

# Current and predicted trends in the production, consumption and trade of live animals and their products

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## Summary

Changes in livestock production, driven by both demand- and supply-side factors, have been significant worldwide. Though historically the developed world was a large supplier of meat and livestock for the developing world, the developing world has rapidly increased production and is meeting more of its growing domestic demand. Many regions of the developing world, however, do not produce enough currently to meet their domestic demand and continue to import more than they produce. There are exceptions, such as Brazil, Thailand, the People's Republic of China and India, where growth in livestock production has been rapid. It is anticipated that in the future many of the developing countries will increase domestic production to meet growing domestic demand. By 2030, beef will probably still be the most significant meat import of developing countries and milk will have more than doubled as a net export of the developed world.

## Keywords

Breeding stock – Livestock – Livestock product – Meat consumption – Milk consumption – Projections – Trade.

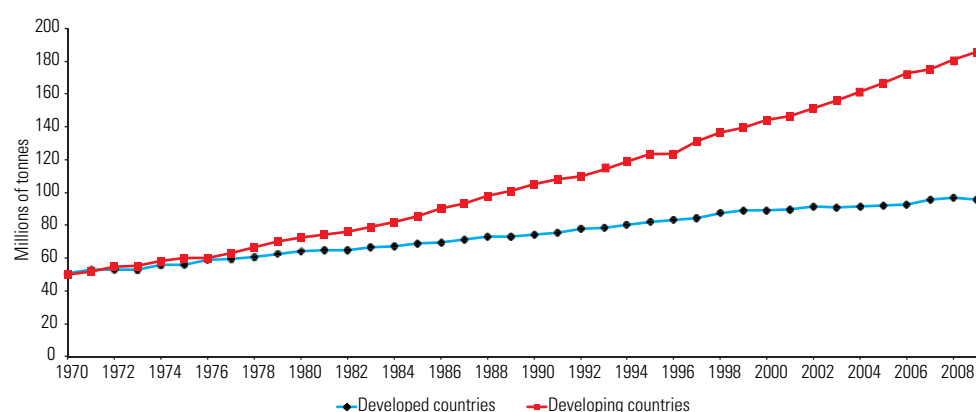
## Introduction

Changes in livestock production driven by both demand- and supply-side factors have been significant worldwide. The key drivers of change in the livestock sector are economic growth and income, demographic and land-use changes, dietary adjustments and technological change (3, 4, 17). Increased individual consumption of livestock products is most closely linked with rising income, although changes in lifestyle, with urbanisation and shifts in the demographic structure, have also contributed towards rising consumption. At the same time, a number of new technologies have been developed that have transformed the way livestock products are produced and processed, and have helped deliver a wider variety of higher quality products to consumers (8).

As incomes rise, the share of a household's budget allocated to food tends to decline, but the composition of the food budget also changes. There is a rise in the consumption of products that have a higher income

elasticity of demand. Thus, with rising incomes, a smaller share of the food budget is spent on grains and other starchy staples and a larger share is spent on meat, milk, fish, fruits, vegetables, and processed and prepared foods. Delgado *et al.* labelled this significant change in the consumption and production of livestock products as the 'Livestock Revolution' (5). The potential for transformation of the agrarian economy from such changes is comparable to that of the Green Revolution; the difference is that while the Green Revolution was largely supply driven, the Livestock Revolution is both demand and supply driven. In addition, while the Green Revolution was driven largely by technology developed by the public sector, in the Livestock Revolution most of the technology, at least on the breeding side, has been developed by the private sector and transferred to developing countries (13).

For some time, meat volume produced in the developing world has outpaced the volume produced in the developed world (Fig. 1) and much of this growth has been in East and South Asia and Latin America and the Caribbean. This



**Fig. 1**  
**Meat production in developed and developing countries, 1970 to 2008**

Source: FAOStat (7) and IMPACT (15); data downloaded November 2010

trend of developing countries producing more than developed countries is the same for milk (see Fig. 2). This trend does not necessarily imply that developing countries are meeting their demands; in fact, as shown in Figure 3, since 1970 developing countries have tended to be net importers of livestock products, with the exception of bovine meat and eggs, which showed increased net exports in 2007.

Apart from more livestock products being demanded worldwide, there have also been significant changes in the way these products are marketed. Demand for normal good attributes, such as food safety and quality, has risen, because there is now the technological ability to monitor for safety attributes and because consumption patterns have shifted as incomes have risen. Though this trend towards demanding foods with specific attributes may be more apparent in the developed world, there is also a

growing demand from wealthy consumers in the developing world (12).

Because of the perishability of high-value products, and concerns over the spread of animal diseases, particularly those of a zoonotic nature, livestock products are subject to very stringent safety requirements. The stringency of these requirements makes it almost impossible for developing countries to export their products to the developed world, although a few of them (e.g. Brazil and Thailand) are starting to provide livestock products to the developed world (see discussion later in the paper). However, rapidly rising incomes in several developing countries have created a domestic high-value outlet for producers, albeit for a market that is rapidly transitioning to resemble the markets in the developed countries of the north, with demands for products with specific attributes.

**Table I**  
**Average annual growth in real per capita income (%)**

Region	Average annual per capita growth rate (%)					1962-2009
	1962-1971	1972-1981	1982-1991	1992-2001	2002-2009	
<b>Developing countries</b>						
East Asia & Pacific of which	4.7	4.8	6.2	6.7	8.7	6.2
China	6.5	4.6	8.2	8.8	10.4	7.7
Latin America & Caribbean of which	2.8	2.5	-0.1	1.1	2.6	1.7
Brazil	3.5	3.8	0.3	1.3	2.4	2.3
Middle East & North Africa <sup>a)</sup>	n/a	1.0	0.2	1.4	2.9	2.2
South Asia of which	3.4	1.7	2.9	3.5	6.0	3.2
India	4.1	1.6	3.0	4.1	6.8	3.6
Sub-Saharan Africa	2.7	0.5	-1.0	0.2	2.4	0.7
<b>Developed countries</b>						
High income: OECD	4.1	2.2	2.8	2.0	0.8	2.4
<b>World</b>	<b>3.1</b>	<b>1.5</b>	<b>1.7</b>	<b>1.5</b>	<b>1.4</b>	<b>1.8</b>

a) Data for the Middle East and North Africa begin in 1968

n/a: not applicable

OECD: Organisation for Economic Co-operation and Development

Source: World Bank (21); downloaded on 5 November 2010

The paper discusses production and consumption growth, livestock production in different regions of the world, current trade patterns, and legal and illegal wildlife trade. It concludes with a discussion of the future outlook of trade patterns based on projected demand. Throughout the paper the authors use the same groupings of developed/developing countries as those used to make the projections, that is, the groupings of the International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT). The model was developed at the International Food Policy Research Institute (IFPRI).

## Demand-side changes and supply response

Since 1972, world per capita annual income growth has been between 1.4% and 1.8% (Table I). Per capita income has grown at an average rate of over 8.7% per year since 2002 in the developing countries of East Asia and the Pacific and at over 6.0% per year in the developing countries of South Asia. The growth in East Asia has largely been driven by the People's Republic of China (hereafter referred to as China). Per capita income growth over this period in sub-Saharan Africa, Latin America and the Caribbean, and the Middle East and North Africa has been slower (2.4% to 2.9% per year), but appreciably faster than in the 1980s and 1990s. Growth in income between 2002 and 2009 for the high income countries of the Organisation for Economic Co-operation and Development was only at 0.8%, considerably less than that occurring in developing countries. The International Monetary Fund reports that in advanced economies, growth rates are forecast to remain low given the recession, while in many emerging economies the projected growth is expected to be robust compared with the experience following past global recessions, with the exception of a number of economies in emerging Europe and the Commonwealth of Independent States (22).

Alongside economic growth, there has been a continuous process of urbanisation, particularly in the developing countries. Table II shows that most of the urban population and income growth has taken place in developing countries. In developing countries, the urban share of the population is smaller than in the industrialised countries, but it is growing more rapidly (21). Calculations by the United Nations (19) indicate that the 50% mark worldwide was crossed in 2009; thus, for the first time in history, the world has more urban dwellers than rural ones. Furthermore, the proportion of the population that is urban is expected to rise to 59.7% by 2030 (18).

**Table II**  
**Population, urbanisation and income: annual growth rates, 1975 to 2010 (% per annum)**

	Developing countries*	Developed countries
Total population	1.7	0.8
Urbanisation	3.1	1.2
Income per capita (2000-2008)	11.7	5.3

\*Using the developed/developing country groupings of the International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT), which was developed at the International Food Policy Research Institute (IFPRI)

Sources: Total population and urbanisation data from the United Nations Population Division, 2010 (18); Income per capita data from the World Bank Development Indicators, 2010 (21); data downloaded on 5 November 2010

Table III presents the changing patterns in consumption that have occurred largely as a result of rising incomes; it shows the shift mentioned earlier away from grains and other starchy staples. Globally, the average annual growth in consumption is among the highest in livestock and fish products. The patterns compare favourably with other high-value products such as fruits and vegetables, and growth in demand for livestock products in the last four decades has been uniformly higher than for cereals.

Annual growth in demand and production in developing countries outpaced demand and production in developed countries for all livestock products in the 1990s and throughout 2000 and were fairly consistent with annual growth in consumption for all regions of the world for all products (see Fig. 4). However, from 2001 to 2007 the annual growth in consumption for poultry, pork, and bovine meat in Latin America outpaced the annual growth in production of those products, while annual growth in sub-Saharan Africa for poultry and egg production outpaced growth in consumption. In addition, developed countries reduced their annual growth in consumption of fluid milk compared to growth in production, and Latin America increased its consumption above growth in production.

As pointed out by Delgado, the significance of the per capita figures is more striking when these are multiplied by population, because four-fifths of the world's population live in developing countries, where consumption of meat and milk is growing (2). Over the last decade, people in developing countries have consumed, on average, close to half the meat, and a little more than one-third of the milk products, consumed in the richer north, but this is changing rapidly, particularly in terms of pig and poultry meat and milk products (see Table IV). The amount of meat consumed in developing countries over the past two decades has grown one and a half times more than in the developed countries (Fig. 4).

