2 Regional briefs

This chapter describes key trends and emerging issues facing the agricultural sector in the six FAO regions, i.e. Asia Pacific (which is split into Developed and East Asia and South and Southeast Asia), Sub-Saharan Africa, Near East and North Africa, Europe and Central Asia, North America, and Latin America and the Caribbean. It highlights the regional aspects of production, consumption, and trade projections for the period 2023-32, and provides background information on key regional issues.

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.

2.1. Regional Outlook: Developed and East Asia

2.1.1. Background

Rapid urbanisation driving demand preferences

The Developed and East Asia region,[1] 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.[2]

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.[3] 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.[4] Considering resource constraints, continued investments in productivity growth in the region will be critical to future sustainability.

2.1.2. 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 2.1 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. d 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. Pigmeat 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 Pigmeat. 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. Pigmeat 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 pigmeat 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.

2.1.3. 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[5] in Japan and Korea already high and set to increase further by 2030 (UN DESA, 2020[1]). 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.

2.1.4. Trade

Diverse group of net importers and exporters

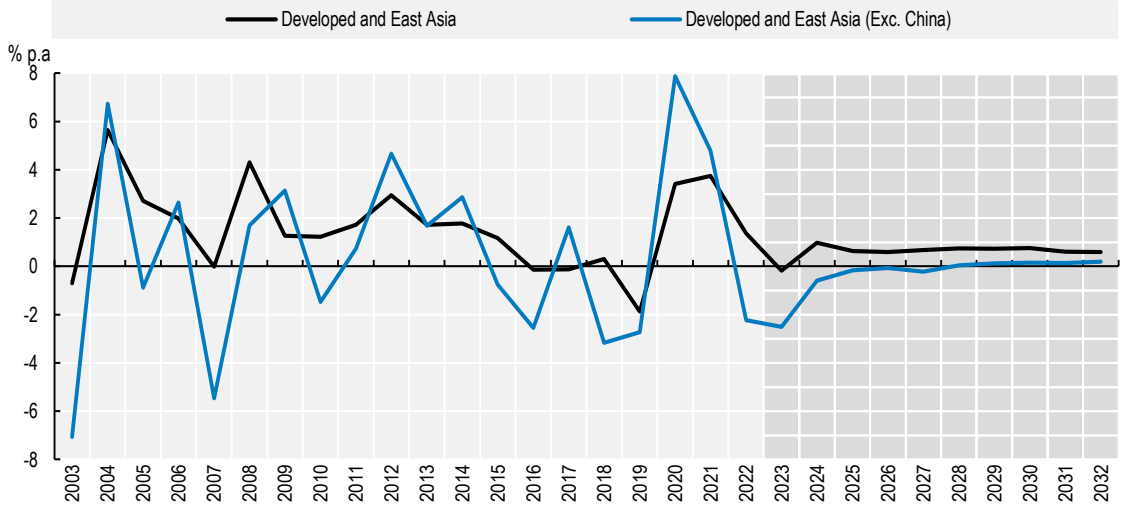
The region's trade deficit is foreseen to stabilise over the coming decade, but it remains the biggest net importer amongst those covered in the *Outlook*. This position mainly emanates from imports into East Asia, particularly China and Japan, and masks net exports from the Oceanic region. The major 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 2.1. 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.

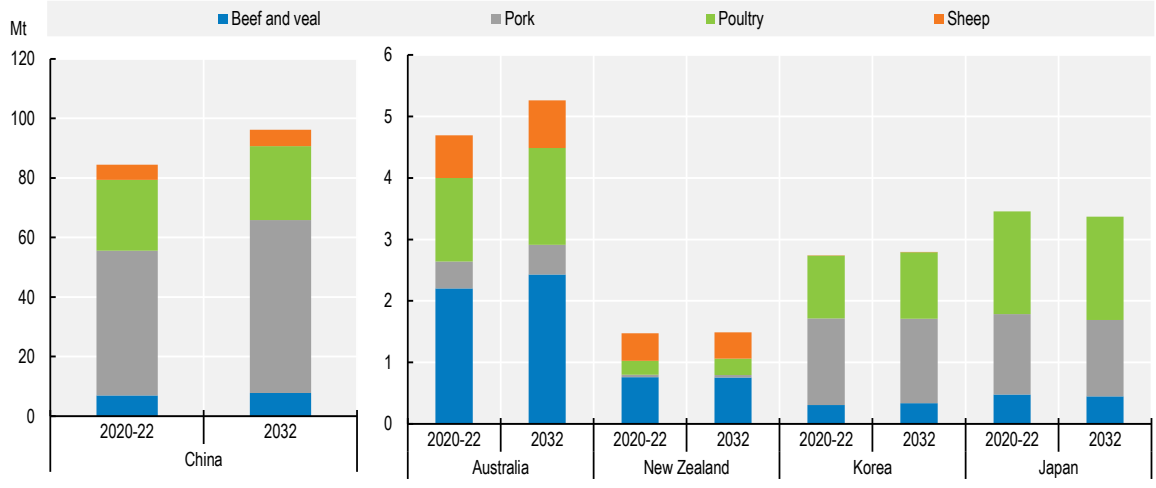
StatLink https://stat.link/dk7wxa

Figure 2.2. 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 https://stat.link/js0mwu

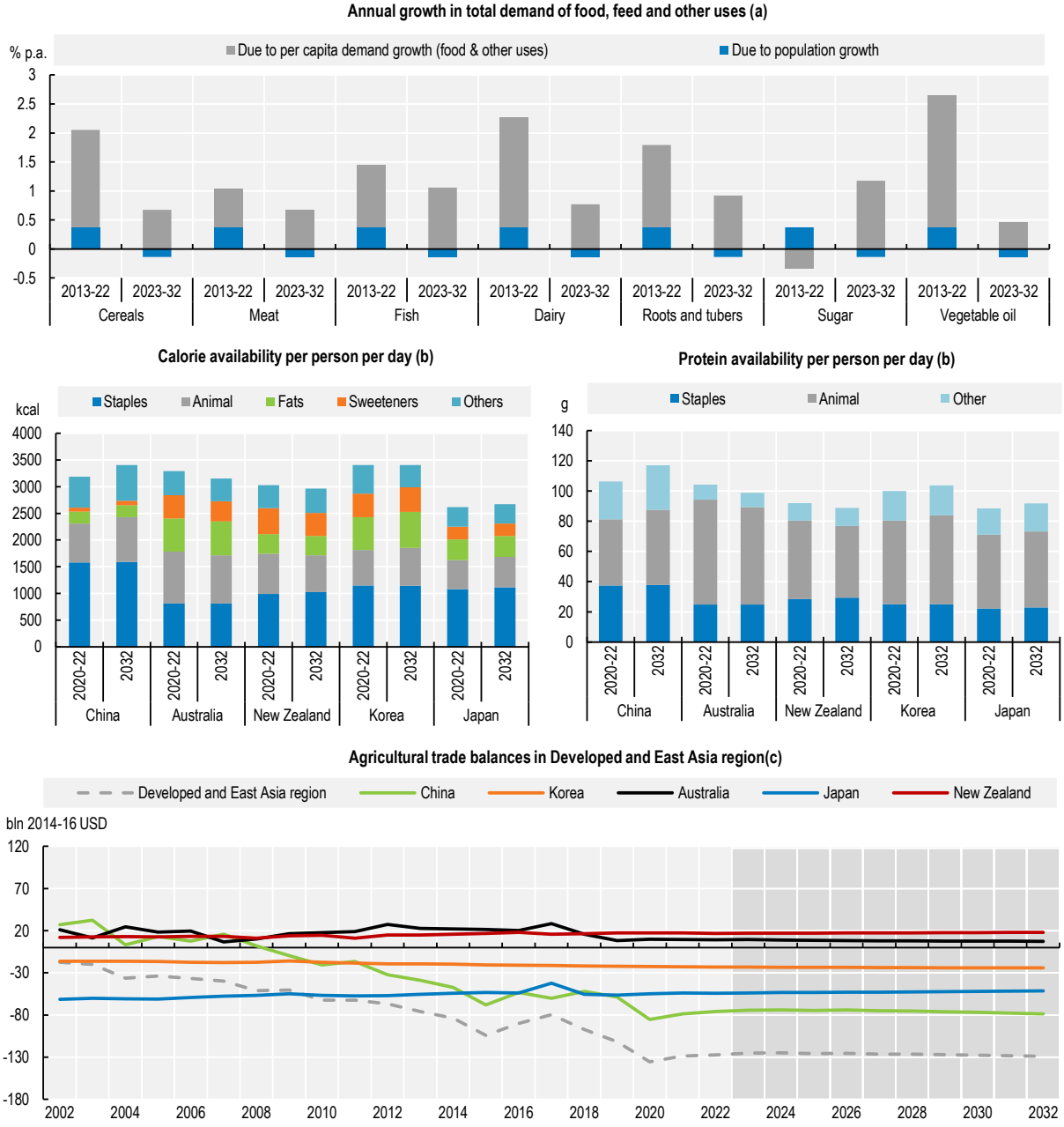
Figure 2.3. Livestock production in Developed and East Asia



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

StatLink https://stat.link/tb5xil

Figure 2.4. 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 https://stat.link/1po7ik

Table 2.1. Regional Indicators: Developed and East Asia

	Average			%	Growth[2]	
	2010-12	2020-22 (base)	2032	Base to 2032	2013-22	2023-32
Macro assumptions						
Population ('000)	1 561 225	1 633 052	1 612 371	-1.27	0.37	-0.14
Per capita GDP[1] (kUSD)	9.65	13.42	19.48	45.10	3.22	3.42
Production (bln 2014-16 USD)						
Net value of agricultural and fisheries[3]	693.6	778.5	845.1	8.56	0.80	0.69
Net value of crop production[3]	249.8	293.3	304.3	3.74	1.61	0.47
Net value of livestock production[3]	277.2	287.8	312.6	8.61	-0.12	0.48
Net value of fish production[3]	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[4]	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[5]	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 production6	158 208	154 968	162 724	5.01	-0.50	0.61
Total pasture land use[7]	775 280	746 368	728 432	-2.40	-0.06	-0.26
GHG Emissions (Mt CO2-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[8] (kcal)	2 948	3 154	3 351	6.25	0.65	0.43
Daily per capita protein food consumption[8](g)	94.5	104.7	114.3	9.21	1.11	0.61
Per capita food consumption (kg/year)						
Staples[9]	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[5]	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[3]	- 64	- 130	- 129	-1.10	..	..
Value of exports[3]	109	119	138	16.35	0.25	1.46
Value of imports[3]	173	249	267	7.21	2.94	0.92
Self-sufficiency ratio10						
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 Production / (Production + Imports - 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.

2.2. Regional outlook: South and Southeast Asia

2.2.1. Background

Population and robust income growth support strong demand, putting pressure on resources

The South and Southeast Asia region is home to 34% of the global population, making it the most populous region amongst those covered in this Chapter. Just over half of its 2.7 billion people reside in India. Urbanisation is rising across the region and the share of population residing in urban areas is expected to surpass 46% by 2032, from an average of 41% in 2020-22. On average, income levels amount to USD 3 157 per capita, which is at the lower end of the global spectrum, but it includes a diverse range of countries. Amongst its least developed nations, income levels average USD 1 345 per capita, whereas in Singapore, they are above USD 60 000 per capita.

Growth in per capita income, at 3.8% p.a., is expected to outpace all other regions in the coming decade. It has been robust in the past, rebounding quickly from the COVID-19 related contraction in 2020. By 2022, average per capita income levels exceeded those of 2019 by more than 3%. In several countries endowed with energy or commodity reserves, the rebound benefitted from the higher commodity price cycle. Given historic growth, the share of primary agriculture, fish and forestry is anticipated to continue its longer-term decline from a share of about 13% in the base period, to around 9% by 2032.

With strong economic growth, the average share of food in household expenditures in the region has fallen to below 17%. However, for the least developed countries this share is 30%[6] and consequently the rise in food prices over the past two years impacted considerably on the food security of many in these countries. This is evident in the rise in moderate to severe food insecurity in both Southern and Southeast Asia – both regions that have made rapid progress in reducing hunger in the past.

The region has increased its positive trade surplus with respect to agricultural goods, although resources are increasingly strained. It encompasses some 580 Mha of agricultural land, which amounts to just 0.2 ha/person, compared to the world average of around 0.6 ha/person. With population growth expected at 0.9% p.a., resource pressures will only intensify, which means productivity gains are of paramount importance. At 2% p.a., total factor productivity growth exceeded the global average of 1.4% p.a. in the last decade, which was a key factor that facilitated economic growth.[7] Given existing pressure on its resource base, sustainability will need to be at the core of future productivity gains.

Rising income and a growing, increasingly urbanised population imply strong demand growth for food products, but the evolution of consumer preferences remains somewhat uncertain, particularly with respect to animal sourced products. Urbanisation typically leads to rising consumption of higher value, more processed and convenience food products. However large parts of the region are either vegetarian (particularly in India), averse to pigmeat consumption, or lactose intolerant, suggesting that diets may evolve differently to many other parts of the world. At the same time, the heterogeneity across the region implies that demand preferences may evolve differently across it and in some countries, the demand for meat products is growing rapidly.

The region has a fairly small positive trade balance but within it are several important importers and exporters of a range of agricultural and food products. It typically exports almost a quarter of agriculture and fish production. Exports are dominated by plant-based products, particularly rice and vegetable oil, where the region has an 81% and 61% share in global exports respectively. The Southeast Asia region is considered a major player in may global value chains, such as fisheries, cassava, or those involving vegetable oils and their further processed products.[8]

The main challenges facing the region relate to its ability to sustainably increase productivity and innovation, particularly in the face of resource limitations, climate change risks and its growing population. Despite historic progress, the region still accounts for about one-third of the world's undernourished population. To continue improving food security, it will need to sustain income growth in a less supportive global environment, amid high inflation and ongoing affordability challenges. Thus, key policy considerations include the nature and extent of market intervention schemes and how they affect global market interactions.

2.2.2. Production

Sustainable productivity gains are paramount to offset resource constraints

The South and Southeast Asian region is the largest contributor to the total value of global output from agriculture and fisheries. Crop production accounts for the biggest share, at 52%, but livestock production is growing faster. By 2032, agricultural output from the region is expected to expand by 20%, among the fastest of all regions and over the projection period, it will account for the biggest share of global output growth. The rate of agricultural production growth is almost double that of its population, suggesting that the value of agricultural output is also set to rise in per capita terms.

Crop production is expected to expand by 16%, resulting in a slight reduction in its share of total agriculture and fisheries output by 2032. This growth is achieved despite a mere 3.5% increase in land used for crop production over the ten-year period. In fact, growth in value generated per hectare of cropland accelerates over the projection period, to 1.2% p.a., reflecting a combination of intensification, crop mix changes and enhanced productivity. Increased fertiliser use will contribute to achieving yield gains, as application per hectare is expected to increase 8% by 2032. The response rates are such that the number of calories produced per unit fertiliser applied is also foreseen to rise.

The region is a major contributor to global output for a variety of food products, including rice, wheat, vegetable oil, pulses, and sugar. Apart from vegetable oil, where it remains stable, the regions share in global production is expected to rise for all these products.

Cereal production in the region is concentrated in India, Indonesia, Pakistan and LDC's such as Bangladesh, Cambodia, and Myanmar. India alone accounts for around 70% and 40% of the region's wheat and rice production respectively. Growth in cereal production is also concentrated in India, which accounts for three quarters of additional wheat and 46% of additional rice production over the coming decade. Growth in rice production is exclusively yield based, with a 15% increase in India and a 14% increase in Least Developed Asia by 2032, on an almost unchanged area.

Sugar production is dominated by India and Thailand, which account for almost 60% and 17% of regional production respectively. Of the projected growth of 17% in regional sugar production, just over half is expected to come from Thailand, where varietal improvements and improved extraction rates are expected to drive growth, with a mere 3% expansion in area.

The region accounts for 44% of vegetable oil produced globally, owing primarily to palm oil output in Malaysia and Indonesia. This sector has faced numerous disruptions in recent years, including adverse weather conditions, severe labour shortages due to restrictions in mobility of foreign workers through the pandemic and a temporary ban on exports from Indonesia to safeguard domestic supply. These are

additional to pre-existing structural constraints, such as aging oil palm plantations and increasing focus on sustainability concerns. Limited expansion of the mature oil palm area underpins a significant slowdown in palm oil production growth in the coming decade, particularly in Indonesia. Most of the additional production is expected to come from yield gains, due to increased mechanisation and renewal of old plantations.

Livestock products currently account for 28% of the value of agriculture and fish output and growth of 2.6% p.a. will lead to an expansion of this share to 31% by 2032. India and Pakistan are the biggest contributors to this growth, which emanates mainly from dairy products. Milk production growth of 33% stems from a 23% expansion in cow numbers and an 8% improvement in milk yield per cow. Half of the expansion in the region's cow inventory is attributed to India.

Poultry accounts for just over half of total meat production and for nearly 60% of additional meat production by 2032. Growth in this sector is largely a result of increased feed intensity and breeding improvements. Pigmeat production in the region is limited and concentrated mainly in Viet Nam and Thailand. Following sharp reductions in 2019 and 2020 because of African Swine Fever (ASF), pigmeat production in Viet Nam has rebounded strongly and by 2022, exceeded 2018 levels. In the medium term, it is expected to expand by an annual average of 1.8%, to exceed 4.7 Mt by 2032. Bovine meat production is expected to rise by 1.6% p.a., with India and Pakistan contributing more than 60% of total production.

Fish production is an important contributor to agricultural output in the region at 20% of total value. However, growth of 15% by 2032 is the slowest amongst the three subsectors, reducing its contribution over time. Whilst growth in captured fisheries is limited, reflecting resource limitations, growth of 2.3% p.a. in aquaculture implies that it will surpass captured fisheries by 2025, accounting for 54% of production by 2032.

Total direct GHG emissions from agriculture are set to rise by 11% by 2032 relative to 2020-22, driven predominantly by the livestock sector. While crop related emissions will rise by 4%, livestock related emissions, which reflect ruminant herd expansion, will increase at a rate marginally slower than the past decade at 1.2% p.a. By 2032, 29% of agriculture related GHG emissions globally will be attributable to the region.

2.2.3. Consumption

Strong demand growth but with distinct regional preferences

After years of progress in reducing food insecurity and undernourishment, these trends in the South and Southeast Asian region have reversed, reflecting reduced income due to the pandemic in 2020, as well as subsequent rising food prices. These factors combined to impact significantly on food affordability and, particularly in East Asia, the prevalence of undernourishment rose above 15% for the first time in a decade. In both Southern and Southeast Asia, the prevalence of undernourishment rose further in 2021, despite the strong rebound in economic growth. Notwithstanding expectations of further income growth, the persistence of high food prices continues to constrain large scale improvements in food security in the short term and, having increased by less than 0.5% in 2022, improvements in calorie availability is again expected to be small in 2023. In the medium term, as food prices start to normalise, the combination of accelerated income growth, modest declines in population growth rates and consistent, albeit slow urbanisation, will support the continued evolution of dietary patterns, driving demand for calorie and nutrient dense foods (Law, Fraser and Piracha, 2020[2]; Kelly, 2016[3]; Reardon et al., 2014[4]). The type of products consumed are, however, also dictated by the region's somewhat unique preferences, with a significant share of the population being vegetarian. By 2032, average calorie availability for consumption is projected to increase by 265 kcal/person/day to approach 2900 kcal, just 5% below the world average, predominantly derived from growth in consumption of wheat, pulses, rice, dairy products, and vegetable oils.

Cereals still account for more than half of the calories available for consumption in the region. By 2032, the share of cereals in total calories consumed is expected to decline to 51%. Rice still accounts for the biggest share of total cereal consumption, but wheat consumption is also rising. At regional level, per capita consumption of rice and wheat products are expected to rise by 0.4% and 0.7% p.a. towards 2032, but trends diverge across countries. In India, rice and wheat consumption are expected to rise at a similar rate. Conversely, in Indonesia and Vietnam, rice consumption per capita is expected to decline, replaced by a concomitant rise in wheat products.

Average protein intake remains well below the global level, but with gains of 9g/person/day by 2032, the deficit is expected to be close to 14%. This is underpinned by growing consumption of dairy and meat products. Dairy product consumption is already well above the world level and growth of 20% in per capita terms by 2032 will see it rise to almost 25% above the average level of consumption globally. The bulk of growth is attributed to fresh dairy products, which are expected to grow considerably in both India and Pakistan. Meat consumption is also expected to grow, but from a low base to reach just 12 kg per capita by 2032, but this regional average masks significant differences within it. In India, meat consumption is very limited and only expected to reach 3.3 kg per capita per year, whereas in Viet Nam, it is expected to rise by 7 kg per capita, to reach 52 kg by 2032. At the regional level, more than half of the growth in meat consumption is attributed to poultry, but in Viet Nam, it's mainly driven by pigmeat.

