

# Regional Outlook: Developed and East Asia

The regional briefs in the *Outlook* highlight broad trends for the regions defined by the FAO in the implementation of its global workplan. Recognising regional diversity, the intention is not to compare results across regions. Instead, they illustrate some of the latest regional developments, highlighting responses to global challenges and emerging trends, and relating these to the main messages of the *Outlook*. The assessments generally compare the end point of the *Outlook's* projection (2032) to the base period of 2020-22. The large and diverse Asia Pacific region has been disaggregated into two separate parts: Developed and East Asia, and South and Southeast Asia.

Agriculture and food systems globally have faced multiple disruptions in recent years – first in the form of the COVID-19 pandemic, and subsequently the impact of Russia's war against Ukraine. The subsequent rise in food prices has impacted affordability and food security in multiple regions. These briefs do not present a quantitative assessment of the impacts of these disruptions, though they do account for the latest expectations with respect to macro-economic developments as the world emerges from these disruptions. The trends and issues presented are those expected to underpin the *Outlook* in the medium term. They assume that the adverse effects on food, feed and fuel production, consumption and trade will gradually moderate, recognising that several uncertainties remain.

This chapter contains seven sections, with text, tabular and graphic information for each region following a similar template. A background section provides the key regional characteristics and provides the setting from which the projection is described in the subsequent sections for production, consumption, and trade. Each regional brief contains an annex providing common charts and tables outlining the key aspects for the region.

## **Background**

### *Rapid urbanisation driving demand preferences*

The Developed and East Asia region,<sup>1</sup> with its 1.6 billion people, is the second most populous of those covered in this Chapter, with the overwhelming majority living in The People's Republic of China (hereafter "China"). It is also the only region where the population is expected to decline over the coming decade. The region encompasses a diverse range of countries, that play a central role in global markets. This includes China and Japan, the second and third largest economies in the world. Considered on a per capita basis, income levels range from USD 8 789 in China to USD 62 344 in Australia. The region has urbanized rapidly, and estimates suggest that by 2032, 74% of people will reside in urban settings, up from just 55% in 2010. Such urbanisation contributes to dietary change, including the associated rising consumption of

higher value, processed and conveniently packaged food, and consequently contributes to rapid transformation of food systems.

Income growth in the region has been resilient in the face of numerous exogenous shocks. The decline in per capita GDP of only 0.6% in 2020 makes it one of the least affected economically by the pandemic, though clear differences exist across countries, with sharp decreases Japan, Australia, and New Zealand, offset by continued growth in China of 2.0%. Its recovery was also one of the fastest. Regional growth rebounded by 5.7% in 2021, with broad recovery amongst all countries – to the extent that average per capita income in 2021 was already 5.1% higher than in 2019. Despite ongoing war in Ukraine, the consequent increase in energy prices and spiralling inflation, per capita income expanded further by 2.9% in 2022 and is expected to rise by 3.5% in 2023 as China continues to lift pandemic related restrictions. While positive, this marks a sharp slowdown from historic norms and near-term growth prospects face many risks, including a more constrained global environment where demand is softer, commodity prices are falling, inflation is high and monetary policies are tightening. In the medium term, per capita incomes are projected to grow by 3.4% per year, implying incomes in 2032 that are 45% higher than the average of the base period. Rising income will be a key driver of demand in China, while consumer preferences may be more important in the high income developed countries.

The region's agricultural resource base is as diverse as the countries included in it. Severe resource constraints in China, Korea and Japan are contrasted by abundance in both Australia and New Zealand. The share in the economy of primary agriculture and fish value added has declined to about 5% and is expected to fall further to 4% by 2032. Economic growth has been accompanied by a reduction in the share of food in total household expenditure to 14%, but it ranges in the region from 18% in China to 8% in Australia. Prevailing high prices and affordability challenges could have a notable impact on food security within the region, but global shocks may be muted to some degree by domestic protection in various countries.<sup>2</sup>

The region encompasses a range of important exporters and importers of agricultural and food products. China and Japan are the largest and second largest net food commodity importers in the world, while Korea is the sixth largest.<sup>3</sup> These countries trade sufficiently to have a notable impact on global agricultural markets and value chains. New Zealand and Australia are among the top 10 global net exporters of food commodities in value terms, particularly for livestock and dairy products. Based on specialisation in the region, there is extensive and growing interregional trade. Apart from Australia and New Zealand, interventionist government policies are influential in local markets. Changes to such domestic policies have the potential to impact global markets significantly, due to the size and contribution to global trade from the countries in which they are imposed.