**Table III**  
Average annual growth in global per capita consumption of various food items (%)

Food item <sup>(a)</sup>	1962-1971	1972-1981	1982-1991	1992-2001	2002-2007	1962-2007
Cereals (excluding beer)	0.4	0.7	0.3	-0.3	-0.1	0.3
Fruits (excluding wine)	1.4	0.7	0.6	1.4	2.4	1.3
Pulses	-2.5	-1.3	-0.3	0.4	1.2	-0.9
Vegetables	-0.2	1.3	1.2	3.9	1.1	1.5
Eggs	1.4	0.8	1.7	2.5	0.9	1.4
Fish, seafood	2.0	0.4	1.1	2.4	0.8	1.4
Meat	1.7	1.0	1.2	1.2	0.8	1.2
Milk (excluding butter)	0.1	0.2	-0.1	0.6	1.5	0.3

a) Consumption was measured in kilograms

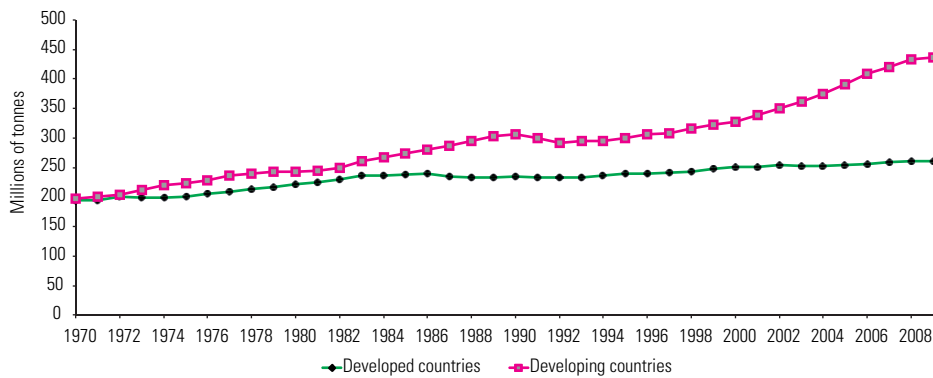
Source: FAOStat (7); data downloaded on 5 November 2010

**Table IV**  
Average consumption (in kilograms/capita/year) of meat, eggs, and milk by region

Food item	Developing countries*	Developed countries	Sub-Saharan Africa	South Asia	East Asia	Latin America & Caribbean	World
1980							
Bovine meat	10.74	21.62	6.90	3.25	5.75	19.62	10.57
Eggs	4.05	12.14	1.12	1.01	4.29	5.96	5.59
Pig meat	6.77	27.99	1.30	0.18	5.49	6.76	11.87
Poultry meat	6.85	14.74	1.76	0.59	4.57	7.97	5.76
Milk (excluding butter)	69.54	217.03	34.85	43.14	22.53	94.43	76.86
1990							
Bovine meat	9.95	20.07	6.39	3.62	5.88	16.70	10.32
Eggs	4.27	11.55	1.16	1.36	4.94	6.07	6.36
Pig meat	7.27	31.16	1.49	0.22	8.08	6.31	13.12
Poultry meat	9.56	18.27	2.39	0.86	6.48	9.80	7.63
Milk (excluding butter)	64.99	214.49	30.74	48.18	23.25	80.93	77.02
2000							
Bovine meat	9.80	19.55	5.77	3.55	6.53	17.06	9.53
Eggs	4.71	10.78	1.24	1.59	5.92	6.28	8.08
Pig meat	8.47	35.34	1.71	0.23	9.08	7.99	14.85
Poultry meat	12.64	25.15	3.12	1.49	10.42	18.53	10.93
Milk (excluding butter)	81.33	212.25	31.40	58.63	31.33	93.40	77.61
2007							
Bovine meat	9.43	20.33	5.96	3.77	5.21	14.84	9.59
Eggs	5.32	11.14	1.29	1.79	7.26	7.16	8.57
Pig meat	10.02	34.09	1.85	0.22	11.95	9.42	15.05
Poultry meat	15.27	28.73	4.14	2.14	12.85	22.57	12.62
Milk (excluding butter)	88.53	210.59	31.05	64.18	37.02	93.19	84.93

\*Using the developed/developing country groupings of the IFPRI IMPACT model

Source: FAOStat (7); data downloaded on 5 November, 2010



**Fig. 2**  
**Milk production in developed and developing countries, 1970 to 2008**

Source: FAO (7) and IMPACT (15); data downloaded November 2010

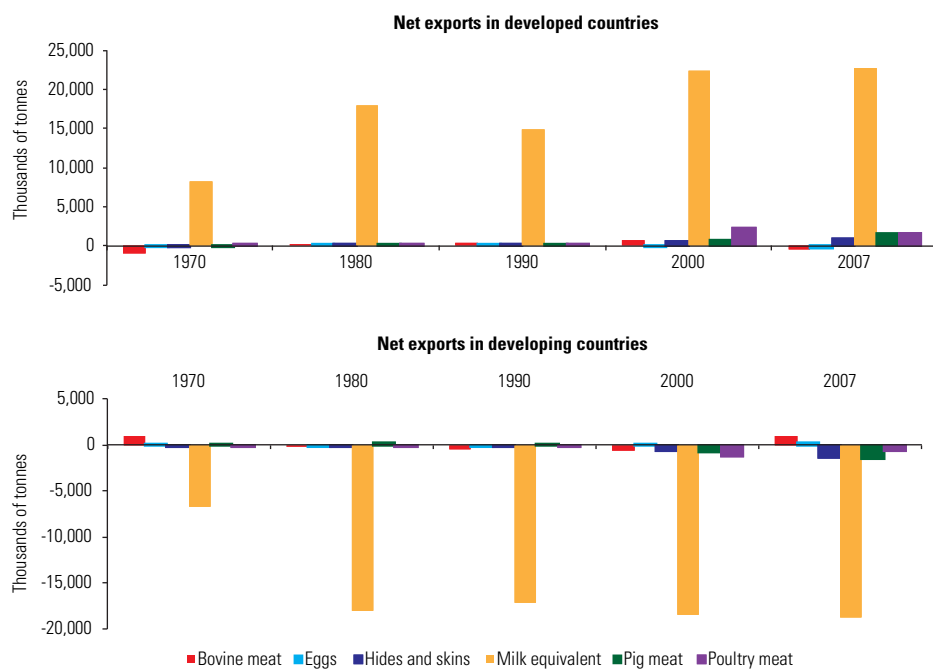
## Changing patterns of trade in livestock inputs and livestock products

A second major factor influencing changing patterns of trade is the globalisation of the market for improved inputs and in particular livestock genetics. Over the last decade, developing countries have steadily begun to establish more specialised enterprises using hired labour, borrowed capital, and purchased inputs so as to produce a more uniform quality livestock product under different modes of industrial organisation with increased productivity (3, 4).

This section looks at trade in breeding stock and trade in meat, eggs and dairy products, followed by a discussion on global and regional net trade in livestock products.

### Trade in improved genetics

Major advances in livestock breeding have occurred in the past decade through the application of quantitative and molecular genetics to enhance animal productivity (8). Over the past several decades a few multinational companies that specialise in poultry and swine breeding have emerged. Most of the genetic research for these companies is carried out at headquarters that are located primarily in the United States and Europe (13). However,



**Fig. 3**  
**Net exports of livestock products in developed and developing countries, 1970 to 2007**

Source: FAO (7); data downloaded November 2010

they sell improved breeds to other countries through franchises and many have operations around the world so as to be near their clients and to maintain grandparent stock in several separate locations in case of disease outbreaks in any one region.

Commercial exports of genetic stock have grown tremendously over the last couple of decades (Fig. 5). In 2008, the combined world exports of live animals for breeding (cattle and swine), improved day-old chicks, and bovine semen totalled US\$2.5 billion (approximately €1.8 billion) compared with US\$151 million (€111 million) in 1988. North America and Europe were the main exporters of genetic resources. Though growth has been large, most of the flow of bovine and swine genetic resources is segmented into trade within high-productivity systems and trade within low-productivity systems, with little trade across the two systems (9). This is less the case in poultry, where breeding companies in the developed north not only trade day-old chicks, but also have set up operations in the developing countries to sell improved breeding stock through hatching eggs with local franchises (14).

Trade data on improved poultry genetic resources are available only for day-old chicks, not hatching eggs. As seen in Figure 5, exports of day-old chicks expanded tremendously in the 1990s from US\$23 million (€16.9 million) in 1988 to just over US\$1 billion (€730 million) in 2008. Data on hatching eggs, however, are only available in terms of production, rather than actual trade. In terms of day-old chicks, the largest exporters in 2009 were the Netherlands, the United States, the United Kingdom (UK), Germany and France, which provided nearly 65% of the world's improved poultry stock (Fig. 6). These birds went to the Netherlands, the Russian Federation, Germany, Ukraine and China (Fig. 7).

After day-old chicks, the highest-value exports in the breeding stock trade are cattle and semen. The largest exporters of cattle in 2009 were Germany, Belgium, France, Austria and Australia, accounting for over 70% of exports. The Russian Federation, Italy, China, Morocco and Venezuela imported nearly 63% of the cattle. Artificial insemination is common in dairy cattle and exports of semen went from US\$3 million (€2.2 million) in 1988 to US\$411 million (€302 million) in 2008. In 2009 the United States, Canada, the UK, Germany and France were responsible for almost 85% of bovine semen exports. The largest importers of bovine semen were the United States, Mexico, the UK, Brazil and Italy.

Currently swine semen cannot be frozen and, although straws of fresh semen can last for a week or so with

extenders, the improvement of genetic stock requires trade in live swine. The largest exporters of swine are Denmark, France, the United States, Canada and the UK, exporting over 80% of the total. The largest importers are Belgium, Germany, the Russian Federation, China and Romania, importing nearly 70% of all exported swine.