As livestock and dairy production grow, the combination of herd expansion, rising feed use intensity and efficiency gains will support growth of 21% in feed use by 2032. This expansion is slower than that of meat and dairy production, reflecting the impact of improved feed conversion ratios across the region. In Viet Nam, growth in feed use is much faster, at 34%, due to increasing feed use intensity in its pigmeat sector. Maize and protein meal constitute the bulk of animal feed in the region. The use of maize and protein meal in animal feed is expected to expand by 27% and 23% respectively by 2032, implying that the share of maize in total feed use will continue to rise.

The region is foreseen to increase its share of global ethanol use to 12% by 2032, from less than 8% in 2020-22. This represents a significant gain in its global market share, which rests largely on increasing mandates, particularly in India, which now aims to achieve its ambitious E20 blending target by 2025. However, given limitations in feedstock supply, it is assumed to only reach this level by 2032. In Thailand, which has also developed blending targets as part of its Alternative Energy Development Plan, blending rates are expected to reach 14% by 2032. Ethanol production will add to the demand for agricultural products in these countries, particularly sugarcane, which is a major feedstock.

The region currently contributes a larger share of 22% in global biodiesel use, and this is expected to grow to 24% by 2032, mainly due to increases in Indonesia where implementation of a 30% biodiesel blend aims to reduce dependency on imported fossil fuels. Combined with support measures under its biodiesel programme, this is expected to direct domestic palm oil supplies to the biodiesel market, underpinning growth of 33% in its biodiesel use by 2032. The additional stability that the biodiesel sector provides to palm oil prices could help to encourage investment into the sector, resulting in increased renewal of oil palm plantations.

2.2.4. Trade

Export surplus sustained by India

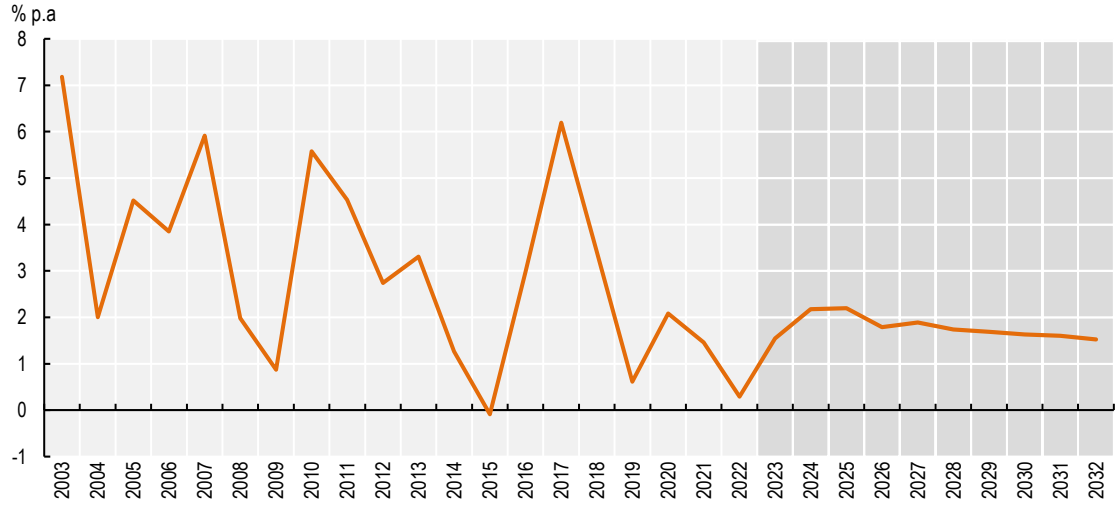
The South and Southeast Asia region is a small net exporter of agricultural commodities, but this surplus is expected to decline and become a small deficit by 2032. The region's aggregate position masks significant differences within it. India is by far the biggest net exporter, and historically drove increasing surpluses, but over the outlook is also the primary driver of the decline in exports. Southeast Asia is also a net exporter, but its surplus is small and remains fairly consistent by 2032. By contrast, net imports from

the LDC's and other developing countries of the region continue to rise. With the reduction in India's surplus, the region reaches a net importing position by 2029.

Total net exports from the region are expected to contract by 6.7% over the next ten years. Export products comprise mainly rice, roots and tubers, sugar, vegetable oil, and meat. Vegetable oil exports mainly accrue to Indonesia and Malaysia, the biggest palm oil exporters in the world. Growth in vegetable oil exports is limited, at just 0.3% p.a., resulting in a slight reduction in the region's share of global exports. Conversely, rapid export growth for rice and sugar implies that the region will increase its global market share to 86% and 28% respectively. Almost a third of the growth in rice exports are expected to come from Thailand, whose exports could rise by an average of 1.9% p.a., with further significant contributions also coming from Viet Nam and LDC's such as Myanmar and Cambodia. While the region is responsible for almost a quarter of global fish exports, this share is expected to decline, due to limited growth in fish exports amid rising domestic consumption. A significant share of fish trade will occur within the region.

The region is increasingly dependent on imports for several commodities, including wheat, maize, soybeans, protein meal. Import dependence for these commodities is expected to rise over the next ten years. While the region is expected to account for a growing share of global meat and dairy product imports, these comprise a small share of total consumption and self-sufficiency rates remain fairly stable by 2032. In several individual countries, the role of imports are more pronounced.

Figure 2.5. Slowing growth of agriculture and fish output in South and Southeast 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.

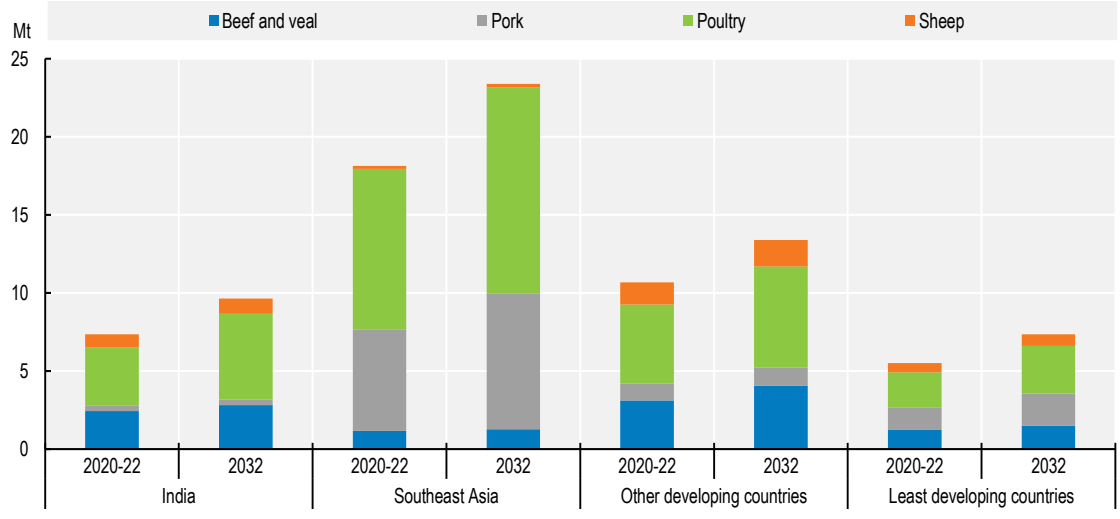
StatLink https://stat.link/k64brx

Figure 2.6. Change in area harvested and land use in South and Southeast Asia

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

StatLink https://stat.link/01acn2

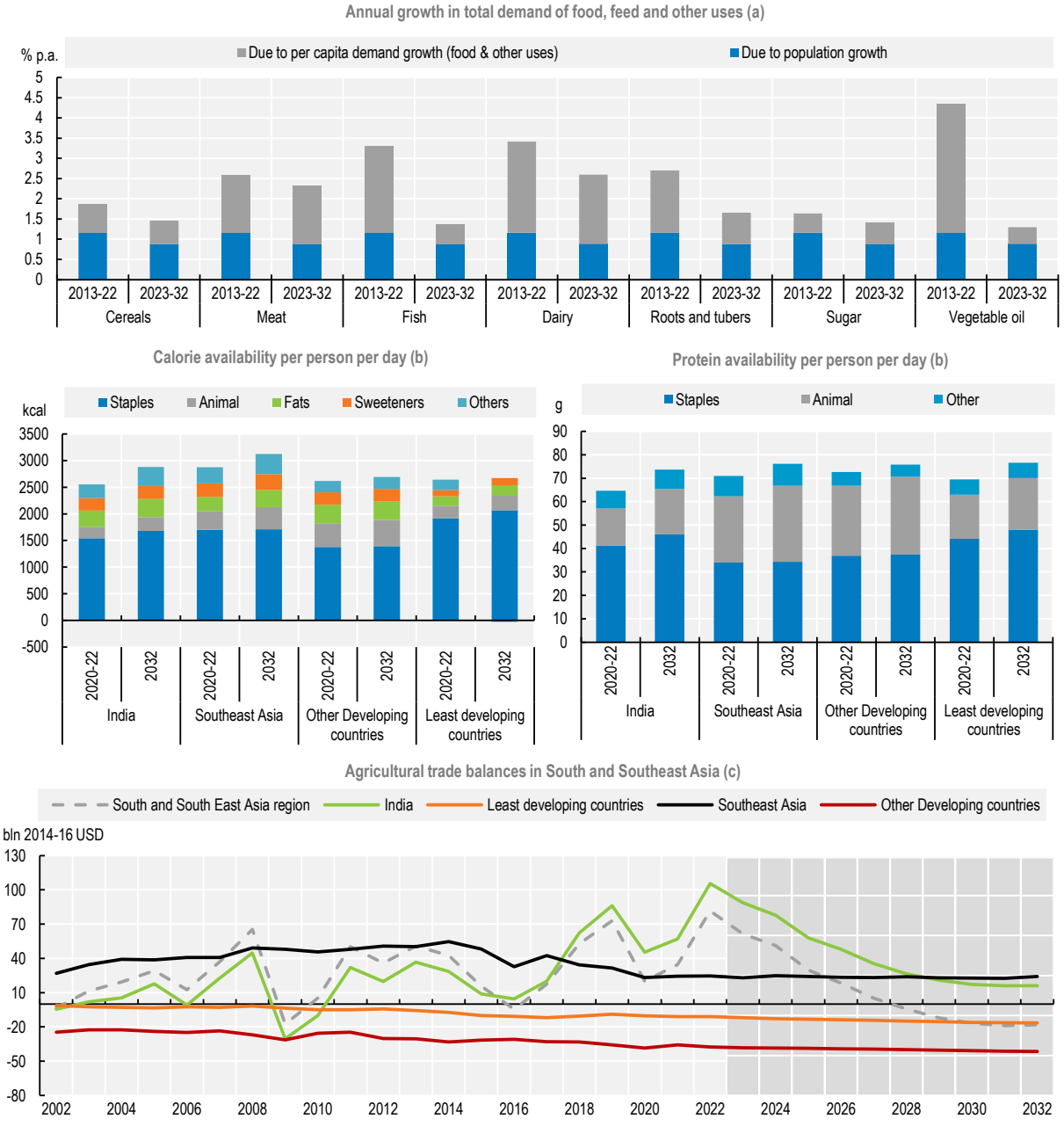
Figure 2.7. Livestock production in South and Southeast Asia



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

StatLink https://stat.link/f1ro4x

Figure 2.8. Demand for key commodities, food availability and agricultural trade balances in South and Southeast 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 https://stat.link/qsoy7m

Table 2.2. Regional Indicators: South and Southeast Asia

	Average			%	Growth[2]	
	2010-12	2020-22 (base)	2032	Base to 2032	2013-22	2023-32
Macro assumptions						
Population ('000)	2 383 748	2 684 329	2 966 152	10.50	1.16	0.88
Per capita GDP[1] (kUSD)	2.38	3.16	4.75	50.43	2.68	3.76
Production (bln 2014-16 USD)						
Net value of agricultural and fisheries[3]	629.4	797.7	957.7	20.06	2.35	1.79
Net value of crop production[3]	359.1	416.5	485.1	16.47	1.50	1.50
Net value of livestock production[3]	154.9	223.8	292.1	30.51	3.68	2.58
Net value of fish production[3]	115.4	157.3	180.5	14.70	2.89	1.36
Quantity produced (kt)						
Cereals	504 777	584 230	681 730	16.69	1.51	1.53
Pulses	26 682	30 403	43 320	42.49	1.59	2.73
Roots and tubers	38 474	52 751	64 465	22.21	2.91	1.93
Oilseeds[4]	16 030	20 723	23 666	14.20	4.40	0.96
Meat	31 371	41 689	53 783	29.01	2.57	2.44
Dairy[5]	29 084	43 441	57 657	32.73	3.44	2.58
Fish	40 966	55 368	63 491	14.67	2.77	1.36
Sugar	47 908	58 418	68 157	16.67	2.06	0.83
Vegetable oil	69 621	96 029	107 361	11.80	3.11	0.83
Biofuel production (mln L)						
Biodiesel	2992.03	13573.36	17767.39	30.90	13.43	1.84
Ethanol	4 122	9 241	18 040	95.22	8.08	3.41
Land use (kha)						
Total agricultural land use	557 782	576 986	587 154	1.76	0.39	0.15
Total land use for crop production6	324 090	348 184	360 525	3.54	0.73	0.29
Total pasture land use[7]	233 692	228 802	226 629	-0.95	-0.12	-0.06
GHG Emissions (Mt CO2-eq)						
Total	1 564	1 705	1 890	10.85	1.07	0.90
Crop	661	689	713	3.59	0.55	0.49
Animal	891	1 002	1 163	16.07	1.42	1.16
Demand and food security						
Daily per capita caloric food consumption[8] (kcal)	2 419	2 541	2 788	9.73	0.49	0.98
Daily per capita protein food consumption[8](g)	60.0	64.7	72.8	12.52	0.7	1.2
Per capita food consumption (kg/year)						
Staples[9]	171.7	172.7	183.4	6.16	0.03	0.58
Meat	8.8	9.8	11.3	15.76	0.81	1.35
Dairy[5]	13.1	16.5	19.9	20.32	1.86	1.69
Fish	14.4	17.1	18.4	7.56	1.54	0.65
Sugar	19.8	21.2	22.7	7.12	0.51	0.51
Vegetable oil	8.3	9.6	10.6	11.05	0.65	0.93
Trade (bln 2014-16 USD)						
Net trade[3]	30	45	-18	-139.97	..	..
Value of exports[3]	179	246	230	-6.70	4.00	-2.16
Value of imports[3]	148	201	248	23.36	3.40	1.73
Self-sufficiency ratio10						
Cereals	97.2	92.6	92.4	-0.19	-0.45	0.11
Meat	94.6	96.6	97.2	0.70	-0.03	0.10
Sugar	98.9	99.9	99.0	-0.87	0.63	-0.26
Vegetable oil	146.3	126.8	119.9	-5.43	-1.23	-0.46

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. Oilseed represents 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 Production / (Production + Imports - 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.

2.3. Regional outlook: Sub Saharan Africa

2.3.1. Background

Food security for a growing population remains a big challenge

Sub-Saharan Africa (SSA) is a vast and diverse region that comprises 19% of the world's agricultural land and home to 1.1 billion people, 14% of the global population. Amongst the regions covered in this chapter, SSA has a distinct and striking demographic profile. Its population is the youngest, its rate of population growth is the fastest and its urbanisation rate is the slowest. By 2032, SSA's 1.45 billion inhabitants are expected to account for 17% of the world's population. While urbanisation is occurring, it is one of only two regions (the other being Near East and North Africa) where the absolute size of the rural population is still increasing and the only region where more than half of the total population is still expected to reside in rural areas by 2032.

Average per capita income levels in the region are the lowest globally, at USD 1 706 in constant 2010 terms. However, levels vary considerably within the region, with incomes of less than USD 1 000 per capita in the Least Developed Countries, to USD 7 810 in South Africa. Economies typically depend strongly on resource based commodities, such as agriculture, oils and mining, with agriculture (including fisheries and forestry) accounting for 15% of economic output between 2020 and 2022. In some countries, this share is much higher. Despite high commodity prices, per capita GDP growth in the region only recovered by 1.9% in 2021, following the 5% contraction in 2020 amid the COVID-19 pandemic. Further recovery momentum has been constrained by the global slowdown, tighter financial conditions across the world, limited funds to support recovery and surging inflation. Amid rising uncertainty in the global economy, exchange rates in many of the developing countries in the region depreciated sharply, accelerating inflation and in some instances leading to concerns over foreign currency reserves. In per capita terms, income growth amounted to less than 1% in 2022 and is expected to be similar in 2023, before averaging 1.2% over the remainder of the projection period. This will enable average income levels per capita to reach USD 1 930 by 2032, but current projected growth rates imply that the region will only surpass pre-pandemic income levels by 2025.

Consistent with low absolute income levels, households in SSA spend a bigger share of total income on food than any other region covered in this chapter. On average, across SSA, this share is 23%, but it varies amongst countries, with the LDCs in the region spending on average 31%.[9] Per capita calorie intake is already amongst the lowest in the world and the large share of total income spent on food heightens the region's vulnerability to the persistently high food prices evident over the past two years. Amid a myriad of external shocks, such as the pandemic and the ongoing war in Ukraine, food affordability, and consequently food security, has become increasingly strained. The FAO's State of Food Security and Nutrition (2022) notes that the recovery in GDP growth in 2021 did not translate to improvements in food security, as the prevalence of undernourishment rose further to 23.2%, having already increased from 20.1% in 2019 to 22.7% through the pandemic in 2020. The absolute number of undernourished people in the region increased by 12 million in 2021, which was less than half the 34 million additional

undernourished in 2020. While the prevalence of undernourishment in the region has been rising since 2018, the pandemic in 2020 induced a sharp acceleration that is proving difficult to turn around in the current environment. The combination of surging inflation, weaker economic growth, and high prices in 2022 will likely have led to further deterioration, with relief only likely when prices start to normalise.

Sub-Saharan Africa is an agro-ecologically diverse, land abundant region that accounts for 16% of global crop land and 20% of pasture. Despite the region's land abundance, significant differences exist among countries in terms of land availability and farm structures. In some regions, there is clear evidence that more medium scale farmers are emerging (Jayne et al., 2016[5]), whereas in others, the agricultural sector is facing pressures from land shortages and declining plot sizes. Large parts of available arable land are concentrated in few countries and is often under forest cover (Chamberlin, Jayne and Headey, 2014[6])), whereas in others it sits in remote areas poorly connected to markets and infrastructure. Despite its high share of land use globally, production practices are often less intensive in nature and the SSA region produced only 5% of the global value of agricultural and fish production in 2020-22. The regions share in global consumption is significantly higher, underpinned by its large population. Dietary composition is still highly staple-dependant and from 2020-22 SSA accounted for 42% of global roots and tuber consumption and 12% of cereals, compared to only 7% of sugar consumption and 6% of global vegetable oil consumption. Protein intake is comparatively low, reflecting weaker purchasing power, with only 6% of global fish consumption, 5% of dairy product consumption and 4% of meat consumption attributed to the region. Despite significant variation across countries, self-sufficiency rates for SSA overall are decreasing for most major food commodities, as domestic supply growth has failed to keep up with the rate of population expansion.

Amongst the greatest challenges facing the region in the near and medium term will be reducing hunger and improving food security in a persistently low-income environment, amid increasingly volatile weather conditions resulting from climate change. Despite improvements and success stories in selected countries, productivity in most of the region remains stubbornly low. Concentration of land abundance in a few countries implies that substantial opportunities may arise to expand intra-regional trade, particularly considering tariff reductions contained in the African Continental Free Trade Area (AfCFTA) agreement, but trade-related costs need to be reduced to improve competitiveness. Over the outlook period, imports into the region are therefore expected to rise further. In an increasingly volatile and fragmented global market, the region's greatest opportunity to supply more affordable food to its growing population and improve food security rests in closing the productivity gap, improving market access, and reducing the costs of transportation and regional trade.

