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**THE ECONOMIC AND POLICY ASPECTS OF LIVESTOCK VERSUS FEED
GRAIN IMPORTS IN SELECTED ASIAN COUNTRIES**

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This study was undertaken within the general framework of the activities of the OECD Committee for Agriculture. The report was first considered by the OECD Group on Cereals, Animal Feeds and Sugar and the Group on Meat and Dairy Products, subsidiary bodies of the OECD Committee for Agriculture, at their meetings in the autumn of 1997. The Committee for Agriculture examined a revised version reflecting recent economic changes affecting many of the countries reviewed in the report as a result of the Asian financial crisis. The Committee for Agriculture has recommended the study for declassification.

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Introduction

1. Rapid income growth and high population growth in many Asian countries have led to rapid increases in food consumption in the region. Increased incomes have led to a change in diets away from cereal based staple foods to dairy and meat products. Some of the increase in consumption has been met by rising domestic dairy and meat production. This in turn has led to a significant increase in the demand for feed grains and protein meals.

2. However, the production capacity in many Asian countries is limited. This is partly because arable land per person is very low. In addition, infrastructure is often inadequate, there is limited access to modern technology and the skills base of farmers is low. Consequently, growth in production of dairy products, some meats and livestock feeds in many Asian countries has not kept pace with increases in demand, resulting in rapid increases in imports of these products.

3. In this paper, China, Korea, Indonesia and Thailand are examined in order to assess the prospects for consumption, production and trade in dairy products, meat and livestock feeds over the medium term. In particular, an assessment is made of the extent to which these countries are likely to meet the increased demand for dairy products and meat through increased imports of finished products or through increased domestic production based on higher feed imports.

4. The four countries chosen represent a cross section of the rapidly industrialising Asian countries at various stages of the industrialisation process. They also vary in their net trade position for meat and dairy products. For example, China generally meets most of its consumption through domestic production. In contrast Indonesia and Korea are net importers of dairy products and most meats, while Thailand is a net exporter of poultry meat. While these trade patterns partly reflect resource endowments and comparative advantage, they are also strongly influenced by government policy.

5. In general, each of the four countries has tended to protect their agricultural sector in order to support their farmers and to reduce their reliance on food imports. The extent to which these policies have resulted in high levels of self-sufficiency for dairy products and meat varies between countries as well as over time and between products.

6. Average annual growth rates in population and income per person have been high in China, Korea, Indonesia and Thailand, particularly in comparison to developed countries (table 1). This has led to rapid growth in consumption of dairy products and meat. Despite this, consumption per person of these products is low, with levels varying widely between the four countries. Consumption has generally been highest in countries with higher income per person and higher urban population (table 2).

Table 1. Average annual growth in population and gross domestic product per person

	%		
	1981-85	1986-90	1991-95
Gross domestic product per person			
China a	9.5	6.8	11.0
Korea a	7.5	8.1	6.0
Indonesia a	2.1	4.5	5.2
Thailand a	3.3	9.7	6.8
Japan a	2.5	4.6	0.4
United States b	2.5	2.0	1.6
Australia c	1.6	2.2	2.6
Population			
China	1.5	1.5	1.1
Korea	1.3	1.0	0.9
Indonesia	2.1	1.7	1.6
Thailand	1.9	1.6	1.2
Japan	0.7	0.4	0.3
United States	0.9	0.9	1.0
Australia	1.4	1.6	1.1

a 1990 prices. **b** 1992 prices. **c** 1989-90 prices.

Source: IMF (1997).

Table 2. Comparison of incomes, consumption and urbanisation in 1995

	Consumption per person		GDP	Urban
	Dairy products kg	All meat ab kg	per person \$US	population %
China	7.5 c	43.4	560	30
Korea	47.8	35.3	8 113	81
Indonesia	7.3	9.9	772	35
Thailand	16.0	22.2	2 155	20
Japan	68.9	43.6	36 174	78
United States	255.7	117.9	23 061	76
Australia	263.7	104.4	18 626	85

a Includes beef, sheep meat, goat, chicken and pigmeat. **b** Demand in dressed carcass weight terms. **c** China includes Chinese Taipei.

Sources: UN (1997); FAO (1997); IMF (1997); National Livestock Co-operatives Federation (1997a); ASEAN Focus Group Pty Limited (1995).

7. In addition, higher incomes have resulted in more widespread availability of refrigeration and cooking facilities which have encouraged consumption of livestock products. Reorientation of retail facilities towards supermarkets, department stores and convenience stores is providing a well equipped, expanding marketing base for refrigerated dairy products and meat.

8. However, the economic outlook for these countries has been significantly affected by the financial upheavals in the Asian region during the second half on 1997 and early 1998. During the period between late May 1997 and mid April 1998, the currencies of Indonesia, Thailand and Korea depreciated by 70, 35 and 35 per cent respectively. In response to the financial upheavals, monetary authorities in

these Asian countries have markedly increased their official interest rates to provide some support for their currencies. Although international organisations such as the International Monetary Fund (IMF) and the World Bank have given assistance to these countries to restore economic stability and to restructure their financial sectors, the IMF has also recommended economic reforms which include tighter monetary and fiscal policies. Given the combination of sharp declines in the foreign exchange, property and equity markets and markedly high interest rates in these Asian countries, the effect of the recent upheavals on economic growth is expected to be significant in the short term (Penm, Woffenden, Hogan, Knopke and Martin 1998). Both Indonesia and Thailand, for example, are assumed to have negative economic growth rates in 1998, before recording growth of 1.5 per cent and 2 per cent respectively in 1999. This compares with 7 to 9 per cent growth rates in 1995 and 1996. Similarly in Korea, growth is assumed to fall from 6 per cent in 1997 to -0.2 per cent in 1998 before rising to 4 per cent in 1999.

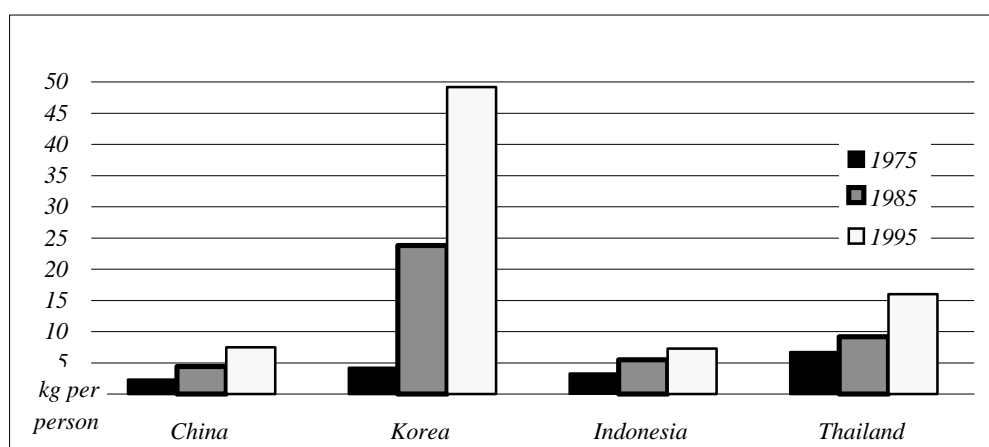
9. While China has so far been largely unaffected by the current Asian economic crisis, China's exports (such as textiles, clothing and footwear) are likely to face increasing competition from South East Asian exports; thereby affecting China's growth in the medium term (Penm et al. 1998).

10. At the moment there is some considerable uncertainty regarding the timing and extent of the economic recovery in these countries. However, over the medium term, the prospects for these countries will depend on the successful implementation of structural reforms in their economies, especially their financial systems (Penm et al. 1998), as well as on economic developments in other countries.

Dairy products

11. Consumption per person of dairy products has increased in China, Korea, Indonesia and Thailand (figure 1), despite the fact that consumers in these countries have had relatively low exposure to dairy products that do not form part of the traditional diet. Consumption of dairy products in all four countries has been highest in urban areas because both income and product availability are higher than in rural areas. In addition, a larger proportion of liquid milk is consumed in urban areas while consumers in rural areas tend to use powdered or condensed milk (ADC 1993).

Figure 1: Apparent consumption of dairy products per person



^a China includes Chinese Taipei.

Sources: FAO (1997); National Livestock Co-operatives Federation (1997a); OECD (1995); ASEAN Focus Group Pty Limited (1995).

12. The dominant products in consumption are milk powders. As an end product milk powders are recombined in the home to make fluid milk. As an intermediate input they are used by domestic processing plants in the manufacture of fluid milk to meet urban demand, and in the manufacture of other dairy and food products (ADC 1994a).

13. An important factor affecting consumption of dairy products in all four countries is changes in taste. Taste changes are occurring for several reasons – there is increasing awareness of the health benefits arising from consumption of dairy products, and new foods, including dairy products, are increasingly being adopted by the younger generation. Government sponsored promotional campaigns have been instrumental in raising consumer awareness of the nutritional benefits of milk and dairy products

14. Lactose intolerance is also an important factor affecting consumption of dairy products. A degree of lactose intolerance is evident in some Asian people. This condition, which applies for fresh milk and cream but not for other dairy products, is most apparent in countries where dairy products have not formed part of the traditional diet. There is evidence that with continued exposure to milk and other dairy products, the next generation is less likely to be lactose intolerant (ADC 1994b). Although lactose intolerance may decline as dairy products become more accepted, the perception of its existence could inhibit market growth.

15. To service the growing consumer market for milk and dairy products in China, Korea, Indonesia and Thailand significant dairy industries have developed, aided by high levels of government support. These industries have sourced product both from local production and imports. However, in China and Korea high levels of government support have allowed these countries to maintain approximate self sufficiency.

16. Imports of dairy products have increased in Thailand, Indonesia, Korea and China, and now account for 34 per cent of total dairy product imports into East and South East Asia (FAO 1997). The biggest importer of dairy products is Thailand. The dominant imported products into the four countries are milk powders (skim milk powder and whole milk powder) and whey powder (FAO 1997).

China

Consumption of dairy products

17. Although per person consumption of dairy products in China is low, consumption has gradually increased since 1975 (figure 1). Liquid milk consumption accounts for over half of the total consumption of dairy products. This is largely a reflection of past and current government policy. In particular, consumer subsidies are provided to encourage milk consumption by young children and elderly citizens (ADC 1994a). Other products in final consumption are milk powders and condensed milk, while milk powders and whey powder are important inputs into domestic manufacturing. Whey powder is used as an input into stockfeed manufacture, in the bakery and confectionery industries, and in the production of infant formulas.

18. There are also signs that ice cream consumption is growing rapidly in China, particularly in urban areas such as Shanghai. A growing number of international food companies such as Nestlé, Wall's, and Baskin and Robbins are making substantial investments in production, promotion and distribution of

ice cream. The number of ice cream parlours and ice cream varieties in urban centres are also increasing (Fuell and Jianping 1997; Zhuang 1997).

Production

19. China has a small dairy industry relative to its population. However, since 1985 both milk production and cow numbers have more than doubled (table 3), while milk yields have changed very little. In 1995 the average milk yield per cow was 1600 kilograms (Fuell and Jianping 1996). While production has increased, quality concerns persist. Dilution of raw milk with water and high bacteria counts in the milk are two of the chief problems (ADC 1994a; Fuell and Jianping 1996).

Table 3. Fluid milk production and cow numbers

	1980	1985	1990	1995
Production	kt	kt	kt	kt
China	1 141	2 499	4 157	5 600
Korea	452	1 006	1 752	1 998
Indonesia	78	192	329	433
Thailand	18	58	126	308
Cow numbers	'000 head	'000 head	'000 head	'000 head
China	na	1 630	2 690	3 500
Korea	180	390	504	554
Indonesia	40	208	300	338
Thailand	4	26	75	146

na Not available.

Sources: FAO (1997); Voboril and Kim (1996); MAFF (1996); State Statistical Bureau (1995); Fuell and Jianping (1996); ASEAN Focus Group Pty Limited (1995); Directorate General of Livestock Services (1997).

20. Administratively set procurement prices are used by the Chinese government to influence milk production. In particular, increased procurement prices in 1994 were the main reason for increases in herd sizes of around 12 per cent in 1994 and 16 per cent in 1995, and increases in milk production of around 8 and 10 per cent in these years (Fuell and Jianping 1996). Other policies used by the Chinese government to encourage milk production include concessional financing for processors, subsidies on feed concentrates, provision of technical services and training, assistance for development of collective farms and regional government development funds (Podbury, Ladlow, Roberts, Felton-Taylor and Chaimun 1995).

21. Around 25 per cent of milk in China is produced by State farms, another 15 per cent by cooperatives and 60 per cent by individual family units. Yields and herd sizes on family farms are generally lower than those on cooperative and State owned farms. In a 1994 survey of dairy production, average yields on the 3000 State owned farms exceeded 6 thousand kilograms a year and average herd size was around 200 cows per farm. However, average yields on the 300 000 family units was less than 2 thousand kilograms per head and each farm had only 2-3 cows. Cooperative farms, with average herd sizes of about 100 cows, had higher yields than the small family units (Fuell and Jianping 1996).

22. An increasing share of milk production is being produced on small family farms (ADC 1994a). These small family farms are usually distant from urban centres and hence incur higher transport costs. In addition, these farms have limited access to improved genetics and herd management is generally poor (Fuell and Jianping 1996). Unless rectified, these factors are likely to constrain further growth in China's milk output. Further growth in milk production may be constrained by increasing land prices due to growing urbanisation. In Beijing, for example, some dairy farms have terminated operations and land has been redirected to non-agricultural uses (Fuell and Jianping 1997).