## Trade in livestock products

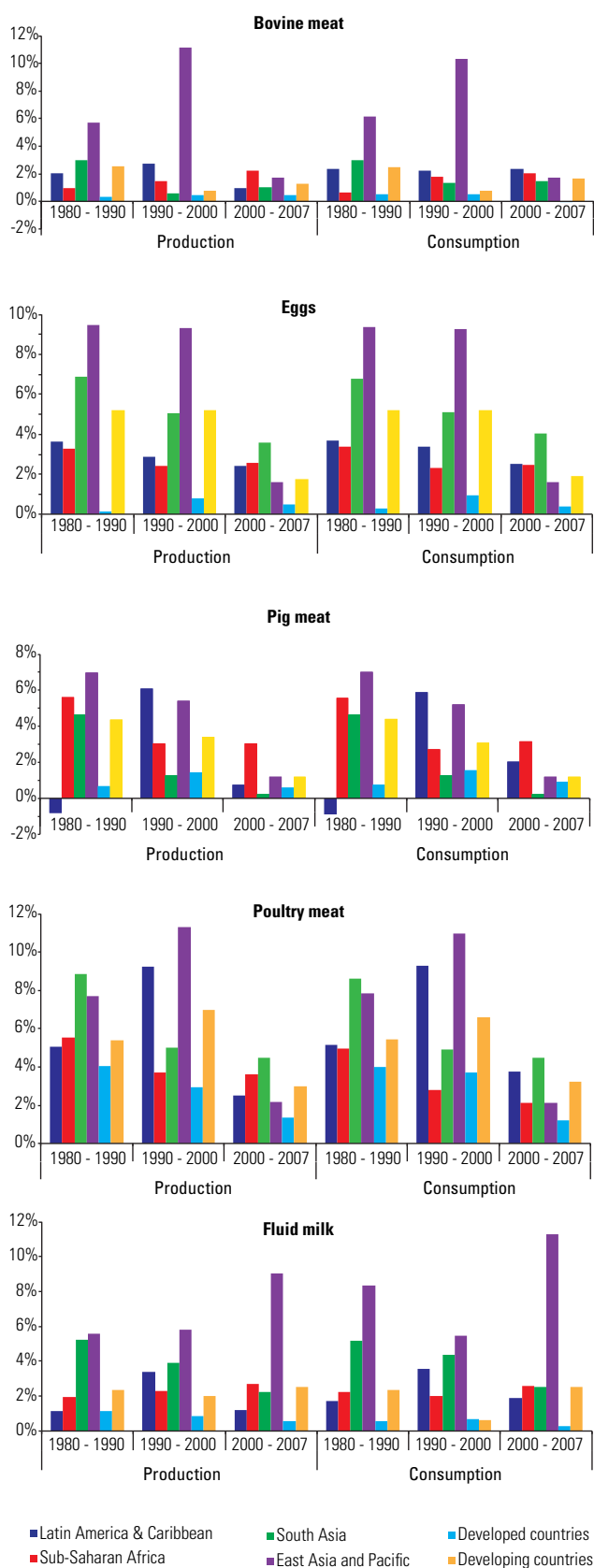
Changes in trade in livestock products were mostly due to:

- strong economic growth in countries such as China, India and Brazil (which also dominate the global production of livestock products)
- lower barriers to trade and regional trade agreements
- greater access to export markets for livestock products by developing countries
- recent disruptions from disease outbreaks, such as bovine spongiform encephalopathy in North America, foot and mouth disease in Argentina and Brazil, and avian influenza in Asia and Europe.

Access to export markets historically has been based on animal disease status and meeting international trade standards (the standards of the Sanitary and Phytosanitary [SPS] Agreement of the World Trade Organization and food safety standards of the importing country) and it has been easier for countries with similar disease statuses to trade with each other than for those with different statuses. Recognising the difficulty that some countries may have in fully eradicating animal diseases or maintaining disease-free status, the World Organisation for Animal Health introduced the concepts of zoning and compartmentalisation for purposes of disease control and international trade and these may improve market access for some producers in some developing countries (1).

However, in light of increasing concerns about food safety and the intrinsic nature of livestock products (e.g. high perishability), the role of trade-facilitating infrastructure and practices has become crucial. Djankov *et al.* (6) estimated the effect on trade volumes of time-sensitive products including fruit and vegetables, which can broadly be applied to livestock products. They found a greater impact on trade volumes of time-sensitive agricultural products than time-insensitive products. For instance, the composition of dairy trade today is dictated by time sensitivity and exports of dairy products are dominated by products (such as cheese and milk powder) that have been processed, making them less time-sensitive.

Major export and import flows of beef are concentrated among a few key players. Brazil, the United States, Canada, Argentina, New Zealand, India and Australia continue to dominate the global export markets, with growth particularly strong from South America (Fig. 8a). Brazil has



**Fig. 4**  
**Annual growth rates in the production and consumption of livestock products**

Source: FAO (7); data downloaded November 2010

maintained its position as the lead beef exporter, although it lost a market share of 3% between 2006 and 2010, while Australia's and New Zealand's market share remained constant throughout the same period, and Argentina lost 3.0% of market share as supply was directed to domestic use. Canada gained 1.0% of market share in beef trade during the same period. The United States remains the world's largest beef importer followed by the Russian Federation, Japan and the European Union (EU) (Fig. 8b). The EU and the United States reduced their beef imports by 4% and 3%, respectively, between 2006 and 2010, while the Russian Federation and Mexico reduced their imports by 1%.

The United States and Brazil are the dominant world poultry exporters; together their exports make up approximately 75% of total exports (Fig. 9a). The Russian Federation, the EU, Japan and Saudi Arabia remain the world's top importers of poultry meat (Fig. 9b). The largest exporter of eggs is the Netherlands (Fig. 10a) while the largest importers are Germany, the Netherlands and France, although some of this trade is in hatching eggs (Fig. 10b). In the case of fluid milk, the top exporters remain the EU, New Zealand, Australia and Argentina (Fig. 11a); most of these exports flow to the Russian Federation, which is the biggest importer of fluid milk, followed by Mexico, the Philippines, Canada, and China (Fig. 11b).

The United States, the EU, Canada, Brazil and China maintained their places as the top exporters of pork between 2006 and 2010 (Fig. 12a). The United States' share of the world market increased significantly over this period, followed by Brazil, while the EU's, Canada's and China's pork exports declined slightly, perhaps because of reduced production in these countries. Exports, primarily from the United States and Brazil, increased following growth in the world economy, a weaker dollar, and competitive prices. Canada's and the EU's market share decreased by 1% and 2%, respectively, while the United States gained 8% between 2006 and 2010. It is expected that Brazil will expand its exports as new markets emerge and demand for pork increases. Reliance on export markets continues as major importing countries, such as Japan, the Russian Federation, Mexico, Hong Kong, the United States and the Republic of Korea, increase their demand.

Although the developing countries are net importers for all commodities (except for bovine meat and eggs in 2007), examination of regional net exports reveals subtle differences emerging. Figure 13 shows how Latin America and the Caribbean were already net exporters of bovine meat and poultry meat in the 1980s and by 2007 had also become net exporters of pig meat. East Asia became a net importer of poultry and pig meat in 2000. South Asia has been a net exporter of bovine meat since the 1980s and from 2000 started to be a net exporter of eggs.

Sub-Saharan Africa has been a net exporter of hides and skins for some time.

## Illegal wildlife trade becoming widespread

In addition to trade in livestock products, there is increased trade in wildlife products; that is, the sale or exchange and distribution, either domestically or internationally, of wild animals and plant resources. Although there is legal trade in certain wildlife species and products of wildlife, there are restrictions on the trade in others which are currently threatened by over-exploitation and extinction. Despite this, demand for wildlife

commodities such as 'bushmeat' and trafficking of wildlife seem to be growing, resulting in a lucrative illegal trade in many parts of the world. Because this trade is illegal, it is difficult to quantify its economic costs or returns. Estimates indicate that approximately 40,000 live primates, 4 million live birds, 640,000 live reptiles and 350 million live tropical fish are traded annually, and these could be valued between US\$5 billion (€3.4 billion) and US\$20 billion (€15 billion) (11). The most profitable wildlife commodities are tigers and their parts, elephant ivory, rhinoceros horns, caviar, exotic birds and reptiles (Table V). If consumers of these wildlife products continue to demand them and are willing to pay more, then the value of illegal wildlife products will also continue to increase. For poor hunters and traders with few alternatives for generating income, illegal wildlife trade has become their sustaining livelihood.

**Table V**  
Selected illicit wildlife trade and estimated retail value in the United States

Illegally traded wildlife	Estimated retail value*
Elephants	\$121-900 (€82-612) per kilogram of ivory
Rhinoceros	\$945-50,000 (€643-34,003) per kilogram of rhinoceros horn
Tibetan antelopes	\$1,200-20,000 (€816-13,601) per shatoosh shawl
Big cats	\$1,300-20,000 (€884-13,601) per tiger, snow leopard, or jaguar skin \$3,300-7,000 (€2,244-4,760) per set of tiger bones
Bears	\$250-8,500 (€170-5,781) per gall bladder
Sturgeon	\$4,450-6,000 (€3,026-4,080) per kilogram of caviar
Reptiles and insects (often live)	\$30,000 (€20,402) per cempelli python \$30,000 (€20,402) per komodo dragon \$5,000-30,000 (€3,400-20,402) per plowshare tortoise \$15,000 (€10,201) per Chinese alligator \$20,000 (€13,601) per monitor lizard \$20,000 (€13,601) per shingleback skin \$8,500 (€5,781) per pair of birdwing butterflies
Exotic birds (often live)	\$10,000 (€6,801) per black palm cockatoo egg \$25,000-80,000 (€17,002-54,405) per mature breeding pair of black palm cockatoos \$5,000-12,000 (€3,400-8,161) per hyacinth macaw \$60,000-90,000 (€40,804-61,206) per Lear's macaw \$20,000 (€13,601) per Mongolian falcon
Great apes (often live)	\$50,000 (€34,004) per orangutan

\*All prices are in 2008 US dollars (2008 euros), with a conversion rate of \$1.47045 = €1, taken from [www.forecasts.org/data/index.htm](http://www.forecasts.org/data/index.htm)  
Source: Adapted from Wyler *et al.* (22). Compiled from government agencies in the United States, international organisations, non-governmental organisations, and media sources

**Table VI**  
Projected trade in livestock food products by region (thousands of tonnes)

Food item	2000	2010	2030
<b>Sub-Saharan Africa</b>			
Bovine meat	0.18	-20.53	-130.30
Eggs	-11.94	-5.54	-27.17
Pig meat	-39.83	-5.31	-28.62
Poultry meat	-303.93	-16.88	-55.84
<b>South Asia</b>			
Bovine meat	288.78	-144.74	-109.63
Eggs	9.05	11.43	21.65
Pig meat	-0.05	-28.93	-43.20
Poultry meat	-1.58	49.99	150.86
<b>East Asia &amp; Pacific</b>			
Bovine meat	-358.74	-159.05	-445.74
Eggs	40.38	72.40	-20.65
Pig meat	-203.32	302.04	32.00
Poultry meat	-275.06	-201.04	35.43
<b>Latin America &amp; Caribbean</b>			
Bovine meat	432.74	330.49	741.87
Eggs	-6.42	9.40	30.46
Pig meat	-146.44	34.66	127.75
Poultry meat	470.04	300.50	470.06
<b>Developing countries*</b>			
Bovine meat	-634.20	-14.91	-39.61
Eggs	70.88	3.27	-9.63
Pig meat	-847.86	12.15	-7.93
Poultry meat	-1156.88	-9.33	22.12
<b>Developed countries</b>			
Bovine meat	696.89	75.34	200.14
Eggs	-17.41	-16.55	48.68
Pig meat	771.12	-59.48	38.83
Poultry meat	2216.15	47.16	-111.78

\*Using the developed/developing country groupings of the IFPRI IMPACT model  
Projections are from the IFPRI IMPACT model which uses FAOStat data. Net trade in 2010 and 2030 are projected production minus consumption for the commodity and region shown  
Source: Data for 2000 are from FAOStat (7); data downloaded on 5 November 2010

