

Chapter 6. Meat

Market situation

Overall world meat production increased by 1.25% to 323 Mt in 2017, with moderate increases in the production of bovine and poultry meats and more modest gains in pig and sheep meat. Much of the world meat production expansion originated in the United States but other main contributors were Argentina, India, Mexico, the Russian Federation and Turkey. Meat production in the People's Republic of China (hereafter "China"), the world's largest meat producer, increased little overall mainly because of the lower growth in poultry meat production as several Avian Influenza (AI) outbreaks affected the country. Nevertheless, China remained the second largest contributor to the 2017 increase in meat production.

Measured by the FAO Meat Price Index, the monthly average for the whole of 2017 was 9% higher than in 2016, but 2.3% below the average of the preceding three years.. International meat prices rose in the first half of 2017, underpinned by a significant increase in import demand for bovine and pigmeat categories. Short availability of export supplies of sheepmeat provided some additional support. As of July, prices began to level off and declined moderately as export supplies increased and import demand weakened. Across the four main meat categories, from January to December 2017, ovine meat prices rose by 35%, and bovine, poultry and pigmeat increased, respectively, by 7.7%, 3.2% and 2.9%.

World meat trade increased to 31 Mt in 2017, 1.5% higher than in 2016, but growth was slower than the 5% registered in 2016. Across categories, world trade expanded in bovine meat by 4.7% and poultry by 1%, while those shipments of pigmeat declined by 0.7% and sheepmeat by 3%. Somewhat sluggish growth in trade in 2017 compared to 2016 reflects a slowdown in imports by China, the European Union, Egypt, Saudi Arabia, Turkey, and the United States, in some cases caused by larger domestic supplies and in others due to falling demand. Meat imports, however, increased in several countries, notably Angola, Chile, Cuba, Japan, Mexico, Korea, Indonesia, Iraq, the United Arab Emirates, Ukraine, and Viet Nam. The expansion of world meat trade exports in 2017 was largely led by Argentina, Canada, India, Thailand, the United States, and Ukraine whereas sales by the European Union and New Zealand declined.

Projection highlights

This year's *Outlook* projects an expansion in meat supply which should result in short-term meat prices declining relative to 2017. The herd rebuilding cycle observed in several regions is nearing an end and additional supply is expected to enter the market in the early years of the projection period. Feed grain prices are also projected to remain low during this period, benefitting regions – such as the Americas, Australia and Europe – where feed grains are more intensively used in meat production. Over the medium term prices will strengthen as per capita meat consumption expands in key developing

countries, in particular Latin America and Asia. The projection indicates that per capita consumption growth, when compared to the base period (average 2015 to 2017), will increase by 2.8 kg retail weight equivalent (r.w.e.) in developed countries and by half this amount in developing countries. Incomes in least developed countries (LDC) are projected to increase somewhat, leading to a small increase in per capita meat consumption in LDC countries. At the global level, per capita meat consumption will increase slightly more than 1 kg r.w.e.

Global meat production is projected to be 15% higher in 2027 relative to the base period. Developing countries are projected to account for the vast majority of the total increase, with greater use of a grain-intensive feeding system in the production process, resulting in increased carcass weight. Poultry meat remains the primary driver of the growth in total meat production, but in the coming decade this growth will slow significantly compared to that of the previous one. Growth in global demand for animal protein in the next decade is projected to slow down for poultry and pigmeat, but increase for beef and sheep meat. Lower product prices have contributed to making poultry and pigmeat the meat of choice, particularly for consumers in developing countries. With income growing over the projection period, those consumers are expected to increase and diversify their consumption towards more expensive meat protein such as beef and sheep.

In the bovine meat sector, cow herds have been rebuilt faster than expected in North America, which will lead to rising slaughter numbers and ample supply of meat on the world market for the coming years. Production will further increase as countries in the herd rebuilding phase, such as Australia, and Brazil are further along the cycle, providing additional supplies of meat in the early years of the projection period. Pigmeat production will also increase, driven by steady herd expansion in China which was slowed by more stringent environmental regulations and animal welfare concerns affecting the pork sector.

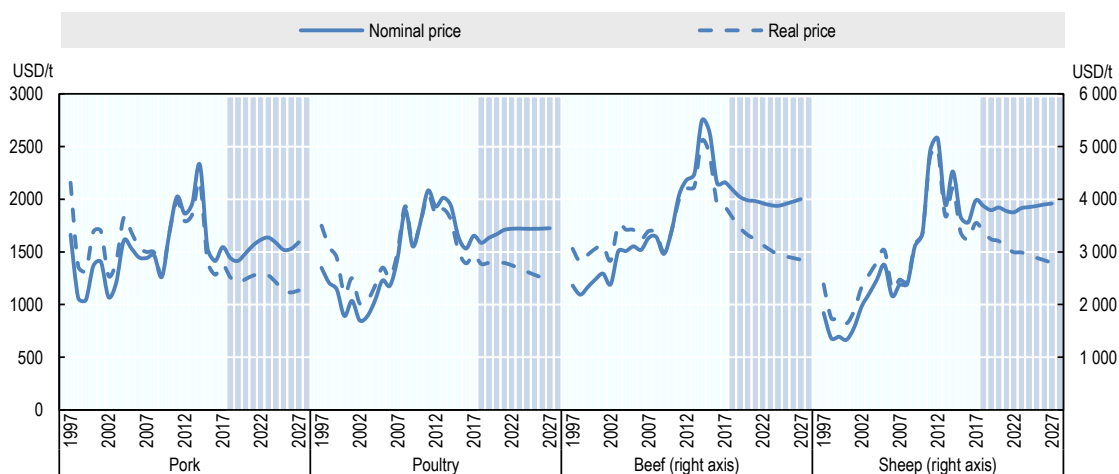
The year 2017 was affected by numerous outbreaks of Avian Influenza (AI) around the world which resulted in a slower increase in world output. China, the second largest producer after the United States, was particularly affected by several outbreaks over the last years and this *Outlook* assumes a return to historical trend growth in China poultry production from 2018 onwards. Production is also expected to increase in the sheepmeat sector with an expected global growth of 1.8% p.a., a higher rate than in the last decade. Production increases will be led by China, but increases will also occur in India, Nigeria, Oceania, Pakistan, Turkey, and Yemen.