2.3.2. Production

Raising productivity is critical

Over the coming decade, agriculture and fish production in the region is projected to expand by 24% in net value-added terms. This average annual gain of 2.2% remains slower than the expected population growth in the region and hence, the value of production per capita is set to decline further, in line with the trend observed since 2015 (Figure 2.5). The bulk of growth in total value is expected to come from crop production, which will account for more than 70% of total agricultural value by 2032, a slight increase from the base period. While the rate of growth in livestock production is marginally higher than crops, it occurs from a smaller base and its share in total value added is expected to rise only modestly from 19.5% in 2020-22 to 19.8% in 2032. The contribution from fish production to total value is set to decline to 10%. Cereals, roots, and tubers constitute the bulk of crop production in the region and, for many crop types, SSA's share in global production is set to rise. By 2032, the SSA region is expected to contribute 42% of global production of roots and tubers, 22% of pulses, 6.5% of cereals, 2% of oilseeds and 6% of cotton. LDC's account for around 65% of the region's cotton production, mostly situated in West Africa where Benin and Burkina Faso are major contributors. Cotton production from Sub Saharan Africa's LDC's is

expected to grow by only 1.5% per annum on average, mostly due to yield gains as a small decline is projected in the area planted to cotton.

Growth of 27% in food crop production over the coming decade will be underpinned by a combination of intensification, productivity gains and changes to the crop mix. The real value of crop production, expressed per unit of cropland used, is expected to rise by 1.7% p.a., accelerating from the past decade. This reflects some intensification, combined with a 7% expansion in land used for crop production by 2032. Double cropping is prevalent in many of the tropical regions with bimodal rainfall, as well as irrigated regions in Southern Africa, where soybeans and wheat are often produced consecutively in a single year. The expansion of rice cultivation, notably in Nigeria, is also expected to benefit from rising prevalence of multiple annual harvests. Further to the intensification, area expansion is also expected in several crops, with increases in roots and tubers, maize, rice, pulses, and other coarse grains only partly offset by reductions in wheat and cotton.

The relatively small expansion in total land use of 0.2% p.a. over the outlook period represents a significant slowdown, at merely half the rate observed over the past decade. The region is mostly considered land abundant, but Chamberlain et al. already noted in 2014 that almost 65% of the available land for expansion is concentrated in only ten countries (Sudan, Madagascar, Democratic Republic of Congo, Mozambique, Angola, Congo Republic, Central African Republic, Ethiopia, and Zambia). Elsewhere, the ongoing expansion of agricultural land use is constrained by land fragmentation, land degradation challenges, conflict in some land abundant countries, and the presence of other competing uses such as mining and urban sprawl. This accentuates the importance of achieving productivity gains to expand production in the region.

Average cereal yields are projected to grow by 1.9% p.a. over the outlook period, marginally faster than the past decade. Continued yield gains for most major crops stem from investments in locally adapted, improved crop varieties, and better management practices. While yield growth for most crops exceeds the rates projected at a global level, this occurs from a base which is often less than half the global average. Consequently, although the region's substantial gap relative to yields achieved in the rest of the world will narrow it will remain substantial by 2032. Efforts to fully close the yield gap are constrained by the limited use of inputs, irrigation, and infrastructure. Despite widespread implementation of fertiliser subsidy programs in many countries, fertiliser use is the lowest of all regions and, as a net importer of fertilisers, sharp cost increases in 2022 dampened purchases further. In many instances, this resulted in later, suboptimal application. Over the outlook period, fertiliser use is projected to increase by 9%, but application per hectare is still expected to be less than 20% of the global average (Figure 2.6). This increase is faster in LDC's, where base period application rates are lower, but closure of the gap in fertiliser use remains constrained by affordability, partly due to the high cost of imported fertiliser in the region.

The net value of livestock production is expected expand by 27% over the coming decade, marginally faster than crops. Much of this growth is led by the dairy sector, with the region expected to add 10 Mt of milk and almost 3 Mt of meat by 2032. Bovine meat is currently the largest among the different meat sectors in SSA and along with poultry is expected to account the biggest share of additional meat production, with 1 Mt of bovine meat and 916 Kt of poultry added by 2032. This is further supplemented by 622 Kt of ovine meat and almost 400 Kt of pigmeat. Most meat production growth is expected to occur in the region's LDC's (Figure 2.12).

Bovine and ovine production systems in the region are typically extensive and growth in the coming decade is fuelled by herd expansion more than productivity gains. In 2020-22, the region accounted for only 7% of global bovine meat output yet almost 17% of the global bovine herd. The region's share in the global bovine herd has increased steadily over the past decade and is projected to expand to almost 19% by 2032, yet its share in global beef production will remain just below 8%. Similarly, the region constitutes 13% of global ovine meat output, with 25% of the global ovine flock. Ovine meat production is expected to increase by 29% in the coming decade, with the region increasing its global share to 15%, but will graze 29% of the

global flock. The extensive nature of production systems also implies that a substantial share of production is reliant on natural grazing, which is influenced by weather conditions. Consequently, extreme weather conditions such as the prolonged drought in the Horn of Africa has resulted in large scale losses due to limited availability of grazing. Such pressures could increase in the coming decade, as the projected herd expansion will occur on an area of almost unchanged pastureland and climate change could have severe impacts on the frequency and intensity of extreme weather events.

While extensive poultry production systems, reliant on indigenous, dual-purpose breeds are still common in the region, a greater degree of intensification is also emerging, particularly in countries that produce surplus feed grains, such as South Africa. Albeit from a small base, feed intensity is expected to continue increasing in the region as supply chains modernise in countries such as Zambia, Tanzania, and Nigeria, but many smaller producers still continue to use non-grain, often informally procured feed inputs. In countries that already use feed more intensively, genetic improvements and better feed conversion over time will reduce the amount of feed required per animal. Overall, in the region, the net effect results in feed use growing at a marginally slower rate than poultry production, but this difference is bigger in Ethiopia and other LDC where intensification is still slower.

Fish production in the SSA region is still mostly based on captured fisheries, which constituted more than 90% of total fish production in the 2020-22 base period. Aquaculture is growing and is expected to expand by almost 20% by 2032, but from a small base and is still expected to account for just under 10% of total fish production by 2032, compared with 8.7% in the base period. Growth in captured fisheries is slower, at 11% for the ten-year period to 2032, reflecting the finite nature of fisheries resources.

These projections imply that the region's direct greenhouse gas (GHG) emissions from agriculture are expected to rise by 19% in 2032 compared to the base period. This is largely underpinned by further growth in extensive livestock, often in semi-arid areas where crop production is not viable and, by 2032, Sub-Saharan Africa will account for 16% of the total direct agriculture emissions globally. However, agricultural emissions per USD value of production in the region are expected to continue a declining trend.

2.3.3. Consumption

Dietary diversification remains sluggish

The region is home to the highest concentration of poor and undernourished people in the world. Total calorie availability per capita is the lowest amongst the regions covered in this chapter. Pre-existing food security challenges in SSA were exacerbated in recent years by the prolonged effects of COVID-19 and the restrictions imposed to contain it, along with the ongoing war in Ukraine, surging inflation, and slow economic recovery. The initial shock from the pandemic was twofold, through supply chain disruptions, particularly in informal markets that abound in the region, as well as income and employment shocks which inhibited affordability of foods. While economies have opened post COVID-19, the effects of the war in Ukraine prolonged many of the supply chain challenges, particularly for commodities such as wheat, which are mostly imported into the region. The combination of persistently high food prices, slower economic growth in the short term and surging inflation will only perpetuate affordability constraints. Consequently, food security and undernourishment will likely remain challenges and even as income levels start to rise, a sustained recovery will require improvements in the availability, accessibility, affordability, and utilisation of food supplies in the future.

The combination of economic contraction in 2020 and high prices since has led to reduced calorie availability per capita in the region for successive years. Stubbornly high inflation and the slow projected recovery in income levels further implies that per capita gains in calorie availability will be slow, suggesting that population growth will remain the major driver of rising food consumption in the region. In fact, the rate of population growth is such that, despite a mere 5% gain in total calorie availability per capita by 2032, SSA will still be one of the largest sources of additional food demand. Consequently, the region's share of

total food calorie consumption in the world is expected to rise from 12% in the 2020-22 base period to 14% by 2032.

Increases of 124 kcal/day over the outlook period will enable average calorie availability in the region to exceed 2555 kcal/capita per day by 2032. Adjusting for estimated household food waste, however, reduces the total intake to 2450 kcal/capita per day. Regardless of adjustments for household waste, total calorie availability in the region is 17% below the global average and still anticipated to be the lowest in the world by 2032.

In terms of composition, the contribution of staples to total calorie availability is higher in SSA than any other region, at almost 70% in 2020-22 (Figure 2.13). Amongst these, maize, roots, and tubers account for the greatest share in total food staples consumption. Per capita consumption of food staples is set to rise further over the outlook period, but the composition is expected to change, with relative stability in roots and tubers contrasted by rising intake of rice and maize. The share of staples in total calorie availability is also expected to decline marginally. For most other commodity groups, including meat, dairy, fish, sugar and vegetable oils, per capita consumption levels are currently the lowest globally. While per capita consumption of meat, dairy, sugar, and vegetable oil is set to rise modestly over the outlook period, a small decline is projected in per capita consumption of fish. Changes in per capita consumption levels suggest that dietary diversification remains slow, but given rapid population growth, total food consumption will rise considerably for all commodities.

Protein availability is expected to increase by 2.6 g per person per day, primarily from plant-based sources (Figure 2.13). Meat and dairy consumption gains are minimal, while fish is expected to decline, limiting improvements in vital nutrient and micronutrient intake.

Cereals are set to overtake roots and tubers over the coming decade as the main source of feed to the livestock sector – with maize the major contributor. However, the extensive nature of production systems that predominate across most of the region dictate that total feed use is low. By 2032, it will account for just over 4% of total animal feed consumed in the world, despite being home to 17% of the world's population.

2.3.4. Trade

Import dependence grows with slow progress in regional trade agreements

To supply its rapidly expanding population, the region is expected to rely progressively on imports to supplement regional production. With few exceptions, most basic food commodities in the region are produced for domestic consumption rather than exports, but domestic production of many products is insufficient to meet demand. Nevertheless, many countries also benefit from counter seasonality in the northern hemisphere and competitive labour costs, enabling net exports of high value fresh produce.

The region's trade deficit in major food items is anticipated to deepen over the coming decade, as the need for imports grows faster than the supply of exports. In constant (2014-16) global reference prices, the deficit is projected to accelerate compared to the past decade, from about USD 9 billion in 2020-22 to USD 24 billion by 2032. Persistent food deficits are expected to be amplified by an increasing food import bill due to global inflation, national debt denominated in US dollars and rising US interest rates, particularly for African countries that are over-exposed to the US dollar.

While largely self-sufficient in maize production, the region is highly reliant on imports of major cereals such as rice and wheat. Amid rising import volumes, self-sufficiency ratios for both these commodities are set to decline to 50% and 24% respectively by 2032. With a large share of wheat imports typically procured from both Russia and Ukraine, imports into the region were severely disrupted at the start of the war in 2022. The cost of imported products also rose sharply over the past year, but initial availability constraints

eased following the UN brokered grain deal. Amid ongoing war in Ukraine, and the debilitating, multi-year drought in East Africa, the renewal of this deal in 2023 is critical to the region.

While most trade related problems directly associated with the initial wave of the COVID-19 pandemic have eased, the region already scored poorly in trade efficiency indicators such as the World Bank's logistics performance index prior to the disruptions that characterised the past three years. Import volumes of most commodities have increased following the challenges of 2020, but the region continues to be bedevilled by high freight rates and persistently high fuel costs, which have exacerbated pre-existing high trade costs, increasing prices for consumers, bearing heavily on those with low incomes.

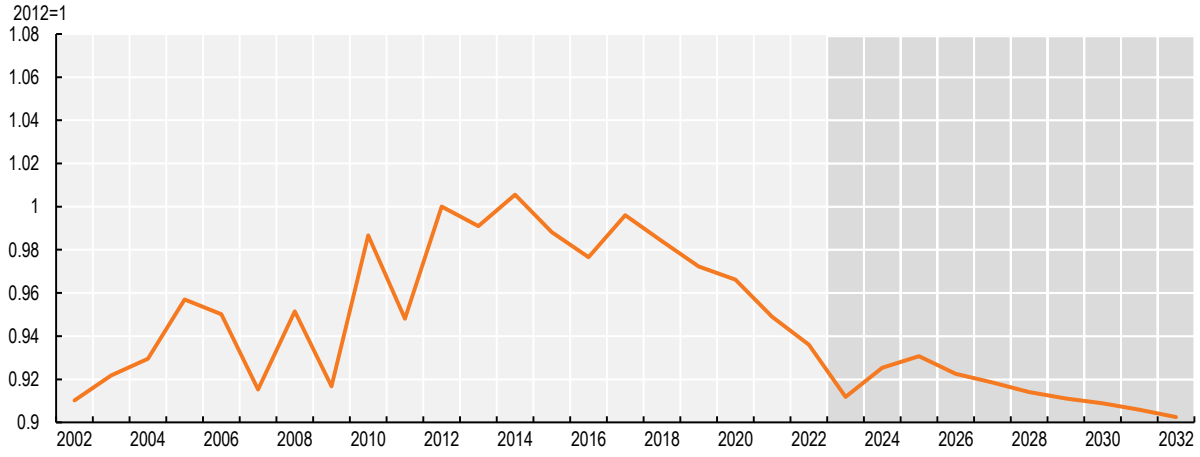
In contrast to basic food crops, the region is a net exporter of higher value products such as cotton, as well as fresh fruit and vegetables. The bulk of cotton is sold in the global market and by 2032, more than 85% of domestic cotton production will be exported. The real value of fruit and vegetable exports are expected to grow by 28% and 44% respectively by 2032. Consequently, the total value of agricultural exports from the region, expressed in 2014-16 USD, are expected to grow by almost 19% over the coming decade.

The SSA region has placed much hope for expanded intra-regional trade on the successful implementation of the AfCFTA. Regionalisation of agricultural value chains for prioritised commodities are part of the African Union strategy to drive agrifood system transformation, increased productivity and agro-processing growth by linking producers and agro-parks in surplus areas to markets and areas of need. The agreement is in its second year of operation and its goal of growing internal trade across the region is critical for economic development, particularly amid rising global uncertainties. The COVID-19 pandemic delayed initial implementation and in 2020 intra-Africa trade declined to 16%, compared to a five-year average of 18%. Agricultural products constitute about a quarter of intra-Africa trade and supply chain disruptions because of the pandemic clearly had an impact, but expectations are high and renewed political momentum has provided the agreement with much needed impetus.

The ambition of the AfCFTA is to achieve a zero-tariff rate on 90% of tariff lines, through a phased approach over a period of ten years for LDC's and five years for others. So far, eight countries are already participating in the Guided Trade Initiative, which seeks to allow commercially meaningful trade under the agreement, to test operational, institutional, legal and trade policy. The products earmarked for trade under this initiative include several agricultural and food products. Despite progress made, many rules of origin agreements remain outstanding, and some customs union members are yet to ratify the agreement, which prevents several regional trade unions from fully trading under preferential terms, unless concessions can be made to allow the agreement to be implemented on an individual basis. While further engagements regarding rules of origin need to be concluded, the agreement will ultimately only exclude 3% of tariff lines and therefore has significant potential to increase intra-Africa trade in the medium term. The UNCTAD, in its 2021 *Economic Development Report on Africa* notes that the projected USD 3 trillion borderless market could be instrumental in reversing current trends in poverty, inequality and growth on the continent.

Apart from tariffs, a major factor constraining trade within the region is high non-tariff barriers. Although the agreement includes a mutual recognition of standards and licences, as well as the harmonisation of sanitary and phytosanitary (SPS) measures, many non-tariff barriers are more difficult to remove or reduce. The non-tariff costs of trade in the continent, as per the ESCAP-World Bank trade cost data, are estimated at an *ad valorem* equivalent of around 283%. Moreover, these are over 300% for agricultural products[10] and more than 100% higher compared to non-agricultural manufacturing products. A major contributor in this regard is the high cost of road transportation, which emanates from poor infrastructure, as well as inefficiencies at border posts. This is supported by the presence of only six SSA countries in the top half of the World Bank's logistical performance index ranking, which covers 160 countries. Based on the regulations implemented to date, and the need to finalise tariff reduction schedules and sensitive product lists, no discernible impact was included in the *Outlook's* baseline projection.

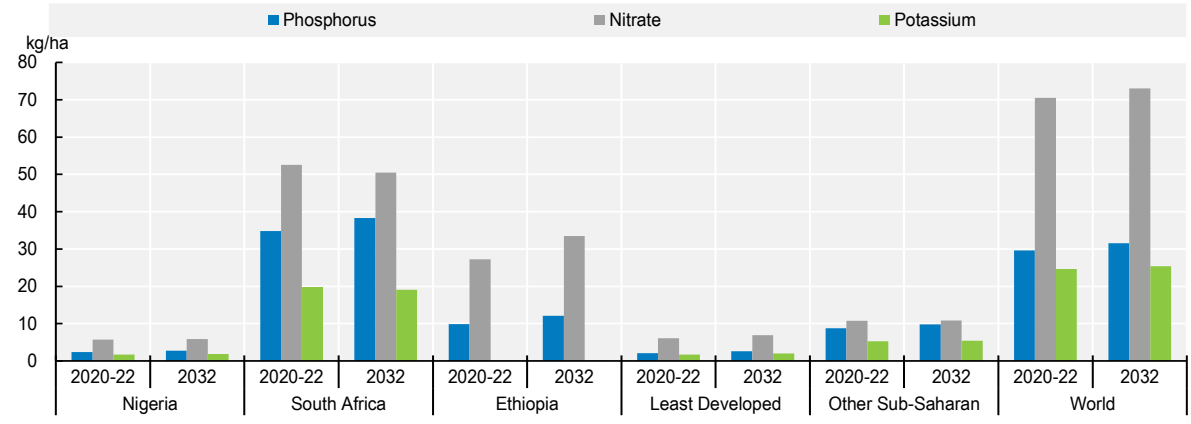
Figure 2.9. Per capita net value of agriculture and fish production in Sub-Saharan Africa



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 https://stat.link/9oavqy

Figure 2.10. Fertiliser application per hectare of land used for crop production is low in Sub-Saharan Africa



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

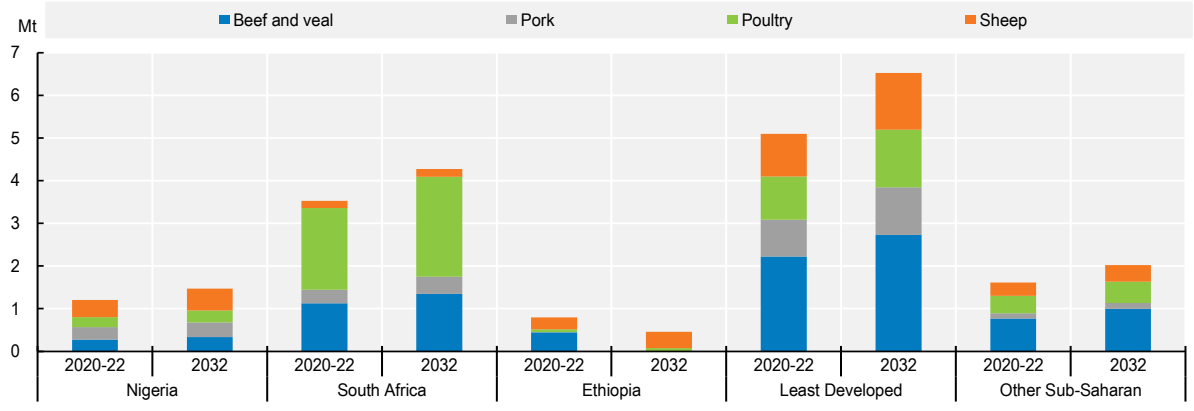
StatLink https://stat.link/f3in7l

Figure 2.11. Change in area harvested and land use in Sub-Saharan Africa

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

StatLink https://stat.link/gkc2t7

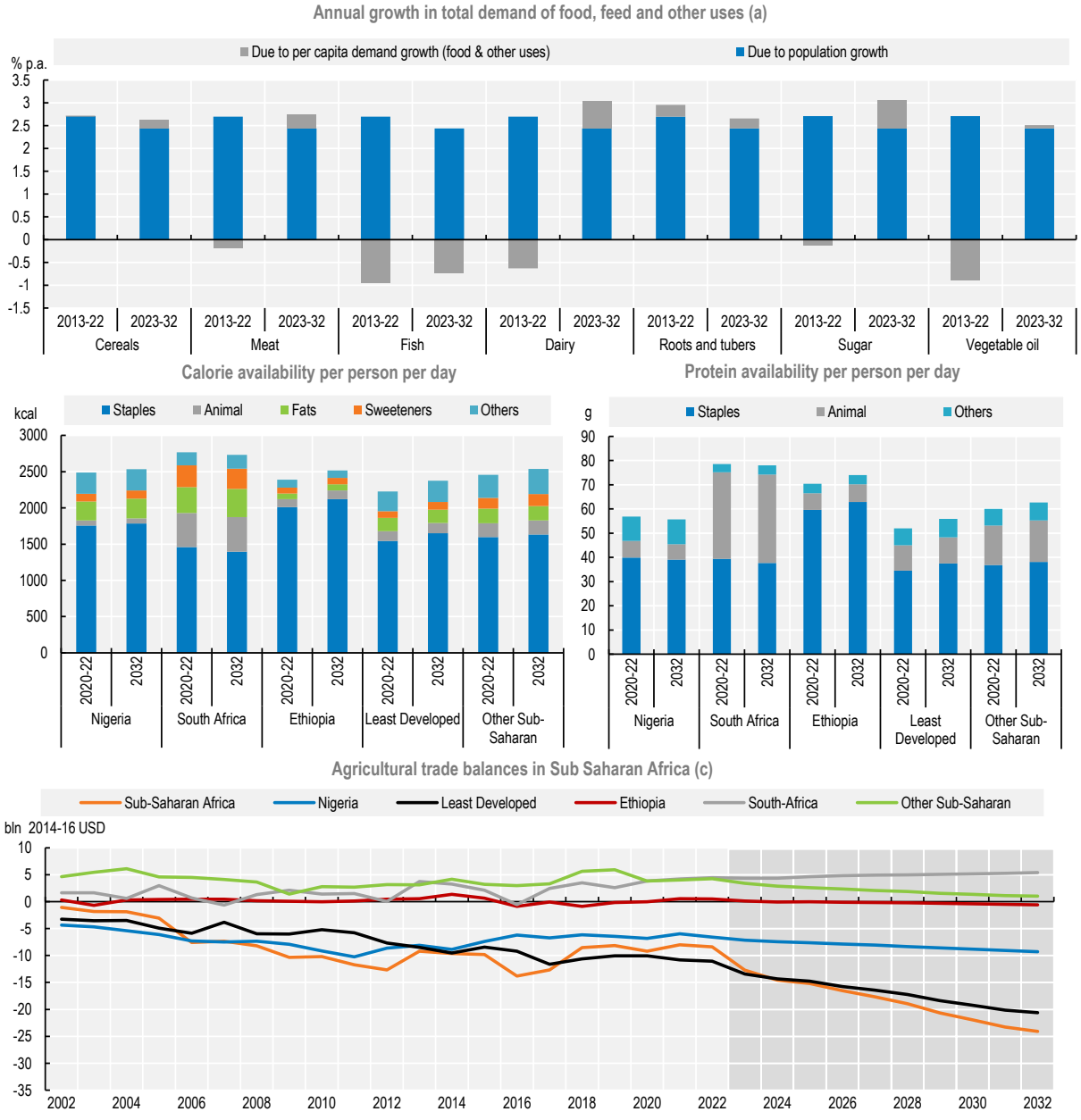
Figure 2.12. Livestock production in Sub-Saharan Africa



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

StatLink https://stat.link/v4gdnl

Figure 2.13. Demand for key commodities, food availability and agricultural trade balance in Sub Saharan Africa



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.