**Table VII**  
**Projected trade in livestock food products by country**  
**(thousands of tonnes)**

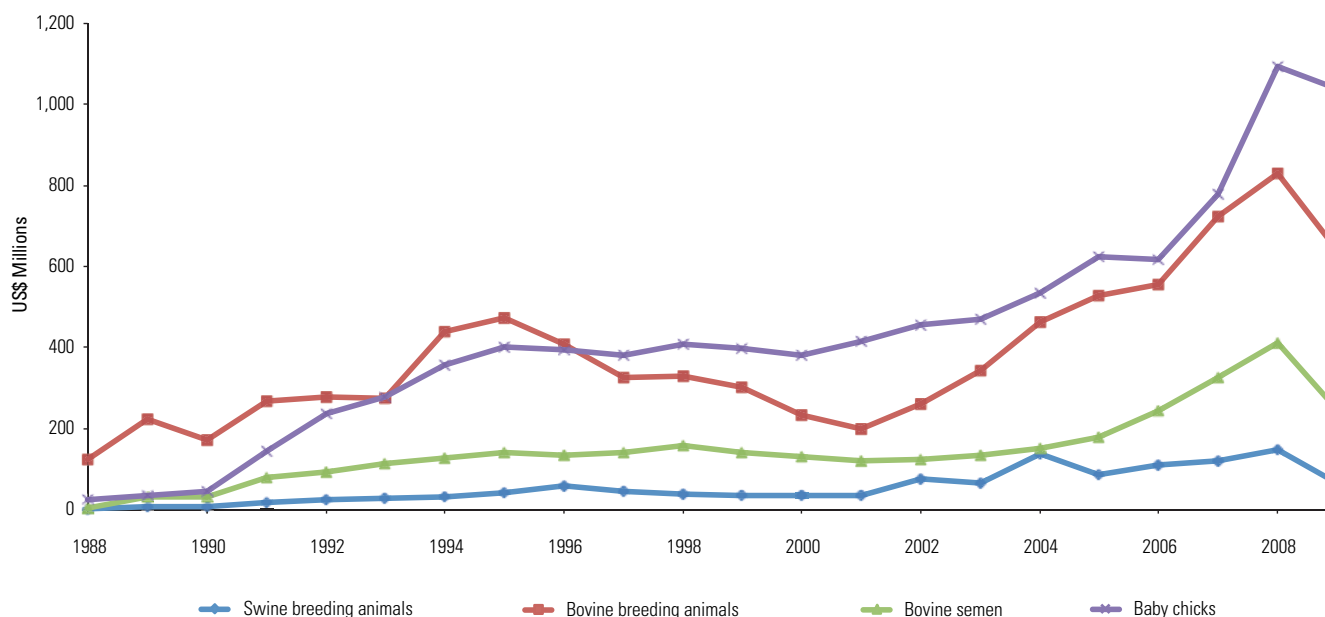
Food item	2010	2030
<b>Brazil</b>		
Bovine meat	2,473.96	5,121.46
Pig meat	546.49	930.18
<b>Argentina</b>		
Bovine meat	877.77	1,773.93
Pig meat	-119.24	-75.19
<b>Australia</b>		
Bovine meat	1,425.28	1,729.00
Pig meat	-30.29	-112.18
<b>Japan</b>		
Bovine meat	-546.62	-493.84
<b>China</b>		
Bovine meat	-1,007.33	-3,409.69
Pig meat	2,915.83	-13.72
<b>Thailand</b>		
Poultry meat	-11.53	30.17

Using the developed/developing country groupings of the IFPRI IMPACT model  
 Projections are from the IFPRI IMPACT model which uses FAOStat data. Net trade in 2010  
 and 2030 are projected production minus consumption for the commodity and region shown

Wildlife trade (including bushmeat trade), however, poses several threats: not only can it lead to biodiversity loss and introduction of invasive species, but it can also be a vehicle for the transmission of emerging infectious and zoonotic diseases (11). Although evidence is anecdotal, it is suspected that imported wildlife may carry diseases harmful to humans that might result in outbreaks causing social and economic harm. Examples are avian influenza from wild birds, severe acute respiratory syndrome (SARS), which is believed to have originated from civets (wild cats), heartwater disease from African ticks, and monkeypox from African rodents (16, 22).

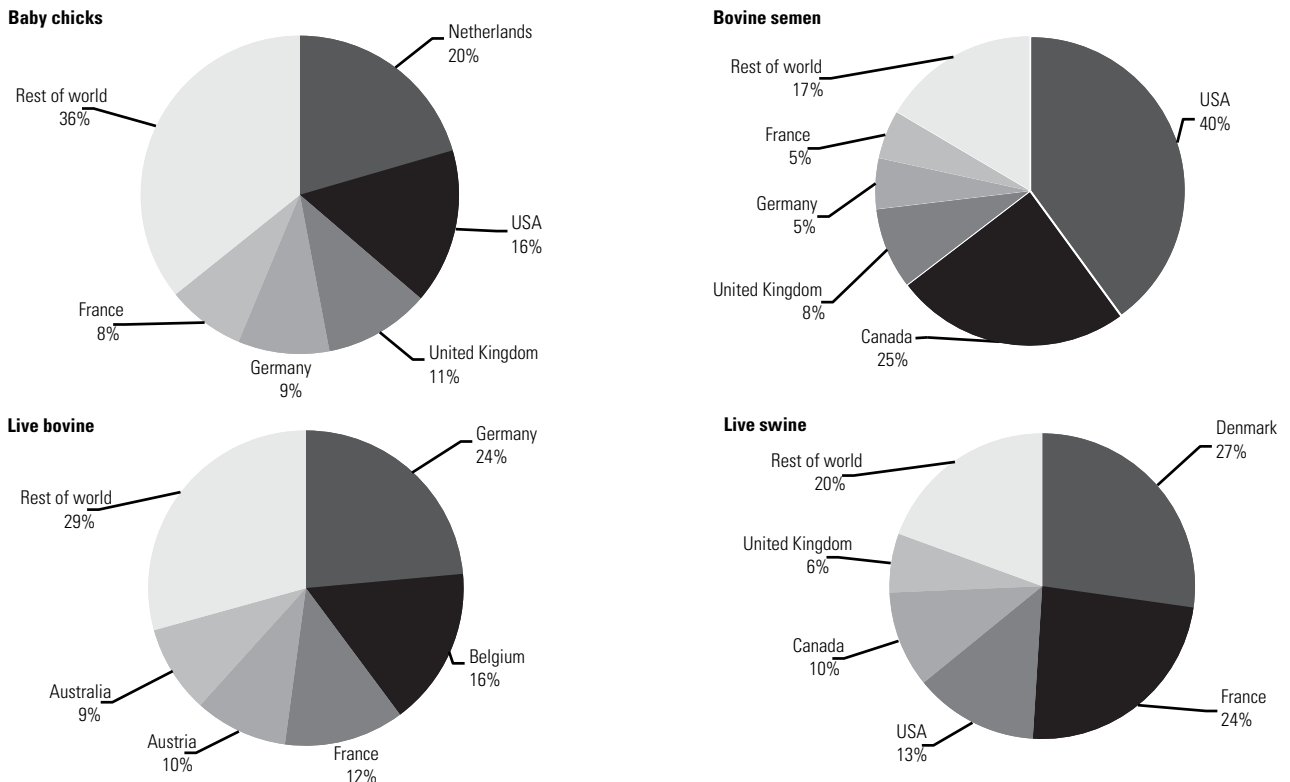
Demand for wildlife products is reportedly increasing. There are different reasons for this increase in different areas of the world: in China and other parts of Asia there is a demand for specific animal parts to practise traditional medicine; in Africa there is a demand for wildlife for human consumption; and in Europe and North America there is a demand for wildlife products as fashion accessories, souvenir items, and hunting trophies (22). Developed countries are the top destinations of wildlife products.

Supply of legal and illegal wildlife products commonly comes from the developing countries with rich biological diversity. Most of the developing countries have weak governance and poor law enforcement capacity because of political corruption or a lack of resources, infrastructure or expertise, making it easier to conduct an illegal wildlife

