the current depression, income growth rates will reflect those of other developed industrial economies, rather than those of the newly industrial economies. This, plus the facts that the urbanisation phenomena in Japan is long over and that livestock protection is high, suggests that Japan's potential demand growth for livestock products is likely to be driven mainly by lower consumer prices should protection be reduced. This is already evident from trade policy reforms for beef and cheese.

Using a global general equilibrium model, projections of the Japanese economy indicated that even without policy reforms, self-sufficiency and the trade balance in livestock products will continue to fall, more especially for non-ruminant meats. Should Uruguay Round reforms have been factored in, self-sufficiency would likely have declined further and import volumes would have grown even faster.

Despite some recent reductions in guaranteed prices and tariffs (noticeable for beef and cheese) Japan's livestock sector remains one of the most highly protected in the world. Moreover, support is delivered primarily through price support, with its consequent distortions of output, consumption and trade volumes. Demand growth has been hampered by substantial policy-induced gaps between consumer prices in Japan and those in less-protected economies.

Japan's beef policy reform is indicative of what might be achieved in other livestock sectors. Consumer prices have fallen and consumption has risen, increasing consumer welfare. Imports have also risen, with a reduction in international friction. And the beef production sector has not been decimated since government has used other instruments to provide support to producers.

Domestic fiscal constraints and international pressures will likely combine to force further reductions in support to the livestock sector. The beef example suggests that these reforms can bring benefits to consumers and at the same time continue to provide less-distorting support to rural population. In addition, the emergence of environmental problems associated with livestock production in Japan, and the political shift towards 'multifunctionality' and support of the rural environment provide possibilities for the future directions of Japan's agricultural policies.

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**Appendix Table 1: Annual growth rates of exogenous variables used in the projections
GDP growth**

	Population	Endowments			Non-agricultural Productivity	Forecas GDP
		Unskilled labor	Skilled labor	Capital		
Australia	0.91	1.04	4.72	1.59	0.75	3.0
China	0.75	1.06	3.33	8.22	1.75	6.3
Japan	0.18	-0.26	2.57	0.33	0.25	0.8
Korea	0.74	0.64	4.74	1.53	1.75	2.9
New Zealand	0.73	0.71	4.72	2.28	0.25	2.3
South East Asia	1.36	1.89	6.27	2.31	0.25	2.6
North America	0.78	0.89	3.02	3.04	0.75	2.7
E.U.	0.09	0.02	3.02	0.76	1.25	1.9
South America	1.37	1.94	5.50	0.96	1.25	2.7
Sub-Saharan Africa	2.55	2.84	5.97	1.05	0.75	3.0
ROW	1.38	1.86	5.45	2.47	0.75	3.2

Source: Hertel et al (1999)

