global perspective

Old players, new players

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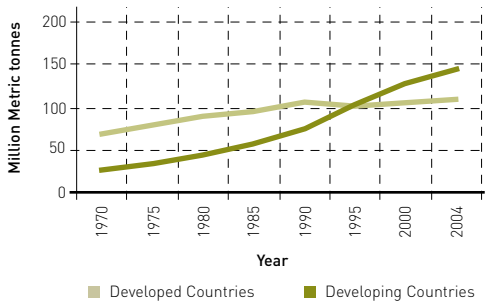
In 1995, for the first time, meat volume produced in the developing countries exceeded that of developed countries and since then the gap in milk output between developing countries and developed countries has been narrowing. In 1998, India surpassed the United States as the world's largest milk producing country. Earlier in the same decade, China overtook the United States and the entire European Union of then 15 countries in terms of meat production. These events mark a substantial shift of the "centre of gravity" of livestock production, from the North to the South, from temperate regions, to tropical and sub-tropical environments.

Until about the early 1980s, diets with daily consumption of milk and meat were the privilege of OECD country citizens and a small wealthy class elsewhere. At that time, most developing countries, with the exception of Latin America and some Near East countries, had per caput meat consumption of substantially less than 20 kg. For most people in Africa and Asia, meat, milk and eggs were an unaffordable luxury, consumed only on rare occasions.

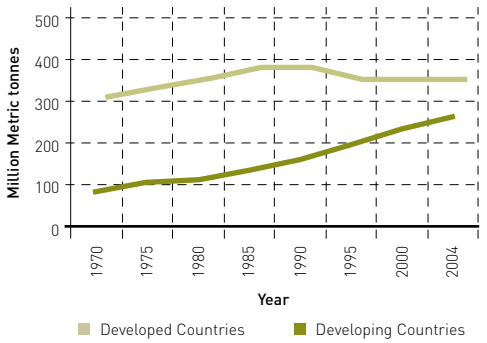
Rather than supplying food, livestock performed many functions, such as providing draught power and manure, and as a capital asset, that was only disposed of in times of emergency. A large proportion of the livestock in developing countries was not primarily kept for food.

MEAT PRODUCTION



Source: FAO (2005)

MILK PRODUCTION



Source: FAO (2005)

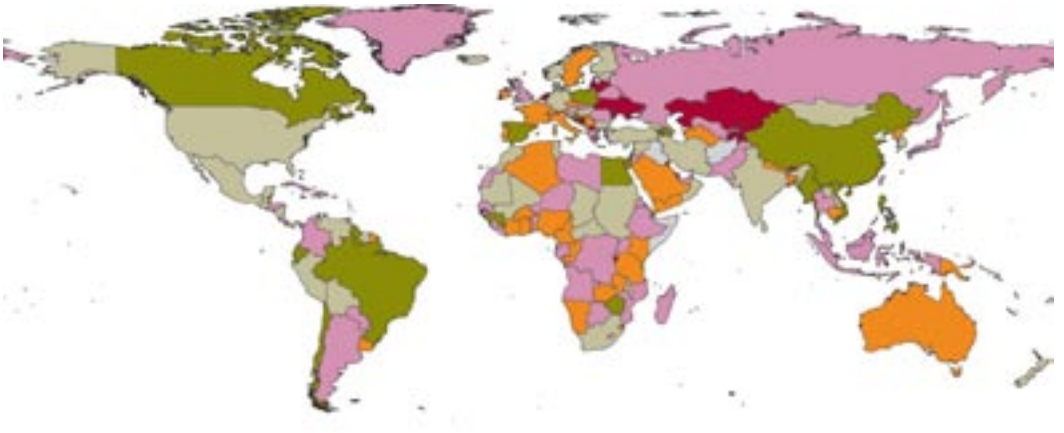
CHANGES IN CONSUMPTION OF ANIMAL PRODUCTS

	Developing countries				Developed countries			
	1970	1980	1990	2002	1970	1980	1990	2002
Annual per caput meat consumption (kg)	11	14	19	29	65	75	82	80
Annual per caput milk consumption (kg)	19	23	27	31	122	99	92	93
Total meat consumption (million MT)	29	47	74	139	70	88	103	105
Total milk consumption (million MT)	82	119	167	256	307	346	372	343