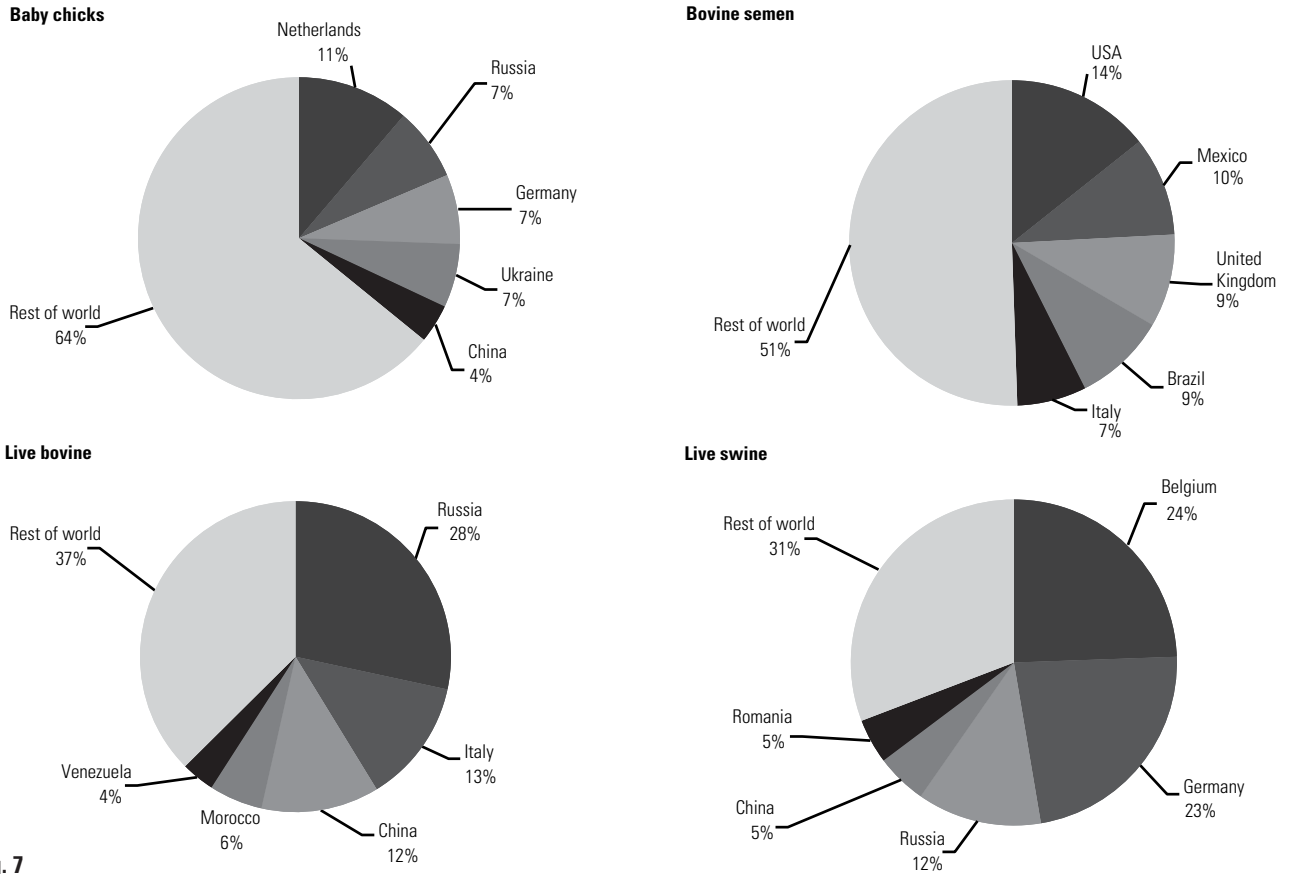


**Fig. 5**  
**World export value of animal genetic material**

Source: UNComtrade (19); data downloaded November 2010

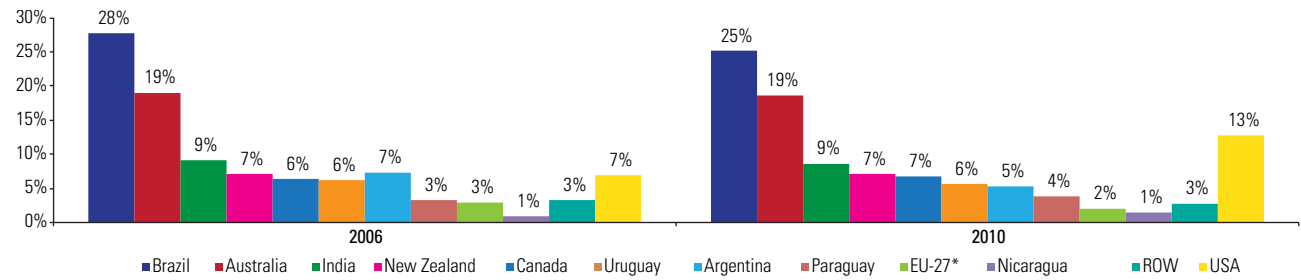


**Fig. 6**  
Share of world exports of improved genetic stock, 2009  
Source: UNComtrade (19); data downloaded November 2010

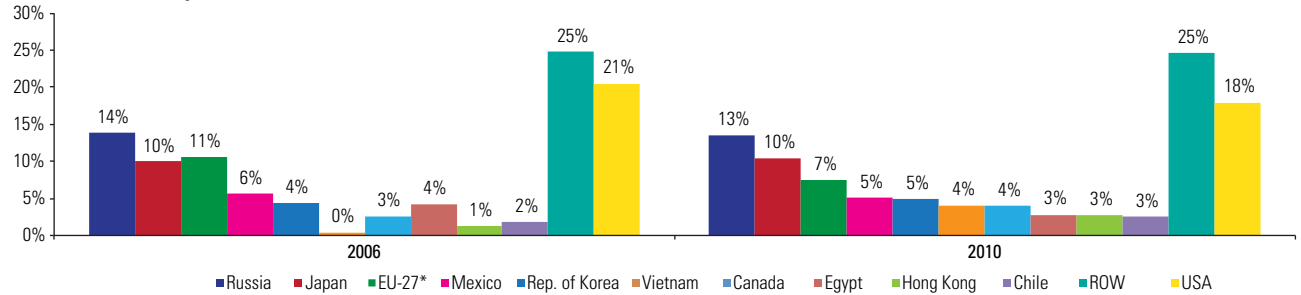


**Fig. 7**  
Share of world imports of improved genetic stock, 2009  
Source: UNComtrade (19); data downloaded November 2010

**a) Share of world exports**



**b) Share of world imports**



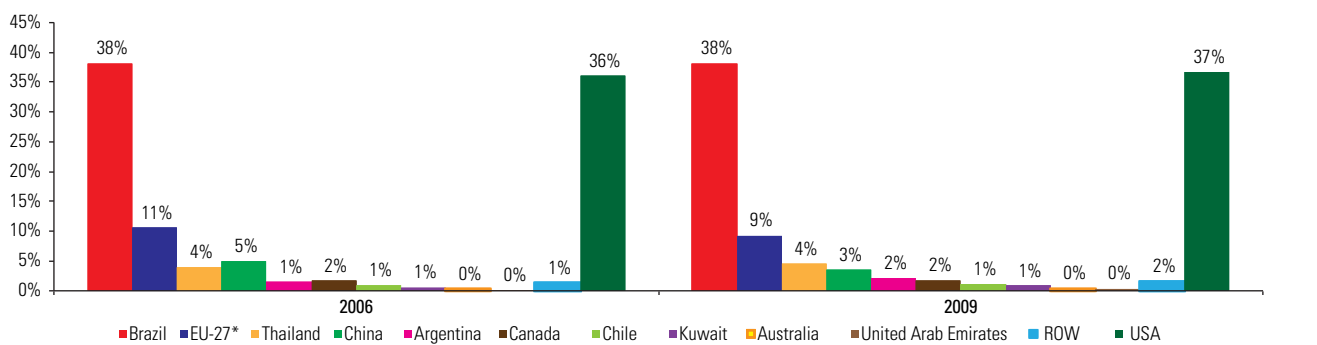
ROW: rest of the world

\*In 2006 the European Union had 25 Member Countries, but data for the two countries which joined in 2007, namely Romania and Bulgaria, were included in the calculations for these figures

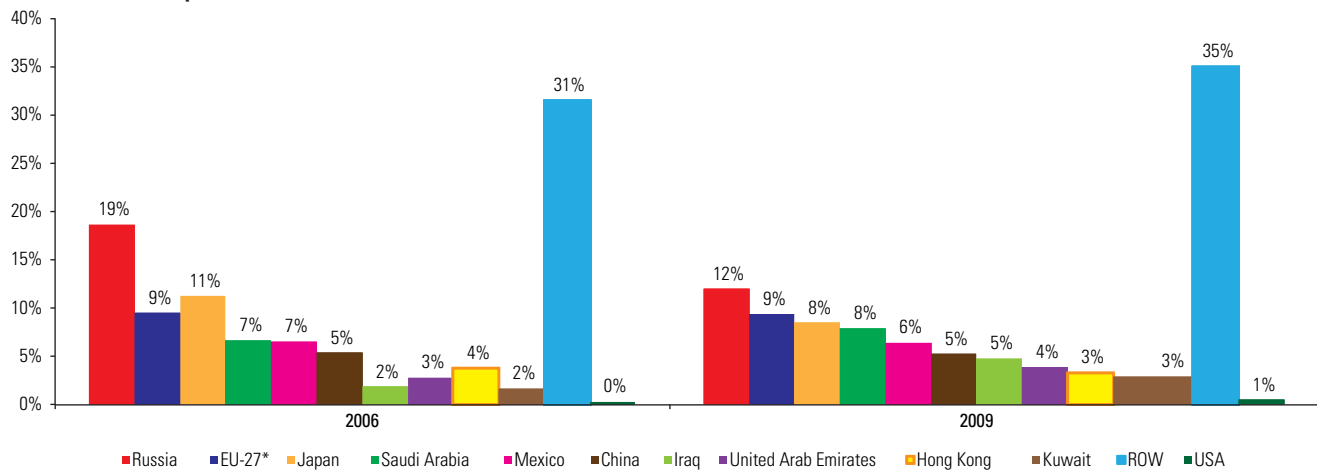
**Fig. 8**  
**Beef meat and veal: share of world imports and exports**

Source: United States Department of Agriculture; data downloaded November 2010 ([www.fas.usda.gov/psdonline/](http://www.fas.usda.gov/psdonline/))

**a) Share of world exports**



**b) Share of world imports**



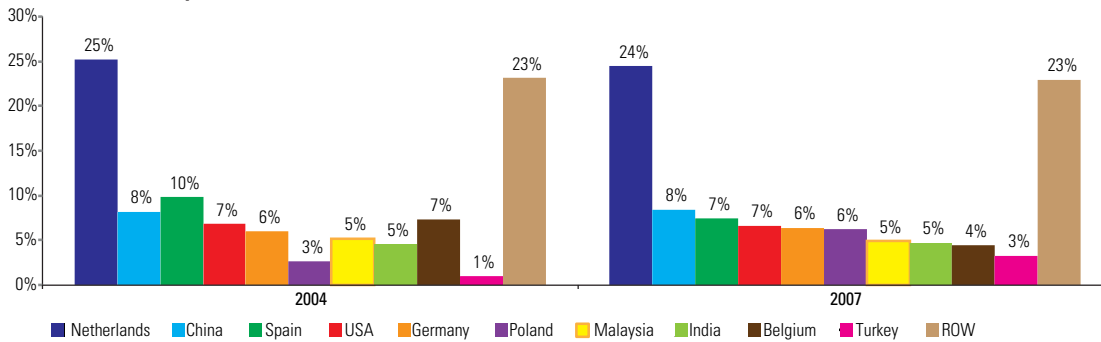
ROW: rest of the world

\*In 2006 the European Union had 25 Member Countries, but data for the two countries which joined in 2007, namely Romania and Bulgaria, were included in the calculations for these figures

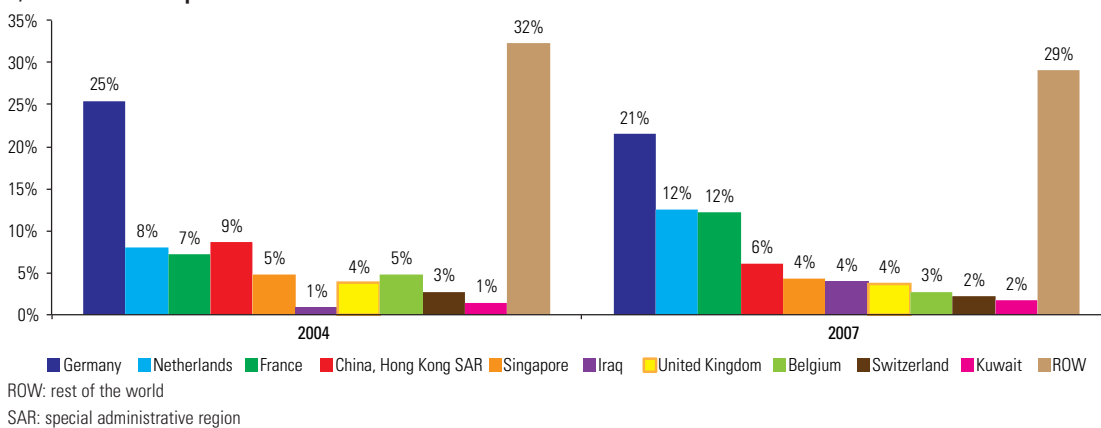
**Fig. 9**  
**Poultry meat: share of world imports and exports**