Stat https://stat.link/v35alo

Table 2.3. Regional indicators: Sub Saharan Africa

	Average			%	Growth [2]	
	2010-12	2020-22 (base)	2032	Base to 2032	2013-22	2023-32
Macro assumptions						
Population ('000)	845 829	1 106 238	1 445 172	30.64	2.70	2.44
Per capita GDP[1] (kUSD)	1.71	1.71	1.93	13.28	-0.56	1.21
Production (bln 2014-16 USD)						
Net value of agricultural and fisheries[3]	157	200	248	24.10	2.04	2.19
Net value of crop production[3]	104	138	174	25.41	2.42	2.33
Net value of livestock production[3]	36	39	49	26.65	0.72	2.46
Net value of fish production[3]	18	23	25	11.69	2.21	0.80
Quantity produced (kt)						
Cereals	120 032	157 616	201 865	28.07	2.67	2.29
Pulses	16 944	20 664	26 885	30.10	1.61	2.67
Roots and tubers	71 176	96 871	123 649	27.64	2.81	2.68
Oilseeds[4]	7 575	8 662	10 030	15.80	1.11	1.45
Meat	9 651	12 241	15 216	24.30	2.02	2.25
Dairy[5]	3 401	3 975	5 292	33.15	2.27	2.91
Fish	6 343	8 015	8 954	11.71	2.16	0.80
Sugar	6 795	7 632	8 876	16.30	1.34	1.52
Vegetable oil	5 684	7 657	8 533	11.44	3.07	1.03
Biofuel production (mln L)						
Biodiesel	0	0	0	142.91	0.00	2.16
Ethanol	623	923	934	1.12	4.30	2.74
Land use (kha)						
Total agricultural land use	856 537	888 950	903 462	1.63	0.36	0.15
Total land use for crop production[6]	184 325	220 195	236 296	7.31	1.65	0.62
Total pasture land use[7]	672 211	668 755	667 166	-0.24	-0.04	-0.02
GHG Emissions (Mt CO2-eq)						
Total	779	889	1 058	18.97	1.37	1.71
Crop	237	213	221	3.42	-0.46	0.29
Animal	542	674	835	23.92	2.01	2.13
Demand and food security						
Daily per capita caloric food consumption[8] (kcal)	2 368	2 359	2 480	5.14	-0.09	0.74
Daily per capita protein food consumption[8](g)	59.9	57.6	60.1	4.39	-0.41	0.66
Per capita food consumption (kg/year)						
Staples[9]	182.0	187.0	197.5	5.63	-0.07	0.23
Meat	8.3	8.3	8.5	2.26	-0.32	0.26
Dairy[5]	4.3	3.8	3.9	2.25	-0.52	0.55
Fish	9.5	8.8	8.3	-6.35	-0.81	-0.65
Sugar	10.5	10.6	11.4	7.34	-0.13	0.53
Vegetable oil	7.8	7.3	7.8	7.33	-2.08	0.83
Trade (bln 2014-16 USD)						
Net trade[3]	-12	-9	-24	181.96	..	..
Value of exports[3]	32	49	58	18.64	3.02	1.67
Value of imports[3]	43	57	82	43.01	2.00	3.05
Self-sufficiency ratio[10]						
Cereals	83.5	81.9	77.6	-5.22	0.09	-0.24
Meat	87.4	83.4	77.5	-7.14	-0.71	-0.47
Sugar	73.7	64.3	53.1	-17.47	-0.61	-1.10
Vegetable oil	58.6	58.5	49.7	-15.05	1.21	-1.46

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 Production / (Production + Imports - 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.

2.4. Regional outlook: Near East and North Africa

2.4.1. Background

Rising import dependence due to fundamental supply constraints

The Near East and North Africa[11] region encompasses a range of countries with diverse income and socioeconomic profiles. Many face similar challenges with respect to the agricultural production environment and a fragile natural resource base. In the region, less than 5% of total land is considered arable and water resources are constrained, so most countries face water scarcity. In several countries, this is extreme. In 2020, 19 of 22 Arab states fell below the threshold for renewable water scarcity of 1 000 m^3 per capita per year, with 13 states situated below the absolute water scarcity threshold of 500 m^3 per capita per year (UN WWDR, 2022[7]). The region is also amongst the most vulnerable to climate change, due to its arid nature and already limited water resources.

Across the spectrum of least developed, middle- and high-income economies, the region includes many oil exporting nations in the Gulf, whose economies are intrinsically tied to energy markets. The contribution of oil to revenue implies that it can have significant impacts on demand prospects. In this regard, energy market volatility in recent years impacted significantly on income levels. The region's economy was amongst the worst affected by the COVID-19 pandemic and per capita income contracted by over 7% in 2020, before rebounding only modestly with gains of less than 2% in 2021. In 2022, support from high oil prices provided new impetus, and growth accelerated to 3.3%. The region's inherent sensitivity to energy market developments implies that it will likely continue to face significant volatility in the short term, as Russia's war against Ukraine continues, but energy prices are expected to remain below 2022 levels by 2032. Medium term prospects will also be influenced by the increasingly challenging global environment and per capita income growth is expected to average 1.7% p.a. over the coming decade. Consequently, it is unlikely to constitute a major driver of demand, which is a concern in a region where healthy diets are unaffordable to more than half of the population (FAO, IFAD, UNICEF, WFP and WHO, 2022[8]).

Population growth is another important factor determining demand and growth is expected to slow only marginally from 22% over the past decade to 20% over the next ten years. This growth rate is second only to the SSA region and will see the region's population exceed 510 million people by 2032. Approximately two thirds of the population is expected to reside in urban areas, which may encourage consumption of higher value products, including meat and dairy products, but also convenience products that often contain substantial quantities of vegetable oil and sugar.

The region is amongst the largest net food importers in the world, largely due to the challenging production environment resulting from its natural resource limitations. Self-sufficiency rates are low for most commodities, but particularly for cereals, vegetable oils and sugar (Figure 2.15). High import dependency also implies that the trade related challenges of the past three years have been particularly impactful in the region. Logistical problems and surging shipping costs emanating from the COVID-19 pandemic and the fragilities it exposed in global trade systems were further exacerbated by Russia's war against Ukraine. Traditionally, the region is highly reliant on both Russia and Ukraine for its wheat supplies. Initial disruptions

to trade have been eased somewhat by the grain deal which enabled exports from Ukraine to resume, but volumes are much lower than before, and the region has been forced to source significant quantities elsewhere. The increase in imported cereal prices, further exacerbated by currency depreciation in many non-oil exporting nations, combined with surging inflation and the cost-of-living crisis, strained affordability of basic foods in lower income areas and that of healthy diets across the region. With average food expenditures around 17% of total household expenditures, and least developed countries at 33%, income and price shocks can have a significant impact on welfare.[12]

In an effort to reduce import dependence in major cereals and thereby also the associated vulnerabilities to disruptions, policies have historically sought to stimulate production. While these policies strove to reduce risk, they in fact constrained growth, as these cereals compete with higher value crops for limited water resources. Consequently, the region's already limited resource base was stretched and with rising cereal production, the availability of higher value fresh produce declined. Such produce might otherwise have aided in improving dietary diversity and provide higher income from the same limited resources. Climate change remains a major challenge and geopolitical conflict in the region has further reduced investment and displaced populations, hindering production growth.

The GDP derived from the agriculture, forestry and fishery sector currently comprises only 5% of economic activity and it is expected to decline to 4% by 2032. Egypt produces 25% of the net value of agriculture and fish production in the region, with a further 51% attributed to the rest of North Africa (18% from LDC's and 33% from other North African countries). These shares are expected to be sustained, such that North Africa will continue to constitute more than three quarters of net agricultural output value in the region by 2032.

In a low-income growth environments, and with several countries affected by geopolitical conflict, some of the greatest challenges facing the region relate to accessibility of affordable food products to a growing population. Import dependence is inevitable given limitations to production and natural resource endowment, particularly in a region highly impacted by climate change, hence self-sufficiency rates for most major commodities are expected to decline further. Imports contribute significantly to dietary diversity and efficient trade facilitation can propel progress toward the 2030 goal of eradicating hunger, food insecurity and malnutrition. However, in an increasingly volatile and fragmented global market, faced with a mounting number of severe trade related disruptions in recent years, adaptable and effective policies and procurement practices will be essential to ensure food security and improve resilience. In an effort to mitigate vulnerability, many countries are actively seeking to diversify import sources.

2.4.2. Production

Productivity gains urgently needed to confront severe resource constraints

The region's dependence on global markets is expected to deepen (Figure 2.14), reflecting a projected expansion of 1.5% p.a. in agriculture and fish production, which is slower than the past decade and below the population growth rate of 1.6% p.a. Crop production from the commodities covered in the *Outlook* constitutes 40% of total value, but average growth of only 1% p.a. implies that this share could decline to 38% by 2032. Livestock production growth is stronger at 2.1% p.a., with its share in total net value increasing to 42% by 2032.

Fish production is an important contributor, comprising 21% of agricultural value, but growth of just 0.9% p.a. is markedly slower than the past decade and will see its share decline marginally to 20% by 2032. Almost 70% of total production comes from capture in coastal areas, but fish stocks are under pressure, resulting in a significant slowdown over the outlook period. The aquaculture sector is growing in importance and expanded by more than 5% p.a. over the past decade, with Egypt the major contributor. Growth is projected to slow over the outlook period, but at 2.4% p.a. is still sufficient to drive aquaculture's share in total production to 33% by 2032.

Little change is expected in total agricultural land use, which expands by only 0.5% over the ten-year period. The expansion is concentrated in the least developed regions, mainly Sudan and Mauritania, and almost half of the additional land is for pasture. In most countries in the region, conditions are not conducive to large scale crop production, but more than half of total cropland is expected to be allocated to cereal production by 2032, reflecting a modest decline of 2% from current levels. Coarse grains and wheat account for the bulk of total cereal production and will account for 63% and 35% respectively of total land used for cereals by 2032.

In a region facing such severe constraints in the availability of arable land and water, productivity gains are essential to drive growth. Total factor productivity grew by a modest 1.2% p.a. in the decade to 2019, driven largely by increased capital inputs.[13] The value generated per hectare land used for crop production has increased consistently by 0.8% p.a. over the past decade and this is expected to accelerate over the next ten years to 1.2% p.a. This trend involves multiple factors. The first is intensification, as the 1.5 Mha expansion in total crop area harvested exceeds the 1.2 Mha gain in land used for crop production. The second is considerable improvements in yields for most major crops. Wheat yields are expected to improve by an annual average of almost 1%, to reach 3 tonnes per hectare by 2032, almost 80% of the global average. Coarse grain yields are expected to rise by 1.8% p.a., but only reach 44% of the global average. Most of the expected yield gains are underpinned by improvement in technology, with fertiliser use per hectare expected to decline marginally over the ten-year period to 2032.

Meat production is expected to grow by almost 2.4 Mt by 2032, mostly derived from poultry. Poultry production already comprises 59% of total meat production and growth of 2.8% p.a. increases its share to 62% by 2032. Anticipated growth in bovine meat and sheepmeat production is slower at 1.9% p.a. and 1.5% p.a. respectively. In the case of ovine meat, this represents an acceleration from the past decade, whereas for bovine meat it represents a turnaround from an historic contraction. Growth in inventory is slower than that of production for both bovine and ovine species, reflecting expected productivity gains in meat production.

Direct GHG emissions from livestock activities in the region will expand by 6.8% by 2032 compared to 2020-22, which sharply contrasts with the growth of 28.0% and 23.9% for meat and dairy production respectively. Such differences clearly illustrate that productivity gains are imperative to contain emissions. With crop emissions expected to decline by 3.2%, total direct emissions from agriculture are projected to expand 5.4% by 2032. The historic decline in GHG emissions per unit value of output is set to continue.

2.4.3. Consumption

Affordability limits a shift to healthier, more diverse diets

In an effort to promote food security, policies in the region have traditionally focussed on supporting the consumption of basic foodstuff through subsidies. In recent years, these have been expanded to include animal products. While they did initially improve food security, these policies have further entrenched the region's staple-heavy diets. Furthermore, in recent years, both the prevalence of undernourishment and the number of undernourished people has started rising again. Impact of the COVID-19 pandemic accelerated these trends in 2020. In the current high price environment, the region has been unable to reverse them, with further deterioration of food security in 2021, despite a higher share of total income being spent on food products and the introduction of a range of policies to improve food security and increase resilience. Despite accelerated income growth in 2022, the combination of persistently high food prices and sustained general inflation further constrained affordability and total calorie availability declined.

By 2032, total calorie availability is expected to increase only marginally to 3034 kcal/person/day, slightly lower than the global average. Accounting for household food waste estimates implies that total calorie intake could be around 2 830 kcal/person/day. Limited gains over the outlook period reflects a combination of factors. Firstly, the prolonged nature of the economic recovery, which sees income levels surpass pre-

pandemic levels by 2024. Secondly, the influence of high current prices, which results in reduced calorie availability in the short term. Thirdly, it also reflects an increasing awareness of healthy eating. There is however great diversity within the region and the relative contribution of these three factors in influencing the number of calories consumed will vary. In the LDC's in the Middle East, calorie availability remains low and is only expected to reach 2 650 kcal/person/day, almost 15% below the global average (Figure 2.19). Within these lower income countries, the share of total expenditure spent on food is also higher, which magnifies the impact of the recent high price environment on food security.

The projections for the average diet in the region suggest that 53% of calories will come from cereals by 2032, well above the global average of 43%. A similar picture emerges for sugar, where the region's share of total calorie consumption derived from sugar will be 9% compared to a global average of 8%. The typical diet, which is highly dependent on starchy foods and sugar is calorie dense but nutrient poor and often associated with a rising incidence of over-weight and obesity, as well as chronic diseases such as diabetes. At the same time, the prevalence of undernourishment, as well as stunting and wasting in young children is high in some countries, particularly those of lower income or affected by conflict. This reflects diversity amongst countries, but also suggests that the "triple burden" of malnutrition (undernutrition, overweight and micronutrient deficiency) will be a key policy challenge that will need to be addressed over the medium term , with food quality central to a solution. However, affordability remains a major constraint to the adoption of healthier, higher quality diets.

The average level of protein availability in the region is projected to reach 84 g/day in 2032, still less than in the base period. Most of the decline is attributed to reduced consumption of plant-based proteins, which is not fully offset by higher quality meat and fish protein sources. Per capita consumption of poultry, bovine meat and most dairy products is set to rise, but typically by less than 1% p.a.

The growth of the livestock sector, particularly poultry, will increase feed use by 15% over the coming decade, but efficiency gains keep the rate of growth below that of meat production. Commodities such as maize, barley and protein meals, are expected to account for more than 70% of the total feed use. The bulk of feed materials will continue to be imported, with maize, for example, reaching 30 Mt by 2032 compared to 25 Mt in the base period. This trend reflects policies that prioritise the production of food crops over feed crops in an environment that has very limited production potential.

2.4.4. Trade

Rising imports continue for most products

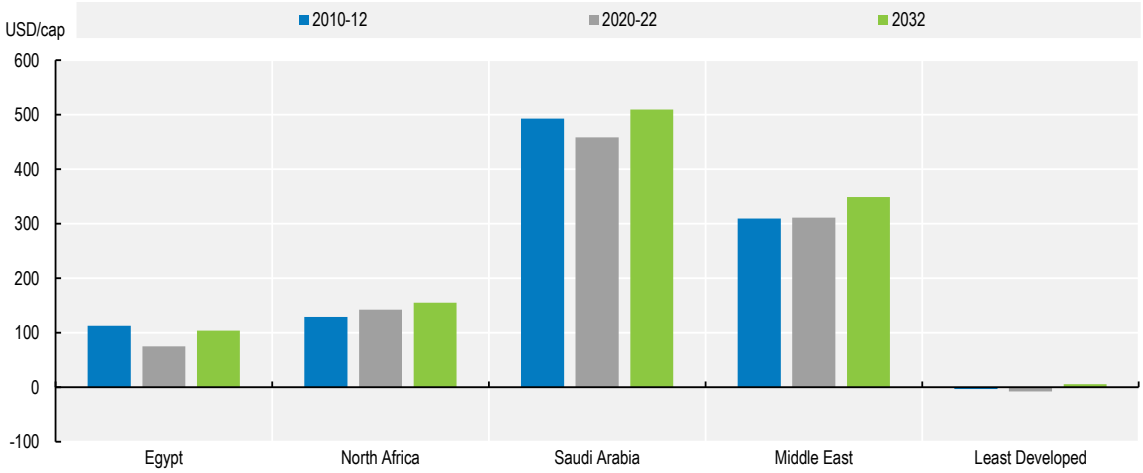
The region is expected to become increasingly dependent on imports of food products over the coming decade, owing to the combination of strong population growth and severe limitations in production capacity. By 2032, the region's net imports of food products are expected to be second only to the Developed and East Asia region, but on a per capita basis will be the largest. Within the region, food imports per person are highest in Saudi Arabia and the Other Middle East area which include the Gulf States (Figure 2.14).

At the height of the logistical and economic challenges of the pandemic, the region's total import bill, expressed in real terms, declined in 2020 relative to 2019. Following a modest increase in 2021, it rose by almost 5% in 2022, despite the problems with trade from the Black Sea region, reflecting the extent of economic recovery amid high oil prices. Imports are expected to rise further, but slower in 2023, constrained by persistently high food product prices and weaker income growth. By 2032, the region's import bill is expected to increase by 30% relative to the base period.

Imports are expected to rise for almost all commodities, though generally at a faster rate for meat and dairy than plant-based products. Imports by the region will sustain high and generally rising shares of global markets for many commodities by 2032, including wheat (26%), sugar (23%) and maize (15%). The region will also account for high shares in global trade for sheepmeat (34%), cheese (21%) and poultry (18%) by 2032. The region is a major importer globally, but as imports comprise a substantial share of domestic

consumption, significant developments in either global or domestic markets have broad food security implications in the Near East and North Africa.