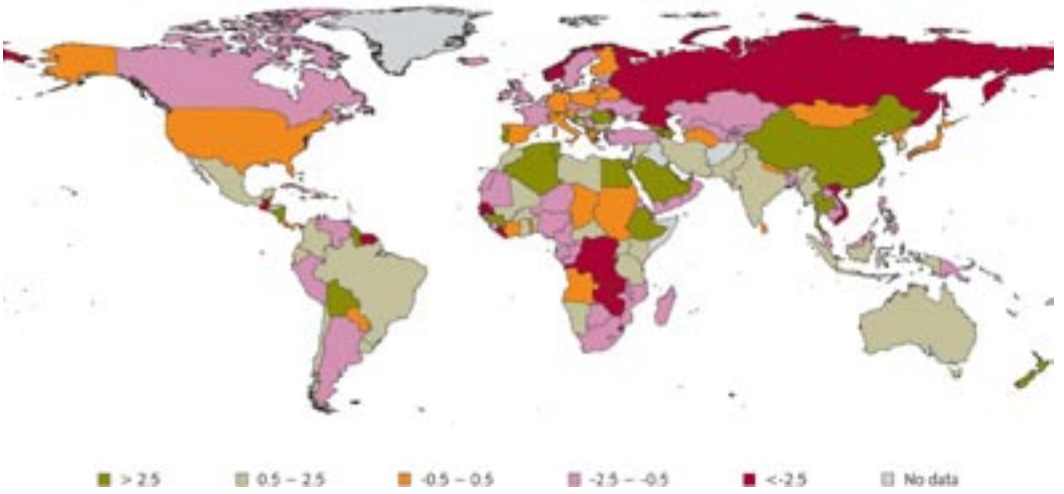
Source: FAO (2005)

ANNUAL GROWTH RATE (%) IN PER CAPUT PRODUCTION OF TOTAL MEAT AND MILK (1994-2004)

Meat



Milk



Source: FAO (2005)

This is changing rapidly. In the developing countries, per caput consumption of meat has doubled since 1980 from 14 kg/cap/year to 29 kg in 2002.

Total meat supply has tripled from 47 million tons to 139 million tons over the same period. Developments have been most dynamic in countries that have shown rapid economic growth, notably East Asia, led by China. China alone accounted for 57 percent of the increase in total meat supply in the developing countries. Looking at milk, developments are less spectacular but still remarkable. Total supply in developing countries has expanded by 122 percent between 1980 and 2002; and 40 percent of that increase came from one country, India. Most of the expansion in supply comes from increased production, and only

a relatively small part from imports. For all developing countries, imports only account for about 0.5% and 14.5% of total meat and milk supply

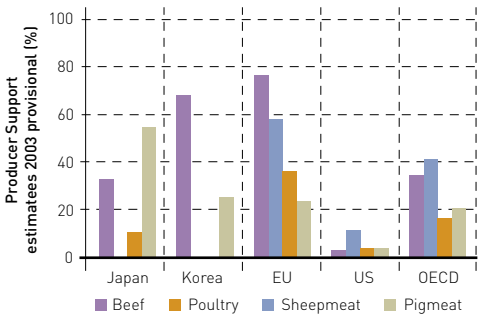
What is triggering these rapid developments? The consumption of meat, milk and eggs is closely linked with income, and a new middle class in many developing countries, that has emerged from economic growth over the past decades, is diversifying its diet. These more affluent people move away from cereals and other staples to a richer diet that includes increased amounts of livestock products, but also of fruits, vegetables, sugars and fats. This trend is amplified by population growth which, while slowing, is still adding another 72 million people to the population in developing countries every year. Other factors, like urbanisation and changing lifestyles, further feed the trend. In contrast, the absence of sustained economic growth also explains why some countries, notably in sub-Saharan Africa, have not yet entered the "meat phase".

The dramatic developments in rapidly growing developing countries are in stark contrast with trends in developed countries where consumption of livestock products is growing only slowly or stagnating. With low or no population growth, most OECD countries are past the "meat phase" and markets as well as people are saturated. Consumers there worry about the health effects of high intake levels of livestock products, in particular red meat, animal fats, and eggs. Continuous high level consumption of these products is associated with a series of cardio-vascular diseases, and certain types of cancer.

Other health aspects associated with animal products, such as the presence of residues (of antibiotics, pesticides, dioxins) and of pathogens (e-coli, avian influenza, salmonella, foot and mouth disease), sporadically and sometimes permanently suppress demand for animal products.

Traditionally, developed countries have been giving varying levels of support to livestock producers, but have now started to reduce the levels of producer support which has helped to reduce

SUPPORT TO LIVESTOCK PRODUCERS IN DEVELOPED COUNTRIES



Source: OECD (2005)

some of the surplus, particularly of the EU. This is in conjunction with the trend within the EU to subsidize incomes rather than production. This has contributed to increasing world market prices, as surpluses dumped at low prices have become less common.