Source: United States Department of Agriculture; data downloaded November 2010 ([www.fas.usda.gov/psdonline/](http://www.fas.usda.gov/psdonline/))

**a) Share of world exports**



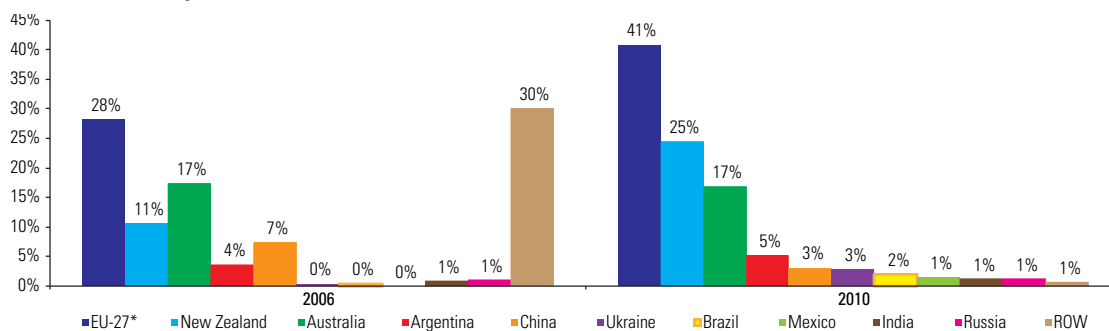
**b) Share of world imports**



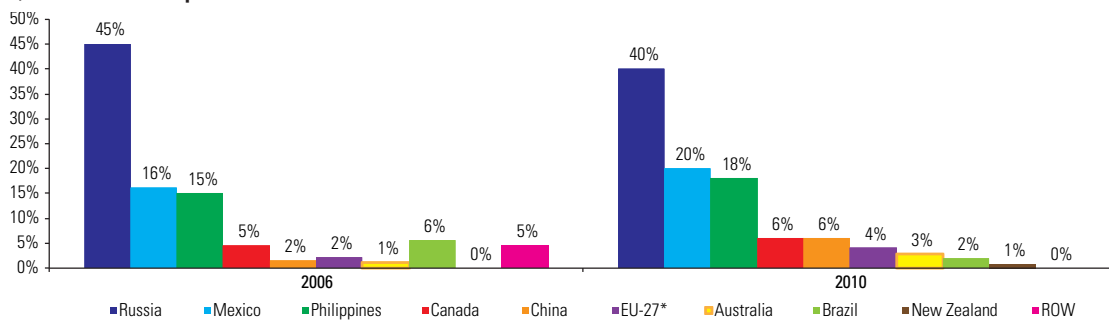
**Fig. 10**  
**Eggs: share of world imports and exports**

Source: United States Department of Agriculture; data downloaded November 2010 ([www.fas.usda.gov/psdonline/](http://www.fas.usda.gov/psdonline/))

**a) Share of world exports**



**b) Share of world imports**



ROW: rest of the world

\*In 2006 the European Union had 25 Member Countries, but data for the two countries which joined in 2007, namely Romania and Bulgaria, were included in the calculations for these figures

**Fig. 11**  
**Fluid milk: share of world imports and exports**

Source: United States Department of Agriculture; data downloaded November 2010 ([www.fas.usda.gov/psdonline/](http://www.fas.usda.gov/psdonline/))

trade. There are also some wildlife species, such as bears, predatory birds and reptiles, which originate in developed countries such as the United States. Though Canada is the biggest individual importer its share of the international market is small compared to the combined amount of imports to developing countries (Fig. 14).

## Future evolution of livestock production, consumption and trade

The growth in production and consumption in livestock products outlined above has occurred despite there being considerable fluctuations in prices (see Fig. 15). It is projected that by 2030 prices will start to decline and then increase again. Average meat prices, in real terms, are expected to surpass the 1990 to 2000 average, initially due to lower supplies, higher feed costs and rising demand (see Fig. 16). Economic recovery will increase consumption of meats relative to cereals, particularly in developing countries, with most growth favouring cheaper meats such as poultry and pork, rather than beef.

With the current trend of rapid urbanisation and higher income growth in developing countries expected to continue, there will be a further shift in food consumption towards high-value products and a large shift in demand is projected towards livestock products. The International Food Policy Research Institute's IMPACT model projects that milk and meat consumption will continue to grow at a faster rate in developing countries than in developed countries.

In the next 20 years, most of the growth in production of poultry and eggs (see Figs 17 and 18) is projected to take place in developing countries, with South Asia leading, followed by East Asia and the Pacific and sub-Saharan Africa. This is also where most of the growth in consumption is expected to occur. Production of poultry is projected to outpace consumption in developing countries, particularly in Asia, while consumption is projected to remain higher than production in the developed world and sub-Saharan Africa. The projection for egg production is slightly different, with the developing countries not quite meeting the growth in demand by 2030. It is projected that production will be significantly less than the projected increased demand in sub-Saharan Africa and this deficit will likely be met from Central Asia, Latin America and the Middle East.

Demand in developing countries will stimulate domestic production so that, by the year 2030, those countries will drive the increase in world meat production (with China

being the largest producer) and the increase in world milk production (with India becoming the largest producer) (15).

Thus, because demand for livestock products will be rising much faster in developing countries and because the stringency of the SPS requirements for shipping livestock products to export markets will continue to exclude at least some developing countries, it will be domestic consumers who will provide a dynamic market for the producers. However, imports of livestock products from developed into developing countries are increasing, consequently, poor producers could miss the opportunity of meeting the growing demand in their countries if they are unable to comply with the regulations and requirements of modern marketing chains.

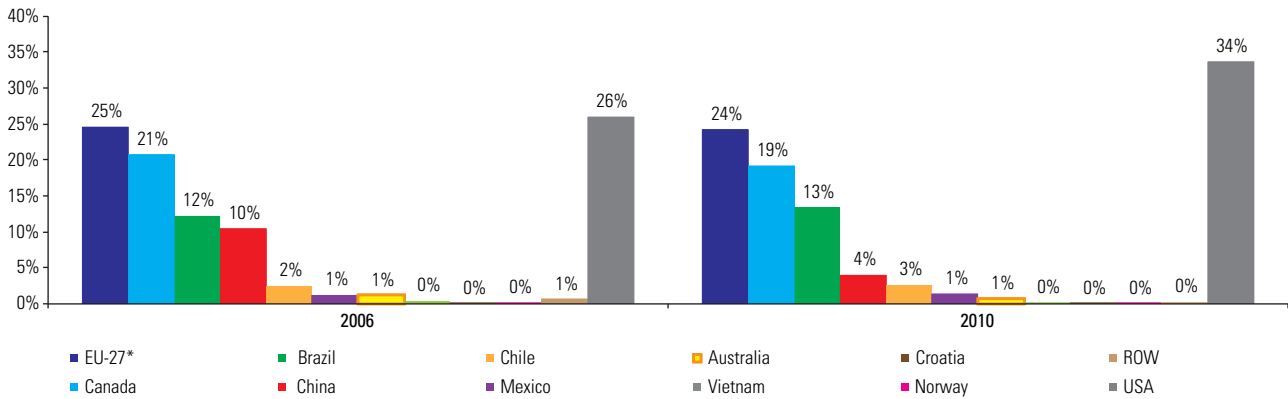
As with poultry and egg production, pork production is projected to grow mostly in the developing world, which will supply some of the developed world's demand (see Fig. 19). In pork production, most of the growth will take place in South Asia, followed by sub-Saharan Africa. Pork consumption is expected to decline in Europe and in the next 30 years, despite an increase in production. It is projected that the largest growth in demand for pork will take place in sub-Saharan Africa but growth in production will not keep up with demand.

Most of the projected growth in consumption and production of beef is expected to take place in the developing world, as this is where demand is expected to grow (Fig. 20). Growth in production is projected to be the largest in South Asia, outpacing demand. Production is also expected to increase in East Asia and sub-Saharan Africa, but the annual growth in consumption will be higher than the growth in production.

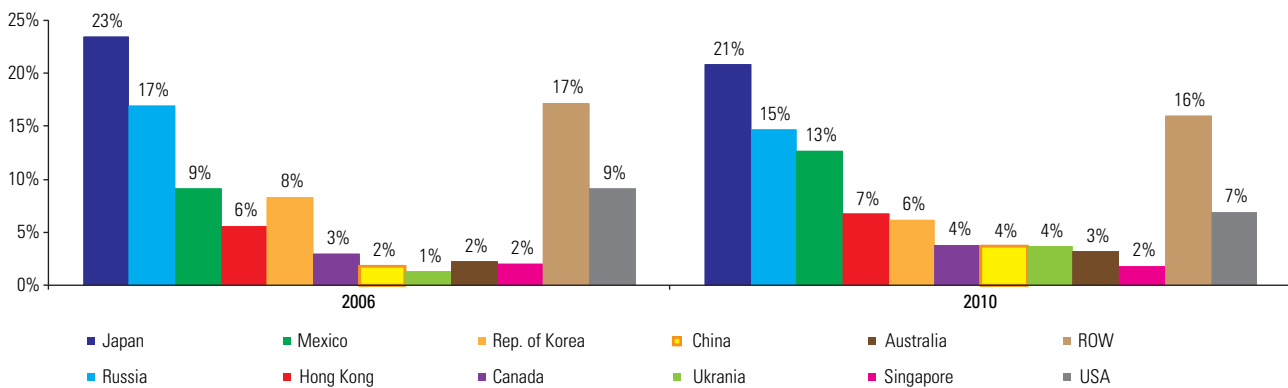
Similarly, most of the growth in fluid milk production will occur in the developing world (Fig. 21). Production growth in the Middle East and North Africa will outpace growth in demand, while sub-Saharan Africa will not yet be able to meet demand. Although growth will occur in Asia, demand will be greater than production.