Globally, the share of meat output traded is expected to remain constant over the projection period, at around 10%, with most of the increase in volume coming from poultry meat. The projected production growth in developing countries remains insufficient to satisfy demand growth, particularly in Asia and Africa. Consequently, import demand is expected to remain strong throughout the outlook period. The most significant growth in the share of additional meat import originates from the Philippines and Viet Nam. Developed countries are still expected to account for more than half of global meat exports by 2027, but their share decreases slightly relative to the base period. The combined share of the two largest meat exporting countries, Brazil and the United States, is expected to increase to around 47%, contributing nearly two-thirds of the expected increase in global meat exports over the projection period.

At the start of the outlook period, nominal meat prices are projected to be marginally lower as the supply expands and exerts downward pressure on prices. Meat nominal prices are projected to gradually increase until 2027 relative to the earlier years of the

projections. By 2027, the price for beef is projected to increase to USD 4 000/t carcass weight equivalent (c.w.e.) and to increase to USD 3 900/t c.w.e. for sheepmeat, while world pigmeat and poultry prices are expected to rise to around USD 1 600/t c.w.e. and USD 1 700/t product weight (p.w.) respectively. In real terms, prices are expected to trend downwards for all meat types (Figure 6.1), although meat-to-feed price margins will generally remain within historical levels.

Figure 6.1. World meat prices



Note: US Choice steers, 1 100-1 300 lb dressed weight, Nebraska. New Zealand lamb price dressed weight, all grade average. US Barrows and gilts, No. 1-3, 230-250 lb dressed weight, Iowa/South Minnesota. Brazil: Export unit value for chicken (f.o.b.) product weight.
Source: OECD/FAO (2018), “OECD-FAO Agricultural Outlook”, OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

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Global meat consumption per capita is expected to increase to 35.4 kg r.w.e. by 2027, an increase of 1.1 kg r.w.e. compared to the base period. Despite high population growth rates in much of the developing world, total consumption is also expected to increase by 1.4 kg r.w.e., half of the increase expected in developed countries. Additional per capita consumption at the global level will consist mainly of poultry with 0.8 kg r.w.e., while beef, sheepmeat and pigmeat will change marginally. In per capita terms the growth will be fastest in Latin America, with an increase of 3.7 kg r.w.e. In absolute terms, total consumption growth quantities in developed countries over the projection period is expected to be approximately a fourth of that in developing regions, where rapid population growth and urbanisation remain the core drivers. These drivers are particularly important in Africa, where the rate of total consumption growth over the outlook period is faster than any other region. Import demand is also expected to grow the fastest in Africa.

Globally, animal disease outbreaks (e.g. swine fever), sanitary restrictions, and trade policies remain the main factors driving the evolution and dynamics in world meat markets. The projections reflect the implementation of various trade agreements, domestic policies and sanitary and phytosanitary restrictions announced or in place by 1 January 2018. Uncertainties related to existing or future trade agreements over the outlook period could impact and diversify meat trade patterns. Domestic policies development could also impact the meat sector such as the review in 2018 of the US

Farm Bill. Further factors that could impact the meat outlook include consumer preferences and attitudes towards meat consumption. Consumers are showing a preference for free-range meat and antibiotic-free meat products, but the extent to which they are willing and able to pay a premium for them remains unclear.

Prices

Despite rising during the first half of 2017, meat prices have declined from recent peaks, in both nominal and real terms. Over the outlook period, meat prices will increase marginally in nominal terms due to sustained economic growth in developing countries. Real term meat prices will continue to trend down following the recent price peak. The actual path over time will differ by meat type.

In the short term, beef prices will decline due to ample beef supply from North America following the rapid rate of herd rebuilding. In line with the expansion of output in key production regions, nominal bovine meat prices will decline until 2024. However, as the beef cow herd declines and the rate of production growth slows down, prices will start to increase until the end of the projection.