The challenges facing the region are as numerous as they are diverse. Natural resource constraints in China, Korea, and Japan have led to intensive application of purchased inputs, and growing sustainability concerns. In some areas, water resources have reached critically low levels and parts of the region are highly vulnerable to climate change. Increasingly severe droughts are occurring more frequently, particularly in Australia, a situation that will likely persist and possibly intensify due to climate change. Amongst the major threats specific to meat production are animal diseases such as ASF and Avian Influenza. The extent of impact from the ASF outbreak in China in 2018 serves to highlight the importance of improved measures required to manage these threats.

Despite these challenges, agricultural value addition per unit of land used for agricultural purposes continues to rise. Total factor productivity growth over the last decade is estimated at 1.6% p.a., down from 2% p.a. in the preceding decade.<sup>4</sup> Considering resource constraints, continued investments in productivity growth in the region will be critical to future sustainability.

## Production

### *China driving production growth*

The region is the second largest global producer of agriculture and fish commodities, contributing almost a fifth of the value of global output in the 2020-22 base period. By 2032, 9% growth in the net value of production results in a modest decline in its share in global production. China is central in the region's output. In the 2020-22 base period, it already accounted for almost 90% of total value and Figure 1 indicates that it is also the sole driver of growth over the outlook period. While China is expected to add 10% to its agriculture and fish production value by 2032, the rest of the region contracts by 3%, mainly due to reduced output in Australia and Japan. Aside from recovery in the livestock sector following African Swine Fever (ASF), growth in the region as a whole has slowed with maturing domestic markets, evolving policies, and strengthened trade competition.

The regions crop sector accounts for 38% of total agriculture and fish output in the base period, although accounting for fruits and vegetables would increase this contribution. Growth of only 4% implies that the share of crops in total agricultural value added could decline to 36% by 2032. Most of this decline is picked up by fish production, which could account for 27% of total value added by 2032, while the livestock sector sustains its share at 37%.

Total land used for agricultural purposes is expected to decline slightly by 2032, in line with historic trends. This reflects a reduction in pasture, as land used for crop production is expected to expand by 5%, almost exclusively in Australia. Resource constraints in the rest of the region suggest that productivity gains must be central to growth. The value generated per hectare of cropland is already higher in Developed and East Asia than any other region and is expected to remain fairly stable towards 2032. While some yield gains are expected, due to progress in new seed varieties, improved production practices and expanded irrigation, these are generally slower than in the past. There are mounting environmental and food safety concerns, due to water scarcity, and the fact that synthetic fertiliser use, on a per hectare basis, is already the highest amongst all regions. Fertiliser application per hectare could rise further over the outlook period, albeit slowly, but the projected crop mix and productivity gains are such that the energy produced per unit of fertiliser applied is also expected to rise by 5%.

The region's crop area is dominated by cereals. Its contribution to global production is notable for several crops, including rice, maize and wheat. Its processing sector also contributes a substantial share of protein meal and vegetable oil produced in the world, but it relies mostly on imported oilseeds. Almost all maize produced in the region is attributed to China, which also contributes 93% of its rice output and 80% of wheat. The balance of wheat production is almost exclusively from Australia. China is expected to expand its area under maize production by 2.3 Mha over the coming decade which, combined with yield gains of 0.7% p.a., fuels production growth of 12% by 2032. Conversely, the area cultivated to rice and wheat is expected to contract by 1.2 Mha and 1.3 Mha respectively. Yield gains are sufficient to induce a 2% expansion in rice production, and maintain wheat production at current levels, despite the area contraction. In Australia, the only other notable wheat producer in the region, production is expected to contract by 16% relative to the base period, reflecting a 5% reduction in area harvested, as well as a normalisation in yields from record levels attained in 2022. Almost all of the decline in regional wheat production is attributed to Australia.