Australia and New Zealand have played and continue to play important roles as exporters of beef, mutton and dairy products, particularly to Japan and to the Near East, and have increasingly moved up-market, with their mainly grass-fed production differentiating their products from the mass market.

The previously centrally planned countries (ex Soviet Union and Eastern Europe) experienced a sharp decline in the livestock sector as it went through dramatic structural change and purchasing power of consumers declined rapidly. With consumer purchasing power now rising again, most countries are now recovering, but at different speeds, and increasing demand is not always met by domestic supply. Russia's chicken meat production in 2002, for example, is still 35 percent lower than in 1992 (935,000 MT down from 1,428,000 MT) but her imports have surged to 1,205,000 MT. In 2002, imports contributed 56 percent to total food supply of chicken meat.

The Eastern European countries that have entered the EU in May 2004, had to go through

rapid adjustments in order to prepare for accession. But these countries now have access to premium markets in the older EU member states. For the previously centrally planned countries as a whole, because of their ongoing process of structural change, they are expected to reach 1990 consumption levels again only by 2030. In contrast, many developing countries show a combination of continuing high population growth and growing per caput incomes. This combination has led to a dramatic increase in demand for livestock products, termed the livestock revolution, since about the mid 80s and this trend is poised to continue for another 10 to 20 years before slowing down (Delgado *et al.* 1999).

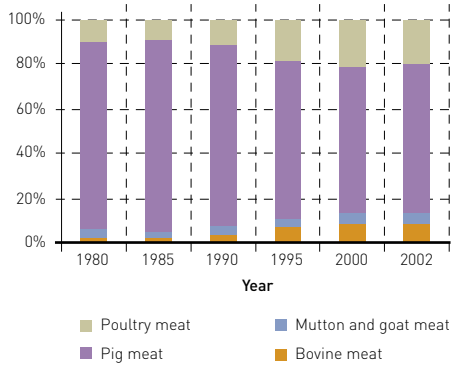
Three developing economies i.e China, India and Brazil account for almost two thirds of total meat production in developing countries and for more than half of the milk. They also account for close to three quarters of the growth in production in all developing countries in both commodity groups. While these countries are very different in their economic structures and consequently, also their livestock sectors, they have one thing in common: they are big. They are accompanied by other countries of their respective regions which follow the same livestock development model. The "big three" are also emerging as world players in the trade of livestock and livestock products, as we will now explore in more detail.

THE BIG THREE IN DEVELOPING COUNTRY LIVESTOCK IN 2004

Country Group/ Country	Meat (million MT)	Milk (million MT)	Meat (%)	Milk (%)
Developing Countries	148.2	262.7	100	100
China	70.8	22.5	47.8	8.6
India	6.0	90.4	4.0	34.4
Brazil	19.9	23.5	13.4	8.9
"big three"	96.7	136.4	65.2	51.9

Source: FAO (2005)

COMPOSITION OF TOTAL MEAT CONSUMPTION IN CHINA



Source: FAO (2005)

China and East Asia

China is the largest producer and consumer of livestock products in Asia and globally is the number one producer of pork, mutton and eggs. Although the per caput consumption of livestock products in China is lower than in developed countries, that of China is rapidly increasing fuelled by economic growth and rise in personal incomes. Since China's accession to the WTO in 2001 and because of the sheer size of China's livestock sector, relatively small changes in livestock inventory growth and demand for livestock products, can have significant implications for global trade in livestock feed and livestock products.

China has a dichotomous pattern in food consumption with urban per caput consumption of almost all types of animal protein products double or triple that of rural residents. The per caput consumption of animal source foods has been increasing at the rate of 5.6 percent, 8.0 percent and 8.1 percent for meat, milk and eggs respectively in the last decade and is poised to continue.

Pork accounts for almost 66 percent of the total meat consumed in China and per caput consumption has increased from a low base in 1980 of 12.0 kg to 34.2 kg in 2002. It is the largest component of China's livestock production, and although

its share in total production and consumption is declining, it still accounts for 65.7 percent of the total meat produced. Partly due to government policies discouraging backyard pork production to favour more efficient animal protein operations, the structure of the pork production in China is changing. It is moving from traditional, farm based waste converter systems and is rapidly intensifying with increased use of concentrates and emergence of large scale production units which are increasingly privately owned. China is self sufficient in pork and has traditionally been an exporter of pork. Although imports have increased in the last few years, it still enjoys a positive net trade in pork. Exports and imports are both less than 1 percent of total production and consumption, respectively.