In the case of world beef trade, Latin America and the Caribbean are likely to remain competitive in the export market and are projected to expand their market share by 2030 (Table VI). Brazil will be the most active, mainly because of investments in improved productivity, favourable domestic policies, and currency depreciation. Brazil will also be the most active country in the case of pork exports from this region (Table VII). Argentina and Australia are also projected to expand their exports as a result of increased production and continued currency depreciation. Japan's beef imports are projected to decrease because of higher world prices and weak domestic economic conditions. The EU, already a small beef

**a) Share of world exports**



**b) Share of world imports**



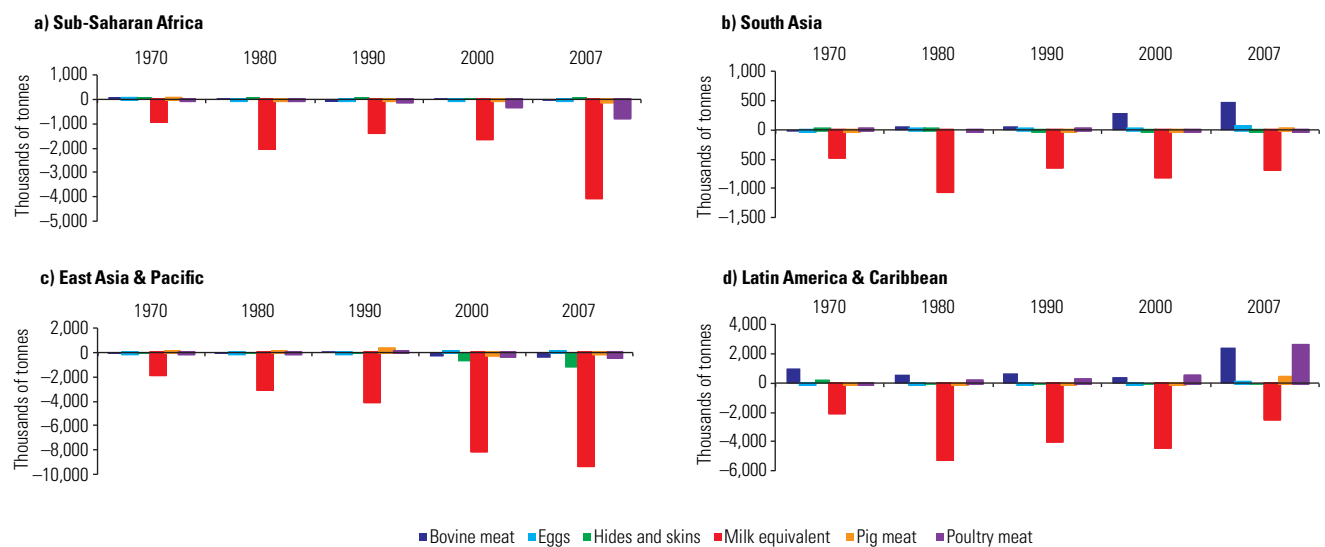
ROW: rest of the world

\*In 2006 the European Union had 25 Member Countries, but data for the two countries which joined in 2007, namely Romania and Bulgaria, were included in the calculations for these figures

**Fig. 12**

**Pork meat: share of world imports and exports**

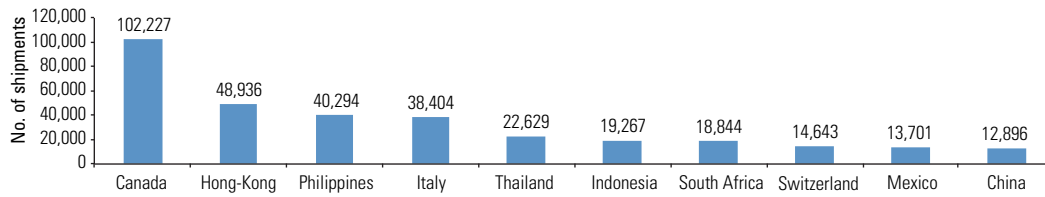
Source: United States Department of Agriculture; data downloaded November 2010 ([www.fas.usda.gov/psdonline/](http://www.fas.usda.gov/psdonline/))



**Fig. 13**

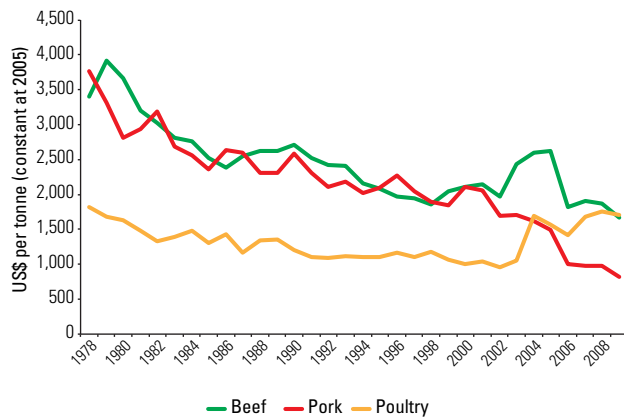
**Regional net exports**

Source: FAO (7) and IFPRI IMPACT model (15); data downloaded November 2010



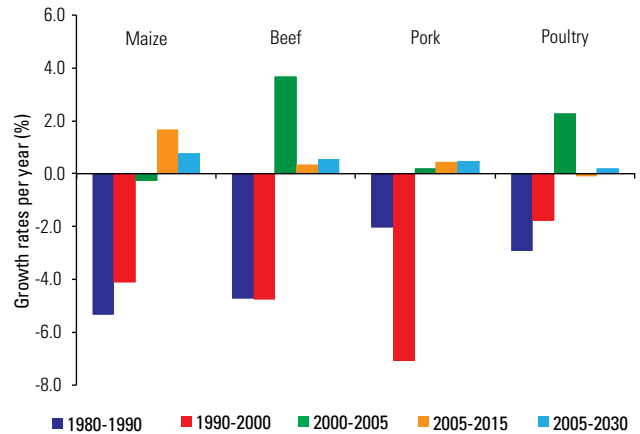
**Fig. 14**  
**Top ten suppliers of wildlife imports to the United States, 1997 to 2003**

Source: Adapted from US Fish and Wildlife Service (20), p.15



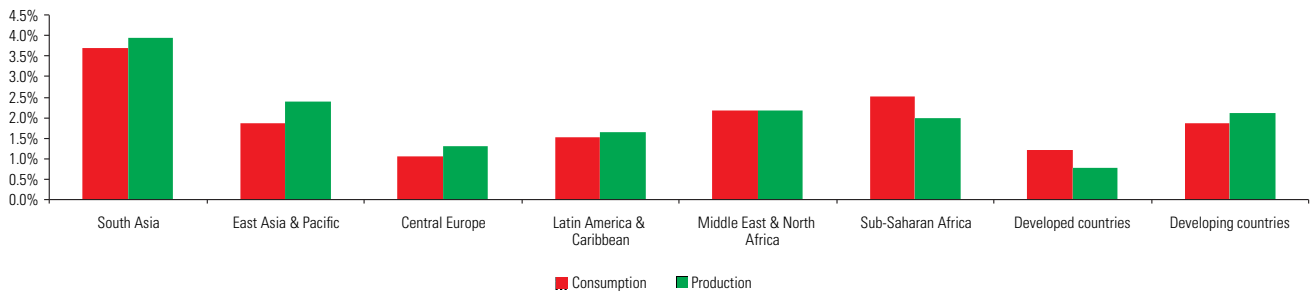
**Fig. 15**  
**Trends in real prices of livestock products, 1978 to 2009**

Source: United States Department of Agriculture; data downloaded August 2010 (www.fas.usda.gov/psdonline/)



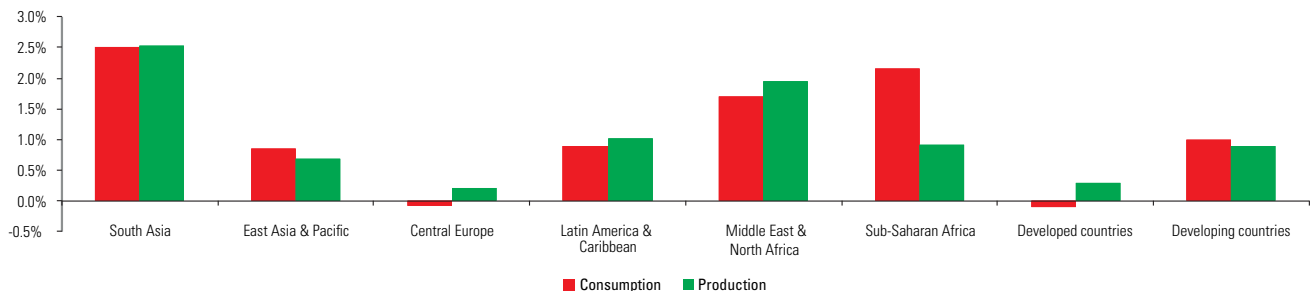
**Fig. 16**  
**Long-term price projections received by farmers**

Source: FAO Commodity Review and Outlook 1982-1991, FAO Commodity Market Review 1995-2000 and projections from IFPRI IMPACT model (15); data downloaded September 2010



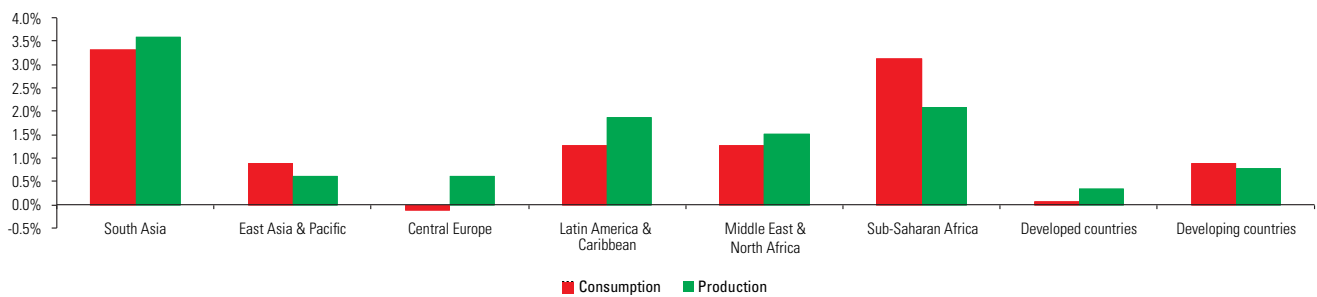
**Fig. 17**  
**Poultry: projected annual growth rate between 2010 and 2030**

Source: IFPRI IMPACT model (15); data downloaded September 2010



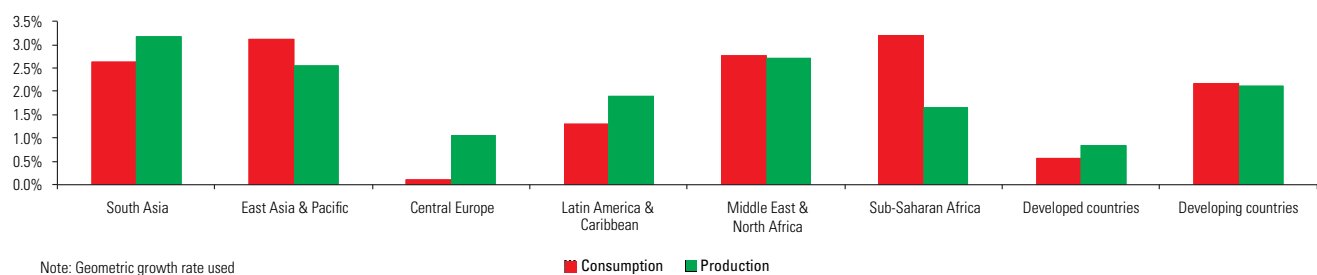
**Fig. 18**  
**Eggs: projected annual growth rate between 2010 and 2030**