Livestock production constitutes 37% of the total value of agricultural and fish production and growth of 9% is sufficient to sustain this share by 2032. Growth emanates mainly from intensification and productivity gains, reflecting the contracting pasture land base in Australia, New Zealand, and Japan. More than three quarters of meat production growth from the region is expected to be pigmeat, with a further 11% attributed to poultry.

China remains the largest contributor to livestock production in the region, accounting for almost 80% of livestock production value. Pigu meat and poultry are the biggest sectors, constituting 58% and 28% of total Chinese meat production respectively. Meat production in China is expected to grow by 14% over the next ten years and 80% of the additional meat produced will be Pigu meat. Following the devastating impact of the 2018 African Swine Fever (ASF) outbreak, China's pig herd has largely been rebuilt and in 2022, its pig herd inventory surpassed 2017 levels. Pigu meat production in 2032 is expected to be 8% higher than in 2022, reflecting large scale intensification in the sector as it recovered from ASF. Many smaller producers were replaced by large, commercial production units that prioritise biosecurity. The effects of ASF in the recent past also initiated growth in poultry production, which has a short production cycle and was able to respond the fastest to high meat prices in China at the height of ASF. From 2018 to 2022, poultry production expanded by 20%, but the recovery in pigu meat production and subsequent normalisation in prices results in further growth of only 4.5% by 2032.

Despite its much smaller share in total meat production from the Developed and East Asian region, Australia's resource base is more conducive to bovine animals, which account for almost half of its total meat production. In turn, Australia contributes 20% of bovine meat production from the region. Growth of 0.8% per annum implies that it will also be a major driver of expanding regional bovine meat production.

The Developed and East Asian region contributes almost 40% of global fish production and 90% is sourced in China. China is also the major driver of fish production growth in the region, which is projected at 1.3% per annum. Growth is much faster in aquaculture, at 1.5% p.a. over the coming decade, compared to only 0.6% p.a. in captured fisheries. Consequently, aquaculture could account for almost 78% of total production from the region by 2032. Given its central role in regional production, the policy environment in China, which has increasingly prioritised sustainability in recent years, will guide fish market developments.

Total agricultural GHG emissions by the region are projected to increase by 5.1% by 2032. Emissions from animal sources are projected to rise by 5.1%, reflecting a 7% and 3% rise in bovine herds and sheep flocks respectively. Crop related emissions also rise by 4.6% over the ten-year period. Nevertheless, when considered relative to the value generated from agriculture and fisheries, the decline in GHG emissions per unit value produced is expected to continue, albeit at a slower rate.

## **Consumption**

### *Dietary change in China driving increased meat consumption*

The East Asian region has made great strides in improving food security and the impact of the pandemic was smaller than in most other regions. While COVID-19 undoubtedly influenced consumer behaviour and agriculture supply chains, GDP performance was fairly resilient, particularly in China, and income support measures in developed countries further mitigated large scale impacts on food security. Despite the marginal increase in the prevalence of moderate to severe food insecurity in 2020, the recovery in 2021 was such that it reached its lowest level in five years, despite rising prices. Total calorie availability increased in 2022 and is expected to rise again in 2023, despite high inflation and the surging cost of living. By 2032, total calorie availability is expected to rise by 6%, around 200 kcal/person/day to reach 3473 kcal/person/day. This is the second highest among all regions and reflects the generally high per capita income levels in most countries. However, corrected for estimated household waste, total calorie intake is expected below 3239 kcal/person/day.

Various trends in population dynamics affect countries across the region. Populations in many parts of the region are aging, with dependency ratios<sup>5</sup> in Japan and Korea already high and set to increase further by 2030 (UN DESA, 2020<sub>[11]</sub>). It is generally assumed that the aging population trend will have a dampening effect on overall food consumption growth rates in these countries. Conversely, rapid urbanisation, particularly in China, drives growing consumption of convenience foods, and meats, fats, and sugars,

which will outpace most other food groups. Sugar consumption is expected to grow fastest among the various food groups and while vegetable oil consumption growth is slower, absolute levels are already high. By 2032, it is expected to approach 28 kg per capita, exceeding the global average by 70%.