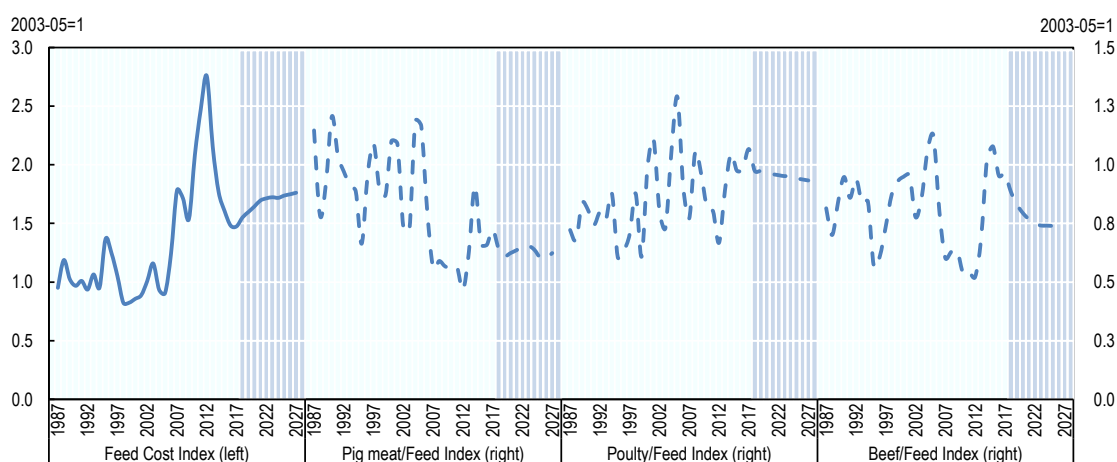
Nominal pigmeat prices will decrease from 2017 and are expected to oscillate in a typical cycle for the projection period, declining in real terms. Notable features of the global sector that shape this trend are increased supply from Brazil, China, the United States and Viet Nam, and higher imports from Mexico and Philippines.

The effect of an increasing poultry flock – the spread of AI is assumed to be contained by 2018 – combined with slowly rising feed costs (Figure 6.2) result in a moderate poultry price increase in the medium term. This is further supported by increasing income over the projection that will stimulate demand growth, particularly from Asia, Latin America and Africa. In real terms, prices will decline throughout the projection period.

Nominal sheepmeat prices are expected to increase marginally, due partly to weak import demand growth from China and the Middle East combined with a gradual increase in lamb production in Algeria, Australia, China, Ethiopia, India, New Zealand, Nigeria, Pakistan and Turkey. After several years of decline, the European Union's declining trend in production was reversed in 2015, and is projected to increase marginally from the current level with an increased profitability of sheep farms in Romania and Cyprus, and implementation of voluntary coupled support in the main sheep producing Member States.

For the medium term, production will benefit from positive meat-to-feed price ratios (Figure 6.2) resulting in herd and flock expansion in key producing regions. Increased productivity in those regions will also support a supply-driven market that will lower meat prices over the early part of the projection period. However, prices are expected to increase moderately in the latter part of the projection period as per capita meat consumption grows. Lower product prices have contributed to making poultry and pigmeat the meat of choice for consumers in developing countries but rising income levels allow those consumers to diversify meat consumption, gradually consuming more of the more expensive meat varieties such as beef and lamb. Nevertheless, poultry meat remains the primary driver of the growth in total meat production. Low production costs, high feed conversion ratios, and low product prices have contributed to making poultry the meat of choice, both for producers and consumers.

Figure 6.2. Feed cost index and meat to feed price ratios



Source: OECD/FAO (2018), “OECD-FAO Agricultural Outlook”, OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

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Production

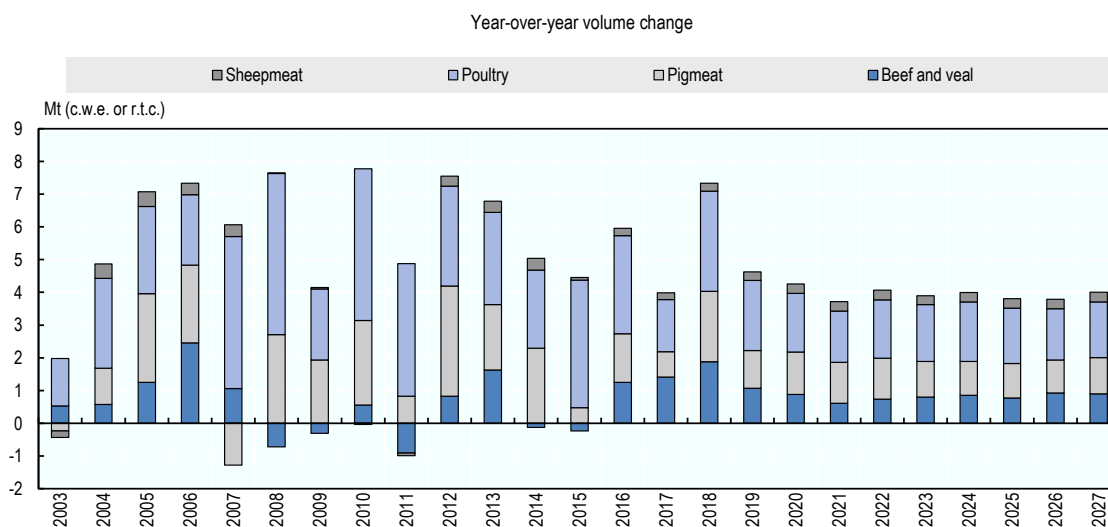
Livestock supply responses to market signals are mainly influenced by the availability of natural resources and the possibilities for increases in productivity; however, both of these factors are increasingly controlled by environmental legislation, such as the Paris climate agreement and food safety regulations (Box 6.1). As such, there is potential for production growth in many developing countries where natural grasslands and agricultural land abound for producing feed grains, e.g. South America.

Total meat production is projected to expand by slightly more than 48 Mt by 2027, reaching nearly 367 Mt. The yearly increase in the overall quantity of meat produced should be relatively constant after 2018 (Figure 6.3). This development occurs predominantly in developing countries which will account for 76% of the additional output (Figure 6.4).