Source: IFPRI IMPACT model (15); data downloaded September 2010



**Fig. 19**  
**Pork: projected annual growth rate between 2010 and 2030**

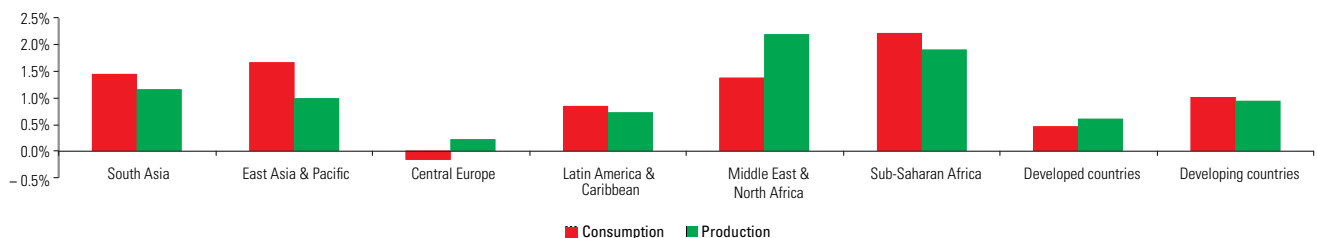
Source: IFPRI IMPACT model (15); data downloaded September 2010



Note: Geometric growth rate used

**Fig. 20**  
**Bovine meat: projected annual growth rate between 2010 and 2030**

Source: IFPRI IMPACT model (15); data downloaded September 2010



**Fig. 21**  
**Fluid milk: projected annual growth rate between 2010 and 2030**

Source: IFPRI IMPACT model (15); data downloaded September 2010

importer, will continue to be a net beef importer. Likewise, for poultry, the EU changed from being a net exporter to a net importer in 2007 and will continue in this position. China is also projected to become a net importer of beef and pork over the same period. In terms of pork trade, EU exports are not expected to be strong, given its appreciating currency, strict animal welfare laws and environmental regulations. Thailand's broiler sector has recovered from the avian influenza crisis that caused a major export drop in 2004. Recovery has been helped by a new tariff rate quota from the EU, expansion of integrated producers, productivity improvements (low feed conversion ratios), reduced processing costs, investment in production innovation, and a shift to higher-valued cooked products.

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## Les tendances actuelles et les prévisions en matière de production, de consommation et d'échanges internationaux d'animaux vivants et de leurs produits

C. Narrod, M. Tiongco & R. Scott

### Résumé

Le secteur de l'élevage s'est considérablement transformé dans le monde depuis quelque temps, sous l'impulsion de divers facteurs déterminés par la demande autant que par l'offre. Historiquement, les pays industrialisés étaient les premiers fournisseurs d'animaux d'élevage et de viande à destination des pays en développement, mais ces derniers ont rapidement augmenté leur production et sont désormais capables de répondre à une partie de leur demande domestique, elle-même en hausse. Néanmoins, dans plusieurs régions en développement, la production est insuffisante pour satisfaire la demande intérieure, de sorte que les pays importent davantage qu'ils ne produisent. Il y a toutefois des exceptions, puisque le Brésil, la Thaïlande, la République populaire de Chine et l'Inde ont enregistré une croissance rapide de leurs productions animales. D'après les prévisions actuelles, un grand nombre de pays en développement vont accroître leur production afin de répondre à une demande intérieure croissante. Il est probable qu'en 2030, la viande de bœuf sera encore la première viande importée par les pays en développement, tandis que le volume des exportations nettes de lait par les pays développés aura plus que doublé.

### Mots-clés

Animaux d'élevage – Commerce international – Consommation de lait – Consommation de viande – Prévisions – Produit d'origine animale – Stock d'élevage.



## Tendencias actuales y proyecciones en cuanto a producción, consumo y comercio de animales vivos y sus derivados

C. Narrod, M. Tiongco & R. Scott

### Resumen

La producción ganadera ha experimentado cambios profundos en todo el mundo, inducidos por factores ligados tanto a la oferta como a la demanda. Aunque históricamente el mundo industrializado ha sido un gran proveedor de carne y ganado para el mundo en desarrollo, éste ha ganado rápidamente en capacidad de producción, y ahora satisface un mayor porcentaje de su creciente demanda interna. Sin embargo, muchas regiones del mundo en desarrollo no producen hoy por hoy lo suficiente para cubrir la propia demanda y siguen importando más de lo que producen. Hay excepciones, como Brasil, Tailandia, la República Popular China o la India, donde la producción ganadera ha aumentado con rapidez. Se prevé que en el futuro muchos de los países en desarrollo acrecienten su producción para responder a su creciente

demanda interna. Para 2030, la carne vacuna seguirá siendo probablemente el principal producto cárnico de importación en los países en desarrollo, y el volumen de exportaciones netas de leche desde el mundo industrializado se habrá duplicado con creces.

#### Palabras clave

Comercio – Consumo de carne – Consumo de leche – Ganado – Ganado reproductor – Productos derivados del ganado – Proyecciones.



## References

1. Bruschke C. & Vallat B. (2008). – OIE standards and guidelines related to trade and poultry disease. *In Poultry in the 21st Century: avian influenza and beyond*. Proc. International Poultry Conference, 5-7 November 2007, Bangkok, Thailand (O. Thieme & D. Pilling, eds). *FAO anim. Prod. Hlth Pap.*, **9**, 48 pp.
2. Delgado C. (2003). – Rising consumption of meat and milk in developing countries has created a new food revolution. *J. Nutr.*, **133** (11), Suppl. II: Animal source foods to improve micronutrient nutrition and human function in developing countries, 3907S-3910S.
3. Delgado C., Narrod C. & Tiongco M. (2003). – Policy, technical and environmental determinants and implications of the scaling-up of livestock production in four fast-growing developing countries: a synthesis. Final Report of IFPRI-FAO Livestock Industrialization Project: Phase II. International Food Policy Research Institute, Washington, DC.
4. Delgado C., Narrod C. & Tiongco M. (2008). – Determinants and implications of the growing scale of livestock farms in four fast-growing developing countries. Research Report No. 157. International Food Policy Research Institute, Washington, DC.
5. Delgado C., Rosegrant M., Steinfeld H., Ehui S. & Courbois C. (1999). – Livestock to 2020: the next food revolution. Food, Agriculture and the Environment Discussion Paper, No. 28. International Food Policy Research Institute, Washington, DC.
6. Djankov S., Freund C.L. & Pham C.S. (2006). – Trading on time. World Bank Policy Research Working Paper No. 3909. World Bank, Washington, DC.
7. Food and Agriculture Organization of the United Nations (2010). – FAOStat statistical data. Available at: [faostat.fao.org/default.aspx](http://faostat.fao.org/default.aspx) (accessed on 5 November 2010).
8. Fuglie K., Narrod C. & Neumeyer C. (2000). – Public and private investment in animal research. *In Public-private collaboration in agricultural research: new institutional arrangements and economic implications* (K. Fuglie & D. Schimmelpfennig, eds). Iowa State University Press, Ames, Iowa, 117-154.
9. Gollin D., Van Dusen E. & Blackburn H. (2009). – Animal genetic resource trade flows: economic assessment. *Livest. Sci.*, **120**, 248-255.
10. International Monetary Fund (IMF) (2010). – World economic outlook: recovery, risk, and rebalancing. Available at: [www.imf.org/external/pubs/ft/weo/2010/02/index.htm](http://www.imf.org/external/pubs/ft/weo/2010/02/index.htm) (accessed on 5 November 2010).
11. Karesh W., Cook R., Bennett E. & Newcomb J. (2005). – Wildlife trade and global disease emergence. *Emerg. infect. Dis.*, **11**, 1000-1002.
12. Mergenthaler M., Weinberger K. & Qaim M. (2009). – Consumer valuation of food quality and food safety attributes in Vietnam. *Appl. econ. Perspect. Pol.*, **31** (2), 266-283.
13. Narrod C. & Fuglie K. (2000). – Private investment in livestock breeding with implications for public research policy. *Agribusiness*, **16** (4), 457-470.
14. Narrod C., Pray C. & Tiongco M. (2008). – Technology transfer, policies, and the role of the private sector in the global poultry revolution. IFPRI Discussion Paper No. 841. International Food Policy Research Institute, Washington, DC.
15. Rosegrant M., Ringler C., Msangi S., Silser T., Zhu T. & Cline S. (2009). – International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT): model description. International Food Policy Research Institute, Washington, DC. Available at: [www.ifpri.org/sites/default/files/IMPACTwater.pdf](http://www.ifpri.org/sites/default/files/IMPACTwater.pdf).

16. Smith K., Behrens M., Schloegel L., Marano N., Burgiel S. & Daszak P. (2009). – Reducing the risks of the wildlife trade. *Science*, **324** (5927), 594-595. [DOI:10.1126/science.1174460].
  17. Steinfeld H., Gerber P., Wassenaar T., Castel V., Rosales M. & de Haan C. (2006). – Livestock's long shadow: environmental issues and options. Food and Agriculture Organization, Rome.
  18. United Nations (2010). – World urbanization prospects: the 2009 revision – highlights. United Nations Department of Economic and Social Affairs/Population Division, New York, 47 pp.
  19. United Nations Commodity Trade Statistics Database (2010). – Available at: [comtrade.un.org/db/](http://comtrade.un.org/db/) (accessed on 5 November 2010).
  20. United States Fish and Wildlife Service, Office of Law Enforcement, Intelligence Unit (2003). – US wildlife trade: an overview for 1997-2003. US Fish and Wildlife Service. Available at: [www.fws.gov/le/pdffiles/Wildlife%20Trade%20Overview%20Report.pdf](http://www.fws.gov/le/pdffiles/Wildlife%20Trade%20Overview%20Report.pdf) (accessed on 5 November 2010).
  21. World Bank (2009). – World development indicators. CD-ROM database. World Bank, Washington, DC.
  22. Wyler L. & Sheikh P. (2008). – International illegal trade in wildlife. United States Congressional Research Service Report. Available at: [ncseonline.org/NLE/CRs/abstract.cfm?NLEid=2066](http://ncseonline.org/NLE/CRs/abstract.cfm?NLEid=2066) (accessed on 12 October 2010).
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