23. Around 60 per cent of the raw milk produced in China is pasteurised for drinking milk with the remaining 40 per cent processed into dairy products such as powdered milk, condensed milk, yoghurt and ice cream (table 4) (Fuell and Jianping 1996). Further growth in output of manufactured dairy products may be limited by poor milk collection systems and inadequate processing, storage and transport infrastructure in major milk surplus regions (ADC 1994a). On the other hand, the entry of international food companies which are investing in ice cream production has the potential to increase manufactured dairy product output (Zhuang 1997).

Table 4. **Production of dairy products 1995 a**

kilo tons

	China	Korea	Indonesia	Thailand ^b
Powdered milk	352	16	55	12
Condensed milk	52	4	199	105
Yoghurt ^c	d	585	–	33
Ice cream	d	na	4	28
Cheese	na	12	4	–
Infant formula	na	27	25	na

^a Product weight. ^b 1992 data. ^c Includes drinking and cup yoghurt. ^d Production of yoghurt and ice cream totalled 114 kt. **na** Not available. – Less than 0.5 kt.

Sources: ADC (1993); Fuell and Jianping (1996); National Livestock Co-operatives Federation (1997a); Directorate General of Livestock Services (1997).

Trade

24. Although imports of dairy products have grown rapidly from very low levels in the early 1980s (FAO 1997; ADC 1994a) import volumes remain small, with around 80 per cent of the local demand for dairy products being met from local production (ADC 1994a). The main imported products are whey powder, which is a relatively low value product, and milk powders (table 5). Imports of skim and whole milk powder have grown rapidly, with whole milk powder becoming the more dominant item since 1992. China has also exported small quantities of milk powder and whey powder in some years, although it has remained a small net importer of these products.

Table 5. Imports of dairy products

	kilo tons					
	1975	1980	1985	1990	1992	1995
China						
Skim milk powder	na	4	20	15	7	10
Whole milk powder	na	0	0	12	9	15
Whey powder	na	0	3	13	21	na
Korea						
Skim milk powder	–	–	2	–	6	8
Whey powder	0	5	11	14	21	40
Lactose	2	7	5	6	9	13
Cheese	–	–	–	0	–	11
Indonesia						
Skim milk powder	7	40	29	25	39	61
Whole milk powder	4	13	6	3	3	2
Whey powder	0	0	0	3	4	14
Butter	4	14	11	4	9	13
Thailand						
Skim milk powder	21	25	26	48	62	80
Whole milk powder	7	11	19	17	25	41
Whey powder	0	0	1	11	7	12

na Not available. – Less than 0.5 kt.

Sources: FAO (1997); ADC (1993); Fuell and Jianping (1996); National Livestock Co-operatives Federation (1997b); OECD (1996).

Table 6. China's tariff rates for dairy products

	per cent	
	MFN ^a	General
Whole milk powder	30	40
Skim milk powder	30	40
Whey powder	7	30
Butter	65	90
Cheese	65	90
Fresh milk	30	40

^a Most Favoured Nation.

Source: APEC (1997).

25. Licensing requirements and tariffs provide substantial support to domestic dairy producers (table 6). Preferential tariff rates are applied to countries which have concluded trade treaties with China or have established accords for reciprocal favourable treatment of imports. China's offer of bound tariff

rates to WTO members are generally higher for dairy products than prevailing rates (Fuell and Jianping 1996).

Korea

Consumption of dairy products

26. Following rapid growth rates in per person consumption over the 1980s, Korea is now the largest consumer of dairy products among the four countries (figure 1). About 70 per cent of consumption is in the form of liquid milk, with processed dairy products accounting for the remainder.

27. The second largest market after liquid drinking milk is fermented milk or yoghurt (National Livestock Co-operatives Federation 1997b, c) which uses skim milk powder as an input. As a result, the demand for skim milk powder has increased in line with the consumption of yoghurt. Cheese consumption has grown rapidly during the 1990s in response to the rapid growth in fast food and other types of restaurants (Voboril and Kim 1997).

Production

28. Korea has a relatively well developed dairy industry in comparison to China, Indonesia and Thailand. Dairy cow numbers and milk production have increased steadily (table 3), aided by border measures. Growth in production was most rapid between 1976 and 1985, due partly to the implementation of a 10 year dairy development project which sought to expand production through the importation of live cattle, by providing financial support to farmers and by establishing dairy processing facilities (ADC 1993).

29. Korea has the highest average milk yield among the four countries considered in this paper, at around 6000 kilograms per cow. These high yields are due mostly to the maintenance of high internal support prices which have enabled farmers to pursue intensive production methods utilising large quantities of purchased inputs, including feed concentrates.

30. Average herd size per farm has increased considerably as a result of the trend towards fewer, larger farms (Voboril and Kim 1996). This trend, together with modern equipment and improved management techniques, has enhanced productivity and improved returns to farmers. Voboril and Kim (1996) note that per head profitability among farmers with herd sizes over 20 head is more than four times that of farmers with herd sizes less than 10 head.

31. Around 70 per cent of the raw milk produced is used in the liquid milk sector, with the remaining 30 per cent manufactured into dairy products such as yoghurt, infant formulas, milk powders and cheese (table 4) (Voboril and Kim 1996).

Trade

32. Volumes of imported dairy products are small, with around 93 per cent of local demand for dairy products being met from domestic production (Voboril and Kim 1996). The main imported product is whey powder, for use in infant formula and stockfeed manufacture (table 5). Imports of lactose have steadily increased due to the growth in associated industries such as confectioneries, feed and

pharmaceutical's (Voboril and Kim 1996). Cheese imports are also growing in importance, in line with the growth in the fast food sector (Voboril and Kim 1997).

33. As a result of the WTO agriculture agreement, import protection for dairy products is largely through tariff quotas (table 7). In addition, Korea applies a very short shelf life criterion to UHT milk that effectively prevents competition from imports. Currently the shelf life is set at 7 weeks from the date of manufacture (Podbury et al. 1995), which makes it difficult for exporting countries to supply and market UHT milk in Korea. However by June 1998, Korea is expected to move to a system where the shelf life of UHT milk is determined by manufacturers.

Table 7. Trade policies

	Quota		In-quota tariff	Above-quota tariff		Tariff only		Applied tariff
	1995 kt	2004 kt	%	1995 %	2004 %	1995 %	2004 %	1997 %
Korea								
Skim milk powder	0.6	1.0	20	215.6	176			20
Whole milk powder	0.3	0.6	40	215.6	176			40
Whey powder	23.0	54.2	20	99	49.5			20
Butter	0.3	0.4	40	99	89			40
Cheese						40	36	40
Evaporated milk	0.08	0.1	40	99	89			40
Indonesia								
Skim milk powder	414.7 ^a	414.7	40	238	210			5-20
Whole milk powder	414.7	414.7	40	238	210			20-25
Whey powder						100	40	20
Butter						50	40	20
Cheese						50	40	5-15
Thailand								
Skim milk powder	45.0	55.0	20	240	216			5
Whole milk powder						20	5-18	5
Whey powder						27-40	24-30	
Butter						60	30	60 ^b
Cheese						60	30	60 ^b
Butterfat						25	20	5
Anhydrous milk fat						20	18	

^a In milk equivalent. ^b The applied tariff rate is 60 per cent or 20 Baht per kilogram, whichever is the higher.

Sources: GATT (1994); APEC (1997).

34. High import protection has allowed Korea to maintain high internal support prices for milk at the farm gate. The government sets farm gate milk prices based mainly on production cost changes. Prices have been continuously increased in response to farmers' claims of higher costs of inputs such as labour and feed. The farm gate milk price in 1996 was 423 won per kilogram (Park Hong Shik, Ministry of Agriculture and Forestry, personal communication, July 1997). This was equivalent to \$A0.67 per kilogram compared to the producer price for manufacturing milk in Australia of \$A0.26 per litre in 1995-96 (ABARE 1997). These factors have limited price competitiveness and resulted in a high cost industry (OECD 1996).

Indonesia

Consumption of dairy products

35. Consumption per person of dairy products in Indonesia is low (figure 1). Most milk is consumed in processed form, in particular as sweetened condensed milk. A major attraction of this product is that it does not require refrigeration. Another important product in final consumption is skim milk powder, the majority of which is imported. This product is also used in local food processing and in the manufacture of condensed milk (ADC 1993). Fluid milk consumption is growing rapidly — at an average annual rate of 13 per cent over the last five years (Union of Dairy Co-operatives of Indonesia 1996).

Production

36. In comparison to Korea, Indonesia has a relatively underdeveloped dairy industry with most milk being produced on small farm holdings with only 3 to 4 cows (ADC 1993). While both cow numbers and milk production have increased (table 3), aided by high levels of government support, it wasn't until the early 1980s that there was any significant increase in fluid milk production. The boost to production was related to the local content scheme (BUSEP). As part of Indonesia's agreement with the International Monetary Fund, the BUSEP scheme was abolished on 1 February 1998¹.

37. Despite high levels of government support, average yields are relatively low, at around 3000 kilograms per cow (Directorate General of Livestock Services 1997). However, they are higher than those in Thailand which has a similar climate. By locating dairying in areas of relatively high altitudes Indonesia has been able to partially offset the effects of a warmer climate.

38. Almost all of the raw milk produced in Indonesia is used in the fluid milk sector with the remainder used to produce skim milk powder, mainly for household consumption (Stephan Issenmann, Nestlé, personal communication, July 1997). Indonesia also produces significant quantities of condensed milk using imported skim milk powder (table 4). Local production of skim milk powder began in 1985 and has been increasing steadily ever since. However, output remains well below actual drying capacity because of the relative expense of product made from local milk compared with imported substitutes. Until this factor is resolved, local production is unlikely to take up an increasing share of demand in coming years (ADC 1993).

Trade

39. The level of raw milk production has not been sufficient to meet the requirements of the fresh milk sector and other dairy processing industries, with almost 60 per cent of total domestic demand for

¹ Under the BUSEP scheme, the total volume of milk substitutes (liquid milk, milk powders, condensed milk and milk concentrates) that could be imported was determined in relation to total domestic production. The ratio of local milk to imported milk equivalent varied over time in line with changes in the supply capacity of local producers and domestic consumption trends (ADC 1993). When the scheme was introduced in 1982, the ratio of local to imported milk was set at 1:7. Prior to the elimination of the scheme the ratio was 1:1.7. Under the scheme, processors of locally produced milk earned certificates which entitled them to import milk substitutes. Processors could either import these products or sell the certificate to other processors (ADC 1993).

dairy products being met from imported inputs (Podbury et al. 1995). Imports of finished dairy products represent only a small proportion of total sales (ADC 1993).

40. The main import item is skim milk powder (table 5). Imports of skim milk powder decreased slightly in the late 1980s due to an expansion in local milk supplies and a very restrictive ratio of local production to imports under the BUSEP scheme, for example, 1:0.7 in 1989. However, import volumes recovered in recent years, as demand continued to outstrip local milk supplies and the BUSEP ratio was less restrictive. Only relatively small volumes of other dairy products are imported (table 5).

41. Until its removal in February 1998, the BUSEP scheme provided the main form of import protection in Indonesia. However, the WTO agriculture agreement established tariff quota arrangements for skim milk powder and whole milk powder and tariff only protection for whey powder, butter and cheese. As with many countries in Asia, applied tariff rates have been below bound rates, with applied rates being in the range of zero to 25 per cent in 1997 (table 7). In early 1998 applied tariffs were reduced to between zero to 5 per cent (Voboril, Bauer, Tilsworth and Hartono 1998).

Thailand

Consumption of dairy products

42. Per person consumption of dairy products in Thailand is high in comparison to Indonesia and China (figure 1). The most widely consumed products are UHT milk and sweetened condensed milk (ASEAN Focus Group Pty Limited 1995). Milk powders are also important products in consumption, mainly for use as an input into domestic manufacture of products such as infant formula, food drinks, soups and biscuits (ADC 1993).

Production

43. Prior to 1960, Thailand had no domestic dairy industry and demand was fully supplied by imports. The industry has grown since, aided by restrictions on imports and local content arrangements. Despite this growth, the average herd size on Thailand's 16 000 farms is low at around 30 cows. Average yields are also low at around 2100 kilograms per cow (ASEAN Focus Group Pty Limited 1995), reflecting an inefficient dairy industry.

44. Local content provisions apply to imports of milk and milk substitutes (butter oil, skim milk powder and whole milk powder). However, these provisions have not been rigidly enforced in recent years as demand has risen beyond quantities which could be supplied with strict adherence to the scheme. Instead, processors are allocated import licenses by the government on the basis of their record of past production and imports (Narong Luesakul, Managing Director, Thai Dairy Industry, personal communication, July 1997).

45. Further growth in milk production is likely to be limited by the relatively small size of most farm holdings, inadequate education, poor feed base, relatively weak production genetics and an unfavourable climate. In order to overcome some of these problems the Thai government has announced the Dairy Herd Development Scheme aimed at increasing the national herd by 65 000 cows over 5 years (1997–2001 (Vdom Photi, Deputy Director-General, Department of Livestock Development, personal communication, July 1997). Under the scheme, low interest loans will be provided for small-scale farmers

and about 40 000 dairy heifers will be procured for farmers. Around 30 000 heifers will be imported, while the balance will come from domestic stocks (Sindelar, Sakchai and Panida 1997). However, the severe depreciation of the baht in 1997 has delayed the implementation of the scheme.

46. Most raw milk produced is used in the production of fluid milk, primarily UHT milk. In addition, significant quantities of condensed milk are produced (table 4) using imported milk powders (ADC 1993).

Trade

47. Almost 80 per cent of the total domestic demand for dairy products is met from imported inputs (Podbury et al. 1995). The main imported products are milk powders (table 5). Imports of finished dairy products represent only a small proportion of total imports of dairy products because almost all are produced locally using imported ingredients. Imports of milk powders have grown rapidly in response to increased production of processed dairy products, with imports of whole milk powder doubling between 1990 and 1995.