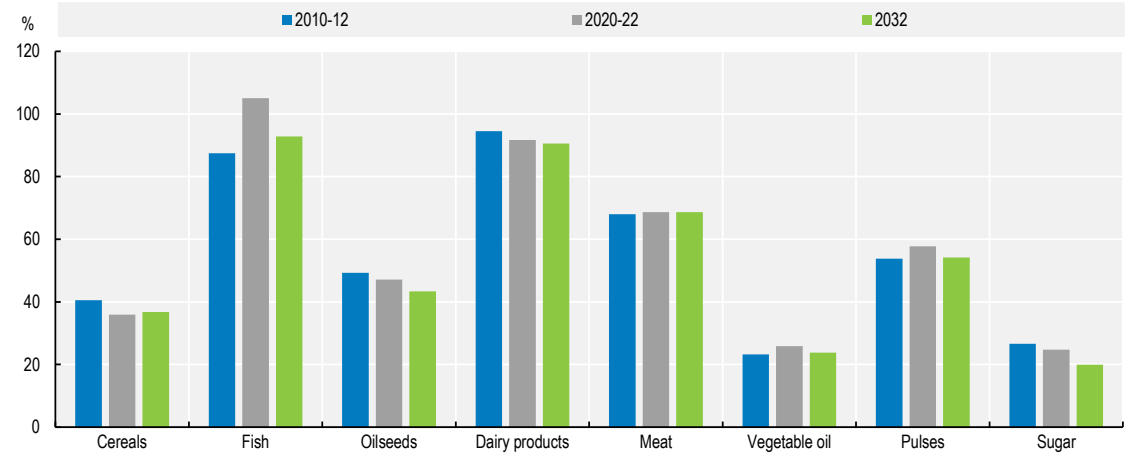
Figure 2.14. Value of net food imports per capita in Near East and North Africa (including processed products)



Note: Estimates are based on historical time series from the FAOSTAT Trade indices domain which are extended with the *Outlook* database. Products not covered by the *Outlook* are extended by trends. Total trade values include also processed products, usually not covered by the Outlook variables. Trade values are measured in constant 2014-2016 USD and trade values for fisheries (not available in the FAOSTAT trade index) have been added 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 https://stat.link/a42t10

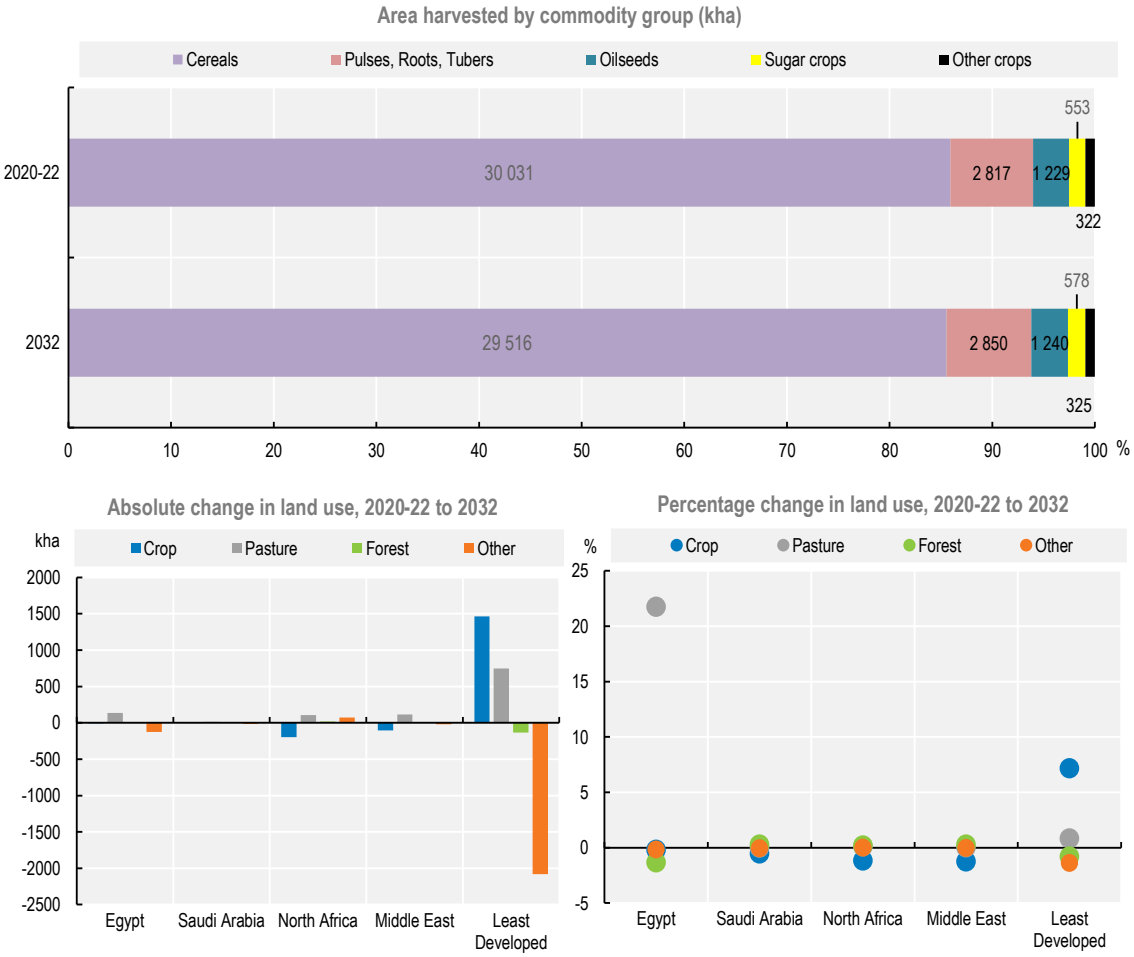
Figure 2.15. Self-sufficiency ratios for selected commodities in Near East and North Africa



Note: Self-sufficiency ratio calculated as (Production / (Production + Imports - Exports))*100
Source: OECD/FAO (2023), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink https://stat.link/3lmku1

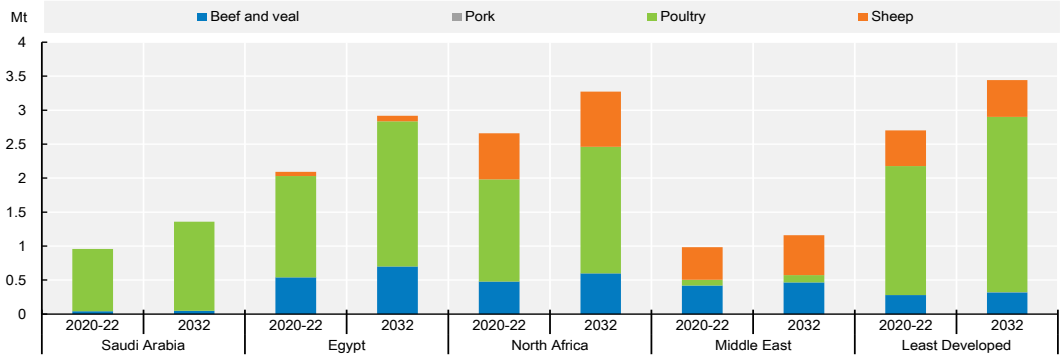
Figure 2.16. Change in area harvested and land use in Near East and North Africa



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

StatLink https://stat.link/39b1am

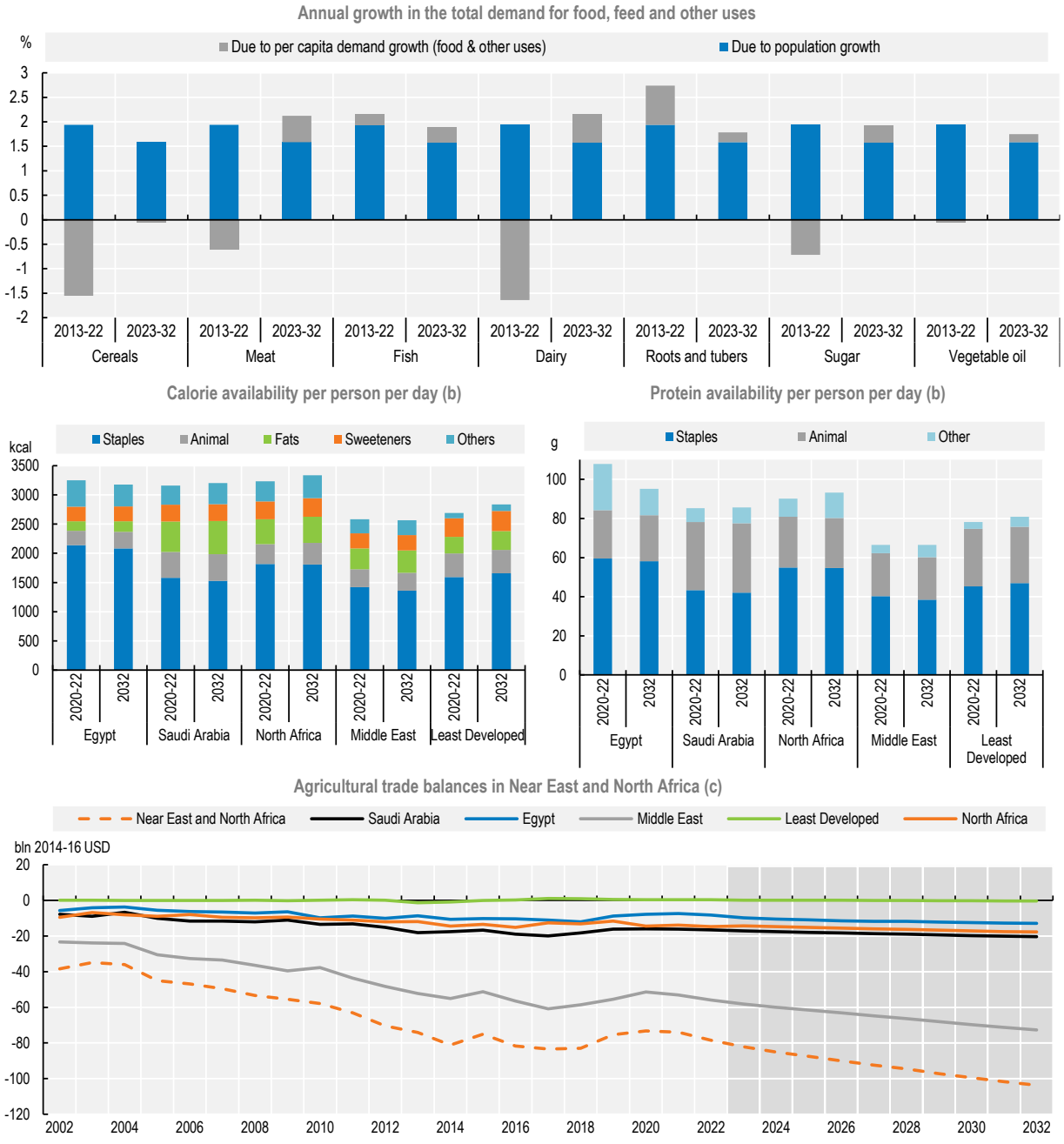
Figure 2.17. Livestock production in Near East and North Africa



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

StatLink https://stat.link/q69o24

Figure 2.18. Demand for key commodities, food availability and agricultural trade balance in Near East and North Africa



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 https://stat.link/7mstfx

Table 2.4. Regional indicators: Near East and North Africa

	Average			%	Growth [2]	
	2010-12	2020-22 (base)	2032	Base to 2032	2013-22	2023-32
Macro assumptions						
Population ('000)	349 438	426 622	510 419	19.64	1.94	1.58
Per capita GDP[1] (kUSD)	6.37	6.41	7.76	21.14	-0.29	1.68
Production (bln 2014-16 USD)						
Net value of agricultural and fisheries[3]	62.4	78.4	91.9	17.20	2.02	1.46
Net value of crop production[3]	24.9	31.0	35.3	13.74	1.93	1.04
Net value of livestock production[3]	27.0	30.7	38.2	24.14	0.77	2.14
Net value of fish production[3]	10.5	16.6	18.5	10.84	4.88	0.92
Quantity produced (kt)						
Cereals	49 624	49 947	60 254	20.64	-1.61	0.94
Pulses	1 616	1 944	2 188	12.52	2.47	1.68
Roots and tubers	2 959	4 002	4 946	23.60	2.68	1.93
Oilseeds[4]	1 023	1 052	1 148	9.12	-0.52	0.93
Meat	6 882	8 439	10 798	27.95	2.27	2.39
Dairy[5]	3 514	3 426	4 148	21.07	0.08	1.87
Fish	3 720	5 900	6 539	10.82	4.91	0.92
Sugar	3 056	3 252	3 330	2.40	-0.98	1.66
Vegetable oil	1 514	2 264	2 644	16.78	6.05	0.93
Biofuel production (mln L)						
Biodiesel	0.02	0.02	0.04	116.15	0.00	0.79
Ethanol	525	556	687	23.67	1.21	1.94
Land use (kha)						
Total agricultural land use	459 460	419 365	421 625	0.54	0.13	0.05
Total land use for crop production[6]	44 669	51 020	52 174	2.26	1.19	0.20
Total pasture land use[7]	414 791	368 345	369 450	0.30	-0.01	0.03
GHG Emissions (Mt CO2-eq)						
Total	178	188	198	5.44	0.20	0.45
Crop	25	26	25	-3.24	0.41	0.09
Animal	153	162	173	6.82	0.17	0.50
Demand and food security						
Daily per capita caloric food consumption[8] (kcal)	2 908	2 914	2 921	0.23	-0.30	0.28
Daily per capita protein food consumption[8](g)	81.4	84.2	81.3	-3.51	0.3	0.3
Per capita food consumption (kg/year)						
Staples[9]	213.1	209.3	206.7	-1.22	-0.30	-0.17
Meat	18.0	17.6	18.7	6.09	-0.58	0.49
Dairy[5]	12.4	10.9	11.6	5.89	-1.69	0.56
Fish	11.2	11.4	12.3	8.07	-0.79	0.58
Sugar	32.5	31.0	31.9	2.99	-0.93	0.29
Vegetable oil	10.8	11.2	12.5	10.88	-1.11	0.79
Trade (bln 2014-16 USD)						
Net trade[3]	-64	-75	-104	37.74	..	..
Value of exports[3]	22	34	39	13.76	4.27	1.15
Value of imports[3]	86	109	142	30.28	0.94	2.19
Self-sufficiency ratio[10]						
Cereals	40.7	36.3	36.8	1.40	-1.30	-0.48
Meat	66.6	67.9	68.6	1.14	0.93	0.26
Sugar	25.8	22.4	19.9	-11.08	-1.75	0.00
Vegetable oil	22.0	25.6	23.8	-7.14	4.0	-0.8

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. Oilseed represents 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 Production / (Production + Imports - 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.

2.5. Regional outlook: Europe and Central Asia

2.5.1. Background

Increasing focus on sustainability amid ongoing risks from Russia's war against Ukraine

The Europe and Central Asian[14] region includes a diverse range of countries that span two continents and exhibit various stages of development. Considerable difference exists across countries in terms of agricultural resources, demographics and public policies. It also faces a multitude of risks, most pertinently Russia's war against Ukraine, which also contributes to persistently high food inflation, and the ever present risks associated with climatic fluctuations.

The region accounts for 12% of world population, but with growth of less than 1% by 2032, this share is set to decline. Population dynamics differ significantly across the region. In Western Europe, home to 55% of the region's inhabitants, it remains almost unchanged by 2032, whereas in Eastern Europe, it is expected to decline by 0.7%. By contrast, in Central Asia, it is anticipated to expand by 11%, but by 2032, Central Asia will still only account for 11% of the region's people. The rate of urbanisation is high across the region and by 2032, 75% of its inhabitants are expected to reside in urban environments. In Central Asia, this share is lower than in Europe, and expected to reach 51% by 2032.

Average income in the region is over USD 26 600 per capita per year. This encompasses a range from almost USD 39 000 per capita per year in Western Europe's highly developed economies, to USD 12 700 per capita in the resource dependant eastern regions to merely USD 5020 per capita per year in central Asia. Having successfully navigated the economic challenges brought by the COVID-19 pandemic with a 5.7% rebound in per capita GDP in 2021, Russia's war against Ukraine unleashed a humanitarian crisis in 2022. The persistence of the war is also taking a growing toll on Europe's economies. The energy crisis had already hampered households' purchasing power, and with Central Banks acting to control obstinately high inflation, financial conditions have tightened substantially. Growth in per capita GDP is expected at just 0.2% in 2023, before improving to 1.6% p.a. in the medium term. Much of the medium-term prospects will depend on the duration of the war, but its current protracted nature suggests that there are significant downside risks to growth, while inflationary risks remain.

In line with different stages of development, the share of primary agriculture, forestry, and fish production in GDP ranges from less than 2% in the European Union, to 13% in Central Asia. Similarly, it is estimated that the share of food in household expenditures averaged about 11% in the region in 2020-2022, from around 6% for United Kingdom to around 17% in Türkiye and even higher in many Central Asian countries.[15] Consequently, the impact of current high food prices, amid elevated general inflation, will differ across countries, with a generally greater impact in regions that spend a larger share of total income on food. This is evident in the sharp increase in the prevalence of moderate to severe food insecurity in Central Asia, due to the pandemic in 2020 and again in 2021, despite the recovery in incomes. Particularly in Eastern Europe, this may increase further in 2022 and 2023 because of the ongoing war.

Major agricultural producers in the region include the European Union, United Kingdom, Russia, Ukraine, Türkiye, and Kazakhstan. It currently accounts for 12% of the global value of agriculture and fish production, a share which is set to decline to 11% by 2032, largely due to stagnation in Western Europe, with output set to expand by 1.2% p.a. and 1.8% p.a. respectively in Eastern Europe and Central Asia. This mirrors historic disparities in factor productivity within the region: in western Europe TFP growth was just 6% in the decade up to 2019, while it was almost 50% in eastern Europe, marked by a large increase in the productivity of labour, but starting from a low base.

The region's agricultural sector overcame a multitude of challenges through the COVID-19 pandemic, including changes to demand, both in terms of quantity and composition, logistical bottlenecks, and workforce shortages , influenced by labour mobility challenges. Over the past year, it has dealt with a new layer of complexity due to the ongoing war. Historically, Russia was a major supplier of agricultural inputs to the rest of Europe and Central Asia, and to many other countries outside the region. After a sharp initial increase, input prices have started to soften and trade patterns have changed. Both Russia and Ukraine are also significant contributors to agricultural exports. The protracted nature of the war limits Ukraine's ability to engage in agricultural activities and destruction to infrastructure has reduced its productive capacity. By December 2022, after eight months of active war, the (FAO, 2022[9]) estimated that damages to the agricultural sector, emanating from destruction of machinery and equipment, storage facilities, livestock, and perennial crops, as well as stolen inputs and output, already exceed USD 2.2 billion. With export volumes severely reduced, despite the enabling role of the Black Sea Grain Initiative, many countries have needed to find alternative sources of imports.

The Europe and Central Asia region's export growth has been striking in the past. Over the past decade, the region accounted for almost 13% of the total growth in the global net value of agriculture and fish, but it constituted 38% of growth in global exports. This reflects improved productivity in both crop and livestock production, along with limited population growth and a relatively mature consumption base in the region. Eastern Europe's expansion was a major contributor to its growing export orientation, with central contributions from both Russia and Ukraine. Consequently, this trend is expected to moderate, particularly in the short term, due to the impacts of the war on Ukraine's production and subsequent ability to export. Many uncertainties remain with respect to possible resolutions to the conflict, and the time required to rebuild damaged infrastructure and fully restore productive capacity. Sanctions imposed on Russia will also influence trade. Although these sanctions do not directly affect trade in agriculture and food products, indirect effects are possible due to logistical challenges and financial constraints. A substantial share of trade occurs within the region, which implies that the evolution of preferential trade agreements, such as future arrangements between the United Kingdom and the European Union, will also play a role.

The European Union accounts for almost half of the value of the region's agriculture and fish production. Its priority afforded to sustainability and improved resilience is reflected in its Farm to Fork and Biodiversity strategies. The Farm to Fork strategy envisions a fair, healthy, environmentally friendly, and sustainable food system. It may influence demand trends, trade flows, competitiveness, and production growth in the region. Other objectives contained in its reforms to the Common Agricultural Policy (CAP), such as the reduction in energy dependency through increased renewable energy production, bolstered sector resilience and changing diets will also play a role.