In some developing countries, production growth is supported by increasing productivity in the form of higher carcass weight per livestock unit and improving feed use efficiency. Least developed countries are not foreseen to improve productivity at the same rate as smallholder structures and lack of investments in the livestock sector limit technological improvements and commercialisation of production.

Meat production continues to be dominated by Brazil, China, the European Union, the Russian Federation, and the United States. Brazil’s production growth will benefit from abundant supply of natural resources, feed, grassland availability, productivity gains, and to some extent the devaluation of the Real. China’s production will benefit mostly from growing economies of scale as small production units grow into larger and increasingly commercial enterprises. United States production will benefit from strong domestic demand and higher slaughter weight, while production in the European Union will remain stable reflecting a decline in fresh domestic meat consumption balanced by increasing use of meat products as ingredients in processed products. Finally, the meat import ban put in place by the Russian Federation increased domestic prices and stimulated domestic meat production.

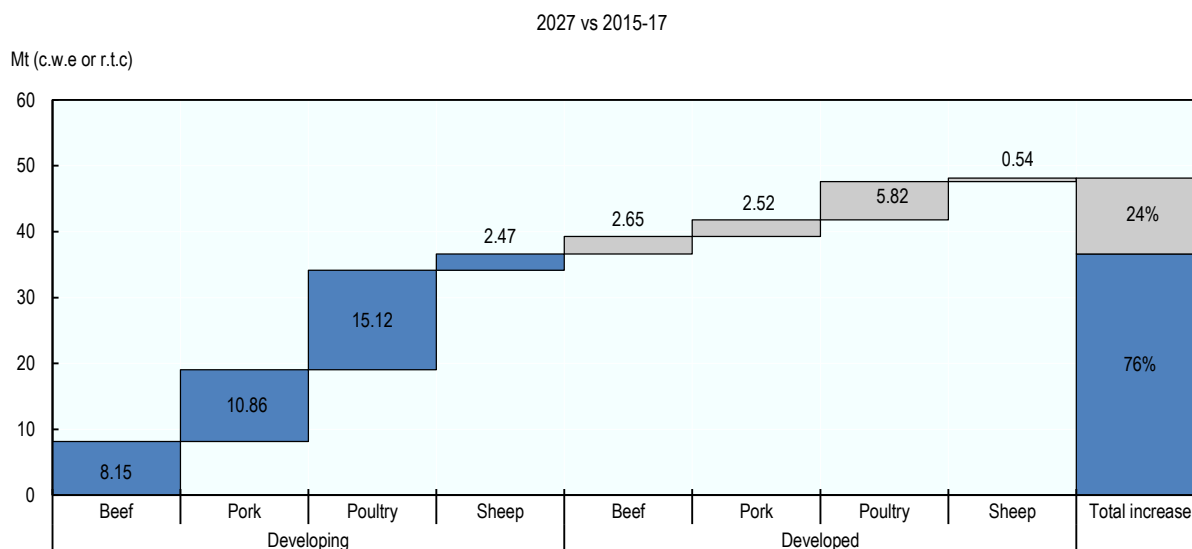
Figure 6.3. Annual growth of meat production by type



Note: c.w.e. is carcass weight equivalent, r.t.c. is ready to cook equivalent.
 Source: OECD/FAO (2018), “OECD-FAO Agricultural Outlook”, OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

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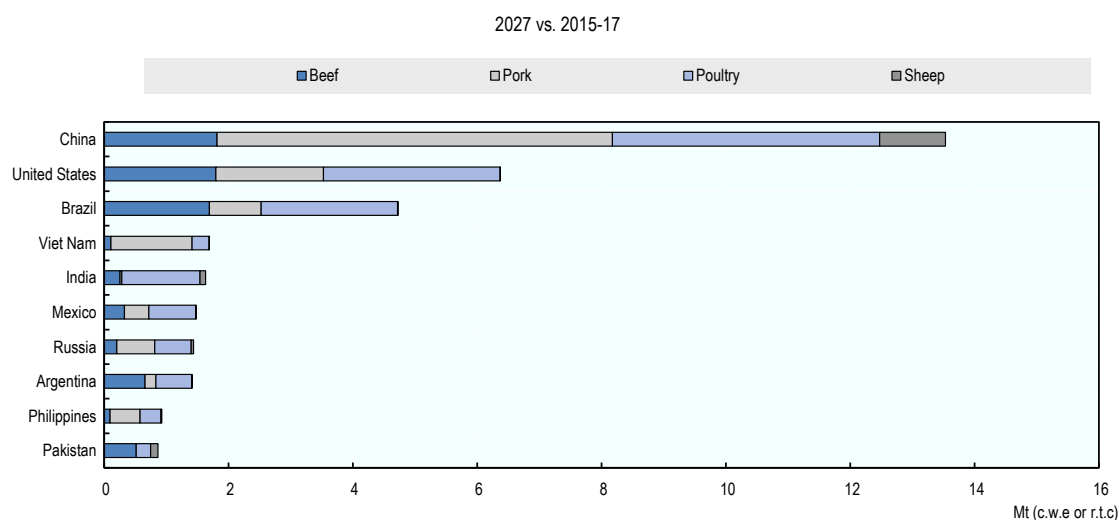
Figure 6.4. Growth of meat production by region and meat type



Note: c.w.e. is carcass weight equivalent, r.t.c. is ready to cook equivalent.
 Source: OECD/FAO (2018), “OECD-FAO Agricultural Outlook”, OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

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Other developing countries with noteworthy potential contributions to additional meat production include Argentina, which benefits from favourable policies for exports, which stimulates herd expansion; India, Mexico and Viet Nam (Figure 6.5).