48. In addition to the local content scheme mentioned above, import protection is provided through a tariff quota on skim milk powder and import tariffs on other products (table 7). However, for skim milk powder, actual imports in recent years have been above quota levels and have entered at actual tariffs of 5 per cent.

49. As part of its commitments under the WTO agriculture agreement Thailand has undertaken to eliminate the local content scheme (ADC 1993). In addition, tariffs on dairy products will be reduced, with butter and cheese facing the greatest reductions (table 7).

Outlook for dairy products

50. The current financial upheaval in Asia is expected to significantly affect consumption of milk and dairy products in Korea, Indonesia and Thailand in two ways. First, the large currency depreciation in these countries will increase the prices of both imported and import competing domestically produced products. Prices of domestically produced dairy products are also expected to increase since a large proportion of these products use imported inputs, for example, imported animal feed concentrates and imported milk powders for reconstitution into drinking milk as well as for the production of yoghurt and ice cream. Second, the reduction in economic growth will lower income growth and possibly lead to lower incomes in these countries. Facing higher prices and lower incomes, consumers are likely to reduce their consumption of non-staple and higher valued foods. As a result, consumption of milk, cheese, ice cream and other dairy products is expected to fall in 1998-99.

51. However, assuming that economic growth in these countries recovers in late 1999, consumption of milk and dairy products is expected to increase over the rest of the medium term, but at a slower rate than before the economic crisis.

52. In China imports are likely to fill the widening gap between supply and demand, especially if market access restrictions are liberalised as part of China's accession to the WTO. Import growth is likely to be strongest for milk powders, whey powder, butter and ice cream (ADC 1994a). However, the entry of multinational food companies may cause some uncertainty as to whether milk powders used as inputs to produce processed dairy products will be imported rather than finished products such as ice cream. In

1996, for example, Baskin Robbins bought a majority share in an established ice cream plant in China. This development is expected to reduce Baskin Robbins' imports of ice cream into China and boost local production (Fuell and Jianping 1997).

53. In Korea, reliance on imported UHT milk and skim milk powder is likely to increase in response to higher consumption of fluid milk. At present, Korea is just able to meet domestic milk needs from local production. Consumption of cheese also likely to grow, with most of the increase taken up by imports (Voboril and Kim 1997). In addition, industrial demand for skim milk powder is expected to rise in response to strong growth in the food processing sector. It is likely that additional imports will be required to meet this demand.

54. With economic recovery expected in both Indonesia and Thailand in late 1999, total consumption of drinking milk, cheese, condensed milk and ice cream is forecast to increase over the remainder of the medium term. Domestic supplies are unlikely to meet all of this increase, therefore there will be an ongoing need for imported dairy products such as skim milk powder, butter oil and speciality cheese.

55. Potential for import growth in all four countries will be influenced by government policies which are gradually liberalising imports. In particular, local content arrangements have already been removed in Indonesia (BUSEP) and are to be removed in Thailand. In Indonesia, the removal of the BUSEP scheme and the lowering of tariffs on imported dairy products are likely to have only a minimal influence on imports in 1998-99. The currency depreciation has caused import prices to rise sharply, while lower incomes are further discouraging milk and dairy consumption. However, over the remainder of the medium term period, the changes in Indonesian dairy trade policies are expected to boost dairy imports. In Thailand, where local content arrangements have been less rigidly enforced, actual imports of milk powders in recent years have been above quota levels and have entered at tariffs of 5 per cent. If this practice is continued, imports are likely to increase as consumption recovers.

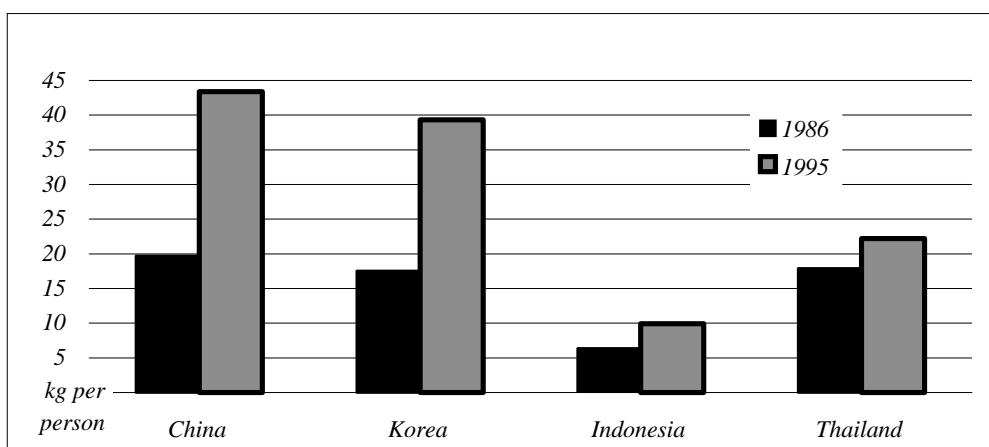
56. In Korea, the proposed extension of the shelf life for UHT milk could lead to increased imports. In addition, import access for other dairy products will improve slightly as tariff quotas are increased. However, for skim milk powder and whey powder, imports have been above the minimum access quota, with the applied tariff being relatively low (tables 5 and 7).

Meats

Consumption trends

57. Although the base levels of consumption are low, meat consumption per person in China, Korea, Indonesia and Thailand has grown considerably since the mid-1980s (figure 2). Consumption patterns, however, have remained relatively unchanged in these countries, with pork and poultry remaining the strongly preferred meats compared to beef and sheep meat.

Figure 2: Meat consumption per person



Source: ABARE.

58. To a large extent, the increase in the consumption of most meats in these countries has been met by rising domestic production, rather than increases in meat imports. While meat production in all four countries has been supported by government policies, the significant growth in some meat sectors, particularly poultry, has been driven largely by the expansion of large scale commercial farms and intensive livestock operations.

China

Consumption of meats

59. Meat has always been a significant source of protein in the Chinese diet. Pork is the dominant meat consumed, followed by poultry, beef and sheep meat (table 8). This is partly because of the strong Chinese preference for pork (Dyck 1993). Also, pork prices are significantly lower than prices of beef and sheep meat (Heng 1997). However, meat consumption differs between regions. For example, in the western regions, beef and mutton are easier to obtain and so consumption of these meats is higher than in other regions; in the coastal provinces seafood consumption is relatively higher than meat consumption; while in the southern provinces poultry is the dominant meat consumed because of the large number of intensive poultry farms in this region (Heng 1997).

60. Since the mid-1980s China's meat consumption per person has increased by 120 per cent (figure 2). However, growth in consumption has varied between the different meats and, with the exception of pork, consumption per person of individual meats is relatively low. In addition, growth in meat consumption is more rapid in some areas such as the coastal provinces which are experiencing greater economic development, urbanisation and income growth than other regions (Heng 1997).

Table 8. Meat consumption

kilo tons

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
China												
Pork	17 767	18 149	20 006	21 025	22 573	24 255	26 236	28 394	31 867	36 257	39 752	40 255
Poultry ^a	1 851	1 982	2 676	2 795	3 187	3 959	4 556	5 800	7 642	9 582	11 196	12 900
Beef	563	759	904	1 015	1 101	1 313	1 729	2 184	3 199	4 062	4 870	5 345
Sheepmeat	620	715	799	961	1 065	1 176	1 247	1 363	1 649	2 014	2 297	2 595
Total	20 801	21 605	24 385	25 796	27 926	30 703	33 768	37 741	44 357	51 912	58 115	61 095
Korea												
Pork	411	478	545	605	648	655	750	786	811	848	895	895
Poultry ^a	151	165	193	179	203	240	269	277	308	345	356	359
Beef ^b	211	219	202	205	253	319	324	333	385	430	461	519
Sheepmeat ^c	4	6	12	12	9	7	13	9	8	10	7	na
Total	777	866	932	1 001	1 113	1 224	1 365	1 427	1 512	1 633	1 719	1 768
Indonesia												
Pork	413	418	462	495	545	572	589	622	649	671	699	na
Poultry ^a	341	379	403	437	473	520	529	687	748	748	748	na
Beef ^b	262	241	218	261	262	286	330	445	378	398	359	na
Sheepmeat ^c	78	79	77	82	83	84	87	112	114	95	97	na
Total	1 094	1 117	1 160	1 275	1 363	1 462	1 535	1 866	1 889	1 912	1 903	na
Thailand												
Pork	276	325	333	334	336	339	342	350	315	301	301	na
Poultry ^a	357	369	402	430	436	466	505	528	627	675	723	na
Beef ^b	226	228	228	234	244	250	253	267	350	354	360	na
Sheepmeat ^c	1	1	1	1	1	1	2	1	1	1	1	na
Total	860	923	965	1 000	1 017	1 056	1 102	1 146	1 293	1 331	1 385	na

a For China and Korea poultry includes chicken (or broiler), duck and other poultry meats. For Indonesia and Thailand poultry refers to chicken meat. b Includes buffalo meat for Indonesia and Thailand. c Includes goat meat for Indonesia and Thailand. na not available
Sources: FAO (1998); USDA (1990, 1991, 1993a, b, 1997b).

61. Meat consumption has also grown in China due to the implementation of several government reforms which has led to an increase in the availability of meats. In particular, since the early 1980s the government has taken steps to reform the urban food rationing system and eliminate price subsidies for specific food items in urban areas. Meat markets were gradually liberalised and prices became more determined by market forces (Webb 1993). However, the government can still intervene in the market to stabilise prices. In mid-1995, for example, some municipalities reintroduced controls on pork retail prices.

Production

62. Meat production has been growing by 9 per cent per year on average since 1987. Growth in meat production has been significantly influenced by reforms associated with China's gradual transformation from a centrally planned to a more market oriented economy.

63. From the 1950s through the 1970s the government tightly controlled the production and distribution of almost all commodities to ensure low food prices for urban residents. Agricultural producers were required to meet compulsory quotas, while commodity prices were set below world market levels. However, in the early 1980s, the government shifted decision making in production from State controlled communes to individual farmers (Webb 1993). The government also allowed farmers to sell their surpluses after meeting their quota obligations, set higher State procurement prices for meats and

allowed market forces to determine meat prices. Farmers, were thus given greater incentives to increase production.

64. Although the government has allowed a greater role for market forces, there is still a strong emphasis on self-sufficiency in pork. Support to the pork industry is provided by subsidising feed inputs for some small producers and by allowing the State owned pork processing industry to operate at a loss (Hayes and Clemens 1997). Though its share in total meat production has declined, pork remains the dominant meat produced in China (table 9).

Table 9. Meat production

kilo tons

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
China												
Pork	17 790	18 349	20 176	21 228	22 808	24 523	26 353	28 544	32 048	36 484	40 000	40 500
Poultry ^a	1 879	2 040	2 744	2 840	3 229	3 952	4 540	5 736	7 550	9 347	10 746	12 500
Beef	589	793	958	1 072	1 256	1 535	1 803	2 337	3 270	4 154	4 946	5 400
Sheepmeat	622	719	802	962	1 068	1 180	1 250	1 373	1 650	2 015	2 300	2 600
Total	21 050	21 901	24 680	26 102	28 361	31 190	33 946	37 990	44 518	52 000	57 992	61 000
Korea												
Pork	412	483	554	622	649	639	771	793	796	820	878	896
Poultry ^a	151	165	173	179	203	240	275	297	306	339	348	335
Beef ^b	215	213	181	129	136	141	142	185	210	221	248	339
Sheepmeat ^c	3	3	1	1	1	1	1	3	0	0	0	0
Total	781	864	909	731	989	1 021	1 184	1 278	1 312	1 380	1 483	1 570
Indonesia												
Pork	412	418	462	495	544	572	588	621	649	671	699	na
Poultry ^a	341	379	403	437	473	520	528	688	747	747	747	na
Beef ^b	239	216	192	227	223	240	280	398	324	334	343	na
Sheepmeat ^c	78	79	77	82	83	84	86	111	113	94	96	na
Total	1 070	1 091	1 134	1 241	1 323	1 415	1 483	1 818	1 834	1 845	1 885	na
Thailand												
Pork	276	325	333	334	337	340	342	350	315	301	301	na
Poultry ^a	431	464	498	538	575	630	680	685	780	825	860	na
Beef ^b	226	227	228	234	243	249	252	264	349	353	359	na
Sheepmeat ^c	1	1	1	1	1	1	2	1	1	1	1	na
Total	933	1 018	1 060	1 108	1 157	1 221	1 276	1 301	1 445	1 480	1 521	na

^a For China and Korea poultry includes chicken (or broiler), duck and other poultry meats. For Indonesia and Thailand poultry refers to chicken meat. ^b Includes buffalo meat for Indonesia and Thailand. ^c Includes goat meat for Indonesia and Thailand. **na** not available
Sources: FAO (1998); USDA (1990, 1991, 1993a, b, 1997b).

65. Eighty per cent of China's pig farms are still considered small scale, subsistence based family farms which use 'low cost technologies' to raise animals. In these farms, farmers traditionally use agricultural residues and by-products (such as rice and corn husks, potato vines, water lilies) as animal feeds. Though some use commercial feeds such as maize, barley and soyabean meal, they usually switch back to using agricultural residues if the prices of commercial feeds become too high (Fuell 1997). However, current government plans and foreign joint ventures are increasing the integration and commercialisation of the sector. These joint ventures are also improving pig production technology and increasing the production of lean pork to meet the preferences of urban consumers (Sindelar 1995).

66. As the sector becomes more commercialised, production becomes more dependent on feed grains and commercial feeds. Further growth in pork production may therefore be constrained by the availability and prices of these feeds. As part of its policy of conserving grain resources, the government

has begun redirecting development programs and providing subsidies to the beef, sheep and poultry sectors (Sindelar 1995; Crook 1996). These sectors have been selected as cattle and sheep can utilise pastures, while poultry are more efficient converters of grain to meat.