Growth in poultry and egg output is expected to remain strong, with their share gradually increasing in total output of livestock products in China. China has moved to the second place behind the United States in total output of poultry meat. Expansion in output has been driven by increasing demand and has been facilitated by general market-oriented policy reforms, government support for such projects as specialised poultry breeding operations. Consumption of poultry meat has more than doubled in the last decade from a low base of 3.9 kg in 1992 to 10.0 kg per person in 2002. China's policy is geared towards self-sufficiency in poultry products, due to the high internal demand. However, trade in poultry products has been increased in the last decade.

Beef and mutton account only for a small share of total meat consumption, but their shares have been increasing. This has mostly been due to a boom in beef production, facilitated by rapid mechanisation in the early nineties, releasing large numbers of cattle and changing the herd structure towards a larger proportion of breeding females. The result has been a rise in the share of beef from 2.2 percent in 1980 to 9.0 percent in 2002.

In the last decade, production has more than doubled as per caput consumption has tripled. More efficient use of crop residues in intensive crop-growing regions, contributing to the rapid growth and adoption of efficient feeding practices, is likely to further boost production. However, beef production is likely to increase more slowly than in the past because of consumer preferences for other meats (Economic Research Service, 1998). Mutton and goat meat output has more than doubled in the last decade largely due to expansion in cropped areas in eastern China, the result of government policies supporting more efficient feeding of crop residues

Milk only accounts for 3.4% of the total animal proteins consumed in China. Per caput consumption is still low at 11.0 kg per annum but has doubled in the last decade. Dairy output has expanded dramatically from 8.4 million tonnes in 1994 to 22.5 million tonnes in 2004, but tighter feed grain supplies over the next decade are likely to reduce the rate of growth (Economic Research Service, 1998)

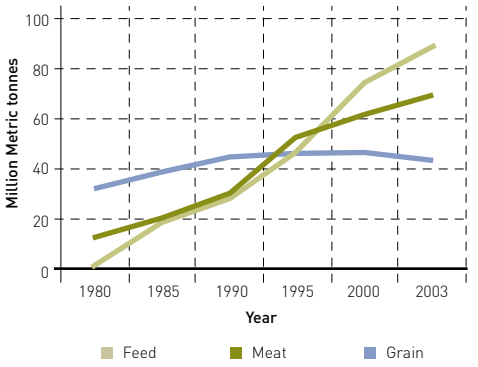
Along with increased production and consumption of meat, milk and eggs, demand for animal feed in China has been ever-increasing. Land scarcity limits China's ability to continue expanding its production to meet the growing domestic demand without increasing its imports of livestock

LIVESTOCK PRODUCTION IN CHINA: TOTAL OUTPUT, WORLD RANKING AND ANNUAL GROWTH RATES

	Output Million MT 2004	World rank	Percentage of world total	Annual growth rate (1994-2004)
Pork	46.7	1	46.5	4.1
Mutton	3.6	1	29.6	9.2
Eggs	28.1	1	44.7	6.6
Poultry meat	12.9	2	16.5	7.1
Beef	6.2	3	10.6	9.6
Milk	22.5	8	3.7	10.4

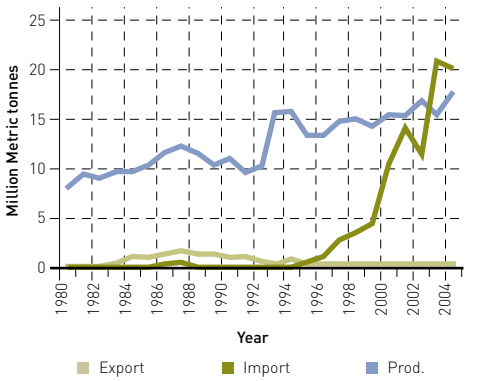
Source: FAO (2005)

PRODUCTION OF GRAINS, FEED AND MEAT IN CHINA



Source: Bingsheng (2004)

SOYBEANS PRODUCTION AND TRADE IN CHINA



Source: Bingsheng (2004)

feedstuffs. Since China's accession to the WTO in 2001, the country has increasingly resorted to importing feed to sustain its rapidly growing pig and poultry industries.

Feed production as well as imports have increased. Total feed imports have surged to 1.2 million tonnes in 2003 from 0.8 million in 1993, giving rise to fears that the expansion of China's livestock industry could lead to price hikes and global shortages of grains, as has been predicted many times in the past. China is still a net exporter of feed stuffs, but this is gradually declining, reduced by 42 percent in the last decade.

Elsewhere in East Asia, Vietnam, Thailand, Malaysia and the Philippines are experiencing rapid growth in their livestock sectors, in particular pig and poultry production. Thailand has taken rapid steps in the nineties to establish a thriving poultry industry and has become one of the leading exporters of broilers worldwide, ranked number five in 2003 after the United States, Brazil, France and the Netherlands before the recent Avian Influenza crisis. In fact Thai poultry and pig production has been scaling up at a rapid pace in the last decade. However, with outbreaks of Avian Influenza in 2004 and 2005, it is currently at risk of losing its export status for unprocessed poultry meat altogether. In the Philippines, the livestock sector (including poultry) almost single-handedly carried the lagging agricultural sector and doubled total agricultural value added in the last 20 years.