Figure 6.5. Countries with the greatest share of additional meat production by meat type

Note: c.w.e. is carcass weight equivalent, r.t.c. is ready to cook equivalent.

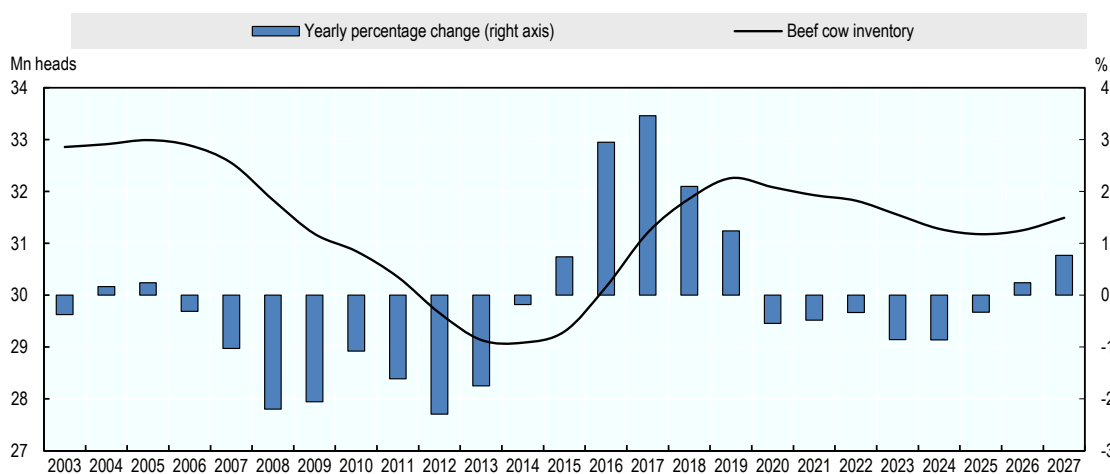
Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

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For the outlook period, beef production continues to grow across the main producing countries (Figure 6.5). Beef production in developing countries is projected to be 21% higher in 2027, relative to the base period, with these countries accounting for 75% of the additional beef produced. The majority of this expansion is attributed to Argentina, China, Brazil, Pakistan, and Turkey. While India is an important bovine producer, production growth is projected to slow down as sales of cattle for slaughter remains a sensitive issue that is creating significant uncertainty amongst producers. In developed countries, production will be 9% higher by 2027 compared to the base period, virtually all of this increase being due to high growth in the United States. Whilst the expansion cycle in the United States is nearing its end, the herd expansion cycle in other countries, such as Australia, Brazil, Mexico, is expected to slow down at a later time. Moreover, the removal of export taxes on beef has promoted beef herd rebuilding in Argentina which is expected, in turn, to increase the beef production back to historical levels over the medium term. The feeder cattle and bovine for breeding import and distribution policies favouring young farmers in Turkey are expected to lead to growth in production in the medium term. However, beef production in the European Union¹ is expected to enter a downward trend as dairy breeds make up approximately two-thirds of the bovine meat supply, and productivity gains in the milk sector will somewhat decrease beef production. This limits the sector's potential to adjust to changes in market signals.

In the short term, production will be supported by both higher carcass weights arising from low feed costs and improved genetics, as well as increased slaughter numbers as final herd rebuilding in several producing regions becomes evident in higher livestock numbers. In the United States, the total beef cow number is projected to increase and reach its peak, much faster than expected in last year's *Outlook*. Domestic and foreign demand has been stronger in the near term, but is expected to slow in the latter years of the outlook period. Declining domestic per capita beef consumption in the latter part of the next decade underpins the projection that the US cow herd will enter a declining cycle post-2020 (Figure 6.6)

Figure 6.6. US beef cow inventory



Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

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The expansion in global pork production will decelerate over the next decade. China's production growth is expected to provide nearly half of the additional global output. The total global volume will remain in line with the demand recovery, which is significantly lower relative to the past decade. Strong production growth rates over the outlook period are also expected in Brazil, Mexico, Philippines, the Russian Federation, the United States and Viet Nam. The European Union's pigmeat production is projected to decline marginally, as domestic consumption stabilises and competition from the world market increases.

Poultry will continue to strengthen its dominant position within the meat complex, accounting for nearly 45% of all additional meat that will be produced over the next decade. Its short production cycle allows producers to respond quickly to market signals, while also allowing for rapid improvements in genetics, animal health, and feeding practices. Production will expand rapidly in countries producing surplus feed grains, such as Brazil, the European Union and the United States. Rapid expansion is also foreseen in Asia, led by China (where the *Outlook* assumes no further outbreaks of AI) and India.

Sheepmeat production will experience a higher rate of growth than that of the previous decade, with developing countries accounting for the bulk of the additional output. Growth in domestic sheepmeat production in the MENA region is projected to increase despite limitations linked to urbanisation, desertification and the availability of feed in some countries. China, the leading sheepmeat-producing country, will contribute slightly more than 36% of additional production as domestic demand continues to grow. Australia and New Zealand's global share of sheepmeat production is expected to slightly decline throughout the outlook period, despite increasing domestic output. The EU flock is expected to increase in the first half of the outlook period, as profitability improves, followed by a marginal decline towards 2027, as competition from Oceania limits exports potential. The share of the African region in sheepmeat production will slowly increase and contribute up to 26% of the additional global supply.