67. Annual growth in poultry production has averaged 16 per cent per year over the past decade. China currently ranks as the third largest producer of poultry meat in the world, but it is projected to become the second largest after the United States (Instate Pty Ltd 1995). The provinces of Guangdong, Shandong and Jiangsu are the top three producers of poultry meat.

68. Poultry production has grown rapidly due to the Chinese government's encouragement of large scale, commercial and intensive poultry farm operations. These operations tend to be partially owned by foreign companies, are vertically integrated to feed mills and meat processing plants and take advantage of economies of size. They also adopt modern technology in breeding, raising, slaughtering and processing the birds.

69. As with pork, further expansion in the poultry sector will be constrained by the availability and prices of feed grains. In 1995, China's main poultry producing provinces were already affected by maize shortages, which were exacerbated by internal trade restrictions between provinces (Reynolds 1995). In addition, State run mills produce poor quality feed (Instate Pty Ltd 1995). The feed constraint is compounded by the type of poultry being raised. In particular, native poultry, which are preferred by Chinese consumers, are less efficient feed converters than Western breeds, which are preferred in China's export markets such as Japan. Other constraints to further growth include inadequate animal health products and inefficient management practices (Instate Pty Ltd 1995).

70. In 1996, China became the third largest producer of beef in the world. Crossbreeding of imported foreign breeds with native breeds, combined with improvements in production technology, is increasing the production and quality of beef. Nevertheless, cattle are still predominantly raised in small farms and fed with straw and other agricultural residues before being sold to finishing lots. Cattle in these operations are also traditionally used as draft animals and slaughtered when they are older. As a result, the beef from these animals is often low quality.

71. Although production technology is improving, the lack of technical and commercial management skills of cattle operators, poor quality genetics and inadequate feed are constraining the growth of beef production.

Trade

72. China is a net exporter of both pork and beef (table 10). Its main export markets include other countries in East Asia and countries in the Former Soviet Union. China imports small volumes of beef, usually for hotels and restaurants. China also imports live cattle and other live animals mostly for breeding purposes.

Table 10. Meat trade

kilo tons

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
China												
<i>Imports</i>												
Poultry a	na	0	24	49	68	130	174	240	344	625	900	950
Total b	na	0	24	49	68	130	175	242	347	630	900	950
<i>Exports</i>												
Pork	193	200	170	203	235	268	117	150	181	230	250	250
Poultry a	28	58	92	94	110	123	158	176	252	390	450	550
Beef	26	34	54	57	155	222	75	155	74	95	79	60
Total b	250	296	319	355	503	617	353	491	508	718	779	860
Korea												
<i>Imports</i>												
Pork	0	0	0	0	3	23	0	0	32	44	50	79
Poultry a	0	0	0	0	0	0	0	0	0	7	11	20
Beef	0	0	14	83	117	184	190	141	172	211	210	216
Sheep meat	14	16	26	26	23	18	25	17	14	15	12	na
Total b	14	16	40	107	143	225	215	158	218	277	283	315
<i>Exports</i>												
Pork	1	4	10	15	7	5	11	15	14	18	47	66
Sheep meat	14	16	25	26	22	19	20	23	0	0	0	0
Total b	15	20	35	41	29	24	31	38	14	18	47	66
Indonesia												
<i>Imports</i>												
Beef b	1	1	1	1	1	2	3	3	5	7	16	na
Total d	1	1	1	1	1	2	3	3	5	7	16	na
Thailand												
<i>Exports</i>												
Poultry a	74	95	96	108	139	164	175	157	153	150	137	na
Total d	74	95	96	108	140	166	175	157	153	150	137	na

a For China and Korea poultry includes chicken (or broiler), duck and other poultry meats. For Indonesia and Thailand poultry refers to chicken meat. **b** Includes buffalo meat for Indonesia and Thailand. **c** Includes goat meat for Indonesia and Thailand. **na** not available
Sources: FAO (1998); USDA (1990, 1991, 1993a, b, 1997b).

73. China is a net importer of poultry meat and currently ranks as the third largest importer in the world (Jin 1997). Imports are mainly in the form of chicken parts, such as feet, which are strongly demanded by Chinese consumers (USDA 1997c). In recent years, however, China has become a significant exporter of poultry meat to Japan, in competition with Brazil, Thailand and the United States. China's lower labour costs and proximity to Japan are enabling it to compete successfully in the Japanese market.

74. In general, meat imports are constrained by the current high tariffs applying to meat imports (table 12), import licensing requirements and poor distribution channels for imported meat.

Table 11. Trade in live animals

kilo tons per head

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Indonesia											
<i>Imports</i>											
Pigs	1	1	–	5	1	0	4	0	–	0	0
Poultry a	2 294	1 988	621	446	426	339	239	2 268	1 825	2 066	1 590
Cattle b	11	22	22	15	11	8	39	43	81	254	408
<i>Exports</i>											
Pig	1	4	25	66	160	284	212	185	163	170	171
Poultry a	60	244	929	617	824	428	807	780	802	1 845	2 406
Thailand											
<i>Imports</i>											
Pig	1	3	4	2	1	12	1	11	3	1	2
Poultry a	2 647	3 563	5 260	2 732	2 338	2 545	3 392	1 620	2 008	3 084	3 330
Cattle b	2	9	10	24	24	25	17	32	14	6	3
<i>Exports</i>											
Pig	55	13	1	1	–	0	–	–	1	–	1
Poultry a	1 809	1 522	1 520	540	1 908	1 664	1 942	2 130	2 319	2 651	1397
Cattle b	0	1	1	1	1	1	5	12	16	18	21

a only refers to chicken (or broiler). **b** Includes beef and buffalo. – Less than 500 head.

Sources: FAO (1998).

Korea

Consumption of meats

75. Seafood (particularly fish) has been the major source of animal protein in Korea. However, in recent years, the share of meats (with the exception of sheep and goat meat) in total protein consumption has been increasing, while the share of seafood has been declining (Reynolds, Shaw, Lawson, Clark, Hamal, Bui-Lan and Baskerville 1994). Meat consumption per person has increased by **91 per cent** over the period 1986 to 1995 (figure 2), mainly driven by the rapid rise in income per person and increasing urbanisation.

76. As in China, growth in consumption per person varies between meats and has come from low base levels. Pork is the dominant meat consumed followed by beef and poultry with roughly similar shares (table 8).

Table 12. Tariff arrangements for meat

	China ab		Korea		Applied d	
	Applied c		WTO commitments			
	%		1995	2004		
			%	%	%	
Live animals						
- Cattle	0-10 e		44.5-99 f	40-89.1 f	na	
- Poultry	0-10 e		10	9	na	
- Pigs	0-10 e		23.7	18	na	
- Sheep or goats	0-10 e		na	na	na	
Lightly processed meats						
- Beef	45		44	40	43.8 f	
- Poultry meat	20		35	20	29 f	
- Pig meat	20		37	25	32.2 f	
- Sheep or goat meat	23		na	na	na	
Highly processed meats						
- Beef	na		80	72	na	
- Poultry meat	na		80	72	na	
- Pig meat	na		60	27-54 g	na	
- Sheep or goat meat	na		na	na	na	
Indonesia						
	WTO commitments		Applied c	Thailand		
	1995	2004		1995	2004	
	%	%	%	%	%	
Live animals						
- Cattle	45	40	0-10 h	0-40 h	30 h	0-40 i
- Poultry	45	40	0-10 h	0-40 h	30 h	0-40 i
- Pigs	45	40	0-10 h	0-40 h	30 h	0-40 i
- Sheep or goats	45	40	0-10 h	0-40 h	30 h	0-40 i
Lightly processed meats						
- Beef	70	50	20-25 j	60	50	60
- Poultry meat	70	50	15-20	60	30	60
- Pig meat	70	50	20	60	30-40 k	60
- Sheep or goat meat	70	50	20	50	30	60
Highly processed meats						
- Beef	100 l	40	15-25	60 m	40 n	45 o
- Poultry meat	100 l	40	20	30 pq	27 qr	45 o
- Pig meat	100 l	40	15-25	60 m	30 s	45 o
- Sheep or goat meat	100 l	40	15-25	na	50 tu	45 o

a MFN tariff rates. General rates are 30 per cent. **b** China is not currently a member of the WTO and therefore does not have bound tariffs. **c** Actual tariff rates in 1996 for Indonesia and Thailand; Actual tariff rates in 1997 for China. **d** Actual tariff rates applied from 1 July 1997. **e** Zero tariff for breeding animals. **f** Cattle for breeding purposes: 1995 99 per cent, 2004 89.1 per cent. **g** Highly processed pig meat in airtight containers: 54 per cent in 2004; other 27 per cent in 2004. **h** Zero tariff applies if live animals are used for breeding purposes only. **i** Zero tariff for breeding, 40 per cent or 10 per cent for non-breeding. **j** 20 per cent for frozen, 25 per cent for fresh and chilled. **k** 30 per cent for carcasses and half carcasses (fresh or chilled); hams, shoulders and cuts thereof, bone in (fresh or chilled); 40 per cent for carcasses and half carcasses (fresh or chilled); hams, shoulders and cuts thereof, bone in (frozen). **l** Fresh, chilled or frozen sausages 45 per cent in 1995. **m** 60 per cent or 50 Baht per kg. **n** 40 per cent or 33.5 Baht per kg. **o** 45 per cent or 37.5 Baht per kg. **p** 30 per cent or 20 Baht per kg. **q** For pig meat not in airtight containers 60 per cent or 50 Baht per kg in 1995; and 30 per cent or 25 Baht per kg in 2004. **r** 27 per cent or 18 Baht per kg. **s** 30 per cent or 25 Baht per kg. **t** 50 per cent or 41.7 Baht per kg. **u** Sausages and similar products 30 per cent or 25 Baht per kg. **na** Not available.

Source: GATT (1994); Hong (1996); Jin (1997); Zhihong (1998); Fuell and Jianping (1998)

77. Pork prices are lower than beef prices (table 13), which partly explains the high level of pork consumption relative to beef. However, poultry is also relatively cheaper than both pork and beef. It has also been estimated that the income elasticities of pork and beef are 1.09, while the income elasticity for poultry is 0.42 (Reynolds et al. 1994). This implies that consumers will increase their demand for pork and beef proportionately more than poultry when their incomes rise.

Production

78. Livestock industries in Korea are heavily influenced by government production policies, and this is likely to continue under the Agricultural Adjustment Program. This program is aimed at preparing the agricultural sector for trade liberalisation and involves public expenditure totalling US\$62 billion. Under this program, public expenditure has been extensive in the pig industry since the government considers it as one industry in which Korea can become internationally competitive.

79. Pork is the dominant meat produced (table 9) and has become Korea's most advanced livestock industry. Production is becoming increasingly integrated (Ban 1995) and farm size is increasing. For example, the average number of pigs per farm has increased from 14 in 1987 to 188 in 1996 (Ban 1995; Ban and Voboril 1997). Strong demand for pork has resulted in high prices and record pig numbers. However, the industry is still inefficient by world standards: in 1995, pork production costs were US\$0.77/lb, compared with US\$0.40/lb in the United States (Ban 1995).

80. Korean poultry production in general is becoming increasingly commercialised. The government is supporting the development of vertically integrated poultry production facilities, or 'complexes', which are designed to take advantage of economies of scale and have a minimum flock of 30 000 birds. In 1992, 20 per cent of poultry production came from integrated farms. The government expects that these enterprises will account for 60 - 70 per cent of production by 2000. However, the poultry industry is facing several problems in increasing production. Disposal of waste water is a major environmental problem, and is subject to strict guidelines, while an increase in fowl diseases is being caused by producers being too slow to adapt to new production systems (Voboril and Choi 1995).

81. Beef production in Korea is characterised by very small scale enterprises with high costs of production. In 1995, only 3 per cent of Korean native cattle (Hanwoo) production was sourced from herds of more than 100 head, and the average herd size was only 4.4 head (Ban 1995). Traditionally, Korean cattle were intensively fed on forage based rations (rice bran and other vegetable matter). However, due to the limited availability of land suitable for forage production, cattle have been increasingly grainfed in feedlots, largely with imported feed grains (Reynolds et al. 1994).

Trade

82. The rapid growth in demand for beef, combined with a small and inefficient domestic beef industry, has led beef consumption to outstrip production in recent years. As a result beef has accounted for about 70 per cent of Korean meat imports in recent years (table 10). The government has been using beef import quotas as a tool to control domestic beef prices. However, beef imports are increasing as minimum market access levels under the WTO agriculture agreement rise from 167 thousand tonnes in 1997 to 225 thousand tonnes in 2000. Beef import quotas will be replaced by a tariff of 41.2 per cent in 2001, with the tariff rate being reduced to 40 per cent in 2004.

83. There are two avenues for beef imports into Korea: selling to the government-administered Livestock Products Marketing Organisation (LPMO), or through the Simultaneous Buy and Sell (SBS) system. Imports through LPMO are purchased under an open tender system and then sold on the wholesale market. Imports under the SBS system, however, are negotiated between sellers and 'supergroups', who represent end-users such as hotels and restaurants. Prices determined under this system are subject to a government-determined 'mark-up', to ensure imported beef prices do not undercut wholesale market prices. Under WTO commitments, the maximum mark-up is to fall from 40 per cent in 1997 to zero in 2000. In addition, the proportion of total imports subject to the SBS system is to rise from 50 per cent in 1997 to 70 per cent in 2000, with no restrictions on the SBS share after 2000.

84. In addition to import quotas, Korea currently imports only small quantities of chilled beef, with the lack of adequate infrastructure to handle chilled beef being a major constraint. In order to facilitate chilled beef imports, the necessary infrastructure to handle chilled beef will need to be established at all stages of the transport and handling process, including at ports and retail outlets to ensure that the quality of chilled beef is maintained until it reaches the final consumer. In addition, appropriate customs clearance procedures will need to be established in order to prevent unnecessary delays.