Given the level of incomes, development, and maturity in most countries of the region, the greatest shift in dietary composition is set to occur in China. By 2032, per capita consumption of sugar products is expected to rise by 15%, whereas fish, meat and dairy consumption are set to expand by 14%, 12% and 12% respectively. These rates contrast with growth of less than 0.5% in cereal consumption, underscoring the extent of dietary change expected.

Increased meat consumption will also result in increased protein availability, with an expected gain of 10g/person/year by 2032. This brings total protein availability in the region to 118g/person/year – more than 30% above the global average. Most of this gain is expected in China, while small increases are also evident in Korea and Japan. In Australia and New Zealand, protein availability is expected to decline relative to 2020-22, mainly due to reduced dairy product consumption, but from high base levels.

At regional level, per capita fish consumption is also expected to grow by 13% or 5 kg per capita by 2032 relative to the base period. This includes strong growth of 14% in China, smaller gains of 6% in Australia, 5% in New Zealand and 4% in Korea, along with relative stability in Japan.

The region accounts for just over a quarter of global animal feed use. By 2032, the use of animal feed is expected to increase by 11%, sustaining the regions share in global use at current levels. Several factors combine to determine total feed use, including the intensity of feeding across different production systems and the efficiency of feed conversion by different species. Differences in production practices and predominant species are prevalent across countries. More than 85% of the feed used in the region is attributed to China, where total feed use is expected to rise by 13% by 2032. This encapsulates rising demand from increasingly intensive pigmeat and poultry operations. These large scale, fully commercial systems use feed more intensively than smaller, more traditional producers, but the combination of controlled environment and improved genetics also yields much improved feed conversion. Considering this combination of factors total animal feed use in China is expected to grow marginally slower than meat production. Conversely, dairy, beef and sheep production systems in Australia and New Zealand are more flexible in terms of feed use intensity and more reliant on pasture. Thus, growth in total feed use is slower.

In feed-intensive production systems, maize and protein meal remain the core ingredients in most pre-mixed feed rations and account for almost 70% of total feed raw material use between them. Their use in animal feed across the region is expected to grow by 15% and 11% respectively over the coming decade, with the slower rate in protein meal reflecting China's efforts to reduce protein inclusion in rations. While wheat constitutes a much smaller share of total feed, its use is expected to grow by 21% over the coming decade.

The region accounts for roughly 10% of global ethanol use and almost 80% of this is attributed to China. In 2017, China announced an ambitious E10 mandate with targeted implementation across the country by 2020 and the aim of reducing excessive maize stocks. Stocks have since normalised, providing limited incentive to expand ethanol production. The *Outlook* therefore assumes that blending rates will increase to only 1.7% by 2032, an increase from the 1.2% average over the base period, but well below the ambitious 10% target. With total gasoline use expected to decline, the increased blending rate sustains China's ethanol consumption growth at 1.1% p.a. over the ten-year period. By 2032, China will still only account for approximately 7% of global ethanol production.