Russia's war against Ukraine implies that, among the regions included in the *Outlook*, Europe and Central Asia face the most uncertainty. After more than a year of war, even when a resolution is found, the extensive destruction of infrastructure, loss of lives and displacement of labour will require considerable investments to restore productive capacity in the agro-food chain. The uncertainty with respect to production prospects from Eastern Europe comes at a time when policies in the European Union are increasingly focused on sustainability, which implies that the cost of increasing production will rise, particularly in the face of ongoing climate change impacts. Amid ongoing efforts to reduce energy dependence and bolster the resilience of the agricultural sector, achieving sustainable productivity gains will remain critical.

2.5.2. Production

Growth slows amid ongoing war in Ukraine

Compared to the 2020-22 base period, the net value of agriculture and fish production is only expected to grow 7% by 2032, less than half the rate observed in the past. This entails an expansion of 22% in Central Asia and 11% in Eastern Europe, whereas output from Western Europe rises by less than 2% in 2032 compared to current levels. While Ukraine is assumed to reach historic productive capacity by 2032, the recovery is slow. Output growth from Eastern Europe is expected to be led by Türkiye and Russia, at 26% and 9% respectively. Kazakhstan accounts for almost a third of the growth from Central Asia. In Russia, growth is underpinned by the crop sector, whereas in Türkiye and Kazakhstan, significant additional output is expected from both crops and livestock products.

Growth is mainly derived from productivity gains, as the long-term decline in agricultural land-use is expected to persist. The contraction in land used for crop production, at 128 Kha, is a fraction of pastureland, at 1.9 Mha. These aggregate shifts in land use mask some regional differences. For instance, in Central Asia, a minimal expansion is expected in total agricultural land-use, but this is much more substantial in pasture than in cropland. In Eastern Europe, land used for crop production could expand marginally, but a significant decline is expected in pastureland. In Western Europe, a contraction is foreseen in both pasture and land used for crop production.

In the total Europe and Central Asia region, 44% of the value generated by agriculture and fish production is attributed to the crop sector. An expansion of 0.9% p.a. is sufficient to push this share up marginally by 2032. This growth combines the effects of intensification, in both Western Europe and Central Asia, and yield improvements, underpinned by technological innovation. Yield gains are expected across all major crops, ranging from 0.7% p.a. for cereals to 0.9% p.a. for pulses. As fertiliser prices normalise, a 7% increase in fertiliser application per hectare of cropland is expected to contribute to these gains.

The bulk of crop production growth from the region is ascribed to cereals and oilseeds, mainly from Eastern Europe. Russia in particular is expected to sustain robust growth in maize (24%), wheat (14%), soybeans (32%) and other oilseeds (19%) over the coming decade. By 2032, Russia is expected to account for 44% of the region's soybean production, as well as 28% of other oilseeds and 29% of wheat. Growth arises from a combination of yield gains and area expansion, with these four crops accounting for an additional 2.7 Mha by 2032 relative to 2020-22. At the same time, yield gains are expected to exceed 1% p.a. for wheat and maize, and only marginally below 1% for oilseeds. Beyond Russia, notable wheat production growth is also expected in Türkiye and Kazakhstan, at 19% and 29% respectively by 2032. In Ukraine, a major contributor to historic increases, the prolonged recovery from ongoing war limits future growth prospects.

Livestock production accounts for 46% of total agriculture and fish output in the region. Production growth is expected to be slower than that of crops, at just 0.4% p.a. Western Europe still accounts for 63% of the region's livestock, but a modest contraction over the coming decade, amid its ongoing transition to environmental sustainability, will see this share diminish to 59% by 2032. Stronger growth in Eastern Europe and Central Asia will enable these regions to expand their contribution to total livestock production in the region to 39% and 12% respectively. Poultry accounts for the bulk of additional meat produced by 2032 and while growth is robust across most of the region, the bulk of additional production emanates from Eastern Europe, as Türkiye accounts for almost 40% of additional output. Pigmeat production is expected to contract, mainly due to reduced output from Western Europe.

Almost half of the region's dairy products are produced in Western Europe, but this share is expected to decline by 2032 to 44%. This follows an anticipated reduction in output from Western Europe of 5%, combined with growth of 7% and 35% respectively in Eastern Europe and Central Asia, which yields a net gain of 5% across the region. While cow inventories are rising in Eastern Europe and Central Asia, a

contraction of 9% is foreseen in Western Europe, mainly from intensive systems. This reduction is shaped by the European Union's ongoing prioritisation of sustainability, which is expected to reduce its share in global production to less than 15% by 2032, down from 17% in the 2020-22 base period.

Fish production constitutes 10% of total agricultural output and growth of 10.5% by 2032 is sufficient to sustain this share. Aquaculture's share in total production is expected to reach 25% by 2032, thanks to growth of 1.6% p.a., compared to a mere 0.5% p.a. for captured fisheries.

Direct agricultural GHG emissions are projected to remain almost unchanged at regional level, rising by only 0.6% by 2032. This encompasses a decline of 5% in Western Europe and 4% in the European Union, mainly from reductions in the livestock sectors. At the same time, emissions are expected to rise in Eastern Europe and Central Asia, where livestock herds are still expanding. Amid ongoing productivity gains, GHG emissions expressed relative to the value of agricultural production are projected to decline by 6% compared to its level in the 2020-22 base period. The decline in emissions relative to output is highest in Western Europe at 7%.

2.5.3. Consumption

Diverging trends in animal sourced foods with reductions in Western Europe and increases in Central Asia

Despite the relative maturity of most of the region's consumer base, the impact of disruptions such as the COVID-19 pandemic, Russia's war against Ukraine and growing inflationary pressure, particularly for food, are widespread. Affordability concerns are greatest in regions with less comprehensive income support measures and a higher share of total income spent on food. Furthermore, in Eastern Europe, the ongoing war brought a whole new set of food security concerns and supply chain disruptions, with millions of people displaced, infrastructure and distribution channels damaged and significant price volatility. Beyond the war-affected region, most of the disruptions associated with the pandemic have eased, but many of the consumer trends that accompanied it, such as shifts in procurement channels, increased local sourcing and a heightened focus on "healthy eating" are expected to persist, influencing demand preferences.

The region's average daily calorie availability per capita is well above the global average and is projected to increase by only 2%, or 54 kcal/day to exceed 3 430 kcal/day by 2032. However, this is not uniform across the region. In Western Europe, and particularly the European Union, total calorie availability is expected to decline, as heightened health consciousness and growing awareness of sustainability (particularly from an environmental perspective) amongst its mature consumer base lead to reduced consumption of vegetable oils and animal-based products. Conversely, calorie availability is expected to rise in Eastern Europe and Central Asia, by 163 kcal/day and 222 kcal/day respectively. These gains are spread across most food groups, with significant contributions from cereals, vegetable oils, meat, and dairy.

Protein availability, expressed in per capita terms, was almost 23% above the global average in 2020-22. By 2032, it is only expected to increase by 4%, to reach 107g/day. While gains are expected across the region, they are smaller in Western Europe than elsewhere. More than half of the additional protein consumption is anticipated to come from plant-based sources, which are often perceived as healthy alternatives. Growth in meat and dairy product consumption is also notable, at 0.2% and 0.6% p.a. respectively, though it will be concentrated in Eastern Europe and Central Asia. Meat consumption is expected to approach 50kg per capita by 2032, more than 67% above the global average.

In the European Union, protein consumption is already high and consumers are increasingly aware of health and environmental considerations. Consequently, dairy product consumption is expected to decline by 5%, but it remains an important product group and by 2032 is still expected to contribute 13% of total calories and 21% of total protein. Per capita consumption of cheese and butter remain more than six times

and double the global average level respectively. Similarly, meat products constitute 24% of total protein availability by 2032, despite the modest decline in total per capita consumption. Minor declines in pigmeat, bovine and ovine meat consumption is expected to be partly negated by rising poultry intake, thereby increasing the share of poultry in total meat consumption to almost 30% by 2032.

Overall, across the region, fish consumption is expected to rise by 5%, with faster growth expected in Central Asia, and the European Union. In Western Europe, consumption levels are already high, and by 2032 are expected to exceed the global average by almost 10%, or 2kg per capita. Conversely, growth in Central Asia, from a small base, is only sufficient for consumption to reach 22% of the global average level by 2032.

The relative importance of animal products in terms of both consumption and production is also reflected in feed, where the region accounts for almost a quarter of global use. Growth prospects mirror those of livestock production, with a distinct slowdown in the coming decade. Total feed use is only expected to expand by 2.6% by 2032, with a 4% reduction in Western Europe offset by gains of 12% and 25% respectively in Eastern Europe and Central Asia. Almost half of the additional feed used in Eastern Europe is attributed to Türkiye. The concentration of growth in Eastern Europe also underpins the faster rate of growth in maize feed use relative to wheat.

The European Union's drive to increase renewable energy production is enshrined in its new overall renewable energy target of 32% by 2030. Despite expected reductions in both gasoline and diesel use, ethanol use is expected to expand by almost 8% over the coming decade, while biodiesel use remains stable. Considering sustainability concerns around palm oil, which is classified as high risk under the new Renewable Energy Directive, its use for biodiesel production is expected to decline by almost 11%.

2.5.4. Trade

Slow recovery in Ukraine exports depends on resolution of the war

Trade in Europe and Central Asia has been amongst the most dynamic of the regions covered in this chapter. Historically a major net importer, this deficit has shrunk to merely a third of the level ten years ago. The primary driver of this shift was Eastern Europe, mainly Russia and Ukraine, where the exportable surplus in 2020-22 was bigger than the deficit a decade ago (Figure 2.19). In light of ongoing war in the region, this trend is also set to change, at least in the short term. Over the past decade, Ukraine accounted for almost 40% of the growth in net exports from Eastern Europe. While the grain deal, signed mid-2022 under the Black Sea Grain Initiative was a critical in enabling continued exports from Ukraine, volumes were significantly reduced and with production set to decline as a result of the war, exports are expected to contract further in the short term. The continued extension of the grain deal also remains uncertain. While a resolution to the ongoing war would enable both production and export growth to resume in the medium term, restoration of its productive and trade capacity would likely require substantial investment and time. Under the baseline assumptions, Ukraine's exports are only expected to recover to 2021 levels by 2031. Consequently, while net exports from Eastern Europe are expected to rise by just over 22% compared to the 2020-22 base period, the absolute growth in net exports is less than half of the level achieved in the past decade. Growth is expected to be concentrated in Russia and Türkiye, where exports are set to expand by 1.9% p.a. and 2.4% p.a. respectively. Combined with growth of 1.8% p.a. in exports from Western Europe, this is sufficient for the total Europe and Central Asian region to reach a small net trade surplus by 2032.

Total exports from the region could expand 19% by 2032, due in large to a 23% expansion in crop product exports, with more subdued growth of 12% in animal-based products. Cereal exports are expected to rise by 20%, or 32 Mt by 2032, with Russia accounting for more than half of additional volumes. By 2032, the Europe and Central Asian region will account for 36% of global cereal exports, with both the Near East and North Africa and Sub-Saharan Africa being significant importers. In line with the concentration in Russia, more than half of additional cereal exports by 2032 will be wheat, resulting in its increased share

in total cereal exports from the region. Maize exports are also expected to rise and by 2032, the region is set to contribute 22% of global maize trade.

Europe and Central Asia contribute more than 40% of livestock product exports globally and almost 90% of these volumes come from the European Union. While growth in the European Union's exports of animal-based products is expected to slow compared to the past decade, the region still constitutes 46% of global trade in such products by 2032. Its share is significant in both meat and dairy products. In line with reduced production, meat exports from the European Union are expected to decline by 16%, but most of this emanates from the pigmeat sector, as poultry and bovine meat exports are anticipated to remain fairly stable. The reduction in pigmeat exports implies that its share in global pigmeat trade will decline to 31%.

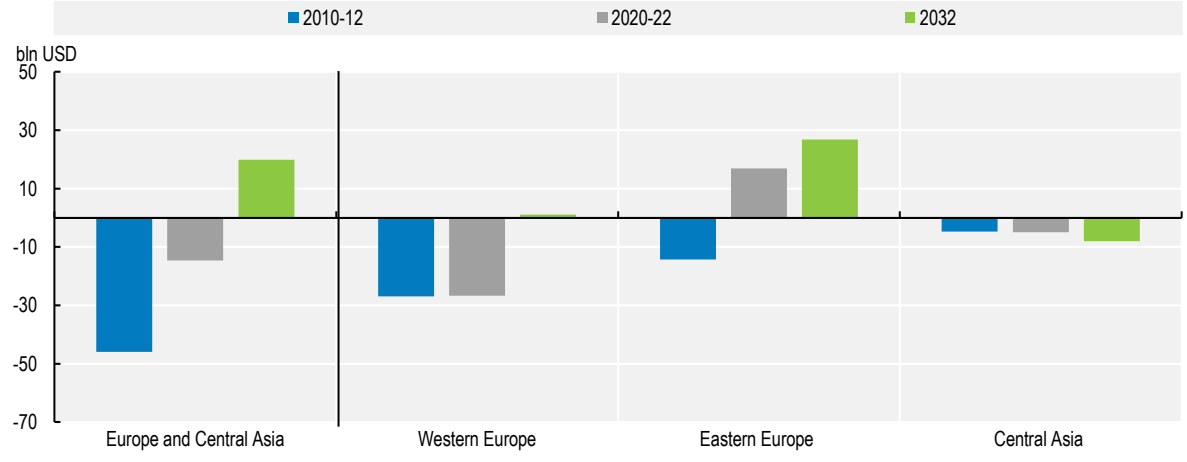
The European Union constitutes 28% of global dairy exports and growth of 1.6% p.a. is sufficient to sustain this share by 2032. Its relative contribution and growth prospects differ across the various dairy products. An increasing share of its smaller milk production pool will be processed into cheese and butter, enabling cheese exports to rise by almost 28% over the next ten years, while butter exports grow by 17%. This enhances its share in the global market to 43% by 2032. On the other hand, its share in the global trade of SMP and WMP is expected to decline.

The region is also an important exporter of fish products, with Russia and Norway the major contributors. The region's 26% share in global fish exports is the highest amongst those covered in this chapter. With growth set to slow to 0.3% p.a., the Developed and East Asia region will capture a bigger market share by 2032.

Despite the shift to export orientation, the region also remains a significant importer of many agricultural products. By 2032, imports are anticipated to increase by 13%, though growth from Central Asia is much faster at almost 39%, from a smaller base. The growing export orientation in Europe, combined with rising imports from Central Asia implies that a substantial share of additional imports could be supplied from within the region. Around 15% of Central Asia's additional imports is expected to be animal products, of which the European Union is a major supplier.

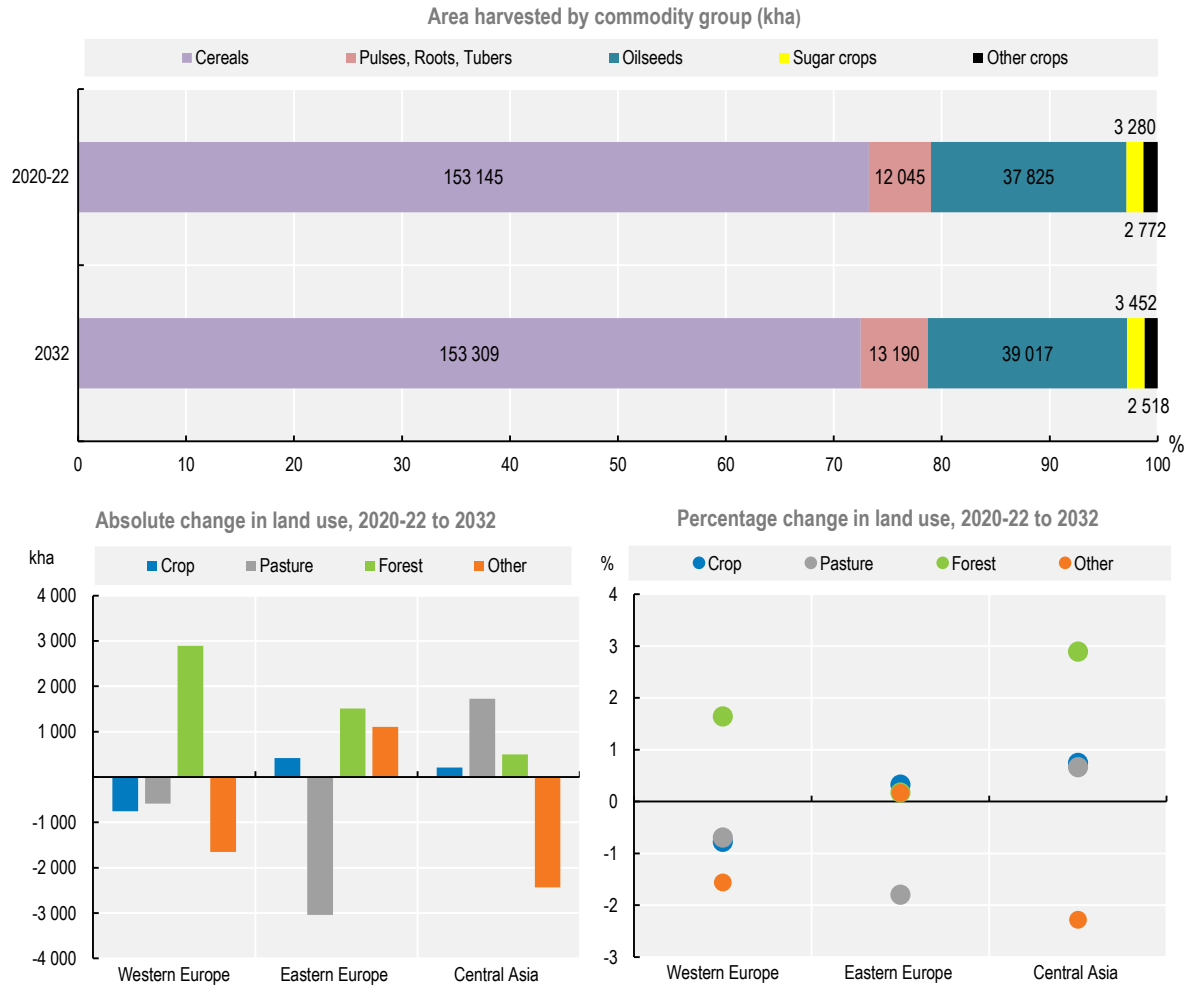
Further to animal products, the region is a significant importer of rice and vegetable oil, as well as maize and protein meal for use in animal feed. For both protein meal, and to a lesser extent wheat, its share in global imports is expected to decline by 2032, due to its projected slowdown in livestock production growth and thus feed use.