85. Prior to July 1997, pork and poultry imports were subject to tariff quotas, with any imports over the quota made at the discretion of government. Since July 1997, however, pork and poultry import quotas have been tariffed. However, as a result of the currency devaluation, wholesale prices of both pork and poultry have not fallen after liberalisation.

86. Korea has exported a small, but increasing, amount of pork, mostly to Japan, in recent years. This is a reflection of the efficiency gains made in Korean pig meat production of late. However, the government also provides a quality improvement incentive of 5000 to 7000 won per head to farmer. The incentive will be abolished in 2 - 3 years.

Indonesia

Consumption of meats

87. Meat makes up a small proportion of total food consumption in Indonesia. Seafood (particularly fish) is more abundant and relatively cheaper than all types of meat in Indonesia (David McKinna et al. Pty Ltd 1995), making it a more affordable source of protein for most consumers. However, in recent years there has been a trend toward higher consumption of meat per person. Although the base levels of consumption are low, the total amount of meat per person consumed has grown considerably since the mid-1980s (figure 2). While the rate of consumption growth has been different for each meat type, poultry and pork have remained the dominant meats consumed (table 8).

88. The rapid growth in meat consumption has been driven mainly by the continuing increase in the population combined with rising average incomes and rapid urbanisation (table 1). However, economic growth has coincided with increased relative inequality during the past 20 years (Warr 1996). If it is assumed that a significant proportion of the Indonesian population had low base income levels, it is likely that only a relatively small proportion of the population has been able to increase their meat consumption significantly.

89. The relatively high consumption of poultry and pork can be partly attributed to differences in the relative prices of meats, as pork and poultry are cheaper than beef (table 13). These prices are influenced

by Indonesia's comparative advantage in producing these meats and the existing distribution channels, marketing and processing stages. For example, domestic beef is relatively more expensive in Indonesia due to the ability of distributors to dictate beef prices (Hartono 1995). In addition, tariff and non-tariff barriers directly affect meat prices, while production subsidies can have an indirect effect on meat prices through the impact on production of the various meats. The Indonesian government also intervenes directly in the market to stabilise general meat prices (Trewin 1996).

90. Religion and the ethnic background of the population are also important factors influencing meat consumption. Islam, the main religion in Indonesia, discourages pork consumption. However, Indonesia's large Chinese population has contributed to a relatively high aggregate pork consumption.

Production

91. Over the past decade, meat production has grown by 5 per cent per year on average. Although production of all meats has increased since 1986 (table 9), poultry production has grown more rapidly than the other meats. Growth in meat production was influenced by government policies and projects on livestock development, some of which are supported by foreign aid.

92. Meat production takes place in three systems: household, family or small scale farms; private enterprises (more commercial, intensive, large scale operations); and nucleus farming. The nucleus farming system is usually a cooperative arrangement between private enterprises (the nucleus) and household farmers (Directorate General of Livestock Services 1995). In this system the nucleus usually provides farm supplies and carries out meat processing and marketing, while the farmers raise the animals. The government encourages the nucleus system because it encourages the rapid transfer of livestock production technology, improves meat marketing and reduces the large capital constraint household farmers face in livestock production. Nevertheless, the government also supports small household farmers by providing subsidised credit programs for the purchase of breeding stock (for example, imported cattle) and other inputs. The government also provides marketing and veterinary services, training programs in raising livestock, and builds infrastructure such as slaughterhouses.

93. Meat production is not fully modernised. Production is dominated by small farmers who own 90 per cent of domestic livestock animals. However, large scale, commercial, integrated farms are expanding their operations, particularly in the poultry and pork sectors. It is this expansion that has led to the strong growth in poultry and pork production and has led to the sectors' growing dependence on maize and other feeds such as soyabean meal.

94. Further growth in these sectors will depend on the availability and price of feed. At present imported maize prices are quite high due to poor port facilities and low unloading capacities (Mulyo, S., Assistant to the State Minister for Food Industry, personal communication, June 1997).

95. In contrast to pork and poultry production, beef production has not been able to keep up with consumption (tables 8 and 9). Growth in the beef sector has been constrained by limited land availability and the short supply of forage (Dyck 1993). In addition, cattle are predominantly raised by many small farmers who lack the technical skills and financial resources to maintain the breeding and/or feeding programs needed to achieve the quality and weight specifications required by feedlots (Riethmuller and Smith 1994).

96. Cattle raised on small farms are usually fed in communal pastures, forests or harvested rice paddies and fed with agricultural residues and by-products. Some of the cattle raised by small farmers are

also used as draft animals in paddy field crops before they are retired, sold off and slaughtered (Sakchai 1996a; Directorate General of Livestock Services 1995). As a result, meat from these older slaughtered cattle is usually of lower quality.

97. There are a small number of large private feedlots in Indonesia. Feedlots may purchase cattle from small farmers, but the larger feedlots have been increasingly importing live feeder cattle in recent years. Feedlots have expanded due to the availability of low cost feed in the form of industrial by-products from food processing industries. Initially these by-products were perceived as virtually 'free' resources since little or no alternative use existed for them. Using these by-products as feed for fattening cattle was seen as a low cost way of adding value to cattle. As a result, feedlots located at or near the source of the various 'green wastes' were established.

98. To a certain extent the government has supported small farmers in raising cattle. In particular, the government provides small farmers with training in cattle raising and subsidised credit to import live cattle. The government also encourages large cattle importers (private enterprises) to assist and cooperate with small farmers to raise imported cattle (Boughton 1995; Directorate General of Livestock Services 1995). In addition, the government has projects to encourage small farmers to raise cattle in Indonesia's less populated islands.

Trade

99. Most of the meat produced in Indonesia is consumed domestically. As a result, Indonesia does not export significant volumes of meat. However Indonesia has been importing increasing volumes of beef (table 10) and is a net importer of live poultry and live cattle. Since 1987 Indonesia has shifted from being a net importer to a growing net exporter of live pigs (table 11). Live animals are usually imported for breeding, but 80-90 per cent of live cattle imported have been for fattening.

100. Prior to the financial crisis the strong preference for live cattle imports was partly because of the availability of low cost feed, the low labour costs for value added activities (Rae 1995) and government policies which are designed to develop local livestock production and increase the incomes of small farmers. Import tariffs also encouraged imports of live cattle (and other live animals) over processed beef (and other meats). For example, before the financial crisis the applied tariff rate on live cattle imported for slaughter was 10 per cent while live breeding cattle had a zero tariff rate reflecting the government's objective to develop Indonesia's own beef industry. In contrast, the applied tariff rate on fresh, frozen and chilled beef imports was 20 to 25 per cent (table 12). Aside from government and trade policies, there are still large rural areas which do not have adequate infrastructure to handle, store or transport imported meats, while a large percentage of consumers in rural areas do not have refrigerators. Eighty to ninety per cent of meats are sold in traditional 'wet markets', where livestock are usually slaughtered at the market and sold on the same day, removing the need for storage and refrigeration facilities. In addition, consumers have a strong preference for freshly killed meat (USDA 1996a; Fuell 1997) and are required to eat Halal slaughtered meat, consistent with Muslim law.

101. Non-tariff barriers are in place which may restrict meat imports. In particular, the Indonesian government usually issues import licenses or permits for livestock imports. These are issued according to the Indonesian authorities' estimates of import requirements and imported meat may only go to supermarkets and hotels (David McKinna et al. Pty Ltd 1995). Also, any imported meat claimed to be Halal slaughtered must meet Indonesian requirements for Halal slaughter.

Thailand

Consumption of meats

102. Meat consumption patterns in Thailand closely follow those in Indonesia. As in Indonesia, seafood is relatively cheaper and is an affordable source of protein. Nevertheless, meat consumption has been growing rapidly (table 8), driven by strong economic growth leading to an increase in disposable incomes and urbanisation. However, Thailand's economic growth over the past 20 years has coincided with increased relative inequality (Warr 1996). Therefore a significant proportion of the population still have low incomes, limiting the growth in total meat consumption.

103. Poultry is the dominant meat consumed, partly because of its lower price relative to beef and pork (table 13). Pork consumption, however, is also relatively high due to Thailand's large Chinese population. Beef consumption is discouraged by Buddhism, the main religion in Thailand.

104. Government policies indirectly affect meat prices through their influence on the availability, processing, distribution and marketing of meat. The government also implements direct price controls on specific meats. Price controls on pork, for example, are usually in effect during peak demand periods.

Production

105. Meat production in Thailand has many similarities to meat production patterns in Indonesia. Small farmers raise 90 per cent of livestock animals. There is, however, an increasing trend towards more integrated, modernised large scale operations, particularly in the pig and poultry industries.

106. As in Indonesia, poultry is the main meat produced. While total meat production has grown by 4.6 per cent per year on average from 1986 to 1996, poultry production has grown at an average rate of 7 per cent annually during the same period. Thailand's poultry industry has evolved from small scale operations to vertically integrated, highly intensive, large scale operations. Most of the large scale poultry operations are engaged in importing breeding stock, feed supplements and medicines; manufacturing their own feed; operating their own slaughterhouses and packaging facilities; and handling the distribution and marketing of their products to both local and foreign markets. Many large operators also contract smaller farms to raise poultry, with the large operators providing advice, veterinary services and feed inputs to their contract farmers (Instate Pty Ltd 1995).

107. Traditionally Thailand has had a comparative advantage in poultry meat production, particularly in deboned and finished poultry products, due to relatively low labour costs. However, in recent years the Thai poultry industry has been facing rising labour and land costs (particularly in Bangkok and other developed areas), higher chick prices, partly caused by poultry cartels controlling chick prices, increased environmental problems and higher feed costs due to import barriers on feed ingredients and other feed policies (Sakchai 1996b, 1997). The government, however, has taken several steps in addressing these problems. Through a series of tax exemptions and reductions, the government has given incentives to the large poultry companies to relocate their plants to less populated regions. The government has also increased its import quota for maize and has abolished quotas and reduced tariffs on soyabean meal. In addition, the government has allocated loans to chick producers to expand their breeding operations and increase chick supplies. Nonetheless, some Thai companies have already relocated some of their operations to China where production costs are relatively lower.

108. In the pig sector, the government has implemented some policies which are detrimental to the development of the industry. Government regulations, for example, have included public ownership of most pig slaughterhouses, license permits for pig slaughtering and restrictions on the marketing of carcasses in different areas (Poapongsakorn 1985; Rae 1992; Giordano and Raney 1993; FAO 1996). Such policies and regulations have given carcass wholesalers substantial market power in both buying and selling, creating inefficiencies in the market by their ability to affect the prices received by producers and paid by consumers (Poapongsakorn 1985). In addition, taxes on pig slaughter have constrained the development of the pork sector (Giordano and Raney 1993).

109. Aside from government policies, other factors that may constrain growth in the pig sector include increasing feed and labour costs; growing concern about environmental problems and occasional uncontrolled disease outbreaks (Sakchai 1996a). To a certain extent, these problems combined with the government policies have led to the gradual decline of the share of pork in total meat production from 30 per cent in 1986 to 20 per cent in 1995 (table 9).

110. Cattle are mostly raised by small farmers, with some cattle being used as draught animals to work in the fields. Land and forage constraints, combined with the lack of cattle management skills of small farmers, are the main factors constraining growth in this sector. To address these problems and boost cattle production the Thai government has started converting former rice and cassava fields in the northern region into pasture lands. In addition, cattle producers were provided subsidised loans for the acquisition of breeding cattle and the construction of animal housing (FAO 1996). However, due to the limited growth in beef consumption in recent years, many beef cattle operators have either closed down or scaled down their operations (Sakchai 1996a).

Trade

111. Thailand has largely been self sufficient in all meats. Thailand's high demand for poultry meat is met by an efficient poultry industry. In addition, there is a strong preference for fresh meats among Thais, with 90 per cent of meats still marketed in wet markets, while imported meats are only available in supermarkets, hotels and restaurants. As in Indonesia, there are still large rural areas which do not have adequate infrastructure to handle, store or transport imported meats.

112. The influence of tariffs (table 12) and non-tariff barriers on Thailand's meat imports appear to be minimal, except perhaps on pork imports. As mentioned previously, controls on pork prices are usually implemented during peak periods. The government usually threatens to relax sanitary and phytosanitary regulations or reduce tariff rates on meat imports to encourage producers to restrain price increases (WTO 1995; Sakchai 1996a).

113. Although live pigs, poultry and cattle are exported to other Asian countries Thailand has been a net importer of these live animals since 1986. A large proportion of these live animal imports have been for breeding purposes. Live poultry imports peaked during the mid-1980s around the same time poultry production began outgrowing poultry consumption in Thailand. At around this time Thai feed companies in joint ventures with Japanese investors embarked on a rapid phase of modernising and integrating poultry operations to produce poultry meat for export (Instate Pty Ltd 1995). Part of this modernising phase included importing large numbers of live poultry from the United States to be used as parent stock.

114. As a result of this modernisation, Thailand became a major exporter of poultry, with Japan its main export market. However, in recent years, Thailand's exports have been declining due to increasing consumption. In addition, lower cost producers like Brazil and China have been increasing their share in

the Japanese poultry markets. To overcome these problems, Thai exporters have been developing and exporting more highly processed poultry products to Japan. The government also provides a refund on feed ingredient import duties when these feed inputs are used to produce poultry for export purposes only (Sakchai 1996b).