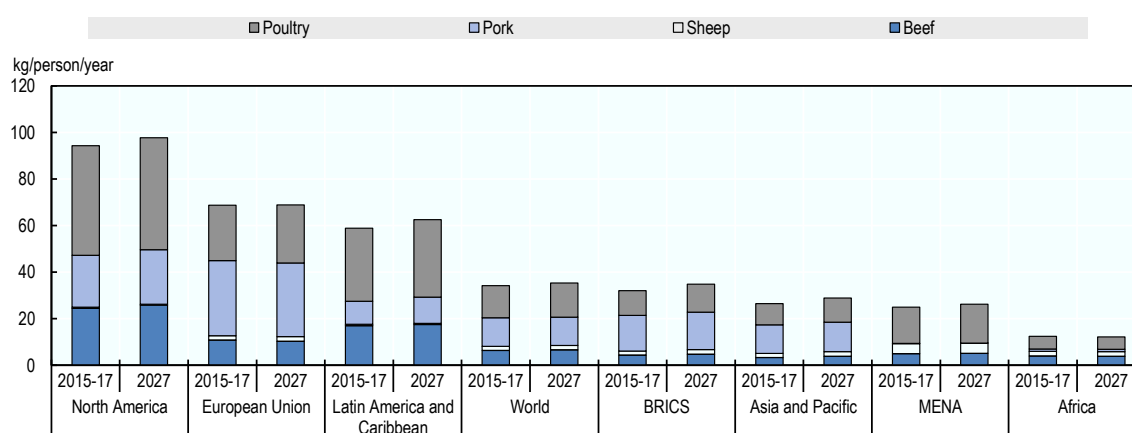
Consumption

In much of the developing world, per capita meat consumption remained stable in 2017 as income growth slowed, particularly in regions highly dependent on commodity imports. Although growth in the demand for meat is expected to recover over the outlook period, particularly in the developing world, growth rates are generally expected to be lower than in the past decade. Growth will stem from a combination of income and population growth, especially in countries with large middle classes. Africa's rate of growth in consumption will be the highest of all continents however, dominated by population growth resulting in a decline in per capita consumption. In developed countries, consumption levels are already high, but meat demand generally continues to increase, particularly in the United States where per capita consumption and meat prices will return to the same levels as a decade ago. Nevertheless, growth rates are generally lower than those in the developing countries (Figure 6.7).

In LDCs with high population growth rates, meat consumption has been growing rapidly, albeit from a low base. This is notably the case in Africa, where poultry accounts for the bulk of additional consumption in the region, followed by beef. Whereas the bulk of the sheep consumption is produced within the African region, a substantial share of additional beef, pigmeat and poultry consumption will be imported.

Beef consumption will increase gradually over the next ten years. By 2027, it is expected to be 8% higher than in the base period in developed countries, whereas in developing regions it is expected to increase be 21% higher. In per capita terms, beef consumption in the developing world remains low relative to developed countries, at about one-third in volume terms. Population increases in Asia are the major driver of growth, together with the positive perception of Chinese buyers' that bovine meat is healthier and disease-free. Increased beef and buffalo consumption levels are also expected in Kazakhstan, Turkey, and Viet Nam. The result is an expected 24% increase in beef consumed in Asia over the next decade.

Figure 6.7. Per capita meat consumption by region



Note: Per capita is expressed in retail weight.

Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

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Global pigmeat consumption on a per capita basis remains stable over the outlook period with consumption in most developed countries reaching saturation levels. Within developing countries, significant regional differences are evident in per capita pigmeat consumption. Growth is sustained in most of Latin America, where it has grown rapidly over the past few years. Growth is fuelled by favourable relative prices that have positioned pork as one of the favoured meats, along with poultry. Several Asian countries with favourable economic conditions which traditionally consume pork such as China, Philippines, Thailand, and Viet Nam – which is projected to become the highest consumer of pork on a per capita basis – are increasing consumption on a per capita basis at the regional level. Population expansion still supports growth in total pork consumption in these regions.

Consumption of poultry meat increases regardless of region or income level. Per capita consumption will grow, even in the developed world, but growth rates will remain higher in developing regions. In China, consumption suffered from the AI virus outbreaks which affected humans in the last years. The *Outlook* assumes that consumption will not be much affected in 2018 and will return to the historical trend afterwards. Among all the additional meat consumed over the next decade, poultry is expected to account for 44%.

Sheepmeat consumption worldwide on a per capita basis will reach 1.8 kg r.w.e. by 2027. Sheepmeat consumption per capita in Africa, North and Latin America, and Oceania is expected to decline slightly. In contrast, sheepmeat will continue to expand in several Asian countries, such as China, where consumers associate sheepmeat with quality and nutritional benefits. An increase in per capita consumption of sheepmeat is projected for the MENA region, where it is traditionally consumed. Demand growth in this region is tightly linked to the oil market which heavily influences both the disposable income of the middle class and government spending patterns.