SELF SUFFICIENCY IN COARSE GRAINS IN SELECTED SE ASIAN COUNTRIES 1980 TO 2003

Country	1980	1985	1990	1995	2000	2003
Indonesia	99.8	98.4	102.0	90.1	88.5	89.1
Malaysia	1.2	2.1	2.3	1.8	2.8	2.6
Philippines	92.5	93.2	93.2	95.0	90.6	97.4
Thailand	364.9	234.7	145.7	96.1	93.8	105.1
Viet Nam	100.0	109.3	105.4	100.9	91.4	95.2

Source: FAO (2005)

Except for Thailand, most other main producers in South East Asia have based their expanding livestock sectors on increased feed imports and have been characterised by gradual declines in self-sufficiency rates.

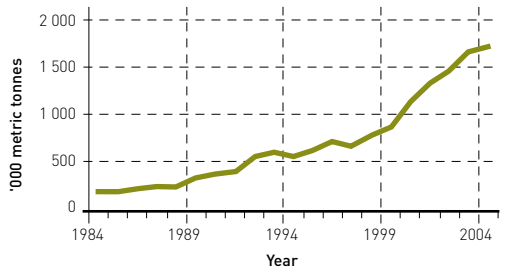
India and South Asia

With an estimated annual production of 90.4 million tonnes of milk in 2004 and an annual growth rate of 3.9 percent, India has emerged as the No. 1 producer of milk and dairy products. Based on its vast ruminant population, and traditional dietary patterns with dairy products, and driven by economic growth, the dairy sector is expected to continue to grow rapidly. Milk production in India continues to be smallholder based, but larger holdings and outside investments are taking hold. Furthermore, cooperative movements, such as the National Dairy Development Board have been very successful in linking smallholders to growing urban markets, providing the smallholders with essential feed and animal health inputs, and basic knowledge for intensification of dairy production. Most of India's dairy production is based on the utilisation of roughages (pastures and crop residues) and if concentrates are fed, they are usually derived from agro-industrial by-products. The availability of fodder will partly determine further expansion of milk production in India.

Despite rapid expansion of production and the potential for surpluses, India finds it difficult to enter international markets with its dairy products. This, to a large extent, is due to food safety and quality issues. In the particular case of India, this is compounded by the fact that millions of smallholders are part of the food chain, and that feed residues are often not private and traceability difficult to establish.

Poultry meat production has tripled in the last decade and has been experiencing double digit growth rates at 12 percent per annum, while egg production has been growing steadily at 2.8 percent. Since 1997, the total poultry population has increased by 32.8 percent from 368 million to 489 million in 2003 (Government of India, 2005). In 1998, poultry meat has overtaken small ruminant meat in importance. The increased consumption of poultry meat is associated with changing eating habits in India, where at least some population groups have moved away from strict vegetarian diets, and many young people are eating fast foods.

TRENDS IN POULTRY MEAT PRODUCTION IN INDIA 1984-2004



Source: FAO (2005)

Like elsewhere, the development of poultry production is rather discontinuous i.e. there is typically no "organic" growth on the production side where small poultry farmers gradually expand and intensify their production. Rather, as soon as urban markets develop, investors step in, often with no previous association with livestock production, and establish industrial type units and associated processing and marketing methods. There are considerable economies of scale in broiler and egg production, and smallholders are quickly losing out to their emerging large-scale competitors. This leads to a rapidly changing structure of the poultry industry which varies from region to region, with three states only, Andra Pradesh, Tamil Nadu and West Bengal, accounting for 51 percent of the total poultry population (Government of India, 2005).

While independent and relatively small-scale producers account for the bulk of production, integrated large-scale producers make up a growing share of output in some regions. Integrators

PER CAPUT CONSUMPTION OF RUMINANT MEAT, POULTRY, AND MILK FOR SOUTH ASIAN COUNTRIES (KG/CAP/YEAR) IN 2002

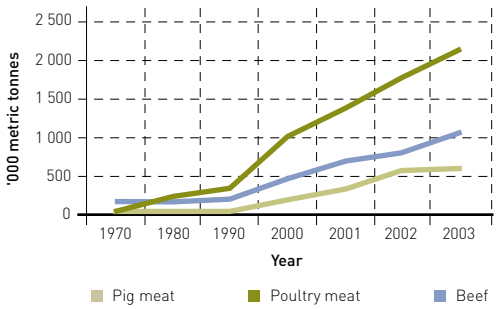
Country	Bovine meat	Mutton and goat meat	Poultry meat	Milk
Bangladesh	1.3	1	0.8	12.4
India	2.5	0.7	1.3	38.5
Nepal	7.1	1.7	0.6	30.3
Pakistan	6.2	3.5	2.4	86.3
Sri Lanka	1.8	0.1	4.6	36.4