The outlook for meat

115. Although meat consumption in the four Asian countries is expected to increase in the longer term, the rapid growth in meat consumption experienced during the past decade is not expected to continue in the next two years. While China has so far remained largely unaffected by the current Asian economic crisis, Korea, Indonesia and Thailand are expected to experience reduced or negative income growth over the next two years. In addition, the large currency depreciations in these countries has increased both imported and domestic meat prices. Since Asian consumers' demand for meats are relatively sensitive to both income and price changes, in the short term consumers in these countries are expected to either lower their overall consumption of meat by substituting lower priced seafood, or substitute domestically produced meats, such as pork and poultry, for imported meats such as beef (US Department of Agriculture 1998). For some of these countries, a reduction in meat consumption has already taken place. In Thailand, pork consumption has declined by 20-30 per cent, while poultry consumption declined by 10-20 per cent in recent months (Sakchai 1998). In Indonesia, poultry consumption declined by 25 per cent during the last quarter of 1997 (Agra Food Asia 1998), while beef consumption in Korea for the first four months of 1998 was 18 per cent lower than in the same period of 1997 (AMLC 1998b).

116. It is expected that pork and poultry will remain the most preferred meats in the four countries over the medium term. While poultry is strongly preferred in Thailand and Indonesia, pork is a traditional and popular meat among the Chinese, including the ethnic Chinese in Indonesia and Thailand. Further growth in incomes in China is also likely to lead to significant increases in pork consumption per person. In 1995, for example, per person consumption of pork in China was 27.6 kilograms, which is significantly below per person consumption of around 40 kilograms in the more affluent Chinese regions such as Hong Kong and Chinese Taipei. In Korea, pork consumption is likely to increase following a recovery in income growth, and an expected decline of pork prices resulting from both import liberalisation and a recovery in the value of the won.

117. In the medium term, demand for pork and poultry in most of these countries is expected to be largely met by domestic production rather than imports. Aside from the expected fall in meat consumption, there are other factors which are likely to dampen pork and poultry imports in these countries. In China, pork is unlikely to be imported, given that the Chinese government is expected to maintain its emphasis on pork self-sufficiency (Hayes and Clemens 1997). As a result, domestic pork production is expected to expand and become more modernised to meet the increase in domestic demand, while pork and live pig exports are expected to decline. The Chinese government is also expected to encourage poultry production as part of its grain saving policies, given the more efficient feed conversion of poultry (Hong 1996), relative to other livestock production. Continued integration and commercialisation of the industry is also likely to result in an increase in China's poultry meat exports. However, given the strong consumer demand for chicken parts, China is still expected to import significant volumes of poultry over the medium term.

118. While pork and poultry imports in Korea are expected to be dampened by the economic and currency upheaval during the short term, Korea is the only country among the four which is expected to significantly increase its pork and poultry imports in the medium term. Although pork and poultry

production in Korea are increasingly becoming more commercialised and integrated, it remains uncertain whether pork and poultry producers will be able to cut their production costs significantly to compete with imports. In 1995, for example, the Korean government predicted that poultry production would grow even after liberalisation, based on the assumption that the industry could cut its costs to match import prices (Reynolds 1995). However, in 1996 the Korean broiler wholesale price averaged 22 per cent above the US tariff paid landed price, while pork prices averaged 17 per cent above US tariff paid landed prices (derived from USDA 1996b, 1997a; National Livestock Co-operatives Federation 1996). In early 1997, following the Foot and Mouth Disease outbreak in Chinese Taipei's pig herds, Korean pork producers expanded their pig herds in anticipation of increased demand from the Japanese market. However, with the devaluation of the won, feed import costs increased, resulting in high pig slaughterings and strong pork production during the first quarter of 1998 (Ban and Henney 1998). Nonetheless, it is likely that over the rest of the medium term domestic pork and poultry production will decrease as pork and poultry prices decline due to import liberalisation and an assumed recovery in the won. With increasing Korean consumption and lower production, it is likely that there will be an increase in pork and poultry imports in Korea (Shaw, Toyne, Bui-Lan and Barrett 1997).

119. In both Indonesia and Thailand domestic production of pork and poultry is expected to continue to account for most of the consumer demand over the medium term. In Indonesia, consumers have a strong preference for native poultry (Directorate General of Livestock Services, 1995). In addition, the Indonesian government has announced plans to provide loans to poultry farmers to assist them in buying chickens, feed and medicines (Agra Food Asia 1998). For both Indonesia and Thailand, the scaling down of tariff barriers for livestock imports as a result of the WTO Uruguay Round agreement is not likely to have a significant impact on pork and poultry imports as applied tariff rates for both pork and poultry are already below the bound tariffs for 2004 (table 12). Nevertheless, pork and poultry import volumes have remained low. Unless significant changes are made to the non-tariff policies, such as licensing and marketing arrangements, and to the storage and transport facilities, particularly in rural areas, it is unlikely that pork and poultry imports will increase significantly over the medium term.

120. In recent years, increasing production costs, rising domestic consumption and competition from other major poultry exporters such as the United States and China, have dampened the growth in Thailand's poultry exports. This trend, however, was reversed during the last quarter of 1997 when poultry meat exports increased substantially, as Thai poultry exports became more price competitive due to the depreciation of the baht and exportable supplies increased due to the decline in domestic poultry consumption (Sakchai 1998). Thai poultry exports are expected to continue exhibiting strong growth, over the medium term.

121. Of the four countries only Korea and Indonesia have shown significant increases in beef consumption and imports. However, this growth is likely to slow over the next two years due to the economic downturn and sharp currency depreciation in both countries. In Korea, consumers are already substituting pork and poultry for beef (Ban and Henney 1998). In addition, the recent disruption to the Korean beef trade caused by the currency depreciation and economic downturn has been exacerbated by the current record cattle slaughter.

122. Although it is likely that Korea's WTO beef import commitments will be met, the lower demand and high production expected throughout 1998 will result in the accumulation of large stocks of (mostly) imported beef. It is possible that Korea's increasing import commitments will mean that these large stocks are carried into 2001, dampening import demand in the first year of beef market liberalisation. Slower consumption growth, higher feed import costs and the eventual reduction of producer prices resulting from import liberalisation are likely to reduce domestic production in Korea.

123. In Indonesia, the strong growth in live cattle imports is not expected to continue over the next 2 years. Higher beef prices and reduced incomes have already reduced beef consumption by 20 per cent (Bauer and Voboril 1998). The sharp depreciation of the Indonesian rupiah has significantly increased live cattle import prices, resulting in a sharp decline in live cattle imports. In January and February 1997, for example, Indonesia imported over 68 000 head of live cattle, a 23 per cent increase compared to the volume imported in this period in 1996. In 1998, however, Indonesia did not import any live cattle in January or February. Additionally, there are other factors which may influence live cattle imports in Indonesia, over the next year at least. First, the financial cost of holding cattle for feed for several months will be greater because interest rates have risen sharply along with the currency devaluation (Andrews, Roberts, Tielu, Brown and Podbury 1998). Also, Indonesian feeder cattle importers are having difficulty obtaining letters of credit from banks to import live cattle (Bauer and Voboril 1998). Second, the severe drought conditions experienced in some areas of Indonesia in late 1997 and early 1998 may reduce the availability of crop by-products (such as those from rice, maize, sugarcane and pineapples) which are used in feeding imported live cattle. Third, some of the policies proposed by the IMF and the Indonesian government is likely to have an effect on live cattle imports. For example, the reduction in chilled beef import tariffs from 25 per cent to 5 per cent and a reduction in frozen beef import tariffs from 20 per cent to 5 per cent has the potential to increase processed beef imports at the expense of live cattle imports (AMLC 1998a). Although live cattle and processed beef imports service different segments of the Indonesian market, there is a degree of overlap.

124. Given these factors and the increasing uncertainty of the profitability of some local feedlots, it is likely that over the medium term, live cattle imports will not rise to volumes experienced before the crisis. Presently, the current crisis and the drought are also prompting local producers to market domestic breeding cattle, thus reducing the domestic herd in the medium term. It is therefore likely that Indonesia's live cattle imports will shift towards breeding cattle once general economic and political conditions in Indonesia improve and the currency recovers (AMLC 1998a).

The feed sector

Feed consumption trends

125. The strong growth in the commercial production of livestock in China, Korea Indonesia and Thailand has increased the feed demand for grains and protein meals significantly in recent years (table 14). This is particularly so for maize and soyabean meal. In 1996, 121 million tonnes of grain were used for feed, which is approximately seven times the amount consumed in 1970. The use of protein meals in feed rations has increased by a similar proportion over the same period. In all four countries, grain by-products, such as wheat pollard, maize bran and rice bran, also constitute an important component in feed rations, as they are high protein and energy sources. Even though 'by-products' such as rice and maize straw are abundant in the region, they are not very widespread sources of livestock feed, reflecting their relatively low nutritional values (Ffoulkes 1997).

126. As the domestic requirement for feed grains and protein meals has grown in each of the four countries, trade in these commodities has become increasingly important. Maize, wheat and rice dominate grain trade in all four countries, although most rice traded is used as food. In 1996, all four countries were net importers of wheat, while only China was a net exporter of maize. Each of the four countries are net importers of protein meals. However, China is a net exporter of rapeseed and cottonseed meals.

China

Feed use

127. Maize is the principal feed grain in China, accounting for around 70 per cent of total feed use over the past ten years (table 14). The increased feed use of maize reflects lower prices relative to other grains such as rice, and higher nutritional value. In particular, it is a high value energy source as it contains 70 per cent starch. High levels of digestible energy are particularly important in the feed rations of animals with high growth rates such as broilers and pigs (Ffoulkes 1997).

128. China is the largest consumer of wheat of the four countries, and in 1996 approximately 3.5 million tonnes were used as feed (table 14). Even though wheat in China is mainly grown for human consumption, its use in feed rations has increased steadily, reflecting not only increased feed demand, but also the poor quality of the locally grown wheat. Other important feed crops in China include rice, sorghum and cassava. The use of broken rice as feed has been declining since the early 1990s, in part reflecting the relatively high price of rice compared to maize. The use of sorghum as feed has remained relatively stable over the past 10 years (table 14).

129. As the high proportion of maize used in feed rations has resulted in a lack of vegetable protein in the feed mixes, the use of high protein soyabean meal in 1996 was almost twenty times higher than in 1980. In 1996, soyabean meal made up almost 70 per cent of China's protein meal use.

130. The use of fodder crops, pastures and agro-industrial by-products is mainly limited to small operations. In China, many farmers also use straw and potato vines as cheap alternatives to feed grains and protein meals.

Production

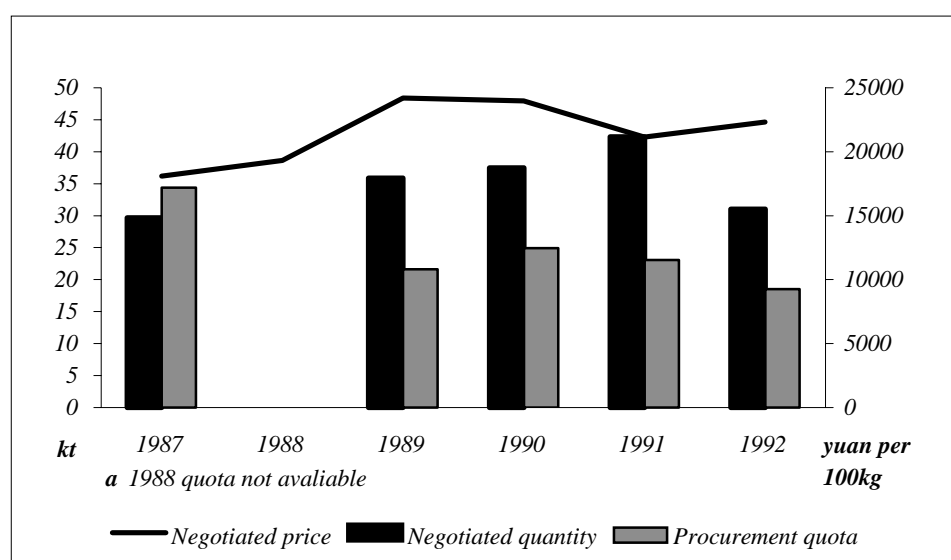
131. The production of grain in China has increased steadily over the past three decades, reflecting strong demand from livestock industries, changing consumer preferences towards wheat-based products and the government's objective to achieve self-sufficiency in grain. While the self-sufficiency policies are mainly aimed at food grains, they indirectly influence the availability of feed grains. Increased production of food grains tends to reduce the land area available for feed grains. However, the emphasis on self-sufficiency of food grains could result in some increase in the supply of grain by-products such as wheat bran.

132. In 1996, China produced almost 120 million tonnes of maize, second only to the United States, and by far the largest producer of the countries considered here. Driven in part by the country's rapidly expanding livestock sector, maize production has grown at an average annual rate of 5 per cent since 1986. Wheat production has more than doubled in the last two decades reaching 109 million tonnes in 1996.

133. To encourage farmers to grow more grain, the government has implemented various support measures. In China, the production of grain is highly influenced by the procurement system. Under this system, farmers enter into a contract with the government to farm an area of land. As part of the contract, a proportion of the harvested crop — the procurement quantity — has to be delivered to the government. The farmers are free to sell any production beyond the procurement quantity on local markets. If the government needs to acquire more grain than was delivered through procurement, additional quantities

can be bought at a negotiated price. As the negotiated price provides a partial floor for free market prices, it has a major impact on grain production. For example, maize production in China in the late 1980s and early 1990s was encouraged through the increase in negotiated purchases and the subsequent rise of negotiated prices (figure 3).