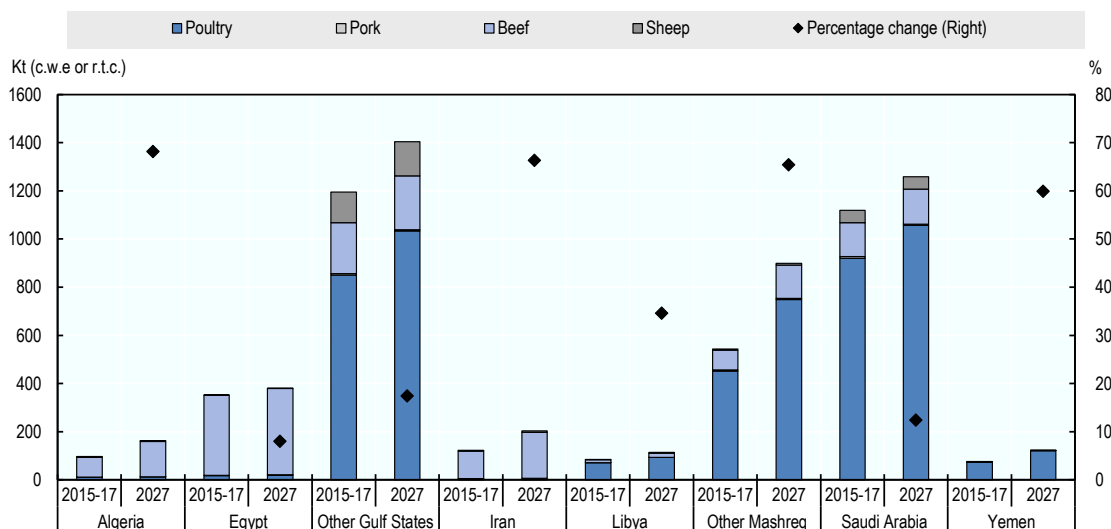
Trade

At the global level, meat exports (excluding live animals) are projected to be 20% higher in 2027 than in the base period. This represents a slowing down of meat trade growth to an annual average rate of 1.5% compared to 2.9% during the previous decade. However, the share of total meat output traded on the global market will remain similar in 2027 to the base period, at slightly below 10%. Global imports will increase, particularly for poultry and bovine meat which will account for the majority of the additional meat traded in 2027. Asia will account for the greatest share of additional imports, with the greatest increases in the Philippines and Viet Nam, where consumption growth is outpacing domestic production expansion. Meat imports into Asia account for 56% of global trade, and poultry will constitute more than half of this additional import demand. Rapid growth in imports from Africa is projected to increase the import share of the region by 2027. The MENA region will also increase its import of meat, the bulk of this growth will accrue to Saudi Arabia and the other Gulf States (Figure 6.8).

Although by 2027 developed countries are expected to account for slightly more than half of global meat exports, their share will decrease steadily relative to the base period. Meat exports will become increasingly concentrated, with Brazil expected to capture more than one third of total trade expansion and the United States more than a quarter. Exports from the European Union, strongly influenced by the exchange rate, will grow at a much slower rate. The European Union has improved its access to Asian markets, but competition from North and South America will prevent it from taking full advantage of this opportunity. In the Americas, traditional exporting countries are expected to retain a

high share of the global meat trade. Argentina, Brazil, Mexico and the United States are expected to increase their share of world meat exports somewhat benefiting from the depreciation of their currencies.

Figure 6.8. Meat imports in selected MENA countries



Note: c.w.e. is carcass weight equivalent, r.t.c. is ready to cook equivalent. Other Gulf States are Bahrain, Kuwait, Oman, Qatar and the United Arab Emirates.

Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

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The highest meat import demand in 2017 was from Japan, which saw a rapid expansion of beef imports that triggered special safeguard (SSG) for frozen beef imports from countries without free trade agreements. Import demand from Japan will slowly decrease as its population declines by nearly 4 million by 2027. For the projection period, China's increase in meat production will not be enough to meet its increasing domestic demand, which implies the need to continue importing at current high levels. Viet Nam and the Philippines are expected to capture a larger share of additional imports for all meat types, supported by favourable economic growth. Africa is another fast-growing importing region, although many countries start from a low base. In the Russian Federation, the long-term effects of the 2014 import ban on meat have permanently reduced the level of imports, which are projected to decline further as a result of the stimulus to domestic production.

Meat import growth in volume at the global level is driven by poultry meat, the bulk of which is imported by developing countries. The vast majority of the additional growth in bovine meat will be traded between developing countries; however, developed countries will supply the bulk of additional exports in pigmeat.

It is anticipated that Brazil and the United States will benefit from strong poultry demand from the developing world where diets are diversifying towards higher animal protein consumption levels.

Australia and New Zealand will continue to supply global sheepmeat markets as the middle class in China and the Middle East continues to expand. Australia is expected to

increase lamb production at the expense of mutton. In New Zealand, export growth will be marginal as land use has shifted from sheep farming to dairy.

Main issues and uncertainties

Trade policies remain a major factor impacting the dynamics of world meat markets. As a result, the projection and implementation of various trade agreements over the outlook period could diversify or consolidate meat trade considerably. Multilateral trade agreements are proving difficult to ratify, which may favour bilateral trade agreements.

Unilateral and/or unexpected trade policy decisions are another risk factor in the projections. For example, in 2017 the Russian Federation extended until the end of 2018 the ban on imports of food from the United States, Australia, Norway, Canada, and the European Union in response to economic sanctions. This ban has resulted in a large decline in meat imports, higher producer price volatility, and higher consumer prices. Domestic policies also influence the competitiveness of meat producers. For example, the Turkish government increased domestic beef production by subsidising feeder cattle and bovine for breeding import and distribution which helped to rebuild the domestic cattle inventory. Another example is found in Argentina which in 2017 introduced a refund scheme on turnover and other provincial value added taxes that are applied to meat and other products that are exported. This should increase Argentina's competitiveness on the world meat market and open new opportunities for exports.