Source: FAO (2005)

include large regional firms that incorporate all aspects of production, including raising grandparent and parent flocks, rearing day old chicks, contracting production, compounding feed, providing veterinary services, and wholesaling (Delgado *et al.* 2003)

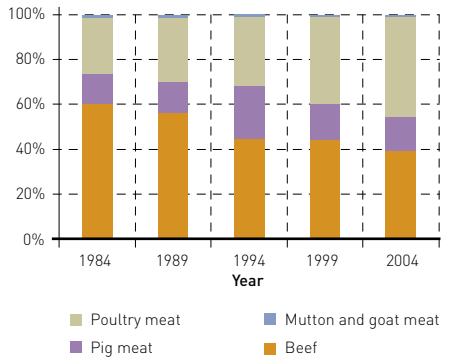
Contrary to the trend in East and South East Asia, increasing feed demand for dairy and poultry meat production has not been met by the importation of feed grains into South Asia. Until now, limited domestic supplies of feed grains, together with heavy use of food processing by-products have sufficed. However, this may be explained by the still very low meat consumption, and it is doubtful whether such a pattern can be maintained if consumption expands further. Echoing the Indian example, neighbouring countries such as Pakistan, Bangladesh, Nepal, and Sri Lanka are predominantly consumers of milk rather than meat. Pakistan as a predominantly Moslem country has comparatively high, and rising, levels of meat consumption, with ruminants playing a larger role. Bangladesh, Nepal and Sri Lanka are more similar to India in their production structure, importance of dairying and with poultry as a rapidly emerging business. Bangladesh has notable developments in terms of cooperative structures in the poultry sectors. Smallholders are likely to continue to play a significant role in dairy and small ruminant production.

BRAZILIAN EXPORTS OF BEEF, PIG AND POULTRY MEAT



Source: FAO (2005)

COMPOSITION OF TOTAL MEAT PRODUCTION IN BRAZIL



Source: FAO (2005)

Brazil and South America

Currently, Brazil is the No. 2 exporter of meat and projections have put Brazil as the No. 1 exporter of livestock products in the long term future. Brazil has emerged as an important exporter of a variety of livestock products, including dairy products, pork, poultry meat and beef. It accounts for 20.7 percent, 12.8 percent and 6.4 percent of the global exports of poultry meat, beef and pork meat exports, respectively.

In the last decade, exports of beef have tripled, while poultry meat has quadrupled and pork

meat has risen by a factor of eleven. In terms of production, Brazil accounts for 71 percent, 70 percent, 60 percent, 50 percent, and 35 percent of the total pig meat, poultry meat, beef, milk and mutton and goat meat respectively produced in South America.

This is largely because Brazil has increasingly taken advantage of low feed production costs for its livestock industry and is poised to continue to be an important producer of feed stuffs. The combination of land abundance and recent infrastructure developments has turned previously remote areas such as Mato Grosso and the Cerrado region of central Brazil into feed baskets as they have the lowest production costs for maize and soyabeans globally. Since about the early nineties, Brazilian producers have started decisively to take strategic advantage of their position. Rather than producing and exporting maize, soyabeans and other feed items, they have started to convert their feed into exportable surplus of livestock commodities and consequently the relative composition of livestock outputs has been changing.

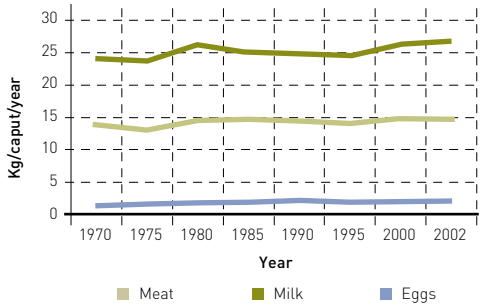
Other Latin American countries, some of which are long term traditional exporters such as Argentina and Uruguay, continue to play a major role, others are emerging, such as Chile and Mexico which are taking advantage of relatively large land endowments and favourable disease status.

Africa

Although Africa is one of the continents with the largest feed resources, it has lagged behind in the development of the livestock revolution which has characterised other developing regions (Mwangi and Omore, 2004). Growth in livestock production has in the last decade not matched growth in the human population and consequently Africa has increasingly become a net importer of livestock products.