Figure 3: China's quota system for maize a



Source: ABARE

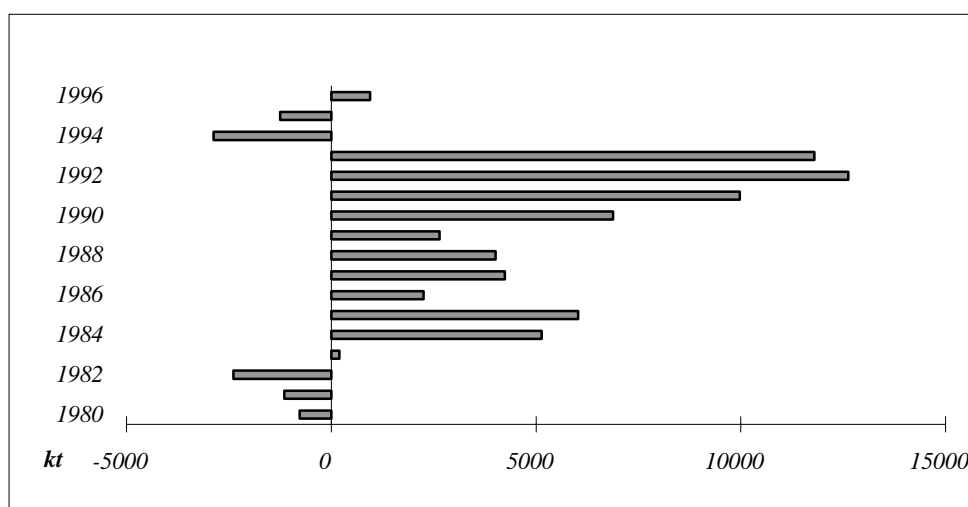
134. Despite the production of soyabean meal in China increasing at an average annual rate of 8 per cent over the past ten years, production has not been able to keep pace with the very strong demand for soyabean meal in the livestock sector. Low prices relative to grains and the emphasis of government policies on self-sufficiency in grains (particularly food grains) are the principal reasons for the relatively low plantings of soyabeans. High grain procurement prices in 1996 induced many farmers in Heilongjiang province, which produces more than one third of China's soyabeans, to switch from soyabeans to maize. Even if prices increase, the shift back into soyabeans may be slow given the large differential in returns between the two crops — in 1996 farmers were earning 50 per cent more from maize production than they would have earned producing soyabeans (Howes 1997).

Trade

135. As the maintenance of grain self-sufficiency remains a policy priority in China, COFCO, the state trading corporation, has kept grain imports to a minimum (table 15). Additionally, China's grain imports are subject to tariffs and quarantine requirements.

136. Until 1993, China was the world's second largest maize exporter. However, given a shortfall in domestic production and a major increase in domestic prices in 1994 and 1995, China became a net importer of maize (figure 4). At the end of 1994, the Chinese government even imposed a ban on maize exports in order to promote maize shipments to maize deficit provinces (Fuell and Hongyan 1997). Even though that ban has since been lifted, China was unable to export more than 1 million tonnes in 1996 when world maize prices were high.

Figure 4: China's net exports of maize



Source: ABARE

137. In 1996-97, China moved from being a net exporter of oilseeds and meals to being a net importer, reflecting a decline in domestic production and a concurrent increase in consumption. Currently, importers require licences for oilseeds while tariffs also apply (table 16). However, import policies are not exceedingly restrictive, reflecting the government's commitment to promote livestock industries.

Korea

Feed use

138. The three main livestock industries in Korea, poultry, pigs and cattle, are highly dependant on grains, protein meals and industrial by-products due to the limited availability of extensive pasture. As is the case in all four countries, maize is by far the most important feed in Korea, with over 6 million tonnes used as feed in 1996 (table 14). However, Korea's highly price sensitive feed sector uses feed wheat as a substitute for maize when maize prices are high. Consequently, feed wheat accounted for 47 per cent of total feed grain consumption in 1993, compared to 4 per cent in 1995, when wheat prices increased markedly. At equal prices, millers prefer feed wheat to maize for cattle and pig mixes due to its high protein content, while maize is preferred for poultry (Morgan and Raney 1994). Millers also use small quantities of rye in feed mixes.

139. Soyabean meal is the most commonly used protein meal in Korea (table 14). However, cottonseed and rapeseed meals make up a large part of feed meal consumption (approximately 30 per cent in 1996.)

Production

140. Very little maize, 70 thousand tonnes in 1996, is grown in Korea, reflecting the low returns to its production. The fall in the profitability of maize compared to other crops has resulted in a 50 per cent decline in domestic maize production between 1980 and 1996. Maize is now mainly grown in

mountainous regions, where farmers have few alternatives in their cropping rotations. However, most of the maize harvested is sold to the snack food market for higher prices relative to maize sold to feed mills.

141. Soyabean plantings in Korea are restricted to small plots along the borders and dykes of rice paddies, and in 1996 Korea only produced 160 thousand tonnes, a 32 per cent fall from 1985 levels. Virtually all domestic soyabean production is used for food. Domestic prices are heavily supported by government purchases — in early 1996 the farm gate price of soyabeans in Korea was around US\$2115/t, compared with a world price of around US\$315/t (Choi and Voboril 1997b). The production of soyabean meal has almost tripled since 1980 facilitated by high soyabean imports, low import tariffs and an agreement between oilseed crushers and feed millers. Under the agreement, the major feed millers will source at least 60 per cent of their soyabean meal requirements from domestic processors of imported soyabeans for a set price based on import prices (Choi and Voboril 1997a).

Trade

142. Maize and wheat dominate grain imports in Korea, representing 63 per cent and 31 per cent of total imports, respectively, in 1996 (table 15). In 1995-96, the feed industry used 80 per cent of maize imports, while only 11 per cent of wheat imported was feed wheat. Import duties for feed grains are low in Korea, as there is very little domestic feed grain production. Feed maize and feed wheat tariff rates are both set at an applied rate of zero per cent for 1997, compared to the 2.7 per cent per cent allowed under WTO commitments (table 17). As mentioned previously, the feed milling sector in Korea is highly price sensitive, and it substitutes feed wheat for maize when its price is low relative to maize. This results in highly variable feed grain imports.

143. Due to the rapid growth in Korea's livestock industries, protein meal imports have increased sixfold since 1985 to reach 1.75 million tonnes in 1996 (table 14). Soyabean meal is the dominant import, representing over half of total feed meal imports in 1996. Almost all of Korea's protein meal imports are used in feed mixes. Tariffs of 5 per cent or less are applied to imports of soyabean meal, rapeseed meal and cottonseed meal (table 17).

Indonesia

Feed use

144. The predominant feed grain in Indonesia is maize, and its use has increased threefold in the last decade to reach 4.5 million tonnes in 1996 (table 14). The increased feed use of maize reflects not only its higher nutritional value, but also its lower price relative to other feed grains. Broken rice is also utilised by the feed sector, and its use is increasing, although not as dramatically as maize. Soyabean meal dominates protein meal use in Indonesia.

Production

145. Indonesia is the second largest maize producer of the four countries, producing on average 5 million tonnes a year. However, the rapid increase in demand for maize relative to production has increased the reliance on imports. To encourage the domestic production of maize, the government has introduced subsidies on farm credits and fertilisers (WTO 1994). In addition, a local content scheme is in

place requiring local feed producers to buy a certain amount of their maize requirements from local farmers at a contracted price (AgraFood Asia 1996). Nevertheless, the higher floor price for rice is limiting the increase in maize production (Alam 1997).

146. The production of rice in Indonesia has increased at an annual rate of 2.5 per cent over the last ten years to reach almost 52 million tonnes in 1996. Although rice is not a major feed ingredient, this has resulted in more broken rice being available for feed. However, the expansion of rice production in Indonesia is likely to come at the expense of other feed grains.

147. In 1996, Indonesia produced almost 1.6 million tonnes of soyabeans, most of which was used as food. The production of soyabean meal has ceased following the closure of Indonesia's only crushing plant.

Trade

148. For the past decade, Indonesia has been a large importer of wheat and maize (table 15), and a small importer of rice, despite the limited grain handling capacity of its ports. While the majority of rice and wheat imports are used for human consumption, the feed industry has used all imported maize (Alam 1997). In general, Indonesian applied tariffs for feed are very low (table 17).

149. With the closure of the Indonesia's only crushing plant, all soyabean meal must be imported. This has been facilitated by the low applied tariff rates since the deregulation of soyabean meal in 1996

150. Under the IMF *Letter of Intent* signed in January 1998, the National Logistic Agency, BULOG, was to relinquish its monopoly control over all products except rice by 1 February 1998. This, however, did not take place. BULOG has instead maintained the monopoly over essential commodities such as rice, wheat, corn, soyabeans, sugar and soyameal in order to import these commodities under a subsidised foreign exchange rate (Voboril, Bauer, Hartono, Alam 1998).

Thailand

Feed use

151. As with the other countries, the most important feed in Thailand is maize (table 14), which accounts for 50-65 per cent of the ration for broilers and 25-30 per cent for pigs (Kurz 1997). Even though broken rice can be substituted for maize in pig rations, a practice particularly common in Thailand, the amount of rice used for feed has been decreasing slightly since the early 1990s. This reflects the relatively high prices of rice compared to maize. The Thai livestock sector also uses small but increasing amounts of wheat as feed.

152. Although Thailand is a major producer of cassava, its livestock sector only uses small quantities. This is largely because it has a low nutritive value and needs to be combined with a protein source (such as soyabean meal), which makes it relatively expensive to use. In addition, most of the cassava processed is exported to take advantage of the higher returns overseas. However, Thailand's largest export market for cassava, the European Union, has lowered internal support prices for many grains, and the price advantage cassava had enjoyed over feed grains in the European Union has declined. The subsequent lower returns to Thai farmers may be a factor in the declining production of cassava in Thailand.

153. Industrial by-products, such as sugar cane tops, pineapple pulp and palm kernel cakes, are also commonly used as low cost feed ingredients, particularly by small enterprises.

154. Soyabean and fish meals are the most commonly used protein meals in Thailand (table 14). The use of soyabean meal is increasing in the shrimp, poultry and pig industries at the expense of fish meal, reflecting the shortage of good quality fish. Given its large intensive livestock sector, Thailand consumed more soyabean meal in 1995 than any other south east Asian country (Norland 1997).

Production

155. Although maize production in Thailand has fluctuated markedly between years, it has been on a downward trend since the mid-1980s. In 1996, Thailand produced 4 million tonnes of maize, most of which is grown on unirrigated land and in the drought-prone upper central plain and the lower northern and north eastern regions. Many farmers in this area are moving out of maize production in favour of more drought-resistant crops such as sorghum (Giordano and Raney 1993). To encourage maize production, the Thai government provides input subsidies for fertiliser and seed.

156. The Thai government supports soyabean production as part of a quasi-import substitution policy to deter the growth in imports required to meet livestock sector demand (Giordano and Raney 1993). To encourage domestic soyabean production, the Department of Agricultural Extension has made seed available at a very low price of 2 baht/kg (US\$0.08/kg) (Panida 1996). However, the low germination rate of these seeds limited the success of this effort.

Trade

157. Thailand has significantly liberalised its maize and wheat trade since 1986 (table 15). Nonetheless, it has maintained import quotas on some feed grain imports. For example, the Thai Cabinet has only allowed an initial amount of 300 thousand tonnes of maize to be imported in 1998, despite a Ministry of Agriculture forecast indicating a need to import about 550 thousand tonnes. However, the import quota may be increased if the initial imports do not meet demand, but the additional quota may be only allocated if maize prices in Bangkok exceed 4.80 baht/kg (approximately US\$ 100/t). A zero tariff will apply to these imports if shipments arrive between 1 March and 30 June 1998. Any non-quota imports will be subject to a 77.8 per cent tariff, plus an additional 180 baht/ton (US\$3.80/t) (Sakchai 1997b).

158. The Thai government had banned imports of rice until the WTO agreement on agriculture required it to open up the market and introduce import tariff quotas. The total rice tariff quota for 1996 was 239 thousand tonnes, 10 per cent of which is allocated to broken rice. This has increased the availability of broken rice for feed.

159. Wheat is subject to an import duty of 1 baht/kg (US\$25/t). The government presently grants an import tax rebate US\$11/t to mills exporting wheat by-products (bran pellets). This rebate, however, is only effective for product exported from 1 March to 31 August 1998 (Panida and Sakchai 1998).

160. Demand for soyabean oil in the tuna packing industries has led to increased soyabean imports, rather than simply the meal (Giordano and Raney 1993). The Thai government abolished import quotas on soyabeans and soyabean meal in 1996 (AgraFood Asia 1997b). A 5 per cent tariff will apply for soyabean meal in 1998 (Sakchai 1997b). Imports of lupins, a protein rich livestock feed, are prevented by high

import tariffs relative to those on soyabeans and soyabean meal (40 per cent for whole lupins and 30 per cent for de-hulled lupins).

Outlook for feed grains and protein meals

161. The Asian currency crisis is expected to dampen feed consumption and imports in Thailand, Indonesia and Korea in 1997-98. In Thailand, although there are reports that poultry exports have risen and feed mills have replaced higher priced broken rice with maize in their feed rations, the overall consumption of maize for feed is expected to fall by 7 per cent in 1997-98, compared to the 1996-97 level (Sakchai 1998). This significant decline is largely attributed to the increase in feed import prices due to the depreciation of the baht and the expected reduction in pork and poultry production following a fall in pork and poultry consumption. Similarly in Indonesia, the depreciation of the rupiah has caused import feed prices to nearly triple on a local currency basis, causing a significant reduction in poultry production. To alleviate the situation, the Indonesian government has authorised the National Logistics Agency (BULOG) to import maize and protein meals and distribute the commodities at subsidised prices to poultry producers (Voboril and Alam 1998). In Korea, both maize and protein meal imports are expected to fall in 1997-98 due to high import costs.

162. Although there is considerable uncertainty about the duration of the economic slowdown in Korea, Indonesia and Thailand, it is expected that the effects of the downturn on feed consumption and feed imports will be temporary. Continued population growth, combined with an expected recovery in the economies of Korea, Indonesia and Thailand will lead to a recovery in meat consumption. Most of the increase in meat consumption in these countries is likely to be met by an increase in domestic meat production in the medium term, resulting in increased feed requirements.