## Trade

### *Diverse group of net importers and exporters*

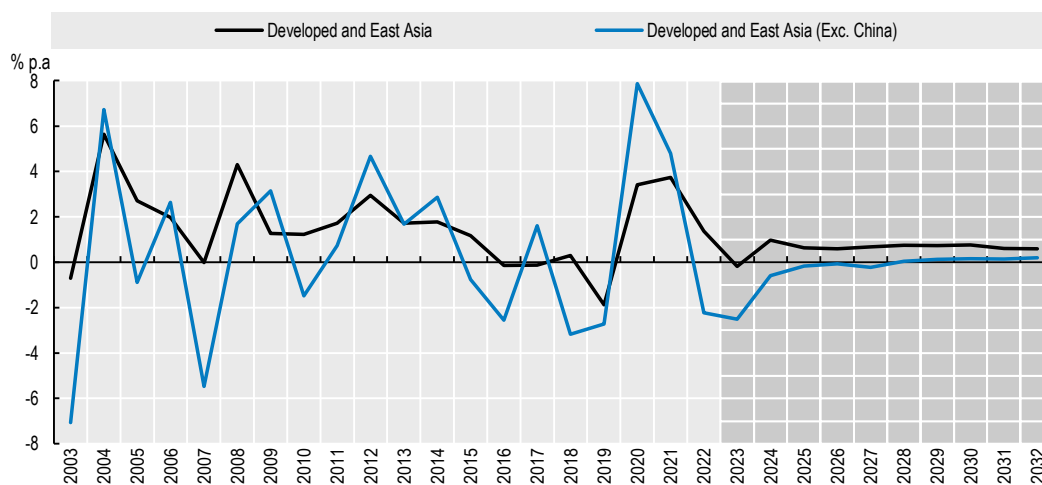
The region's trade deficit is foreseen to stabilise over the coming decade, but it remains the biggest net importer amongst those covered in the *Outlook*. This position mainly emanates from imports into East Asia, particularly China and Japan, and masks net exports from the Oceanic region. The major products imported into the East Asian region include soybeans, maize, barley, sorghum, wheat, vegetable oil and livestock products. The Oceanic region is a significant net exporter of wheat, barley, canola, sugar, meat, and dairy products.

The net value of imports into the region is expected to rise 7% by 2032 relative to the 2020-22 base period – a significant slowdown compared to the past decade. Almost three-quarters of the additional imports accrue to China, the largest soybean importer in the world. China's soybean imports reached an all-time high in 2020, despite the logistical challenges associated with the COVID-19 pandemic. Import demand was driven by rapid growth in poultry production, as well as the recovery in its pig herd post ASF. Imports have subsequently slowed in the current high price environment, but by 2032 are expected to rise by a further 6% due to further livestock production growth and fewer trade related challenges. Despite the slowdown in growth relative to the past, China will still account for 60% of global soybean trade, with the bulk of products sourced from Brazil, the United States and Argentina. While growing animal feed use is also driving demand for maize, imports are set to decline because of strong domestic production growth. By 2032, China is expected to produce almost 95% of its total maize use yet will still account for 9% of global maize trade.

Meat imports into the region are set to decline by 14% over the next ten years, mainly due to the 25% reduction in imports into China, given that its own production has recovered from the impacts of ASF. Bovine and to a much lesser extent ovine are the only meat types where China is expected to increase imports. In the rest of the region, Korean meat imports are set to expand by 12%, but its contribution to total imports into the region is much smaller. Part of East Asia's meat import requirement will likely be met by rising exports from Oceania, which is favourably located to supply Asian markets. Australia is already amongst the top 5 suppliers of bovine meat into China and bilateral trade relations have improved. Australia's bovine exports are expected to grow by 19% to reach 1.8 Mt by 2032. The additional 290 Kt supplied from Australia by 2032, however, only equates to a third of China's expected import growth for bovine meat.

The Oceanic region is a major exporter of numerous other products, but several of these are expected to contract over the coming decade. Wheat exports are expected to decline, but Australia remains an important global supplier, particularly amid the ongoing war in Ukraine, which has constrained exports from the Black Sea region. By 2032, Australia is still expected to constitute 10% of global wheat exports. Despite its small land area, New Zealand accounts for more than 30% of global sheepmeat exports and for 23% of the world's dairy exports. With pastureland increasingly constrained and set to decline further by 2032, sheepmeat exports are projected to remain stable, while dairy exports grow by a modest 6%. Consequently, New Zealand's share in global exports is expected to decline for both products.

**Figure 1. China a major driver of growth in agriculture and fish output in the Developed and East Asia region**



Note: Estimates are based on historical time series from the FAOSTAT Value of Agricultural Production domain which are extended with the *Outlook* database. Remaining products are trend-extended. The Net Value of Production uses own estimates for internal seed and feed use. Values are measured in constant 2014-2016 USD.