Figure 2.19. Net exports of agriculture and fish products from Europe and Central Asia (including processed products)



Note: Estimates are based on historical time series from the FAOSTAT Trade indices domain which are extended with the Outlook database. Products not covered by the *Outlook* are extended by trends. Total trade values include also processed products, usually not covered by the Outlook variables. Trade values are measured in constant 2014-2016 USD.
Source: FAO (2023). FAOSTAT Trade Indices Database, http://www.fao.org/faostat/en/#data/TI; OECD/FAO (2023) "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

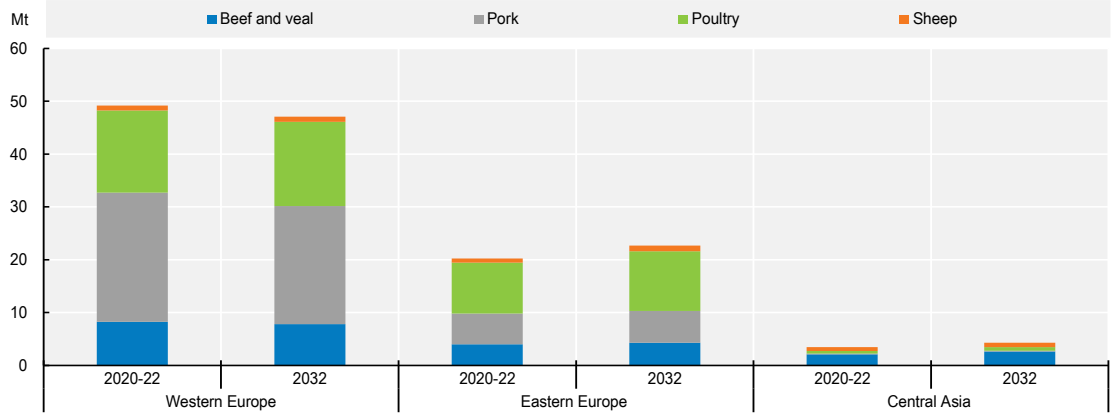
Figure 2.20. Change in area harvested and land use in Europe and Central Asia



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

StatLink https://stat.link/o4g3au

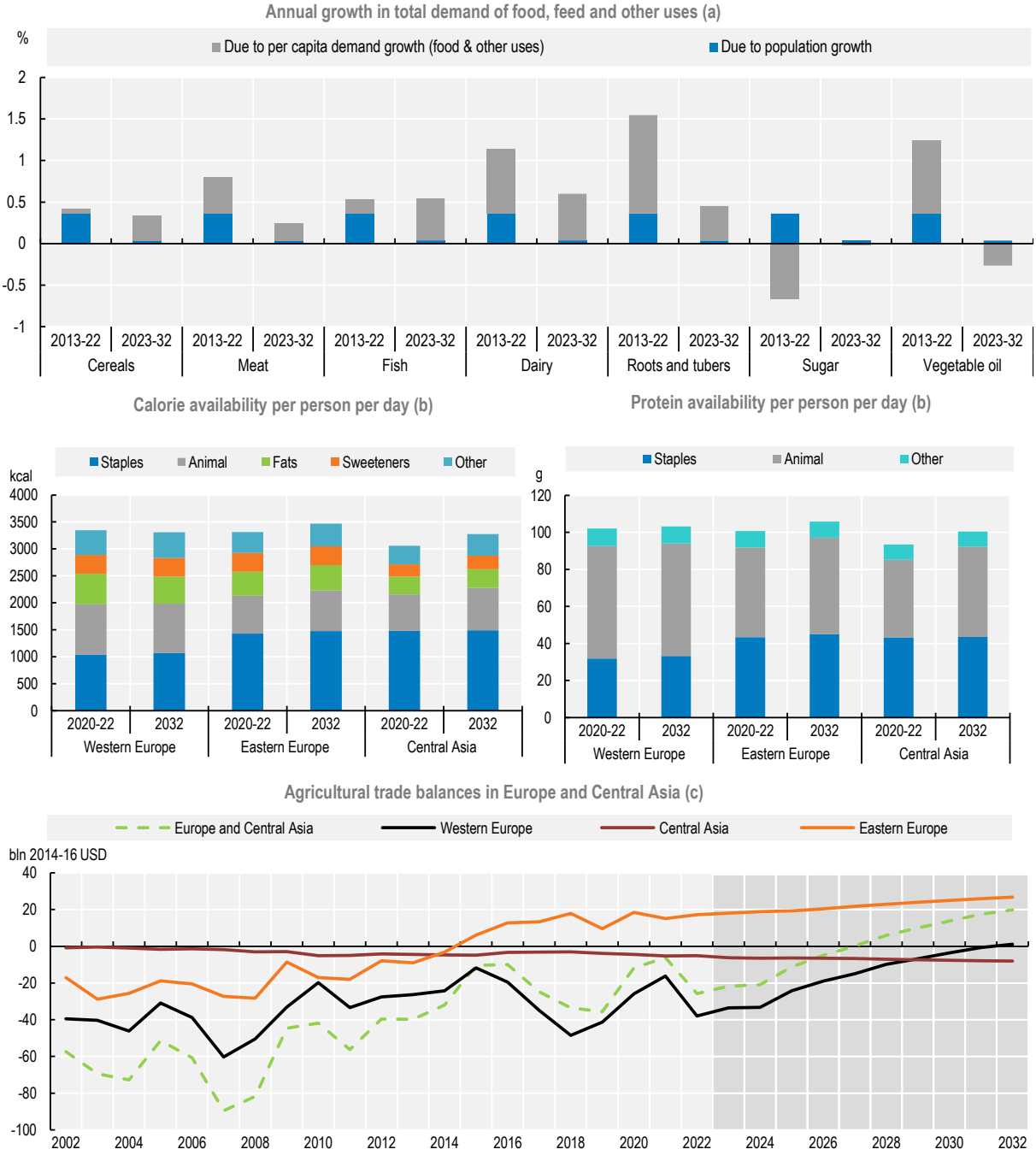
Figure 2.21. Livestock production in Europe and Central Asia



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

StatLink https://stat.link/b95lqh

Figure 2.22. Demand for key commodities, food availability and agricultural trade balance in Europe and Central 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 https://stat.link/p65kns

Table 2.5. Regional indicators: Europe and Central Asia

	Average			%	Growth [2]	
	2010-12	2020-22 (base)	2032	Base to 2032	2013-22	2023-32
Macro assumptions						
Population ('000)	898 949	933 612	941 640	0.86	0.36	0.04
Per capita GDP[1] (kUSD)	24.14	26.67	31.98	19.89	1.17	1.62
Production (bln 2014-16 USD)						
Net value of agricultural and fisheries[3]	446.1	510.2	544.4	6.71	0.90	0.67
Net value of crop production[3]	192.3	223.7	243.5	8.85	0.52	0.88
Net value of livestock production[3]	205.7	234.3	243.2	3.82	1.32	0.44
Net value of fish production[3]	48.1	52.2	57.7	10.51	0.75	0.80
Quantity produced (kt)						
Cereals	493 164	597 565	638 602	6.87	0.61	0.74
Pulses	8 450	12 888	16 742	29.90	4.63	2.47
Roots and tubers	28 705	31 318	33 355	6.50	1.52	0.54
Oilseeds[4]	49 460	69 540	76 464	9.96	2.19	1.08
Meat	61 798	72 875	74 075	1.65	1.66	0.26
Dairy[5]	25 684	29 588	31 628	6.90	1.25	0.69
Fish	17 177	18 767	20 699	10.30	0.87	0.79
Sugar	26 768	27 232	28 733	5.51	0.74	0.42
Vegetable oil	24 391	34 422	36 854	7.06	2.74	0.76
Biofuel production (mln L)						
Biodiesel	11322	17877	18071	1.09	4.34	0.12
Ethanol	7 028	8 402	9 266	10.28	1.46	1.03
Land use (kha)						
Total agricultural land use	774 111	767 890	765 863	-0.26	-0.05	0.01
Total land use for crop production[6]	254 143	254 015	253 887	-0.05	-0.03	0.09
Total pasture land use[7]	519 968	513 876	511 977	-0.37	-0.06	-0.03
GHG Emissions (Mt CO2-eq)						
Total	757	787	792	0.63	0.19	0.07
Crop	190	204	207	1.32	0.43	0.25
Animal	555	567	568	0.18	0.06	-0.03
Demand and food security						
Daily per capita caloric food consumption[8] (kcal)	3 269	3 307	3 359	1.57	0.05	0.32
Daily per capita protein food consumption[8](g)	99.0	100.8	104.6	3.8	0.2	0.4
Per capita food consumption (kg/year)						
Staples[9]	160.3	160.3	166.7	4.01	-0.15	0.39
Meat	46.2	47.8	48.7	1.85	0.20	0.16
Dairy[5]	27.3	29.4	31.1	5.71	0.58	0.56
Fish	18.5	18.1	18.7	3.33	-0.07	0.43
Sugar	35.9	33.2	33.1	-0.52	-0.57	-0.02
Vegetable oil	18.1	20.5	20.2	-1.45	0.18	0.02
Trade (bln 2014-16 USD)						
Net trade[3]	- 46	- 15	20	-235.86	..	..
Value of exports[3]	435	573	684	19.35	2.45	1.84
Value of imports[3]	481	588	664	13.00	2.09	1.04
Self-sufficiency ratio[10]						
Cereals	112.0	118.9	124.1	4.38	0.19	0.30
Meat	99.6	107.0	106.2	-0.80	0.86	0.01
Sugar	81.9	87.6	91.7	4.70	0.96	0.53
Vegetable oil	84.2	95.7	105.2	9.90	1.5	1.0

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 2004-06. 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 Production / (Production + Imports - 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.

2.6. Regional outlook: North America

2.6.1. Background

Productive and resilient agro-food sector

The North American region comprises just two countries, but it covers a vast land area, while its 375 million people comprise just 5% of the world's population. This share could decline somewhat by 2032, as population growth in the region is slow at only 5.8% for the ten-year period. More than 80% of the population already resides in urban areas, with little change expected by 2032. Both the United States and Canada are highly developed countries with mature and diverse economies. This is reflected in the low share of agriculture, forestry, and fisheries in total regional GDP, which is already below 2% and expected to decline further by 2032. This does not detract from its contribution to global agriculture, where it provides 11% of total output.

North America's contribution to global agriculture reflects its sizable land base. It accounts for 10% of the land used for agriculture globally and the availability of agricultural land per capita is the highest amongst all regions included in the *Outlook*. Its agricultural trade surplus is the third largest among all regions, after Latin America and South and Southeast Asia and it accounts for 12% of global exports. While positive, growth in agricultural production has been among the slowest of all regions, outpacing only Developed and East Asia and Europe and Central Asia over the past decade. By 2032, its share in global output and exports is expected to diminish, while its trade surplus could decline to just a quarter of current levels.

The region is highly productive, with an agricultural sector characterised by significant capital intensity and a predominance of large, commercially orientated farming enterprises that attain impressive yields. Production systems are input intensive and fertiliser application rates per hectare of cropland are high, implying that the sharp rise in fertiliser costs impacted substantially on producer margins. It also induced a reduction in fertiliser use per hectare in 2022, along with a heightened focus on optimising efficiency. Fertiliser imports into the United States declined by 22% in 2022. While prices normalise over the outlook period, fertiliser use per hectare does not fully recover to pre-2022 levels, reflecting the investments made to improve use efficiency, which also enable fertiliser use per calorie produced to decline further. Agricultural land use has stabilised over the past decade, with a consistent share of 37% dedicated to crop production. Thus, output growth has predominantly come from productivity gains. The relative importance of livestock is reflected in its 42% share of total agricultural production value, well above the global average of 36%. North America contributes 13% of the global value of livestock production, but thanks to high productivity, its share in livestock numbers is proportionately lower.

North America has a mature, high income consumer base and food intake is highest amongst all regions. Calories and protein available for consumption is 30% and 36% higher respectively than the world average. Consequently, consumer preferences could play a bigger role than income growth in the evolution of food demand. Consumption is proportionately high in animal products, which comprise almost 30% of total calories and 65% of total protein intake, compared to the global average of 18% and 40% respectively. Diets are also high in vegetable oil and sweeteners, where calorie shares are almost double the global

average. Dietary composition and lifestyles in the region have led to higher incidence of obesity and food related chronic diseases such as diabetes, although the COVID-19 pandemic heightened awareness of healthy eating habits. This could have a lasting impact on consumer preferences and total calorie intake is expected to decline by 2032.

Even at the height of the pandemic, total food consumption remained high, reflecting the maturity of the region's consumer base, as well as income support measures that mitigated the effects of the economic contraction on spending power. Nevertheless, its influence on the composition and distribution of food sales was profound. Expenditure on food away from home declined, while retail sales increased, inducing significant changes in the food supply chain to adapt to both the type of food and packaging size requirements. Weersink et al. (2021[10]) note that, despite the time required to adapt to the changes, the adjustments in the supply chain have improved its resilience to future shocks.

Despite high average levels of income and food intake, the region is not immune to food security concerns amongst the lower echelons of its income distribution. Even prior to the pandemic, an estimated 10-13% of the region's population was estimated to experience food insecurity (Tarasuk and Mitchell, 2020[11]). Despite the mitigating effects of income support measures, the prevalence of moderate to severe food insecurity increased for the first time in 2020 and remained elevated in 2021 amid rising food prices. The current environment of financial tightening, high inflation and persistently high food prices will weaken affordability and likely constrain significant improvements to food security in 2022 and 2023.

The recovery from the pandemic induced recession in 2020 was robust and the 5.4% rebound in per capita GDP in 2021 elevated average per capita income beyond pre-pandemic levels. However, this momentum was short lived and as Russia's war against Ukraine provided new impetus to energy prices and rising inflation, growth in per capita GDP slowed to 1.6% in 2022. Expectations are for a mere 0.1% in 2023. The outlook will continue to be shaped by tightening financial conditions, as monetary policy strives to keep inflation under control amid Russia's war against Ukraine. In the medium term, growth in per capita income is expected to recover to an annual average of 1.1%, to exceed USD 62 100 per capita by 2032.

Industrial use of agricultural products is high in North America and the United States is the biggest producer of biofuel in the world, accounting for almost 38% of global output. This comprises mainly ethanol, derived from maize feedstocks, with some biodiesel derived from soybean oil and used cooking oils. Biofuel use in the United States is sustained by the Renewable Fuel Standard. The United States also supplies substantial ethanol exports to Canada.

The agriculture sector in North America is mature, productive, and resilient, contributing substantially to global production and exports of several products. Its ability to expand production may be critical to normalising the current high price cycle, amid ongoing war in the Black Sea region, particularly under conducive weather conditions. Nevertheless, it also faces challenges, as evidence suggests that its impressive historic productivity growth has slowed in the past decade (Fuglie, 2015[12]) and, as environmental costs continue to rise, competitiveness may be eroded in the future.

2.6.2. Production

Productivity gains are the primary driver of growth

Growth in agricultural and fish production in North America is expected to persist, but the expansion of 8% by 2032 is significantly slower than in the past. The strength of the US dollar is a contributing factor, combined with the expectation that most prices will normalise from current high levels and in the medium term, return to a long term trend of a decline in real terms. Growth in crop production is expected to outpace that of livestock, reversing the trend that emerged over the past decade. By 2032, an 12% expansion in crop production sees its share in total agricultural output rise to 55%, compared to 41% for livestock and only 4% from fisheries.

The historic decline in land used for agriculture stabilised over the past decade. By 2032, little change is expected in total agricultural land use, though some reallocation may occur from cropland to pasture in the United States. Despite the consequent decline of 1.9% in total land used for crop production by 2032, output from the crop sector is expected to rise by an annual average of 0.8%, benefitting from a combination of intensification and yield gains. The total area harvested is expected to decline by 1.2 Mha, less than half of the decline in land use. Similarly, the total value of crop production per hectare of land is expected to rise by 14%. This increase is more pronounced in Canada, where it reverses an historic decline.

The area under cereals and oilseeds is expected to expand by only 2.4% by 2032 but will still constitute the bulk of total area harvested, with almost 60% dedicated to maize, wheat and soybeans. Among smaller crops, the area under pulses and cotton could grow by 28% and 11% respectively. Despite the faster expansion, pulses will still only account for 4% of total area in the region, but in Canada their share is more prominent at 14%. Yield gains are expected to remain robust across all commodities, but growth rates differ. Maize yields already average more than 10 t/ha in the 2020-22 base period, which is 80% above the global average. By 2032, they are expected to rise by only 5%. Similarly, soybean yields are expected to rise by 7%, whereas for wheat and other coarse grains, yield gains are expected to be higher at 13% and 16% respectively. This reflects a degree of recovery, as wheat and barley yields were significantly reduced in 2021, due to inclement weather conditions, particularly in Canada.

Meat production systems in North America are highly intensive and profitability has come under severe pressure in recent years – initially due to weak prices at the height of the pandemic induced lockdown in 2020 and subsequently due to the sharp and persistent rise in feed costs. In the short term, these factors combined to result in reduced production volumes of both pigmeat and bovine meat, as well as a dramatic slowdown of poultry production. While some recovery is evident in the medium term once feed prices normalise, the net results is substantially slower growth in meat production, which is expected to rise by only 5.4% by 2032, to approach 56 Mt. The United States is expected to account for 90%. Poultry production is expected to grow faster than any other meat type, expanding by 8.2% over the ten-year period, compared to merely 3.3% for pigmeat and 2.6% for bovine meat, where production cycles are longer and the response to improved profitability takes longer. While improved profitability in the medium term could induce some expansion in poultry and pigmeat operations, bovine production growth is exclusively driven by productivity gains and increased carcass weights, as bovine herd numbers are not expected to fully recover to pre-2022 levels by 2032.

Milk production growth is expected to exceed that of meat and by 2032, could expand by 14% relative to the 2020-22 base period. These gains are derived predominantly from increased milk yields, which are already the highest of all regions. Cow inventories are only expected to rise by 2% – mainly in the United States, as Canada's dairy cow herd remain largely unchanged. By 2032, milk yields in the United States and Canada are expected to rise by 10% and 20% respectively. Consumer preferences dictate that an increasing share of total milk production is expected to be processed into products such as cheese, butter, and milk powders, with less going to fluid milk.

Captured fisheries still constitute the bulk of fish production in North America. Despite relative stability by 2032 in captured fisheries, growth of only 4.3% in aquaculture production implies that 88% of total production is still expected to come from captured fisheries. This also reflects the fact that production will be significantly impacted by environmental regulations. At present, 84% of total production comes from the United States, but the bulk of production growth is expected to come from Canada.

The North American region is responsible for 7% of direct agriculture related GHG emissions globally – less than its share in global output. While total agriculture emissions are expected to rise by 1.5% over the coming decade, the total emissions per unit of output value is expected to decline further. Additional emissions emanate mainly from livestock production, with increases of 0.45% p.a., compared to 0.12% p.a. from crop production.

2.6.3. Consumption

Changing consumer preferences are key to demand prospects

The highly developed nature of the United States and Canadian economies means that its mature, higher income consumers spend on average only 6% of total household expenditure on food. This implies that the current high food price cycle will present less of an affordability challenge than in many other regions, and that medium term demand prospects will to a large extent be dictated by the preferences of these consumers, with comparatively less influence from their economic means. Many of the expected changes in these preferences are centred around an increased focus on healthy eating habits, which was amplified by the COVID-19 pandemic. Such a shift would influence the absolute level of calories consumed, as well as their composition.

Total calories available for consumption, which includes substantial household waste, is the highest in the world. By 2032, it is expected to decline by almost 80kcal/person/day, to 3750 kcal/person/day – still 22% above the global average. Accounting for current estimates of household waste would bring caloric intake to 3480 kcal/person/day. The bulk of the decline emanates from the United States, with a far smaller reduction expected in Canada. In terms of composition, the heightened focus on health may induce a shift to increased fresh produce consumption, with fruit consumption per capita expected to rise by 14%. It is also foreseen to induce a reduction in products such as vegetable oil (-8%), sweeteners (-8.5%) and cereals (-1.2%). Meat consumption is expected to remain fairly stable, increasing by just 0.6% over the ten-year period, whereas the consumption of dairy products, on a dry matter basis, could rise by 3% and pulses, which are often perceived as healthy alternatives, could rise by 24%. This increase is from a small base, however, and by 2032, pulse consumption per capita will still be less than half of the global average, whereas consumption of products such as vegetable oil and sweeteners remain 125% and 77% respectively above the global average.

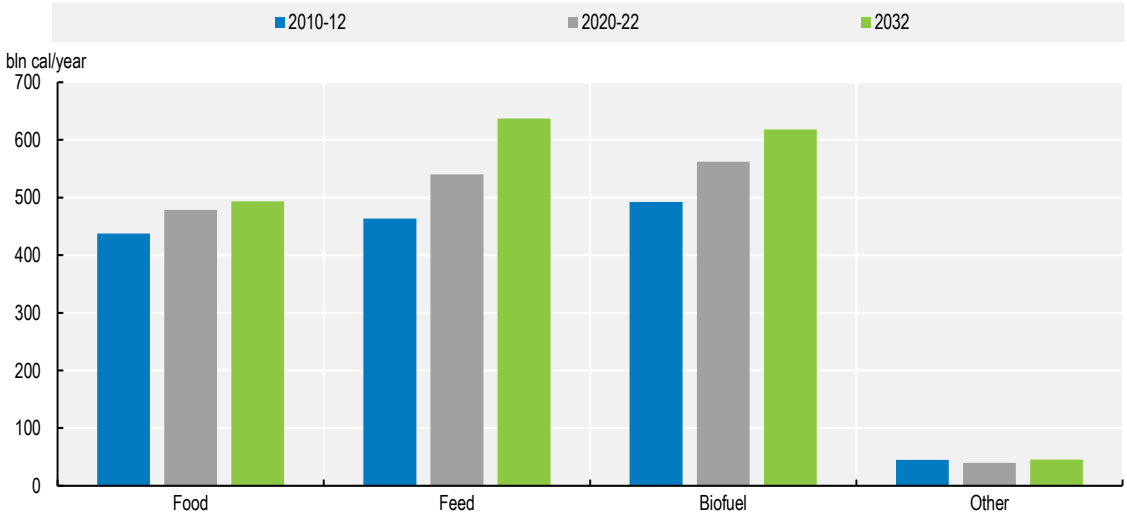
Protein intake in North America is expected to rise by a mere 1.8g/person/day by 2032, to reach 116g/person/day – still more than 30% above the global average. This increase is derived predominantly from animal sources, which are expected to rise by 2% over the ten year period, compared to just 0.4% from plant-based sources. While meat consumption remains fairly stable, increased intake of poultry and pigmeat products, combined with reductions in bovine and ovine meat consumption still enables a 1.7% increase in protein availability from meat products. Similarly, increased dairy product consumption encompasses an almost 17% increase in cheese intake, compared to a 2.4% gain in butter and reduced milk powder and fresh dairy consumption. Overall, this results in a 1.9% gain in protein available from dairy products by 2032. Per capita consumption of fish products is also expected to rise, to reach 23 kg per capita by 2032, a gain of 2.5% compared to 2020-22. In the case of plant-based protein sources, a gain of 0.4g of protein per person per day from pulses, is almost fully offset by the reduction in cereal consumption.