163. Over the medium to longer term, it is likely that imports will meet an increasing proportion of the feed requirements of these countries. The production of feed grains is expected to be slowed by the expansion of food grain production, reflecting the food self-sufficiency policies adopted in these countries. Furthermore the availability of suitable land is expected to be a limiting factor given that since 1985 the arable area in these countries has declined, notably in China where arable area declined from 96 million hectares in 1980 to 91 million hectares in 1994. This decline is the result of continued population growth, urbanisation and rising industrial production. While the fall in Korea's total arable land has been minimal land is being shifted to different crops, such as horticultural crops and vegetables, resulting in reduced areas for growing feed grains.

164. Increased demand for imported feed will require increased investment in grain handling capacity, as existing facilities are already stretched.

165. In China, demand for feed grains and protein meals is expected to increase steadily in response to the rapidly developing livestock industries. However, the grain stocks held in China are likely to influence future production and trade patterns. Given that stocks are not publicly reported, it is very difficult to make forecasts. However, if China needs to import more grain to meet domestic demand, its grain handling and storage facilities will be stretched greatly (Crook and Colby 1996). Grain export levels, however, are likely to be stable. According to the US Department of Agriculture (Crook 1996), China's gross maize exports are projected to remain at 1 million tonnes from 1996 through to 2005. Most of these maize exports are expected to come out of China's north-eastern provinces (Heilongjiang, Liaoning, Jilin) reflecting their good transport links to Russia, Korea and Japan (Crook 1996). On balance, China is likely to gradually grow in importance as a grain importer.

166. In Korea, the currency devaluation has so far had the effect of limiting pork and poultry imports. However, the removal of tariff quotas on pig and poultry meat imports in 1997, combined with a gradual reduction in tariffs and an assumed recovery in the won over the rest of the medium term is expected to result in increased imports of these products. This, combined with an expected decrease in domestic meat production, is likely to slow the growth in both feed demand and imports over the rest of the medium term.

167. In Indonesia, industry officials project that poultry production, dampened by high feed prices in 1997-98, may start to recover in late 1998. In the medium to longer term, demand for feed grain (particularly maize) is expected to increase, reflecting the growth in the poultry industry and increasing feed mill capacity. Currently, the feed milling capacity in Indonesia is 6 to 7 million tonnes — roughly the same as the level of feed production. However, several large feed millers have been expanding their operations by building new mills in new areas. This, together with the entrance of new companies (for example, Samsung), is expected to push milling capacity to over 10 million tonnes (Alam 1997). There is some uncertainty on whether the expansion of feed mills will continue in the near future, given the current economic situation in Indonesia and fall in maize production as a result of the El Nino weather phenomena. However, it is expected that, over the remainder of the medium term, demand for feed grains will rise following an expected recovery in the poultry industry. As the majority of required grain supplies are expected to be imported, additional domestic processing facilities will be needed.

168. Feed demand in Thailand is forecast to increase over the medium to longer term, given the anticipated expansion in livestock production, particularly poultry. Assuming favourable climactic conditions, Thai maize production is forecast to increase by 14 per cent to 4.0 million tonnes in 1998-99, due to an expected expansion in maize area, resulting from favourable maize prices in 1997-98 (Sakchai and Panida 1998). For the rest of the medium term, maize production will largely depend on whether maize prices remain relatively high compared to crops such as sugar cane, cassava or soyabeans, and whether farmers switch to more drought resistant crops, such as sorghum and soyabeans.

169. Feed imports will be largely influenced by changes in import policies. In 1996, for example, the Thai government was under considerable pressure from the domestic poultry industry to eliminate quota restrictions on soyabeans, soyabean meal and maize to lower production costs and improve Thailand's export competitiveness in poultry meat. In response, the Thai government completely eliminated the import quota on soyabeans and soyabean meal and reduced tariff rates. This resulted in a significant increase in soyabean and soyabean meal imports in 1997. If similar changes are made to Thailand's maize trade policies, imports are likely to increase significantly. Also if China becomes a WTO member, maize imports from this source may increase further. At present Chinese maize is uncompetitive as a surcharge of 1000 baht/t (approximately US\$40/t) applies to imports from countries which are not members of the WTO (Kurz 1997).

Conclusions

170. In the last decade, dairy products, meat and feed consumption, production and trade have risen significantly in China, Korea, Indonesia and Thailand. The current Asian financial crisis, however, has disrupted this upward trend in most of these Asian countries. As a result of the very large currency depreciations in Korea, Indonesia and Thailand, the prices of both imported and import competing meat, dairy products, feed and other inputs have risen in these countries. The economic crisis has also reduced income growth and lowered incomes of the populations of these countries. As demand for dairy products and meat is relatively sensitive to both income and price changes, consumers in these countries are expected to either lower their overall consumption of dairy products and meat, substitute lower priced

domestically produced meats such as poultry or pork for imported meats such as beef or reinstate traditional food in their diets, (for example seafood for meat). Dairy and meat production are also likely to fall due to the high prices of feed and other inputs.

171. While China has so far remained largely unaffected by the crisis, it is uncertain how long it will remain insulated. It is likely that China's economic growth will be affected by growing competition from Indonesia, Thailand and Korea in exporting manufactured products such as clothing and footwear. There is also considerable uncertainty regarding the strength and timing of the economic recovery in these Asian countries. In particular, recovery in these countries will depend on the success in implementing the necessary reforms to restructure the financial sector and other industries.

172. However, assuming these countries recover beyond 1999, it is expected that consumption of dairy products and meat in China, Korea, Indonesia and Thailand will increase over the medium to longer term. For dairy products and beef, much of this increased consumption is likely to be met through increased imports. In contrast, the increased demand for pork and poultry is likely to be largely met through increased domestic production. This will, however, require increased imports of feed grains and protein meals.

173. Demand for milk and processed dairy products in these four countries is expected to continue to exceed the growth in domestic production, resulting in further increases in imports. Import growth is expected to be most rapid for milk substitutes, such as skim milk powder, for its reconstitution into fluid milk and other dairy products. This will be especially the case in countries such as Thailand and Indonesia, which are already meeting a large proportion of domestic drinking milk needs using imported milk substitutes. In China and Korea, on the other hand, domestic milk production is currently sufficient to meet most domestic milk demand. However, as consumption of fluid milk increases in both of these countries, reliance on imported milk substitutes is likely to increase.

174. The potential for further increases in domestic milk production in the four countries will be limited by several factors, including limited access to modern technology; small herd sizes; the low skills base of farmers; poor genetics; and the limited quantity and low quality of feeds. It is likely that countries will increase live cattle imports for breeding purposes and increase the use of commercial feeds in order to overcome some of these problems and to increase production. However, milk production is likely to remain costly and therefore uncompetitive with imported products.

175. While total meat consumption is also expected to increase in each of the four countries over the medium term, meat consumption patterns are expected to remain relatively unchanged. In particular, pork and poultry are expected to remain the dominant meats consumed in these countries. Following past trends, domestic production is expected to meet most of the increase in pork and poultry consumption, given the self-sufficiency policies existing in some of these countries and the continued shift of pork and poultry production towards large scale, more integrated, commercialised and intensive operations. However, the continued integration and commercialisation of these industries is expected to lead to a significant increase in the use of feed grains and protein meals, particularly maize and soyabean meal. This will require increased imports of these feeds, given the limited arable land areas and continued population growth, urbanisation and industrialisation of these countries. Nevertheless, there are some exemptions.

176. China is expected to import both feed grains for their pork and poultry industries and import chicken parts to meet domestic demand. However, China is also expected to increase its exports of poultry meat, particularly to Japan where it is currently competing with Thailand. The depreciation of the Thai currency, meanwhile, has made Thai poultry exports more competitively priced. This combined with the

current slow growth in domestic poultry consumption is likely to boost Thai poultry exports over the medium term. In Korea meanwhile, the removal of import tariff quotas on pig and poultry products is expected to increase imports and lead to a gradual decline in pork and poultry production, thus reducing the need for feed imports.

177. While growth in beef consumption in Korea is expected to be constrained in the medium term by the current economic upheaval, beef consumption in the longer term is likely to increase. As a result of a contraction in Korean beef production, feed imports for cattle are expected to decline. In Indonesia, lower beef consumption is likely to dampen beef and live cattle imports. The reduction in the tariffs of frozen and chilled beef, the tight supply situation of by-product feedstuffs resulting from drought conditions, and the high financial costs of raising cattle are also expected to significantly reduce the growth in live cattle imports over the medium term.

Table 13. Retail meat prices

	Unit	1991	1992	1993	1994	1995	1996
Korea							
Poultry a	Won/kg	2 073	2 052	2 307	2 713	2 934	2 916
Pork	Won/kg	5 242	4 383	4 538	4 737	4 908	4 893
Beef	Won/kg	12 884	14 171	14 790	15 438	16 186	16 236
Indonesia							
Poultry a	Rupiah/kg	3 382	3 150	3 510	3 905	3 861	na
Pork	Rupiah/kg	4 610	4 542	5 090	5 123	6 396	na
Beef	Rupiah/kg	6 413	7 927	8 220	9 203	10 002	na
Thailand							
Poultry ab	Baht/kg	37.63	na	na	29.72	33.57	32.54
Pork b	Baht/kg	64.49	na	na	59.82	72.41	77.99
Beef b	Baht/kg	67.92	na	na	71.35	71.35	77.99

a Poultry refers to chicken only. **b** Retail price in Bangkok area for 1991, wholesale price for 1994-1996. **na** Not available.

Sources: Directorate General of Livestock Services (1996); USDA (1994); National Livestock Co-operatives Federation (1996, 1997a).

Table 14. Feed use

kilo tons

	China		Korea		Indonesia		Thailand	
	1986	1996	1986	1996	1986	1996	1986	1996
Maize	47575	89250	3540	6650	1500	4500	1600	4100
Wheat	2400	3500	1788	1800	0	140	0	235
Sorghum	3615	3500	45	99	na	na	85	190
Rice	3800	2000 a	na	na	795	933 a	700	500 a
Cassava	1239	2183 a	na	na	242	315 a	226	212 a
Soyabean meal	1465	8723	930	1800	313	1025	423	1539
Peanut meal	1004	2187	na	na	35	161	47	126
Fish meal	285	855	172	105	52	100	227	491
Cottonseed meal	85	160	49	297	0	0	5	7
Rapeseed meal	267	354	170	520	50	65	na	na

a 1994 figures. **na** Not available.

Source: USDA (1997b); FAO (1997).

Table 15. Feed imports

kilo tons

	China		Korea		Indonesia		Thailand	
	1986	1996	1986	1996	1986	1996	1986	1996
Maize	1551	50	4475	8250	61	750	0	400
Wheat	8817	4000	3895	4000	1600	4000	197	800
Soyabean meal	3	2100	223	900	263	1025	233	950
Cottonseed meal	0	0	49	300	0	0	0	4
Rapeseed meal	0	0	165	500	55	65	0	0
Peanut meal	0	0	0	0	19	150	35	125
Fish meal	230	625	24	50	52	100	0	145

Source: USDA (1997b).

Table 16. China: tariff rates

	In-quota tariff	Above-quota tariff	
		MFN ^b	General
	%	%	%
Grains			
Wheat	1	114.0	180
Groats and meal of wheat	9	91.2	120
Maize	1	40.0	180
Groats and meal of maize	9	91.2	120
Rice in husk	1	114.0	80
Broken rice	1	40.0	180
		Above quota tariff	
		MFN ^b	General
		%	%
Oilseeds and protein meals			
Soyabeans		114	180
Peanuts		20	70
Rapeseeds		40	80
Soyabean meal		5	30
Peanut meal		5	30
Rapeseed meal		5	30

^a Although imported grains and oilseeds are subject to licensing and quotas, this information is not published. ^b Most Favoured Nation.

Sources: Fuell and Hongyan (1997); APEC (1997).

Table 17. Applied tariffs and Uruguay round tariff reduction commitments

	Quota		In-quota tariff		Above-quota tariff		Tariff only		Applied tariff ^a
	1995 kt	2004 kt	1995 %	2004 %	1995 %	2004 %	1995 %	2004 %	1997 %
Korea									
Feed Wheat							10	1.8	0
Maize	6100	6100	3	1.8	365	328			0
Sorghum							10	9	3
Rice	51	205	5	5					5
Soyabeans	846.3	846.3	5	5					1
Soyabean meal							20	1.8	2.64
Cottonseed meal							10	6.6	5
Rapeseed meal							20	0	5
Fish meal							10	9	5
Indonesia									
Feed wheat							30	27	0
Maize							70	40	0
Sorghum	70	70	70	40	90	90			0
Rice							180	160	0
Soyabeans							30	27	0-5 ^b
Soyabean meal							50	30	5
Cottonseed meal							50	40	5
Rapeseed meal							50	40	5
Fish meal							80	40	0
Thailand									
Feed wheat							71 ^c	27	^d
Maize	52.1	54.7	20	20			81	73	20 ^e
Sorghum							^f	27	na
Rice							58	52	na
Soyabeans	10.4	10.9	20	20			89	80	0
Soyabean meal							20	20	5
Cottonseed meal							10	9	na
Rapeseed meal							10	9	na
Fish meal							40	30	na

^a Tariff rate applied in 1996. ^b 0 for yellow soyabeans, 5 per cent for others. ^c Tariff is 71 per cent or 2.75 Baht per kg. ^d 1 Baht per kg. ^e 52 thousand tonnes quota applies during domestic harvest season. ^f 2.75 Baht per kg. ^{na} Not available.

Sources: GATT (1994); APEC (1997); AgraFood Asia (1997b, 1997c); Kurz (1997); Sakchai (1997b).

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