Source: FAO (2023). FAOSTAT Value of Agricultural Production Database, <http://www.fao.org/faostat/en/#data/QV>; OECD/FAO (2023) "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

StatLink 2 <https://stat.link/dk7wxa>

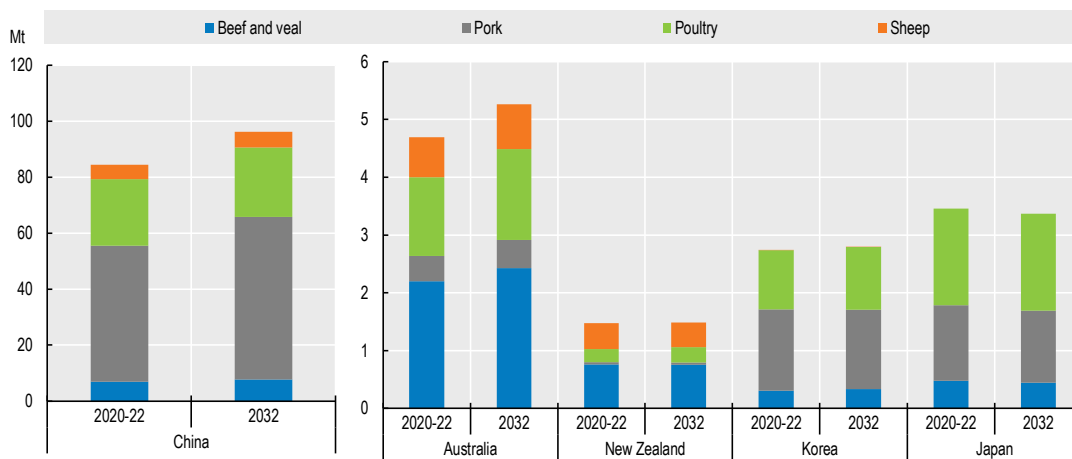
**Figure 2. Change in area harvested and land use in Developed and East Asia**