An important factor that could impact the outlook relates to sanitary and food safety concerns arising from animal diseases outbreaks (e.g. swine fever). For example, Brazil could be declared free of Foot and Mouth Disease (FMD) with vaccination in 2018 and FMD-free without vaccination in 2023, which could open a larger market for Brazilian beef and pork from countries which prohibited imports from areas where the disease existed. Depending on the duration, intensity, potential government and consumer reactions, and trade restrictions, diseases could impact domestic and regional meat production, consumption and trade. For example, the outlook for meat production and consumption will depend on how quickly the Human AI virus will be contained in China. A concern is the further spread of the virus during the outlook period. The Chinese government is closely monitoring the situation in all provinces affected by AI outbreaks.

Finally, changing consumer preferences, such as the rise in vegetarian or vegan lifestyles, are relatively new and difficult to assess. They, however, somewhat affect global meat markets if they are adopted by an increasing share of the population.

Box 6.1. The economics of antimicrobial resistance in livestock production

There is growing global awareness that the high level of antibiotic use in food animal production is closely linked to the risk of antimicrobial resistance (AMR) as bacteria mutate and develop traits that become resistant to the commonly used antibiotics. Not only are there concerns over the AMR effects on animal production and productivity, but on the transmission of resistant genes and bacteria between different species. At issue is the frequent and inappropriate use of antibiotics on animals and humans which accelerates the emergence and spread of resistant pathogens. Indeed, many antibiotics used in animal husbandry are used also in human medicine, thus increasing the risks of cross-over and the emergence of multi-resistant pathogens. Studies have estimated this problem could generate up to ten million deaths by 2050 and a reduction in global GDP of 2%-3.8% (WHO, 2015; WB, 2016). Estimates also show that by 2050 the potential impact of AMR on

animal production could reduce global animal production by 2.6% to 7.5%, with the most severe impact likely to occur in low-income countries, which would suffer an estimated decline of up to 11% (WB, 2016).

Antibiotics have been widely used over the last 30-40 years in animal production to treat (therapeutic), prevent (prophylactic) and control (metaphylactic) disease outbreaks, and to increase the growth rate of animals and improve their productivity. The use of antibiotics in animal production is complex and difficult to estimate at the industry and species level due to lack of reliable data. At the farm level, the optimal level of use is largely an economic decision by the farmer within the context of good animal health and animal welfare. As large intensive animal production operations, particularly in emerging economies, have developed over the last 30 years, global demand for veterinary antibiotics has increased sharply. In many countries, the use of antibiotics in animal production is substantially larger than in human medicine.

OECD and the BRIICS account for about four-fifths of global meat production, with poultry, pig meat and beef accounting for more than 70% of the total. The use of antibiotics is closely related to the size of the farm animal population, the intensity of the production system, and how that system is managed. Four countries – China, the United States, India, and Brazil – are estimated to account for over three-fifths of global antibiotic use in animal production. Studies of the productivity impacts from such use in feed or water have concluded that the benefits are declining in most countries in view of improvements in animal management, nutrition, breeding, and biosecurity measures. For example, although several recent studies have estimated the gains from using antibiotics at 1% and 3% for pig and poultry production, respectively, producers in emerging economies often experience much higher gains due to the lower starting point in terms of management and biosecurity standards.

Much of the current AMR focus is on the potential cost burden to the public health sector, and the benefits and costs for livestock production. Findings from recent studies in Denmark, Netherlands, Belgium, France, and Sweden show that the use of antibiotics in pig and poultry production can be reduced by more than 50% without adversely affecting animal productivity, animal health, or the profitability of the farm provided that good management and biosecurity measures are implemented. Alternatives to antibiotics currently under review include vaccinations, probiotic, bacteriophages, and the use of heavy metals, as well as other substitutes including better management and hygiene measures.

At the international level, AMR is a high priority at the UN General Assembly (2016) and for the G20 countries. The WHO's Global Action Plan 2016 (GAP) on antimicrobial resistance sets out several broad recommendations to contain the growth in AMR and which is implemented through the work of the Tripartite (WHO/OIE/FAO) which seeks to improve awareness, education and training, in addition to developing measurement standards and surveillance systems. The work of the Tripartite is undertaken in close co-operation with the OECD and World Bank, both of which assess in particular the potential economic impacts of AMR on human health and food animal production. As AMR is a global issue, the "One Health Framework" has been adopted by most countries tackling this issue. Most WHO member countries have developed specific National Action Plans with specific targets to reduce antibiotic use and, consequently, AMR in human medicine and animal food production.

Sources: OECD (2018, forthcoming), *The economics of antimicrobial resistance in livestock production*, OECD Publications, Paris.

World Bank (2016), "Drug-Resistant Infections: A Threat to Our Economic Future. Part VI", in *Antimicrobial Use in Animals and AMR*, pp 65–78, The World Bank, Washington, D.C.

World Health Organisation (2015), *Global Action Plan on Antimicrobial Resistance*, World Health Organisation, Geneva.

See also Workshop on Economics of Antimicrobial Use and Resistance in the Livestock Sector website. <http://www.oecd.org/tad/events/workshop-economics-antimicrobial-use-resistance-livestock-sector-october-2015.htm>.

Note

- ¹ Insight on beef sector developments in EU Member States is explained in more detail in Box 4.1 of the European Union (2017), “EU Agricultural Outlook for the EU agricultural markets and income 2017-2030”.