For Africa as a whole, although total production of meat, milk and eggs has been increasing at an annual rate of 2.6 percent, 3.0 percent and 2.5 percent for meat, milk and eggs respectively, growth in per caput production has been marginal, only 0.3 percent, 0.7 percent and 0.2 percent for meat, milk and eggs. However, North African countries, have experienced increased consumption levels, largely sustained by imports. In sub-Saharan Africa as a whole, consumption levels for meat, milk and eggs have not only been low, but have remained static and even declined over the last decade.

TRENDS IN PER CAPUT CONSUMPTION OF LIVESTOCK PRODUCTS IN SUB-SAHARAN AFRICA

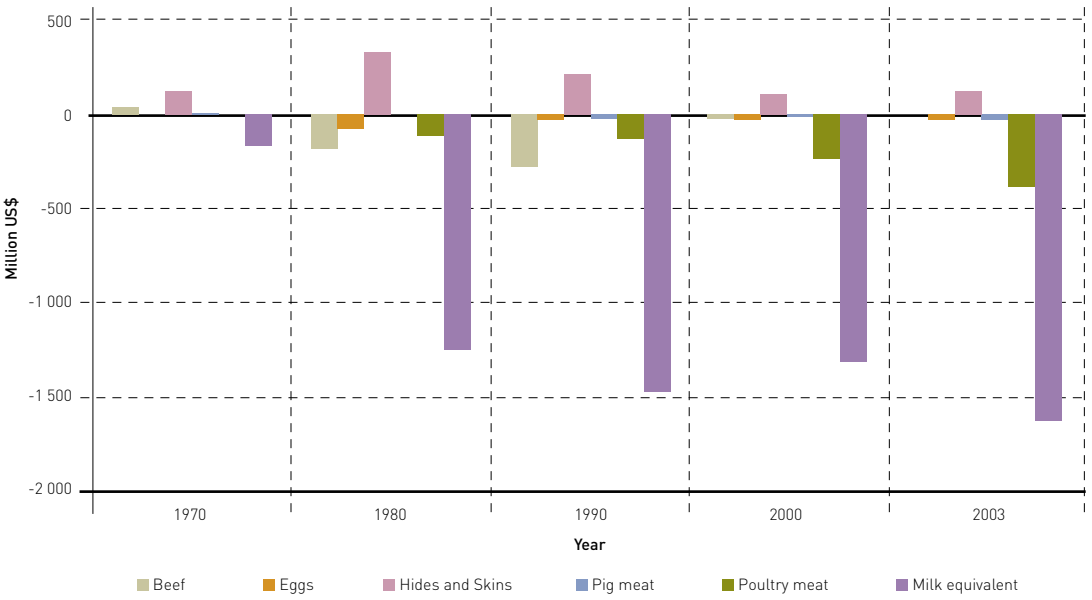


Source: FAO (2005)

Per caput consumption of meat, milk and eggs in 1980 were 12.8 kg, 24.8 kg and 1.3 kg and have changed marginally since then to 11.4 kg, 24.2 kg and 1.3 kg in 2002. This is largely because of rapidly expanding human populations coupled with factors such as the dominance of low yielding livestock breeds, presence of animal diseases, feed constraints as well as institutional and policy constraints affecting the livestock sector.

Africa is a net importer of all livestock products with the exception of skins and hides. The tendency has been that of increasing net imports and this is likely to continue in the coming decades. Total net imports of livestock and livestock products stood at US$ 2,258 million in 2003. The north African countries i.e. Algeria, Egypt, Libya, Tunisia and Morocco account for 40% of the total imports of livestock and livestock products into

NET TRADE IN LIVESTOCK PRODUCTS IN AFRICA



Source: FAO (2005)

Africa, while the rest is imported by sub-Saharan African countries including South Africa. In particular, the African countries have to contend with the imports from the European Union and increasingly from Brazil.

However, within this picture, some success stories have emerged, notably Botswana, Namibia and South Africa which have accessed high value markets in developed countries and are also experiencing higher per caput consumption levels for livestock products. For example, in East Africa, Kenya has developed a strong position in milk production and has one of the highest per caput consumption of milk products in sub-Saharan Africa at 83.4 kg per person.