Source: OECD/FAO (2023), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

StatLink 2 <https://stat.link/js0mwu>

**Figure 3. Livestock production in Developed and East Asia**

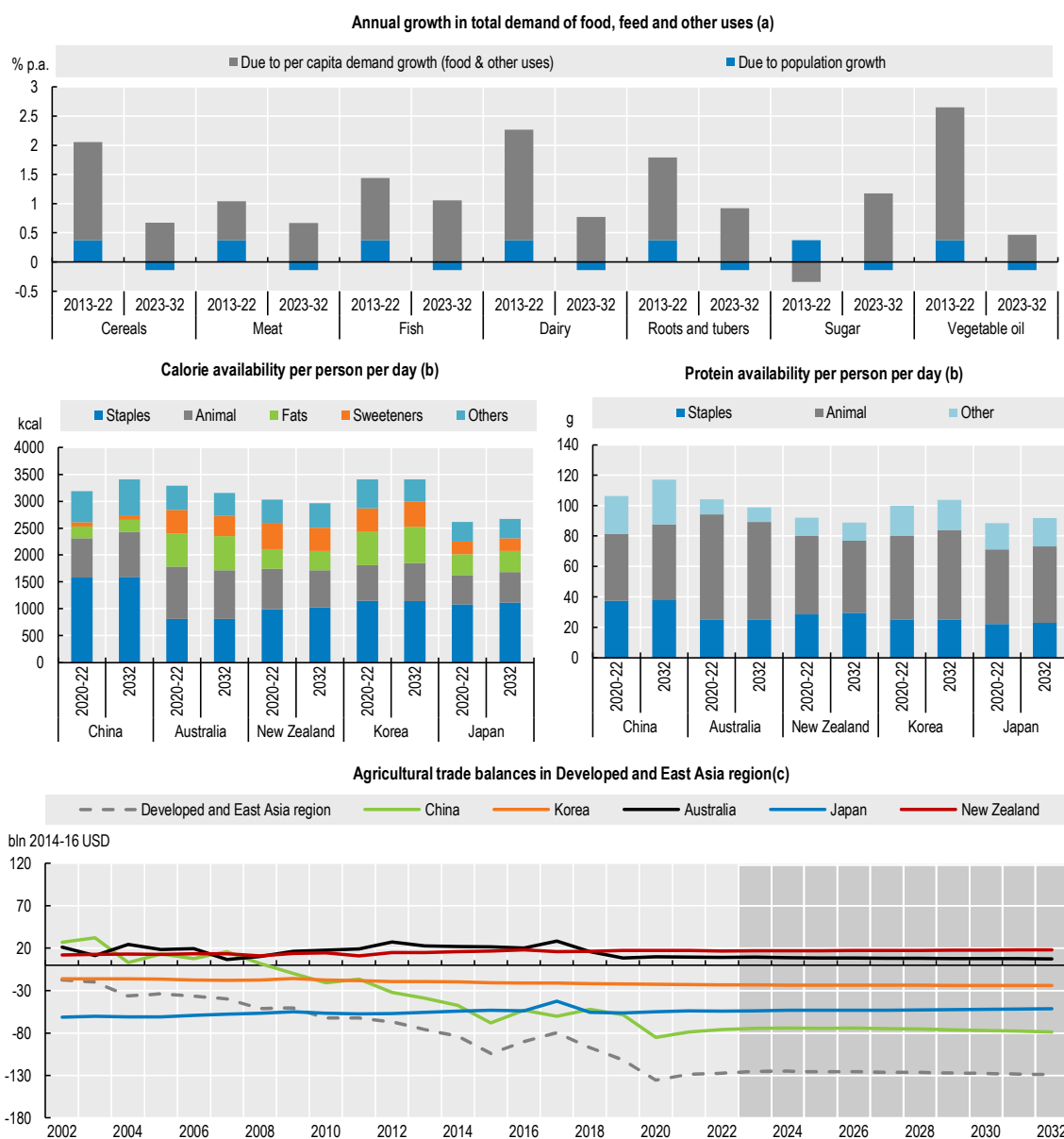


Source: OECD/FAO (2023), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

StatLink 2 <https://stat.link/tb5xil>



**Figure 4. Demand for key commodities, food availability and agricultural trade balances in Developed and East Asia**



Notes: Estimates are based on historical time series from the FAOSTAT Food Balance Sheets and trade indices databases and include products not covered by the *Outlook*. a) Population growth is calculated by assuming per capita demand constant at the level of the year preceding the decade. b) Fats: butter and oils; Animal: egg, fish, meat and dairy except for butter; Staples: cereals, oilseeds, pulses and roots. c) Include processed products, fisheries (not covered in the FAOSTAT trade index) based on outlook data.  
 Source: FAO (2023). FAOSTAT Value of Agricultural Production Database, <http://www.fao.org/faostat/en/#data/QV>; OECD/FAO (2023) "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