Near East

Although permanent pastures occupy about 80 percent of all the land suitable for agriculture, the Near East countries are net importers of virtually all livestock products. Growth in production has not matched growth in consumption due to factors such as the rapid growth in the human population, shrinking of traditional pastures, recurrence of drought and outbreaks of transboundary animal diseases. The region has experienced stagnation in per caput production and where consumption is rising this has mainly been due to increasing imports. The region is a net importer of livestock products i.e. in 2002 net imports were a total of 1,296 million, 3,855 million and 47 million metric tonnes of meat, milk and eggs which represent 16.3 percent, 40.8 percent and 6 percent of total consumption, respectively. Furthermore, importation of livestock products into the region is increasing. The region is a net importer of live animals. A total of 11.9 million sheep and goats and 500 thousand bovines were imported in to the region in 2003, when the total value of live animal imports was US$1,205 million.

Conclusions

Looking at the key players in the world of livestock, there is a great deal of variation in terms of the extent and the nature of livestock sector growth. The "old players", i.e. the developed countries led by the US and the EU, although characterised by high production levels, are experiencing stagnation in livestock sector growth in the absence of further increases in demand for livestock products. China and East Asia have experienced the most impressive growth in consumption and production, first in meat and more recently also in dairy products. The region will need to import increasing amounts of feed, and perhaps also livestock products, to meet future consumption growth. In contrast, India's livestock sector continues to be dairy-oriented, using traditional feed resources and crop residues. This picture is likely to change as the booming poultry industry will pose feed demands which will by far exceed current supplies. In stark contrast, Brazil, Argentina and other Latin American countries have successfully expanded their domestic feed base, taking advantage of low production costs and abundance of land. They have moved to adding value to feed, rather than exporting it – they are poised to become the major exporting region for OECD and East Asian countries.

As markets are globalized and tariff barriers become weaker, trade in livestock products has increased much faster than trade in feed. While the share of traded feed grains in total production has remained fairly constant in the range of 20 to 25 percent over the last decade, that of meat and milk has increased from 13.9 and 18.5 percent in 1980 to 20.8 and 21.0 percent respectively, in 2002. Growth in trade in livestock products is also outpacing growth in production. This points to a gradual trend towards producing livestock where feed is available rather than close to consumption centres. It appears that this is facilitated by infrastructure development and cold chains in major producing countries.

This trend of faster growth in trade in livestock products is remarkable when viewed against the background of important disease outbreaks, such as FMD, BSE and Avian Influenza, which have often had a dramatic disruptive impact on the export capability of countries, such as the UK and Thailand. In the global picture, however, these are hardly noticeable.

Challenges differ greatly from region to region but some general observations can be made. On the production side, the trend towards rapidly increasing livestock production in the tropics poses a series of technical problems (climate, disease), some of which countries do not appear to be readily prepared for, as demonstrated by the series of outbreaks of Avian Influenza in the last two years. The surge in production, as has been shown above, also entails an expansion of food supplies, and in particular in Asia, an increasing amount will need to come from imports. Some countries will be faced with the question as to whether to meet this demand by feed import-based domestic production, or whether to opt for imports of livestock products. Production moves away from established production areas with high environmental standards; this potentially creates opportunities for circumventing locations with high environmental standards.

On the consumption side, we observe that diets converge globally. Cultural peculiarities become increasingly blurred as demonstrated by the surge of poultry consumption in South Asia. These changing patterns are further supported by the fact that the same eating habits, such as fast and convenience food, are catching hold almost everywhere.

References

Bingsheng Ke (2004). *Livestock sector in China: Implications for food security, trade and environment.* Research Center for Rural Development (RCRE)

Delgado, C., C. Narrod, and M. Tiongco (2003). *Policy, Technical, and Environmental Determinants and Implications of the Scaling-Up of Livestock Production in Four Fast-Growing Developing Countries: A*

Synthesis. Final Research Report of Phase II. Food and Agriculture Organization, Rome. Italy

Delgado, C., M. Rosegrant, H. Steinfeld, S. Ehui, and C. Courbois (1999). *Livestock to 2020: the next food revolution*. Food, Agriculture and Environment Discussion Paper 28, International Food Policy Institute (IFPRI), Washington, DC, USA.

Economic Research Service (1998). China's livestock sector growing rapidly. United States Department of Agriculture. http://www.ers.usda.gov/publications/agoutlook/nov1998/ao256e.pdf

FAO (2005) FAOSTAT data. Food and Agriculture Organisation, Rome. http://faostat.external.fao.org/default.jsp (accessed April, 2005).

Government of India (2005). *17th Indian Livestock Census – Livestock, poultry, agricultural machinery & implements and Fishery statistics*. Ministry of Agriculture, Dept of Animal husbandry and dairying, New Delhi, India

Mwangi, D.M. and A. Omore (2005). *The Livestock Revolution – a view on implications for Africa*. British Society of Animal Science, Penicuik, UK.

OECD (2005) OECD data. http://www.oecd.org/document/47/0,2340,en_2649_33727_32019951_1_1_1_1,00.html