StatLink 2 <https://stat.link/1po7ik>

Table 1. Regional Indicators: Developed and East Asia

	Average			%	Growth <sup>2</sup>	
	2010-12	2020-22 (base)	2032		Base to 2032	2013-22
Macro assumptions						
Population ('000)	1 561 225	1 633 052	1 612 371	-1.27	0.37	-0.14
Per capita GDP <sup>1</sup> (kUSD)	9.65	13.42	19.48	45.10	3.22	3.42
Production (bln 2014-16 USD)						
Net value of agricultural and fisheries <sup>3</sup>	693.6	778.5	845.1	8.56	0.80	0.69
Net value of crop production <sup>3</sup>	249.8	293.3	304.3	3.74	1.61	0.47
Net value of livestock production <sup>3</sup>	277.2	287.8	312.6	8.61	-0.12	0.48
Net value of fish production <sup>3</sup>	166.6	197.4	228.2	15.65	1.06	1.31
Quantity produced (kt)						
Cereals	530 611	631 947	656 970	3.96	0.94	0.58
Pulses	7 698	7 997	8 954	11.96	1.49	0.96
Roots and tubers	39 781	46 356	48 490	4.60	1.62	0.29
Oilseeds <sup>4</sup>	29 227	42 359	45 285	6.91	4.15	0.24
Meat	90 627	96 787	109 126	12.75	-0.03	0.60
Dairy <sup>5</sup>	9 454	10 536	11 447	8.64	1.05	0.71
Fish	59 227	70 199	81 153	15.60	1.08	1.31
Sugar	16 334	14 888	15 612	4.86	-1.65	0.51
Vegetable oil	22 025	30 655	34 679	13.13	2.57	0.83
Biofuel production (mln L)						
Biodiesel	1 220	2 648	2 627	-0.80	6.16	-1.76
Ethanol	8 952	10 406	11 678	12.23	0.63	0.99
Land use (kha)						
Total agricultural land use	933 488	901 336	891 156	-1.13	-0.14	-0.11
Total land use for crop production <sup>6</sup>	158 208	154 968	162 724	5.01	-0.50	0.61
Total pasture land use <sup>7</sup>	775 280	746 368	728 432	-2.40	-0.06	-0.26
GHG Emissions (Mt CO <sub>2</sub> -eq)						
Total	967	887	932	5.08	-0.68	0.34
Crop	455	378	395	4.57	-1.61	0.51
Animal	500	498	525	5.42	0.08	0.20
Demand and food security						
Daily per capita caloric food consumption <sup>8</sup> (kcal)	2 948	3 154	3 351	6.25	0.65	0.43
Daily per capita protein food consumption <sup>8</sup> (g)	94.5	104.7	114.3	9.21	1.11	0.61
Per capita food consumption (kg/year)						
Staples <sup>9</sup>	156.3	156.3	157.1	0.54	0.06	0.02
Meat	40.3	43.2	48.1	11.41	0.84	0.65
Dairy <sup>5</sup>	4.7	5.4	5.9	9.00	1.97	0.72
Fish	36.0	41.0	46.2	12.55	0.81	1.07
Sugar	11.9	12.0	13.3	10.81	-0.37	1.17
Vegetable oil	20.4	25.1	26.2	4.59	1.65	0.52
Trade (bln 2014-16 USD)						
Net trade <sup>3</sup>	- 64	- 130	- 129	-1.10	..	..
Value of exports <sup>3</sup>	109	119	138	16.35	0.25	1.46
Value of imports <sup>3</sup>	173	249	267	7.21	2.94	0.92
Self-sufficiency ratio <sup>10</sup>						
Cereals	96.1	91.2	91.8	0.64	-0.34	-0.04
Meat	98.8	91.0	93.7	2.96	-1.07	0.07
Sugar	79.9	70.0	70.0	0.09	-1.45	-0.70
Vegetable oil	66.0	72.0	78.5	9.11	0.01	0.50

Notes: 1 Per capita GDP in constant 2010 US dollars. 2. Least square growth rates (see glossary). 3. Net value of agricultural and fisheries data follows FAOSTAT methodology, based on the set of commodities represented in the Aglink-Cosimo model valued at average international reference prices for 2014-16. 4. Oilseeds represent soybeans and other oilseeds. 5. Dairy includes butter, cheese, milk powders and fresh dairy products, expressed in milk solid equivalent units. 6. Crop Land use area accounts for multiple harvests of arable crops. 7. Pasture land use represents land available for grazing by ruminant animals. 8. Daily per capita calories/protein represent food consumption per capita per day, not intake. 9. Staples represent cereals, oilseeds, pulses, roots and tubers. 10. Self-sufficiency ratio calculated as  $\text{Production} / (\text{Production} + \text{Imports} - \text{Exports}) * 100$ .

Sources: FAO (2023). FAOSTAT Food Balance Sheets and trade indices databases, <http://www.fao.org/faostat/en/#data> ; OECD/FAO (2023), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

## Notes

<sup>1</sup> Australia, China, Japan, Korea, and New Zealand.

<sup>2</sup> Source: OECD-FAO interpolated for 2017-19 from the database of the Global Trade Analysis Project (GTAP) 2011, using food expenditure and GDP data used in this *Outlook*.

<sup>3</sup> This analysis assumes the EU-27 as one integral region.

<sup>4</sup> Fuglie, Keith (2015), "Accounting for growth in global agriculture", *Bio-based and Applied Economics*, Vol. 4 (3): 221-254. Estimates are based on the International Agricultural Productivity dataset produced by the USDA. See <https://www.ers.usda.gov/data-products/international-agricultural-productivity>.

<sup>5</sup> The old age dependency ratio is calculated that the over 65 population divided by 15-64 population.