The intensity of livestock production in the region implies that feed use is already high, with calories dedicated to animal feed already exceeding those consumed as food in the base period (Figure 2.23). In line with expansion in pigmeat and poultry production, feed use is expected to rise by 13% over the coming decade, with maize and protein meal comprising almost 90% of the additional feed. By 2032, the share of maize in total feed use could rise to 55%, whereas the share of protein meal remains fairly constant at 17%.

Biofuel production is an important market for feed grains in the region, accounting for more calories than food or feed in the base period (Figure 2.23). The increasing focus on sustainability is reflected in further growth of 15% in biofuel production by 2032. Almost two-thirds of this growth is attributed to biodiesel, underpinned by increased renewable fuel targets and biomass-based diesel tax credits. The prevalence of used cooking oil as feedstock is expected to increase. Growth in ethanol production is slower, partly due to reduced gasoline use. Positive production growth reflects some additional E15 blends, but most of the

gasoline will still be blended at 10%, as limitations in infrastructure and technology constrains wider adoption of mid to high level blending.

Figure 2.23. Calories used in food, feed and other use in North America



Note: Estimates are based on historical time series from the FAOSTAT Food Balance Sheets database which are extended with the *Outlook* database. Products not covered in the Outlook are extended by trends.
Source: FAO (2023). FAOSTAT Food Balances Database, http://www.fao.org/faostat/en/#data/FBS; OECD/FAO (2023) "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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2.6.4. Trade

Trade surpluses continue to shrink

In line with the prevailing trend of the past decade, North America's trade surplus in agriculture and food products is expected to decline further and, by 2032, could be almost 75% smaller than current levels. This follows growth in net imports, which are expected to increase by 20% over the ten-year period, more than double the expected gain in net exports, which only rise by 8.6%. Trade developments in the United States also diverge from Canada, where the trade surplus is expected to grow by 3% p.a., but the United States is expected to move from a surplus in the 2020-22 base period, to a deficit position by 2032.

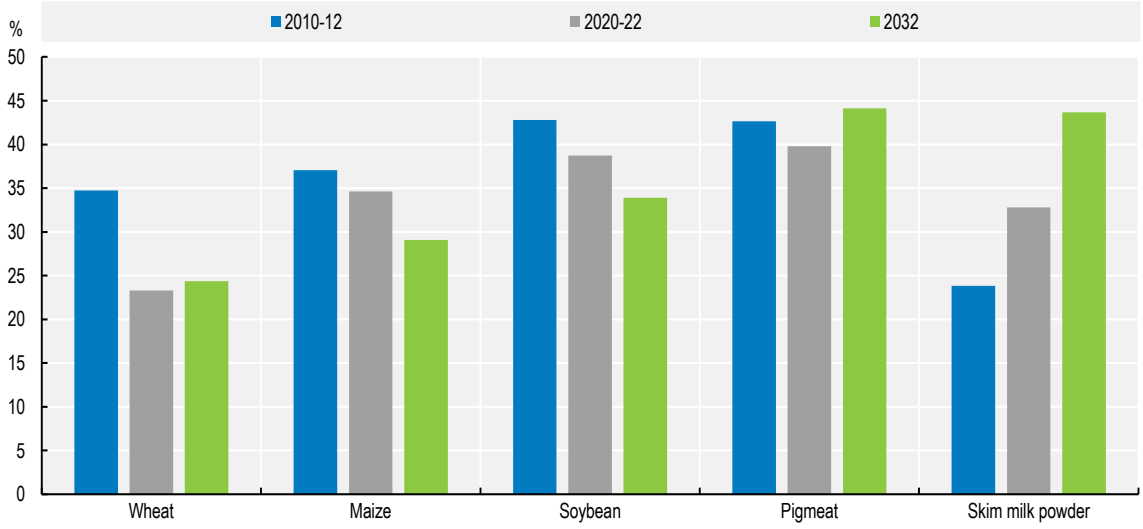
Amongst the factors contributing to the marked deceleration in export growth from the United States, is the slowdown in global demand, as well as its trade relations with China, which is the single biggest importer of US products, and rising competition from Latin America. After a period of turbulence, trade relations between the United States and China have improved, suggesting that the projected slowdown is mostly a factor of China's demand dynamics. Historic trade growth was driven mainly by feed products, such as soybeans and maize, due to rapid expansion in China's pigmeat and poultry operations, particularly in the years of rebuilding from the devastating impact of ASF. Consequently, soybean imports increased by nearly 4% p.a. over the past decade. In line with China's meat production dynamics, these imports are expected to be sustained, but further growth is limited at just 0.7% p.a. In the case of maize, China's imports are expected to decline. Amid rising competition from Latin America, the concomitant reduction in US exports of 8% for both soybeans and maize represents a marked turnaround, as these two products combined accounted for 45% of export growth over the past decade. Amid the slowdown in demand from China, opportunities for export growth could come from within the region, through the United States-

Mexico-Canada (USMCA) Agreement, which was implemented on 1 July 2020 to replace the North American Free Trade Agreement (NAFTA). Canada is already the second biggest export destination for US products and trade under the agreement has already grown substantially since its inception.

In line with its diminishing surplus, the North American region is also expected to account for a smaller share in global trade for several products. These include soybeans and maize, where its share in global exports could decline to 34% and 29% respectively by 2032, due to increasing competition from Latin America and the Caribbean. Conversely, it is expected to gain market share in wheat, partly due to the ongoing war in the Black Sea region, which constrains export growth from Ukraine in particular. The North American region is also expected to expand its share in global ethanol exports to almost 58% by 2032. Similarly, its share in global pigmeat exports could rise to 44%, while its contribution to global dairy exports could reach 17%, due mainly to growth in skim milk powders.

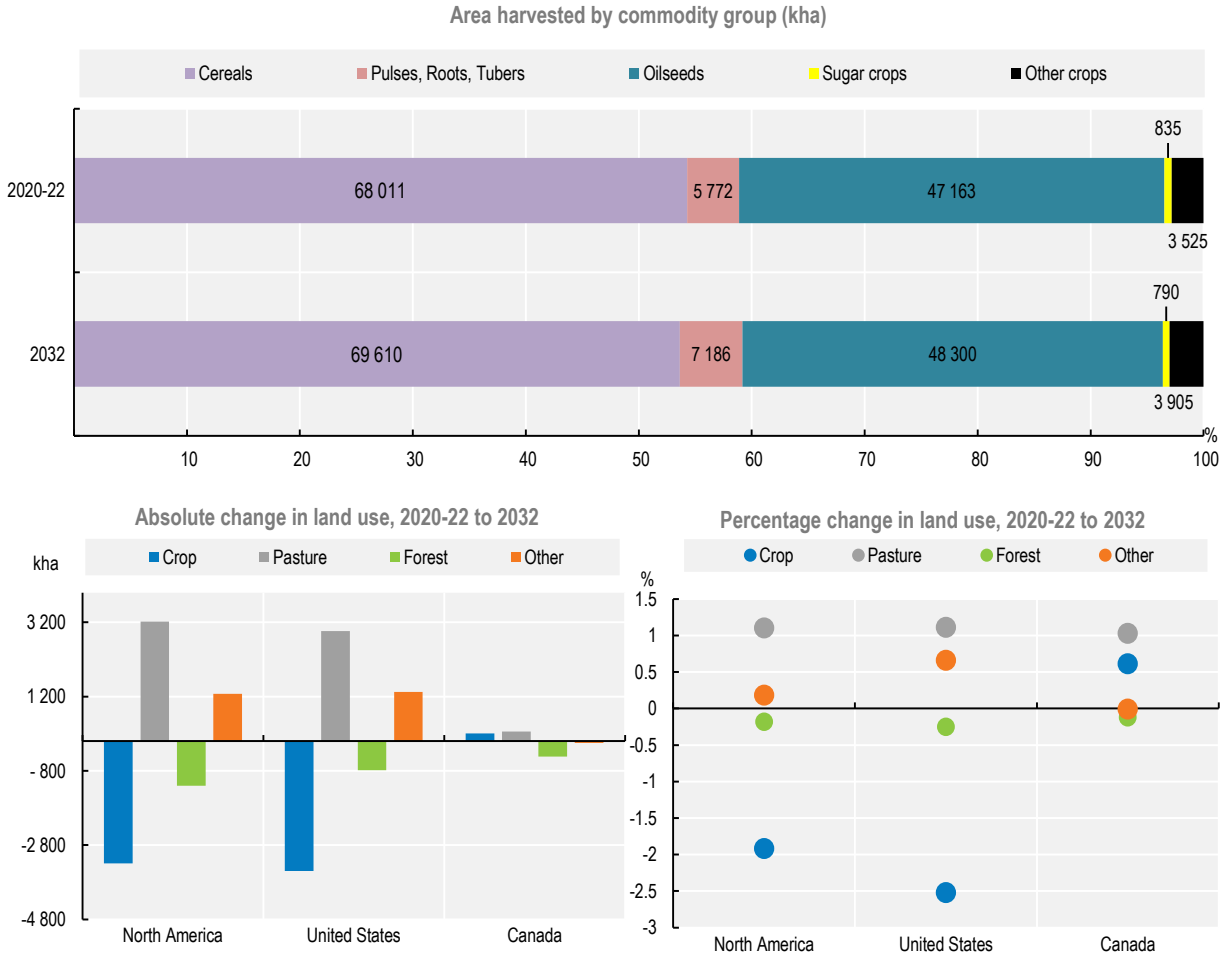
Despite its trade surplus and prolific role in global exports, the North American region is also a significant importer of several products. These include fish, bovine and ovine meat. Its share in bovine and ovine meat imports continues to decline, to the extent that it has in the past decade become a net exporter of bovine products, but it is still expected to account for 14% of global imports by 2032. In the case of fish, its imports continue to rise by 1.1% p.a. and by 2032, it will account for almost 16% of global fish imports. The region is also a major importer of fresh fruit and vegetables, which is expected to rise further to account for 18% and 23% of global imports respectively by 2032.

Figure 2.24. Trends in export market shares of selected commodities of North America



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

Figure 2.25. Change in area harvested and land use in North America



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

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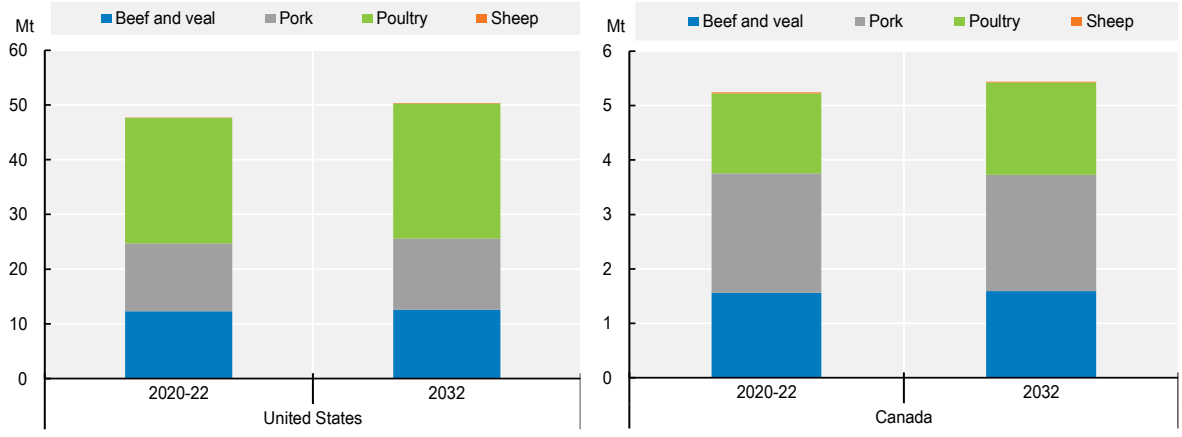
Figure 2.26. Livestock production in North America



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

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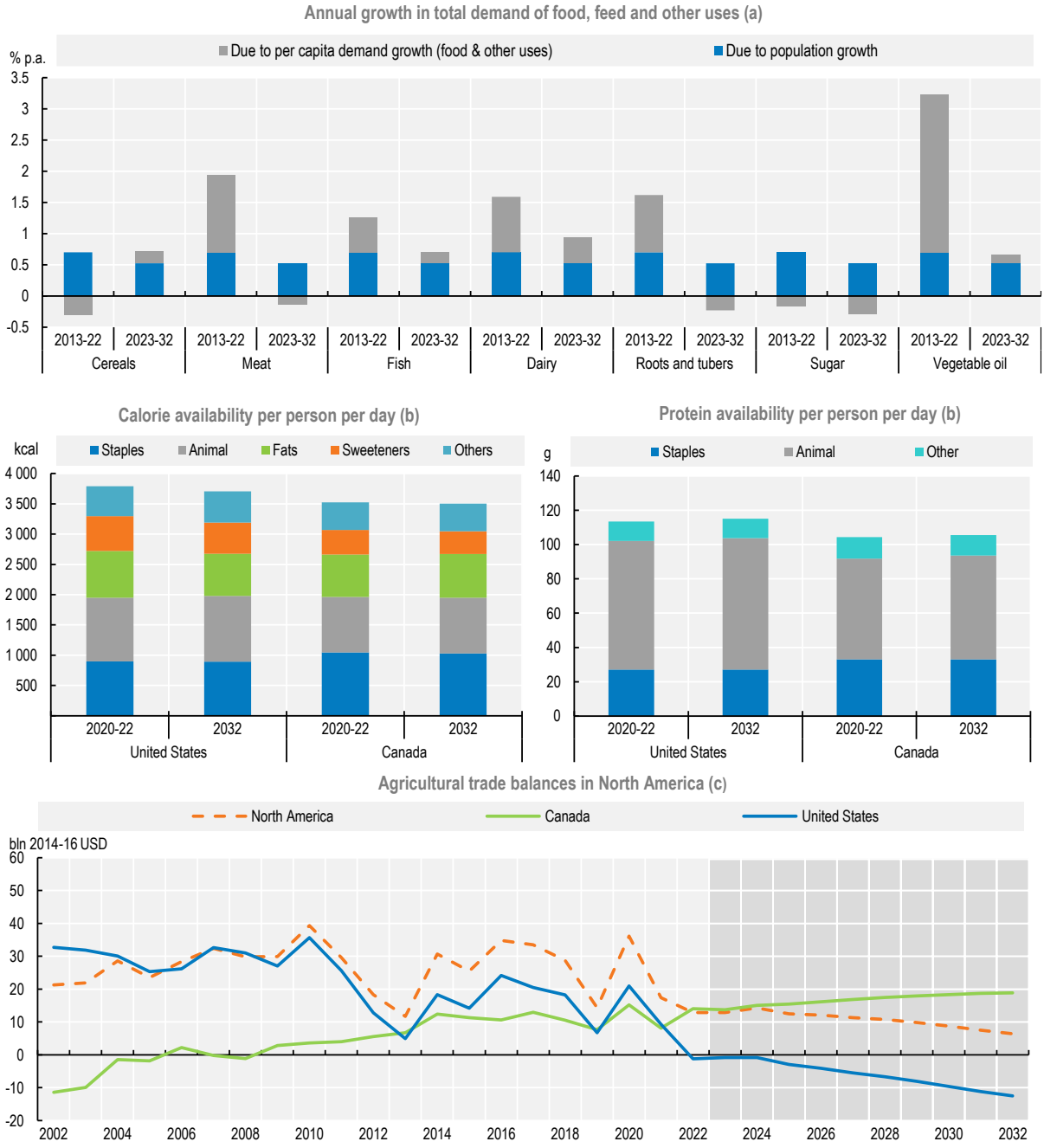
Figure 2.27. Demand for key commodities, food availability and agricultural trade balances in North America



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) Includes 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.

StatLin https://stat.link/b3dpoh

Table 2.6. Regional indicators: North America

	Average			%	Growth [2]	
	2010-12	2020-22 (base)	2032	Base to 2032	2013-22	2023-32
Macro assumptions						
Population ('000)	348 230	375 243	397 039	5.81	0.70	0.52
Per capita GDP[1] (kUSD)	48.76	54.78	62.19	13.53	1.24	1.14
Production (bln 2014-16 USD)						
Net value of agricultural and fisheries[3]	289.5	342.9	371.6	8.36	1.20	0.65
Net value of crop production[3]	154.2	182.4	203.6	11.62	0.24	0.81
Net value of livestock production[3]	117.6	144.8	152.1	5.05	2.97	0.53
Net value of fish production[3]	17.8	15.8	16.0	1.06	-1.92	-0.22
Quantity produced (kt)						
Cereals	426 672	489 245	540 956	10.57	-0.29	0.59
Pulses	7 769	10 432	14 519	39.18	0.95	2.13
Roots and tubers	5 146	5 706	5 968	4.58	1.23	0.33
Oilseeds[4]	17 574	21 874	25 423	16.22	-0.08	1.07
Meat	45 775	52 927	55 780	5.39	2.03	0.44
Dairy[5]	12 126	14 429	16 397	13.64	1.75	1.25
Fish	6 367	5 647	5 695	0.85	-1.72	-0.23
Sugar	7 175	7 820	8 510	8.82	0.98	0.72
Vegetable oil	13 990	18 407	20 842	13.23	2.74	1.15
Biofuel production (mln L)						
Biodiesel	3142.18	10210.14	16860.78	65.14	8.46	2.80
Ethanol	54 223	59 571	63 495	6.59	0.88	0.26
Land use (kha)						
Total agricultural land use	462 953	463 775	463 698	-0.02	0.05	0.00
Total land use for crop production[6]	171 953	172 077	168 781	-1.92	0.05	-0.18
Total pasture land use[7]	291 000	291 698	294 917	1.10	0.06	0.10
GHG Emissions (Mt CO2-eq)						
Total	435	442	448	1.54	0.29	0.41
Crop	120	117	117	0.64	-0.72	0.18
Animal	295	301	306	1.61	0.60	0.48
Demand and food security						
Daily per capita caloric food consumption[8] (kcal)	3 584	3 762	3 686	-2.01	0.55	-0.16
Daily per capita protein food consumption[8](g)	108.2	112.6	114.4	1.6	0.7	0.0
Per capita food consumption (kg/year)						
Staples[9]	129.2	125.4	124.6	-0.62	-0.09	-0.08
Meat	73.4	79.4	79.1	-0.36	1.17	-0.11
Dairy[5]	32.0	34.6	35.7	3.15	0.78	0.41
Fish	21.6	23.3	23.4	0.59	0.85	0.31
Sugar	32.2	30.6	29.9	-2.31	-0.31	-0.29
Vegetable oil	35.7	39.1	36.6	-6.37	0.36	-0.23
Trade (bln 2014-16 USD)						
Net trade[3]	29	22	6	-71.13	..	..
Value of exports[3]	148	179	195	8.64	0.54	1.00
Value of imports[3]	119	157	188	19.88	2.02	1.58
Self-sufficiency ratio[10]						
Cereals	124.5	125.8	125.8	-0.03	0.01	-0.03
Meat	116.5	115.0	114.4	-0.52	0.13	0.03
Sugar	64.0	66.7	70.6	5.80	0.40	0.49
Vegetable oil	99.4	93.9	97.4	3.82	-0.62	0.46

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. Oilseed represents 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 Production / (Production + Imports - 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.

2.7. Regional outlook: Latin America and the Caribbean

2.7.1. Background

Export led growth facing increased risk amid global volatility

The Latin America and Caribbean[16] region spans some 2 billion hectares and contains an abundance of agricultural resources. It houses more than 650 million people, almost 8.5% of the global population. While its average population density is low, it is the most urbanised amongst the developing regions. By 2032, its population is expected to exceed 700 million, of which 84% could reside in urban settings. This implies that most of the regions poor live in urban areas, but at the same time, the obstinately high incidence of poverty in rural settings presents significant challenges.

The disruptions of the past three years reversed years of progress in reducing poverty and hunger in the region. At the height of the COVID-19 pandemic in 2020, the combination of economic recession, deteriorating financial conditions and value chain disruptions resulted in a substantial increase in the prevalence of undernourishment and food insecurity. The Economic Commission for Latin America and the Caribbean suggests that the pandemic pushed the extreme poverty rate in the region to 13.8% by 2021, implying that the number of people living in extreme poverty reached 86 million. During the subsequent period of rising food prices, the prevalence of undernourishment increased further and in 2021, reached levels last seen in 2006. In 2022, the persistently high global food prices, which was exacerbated by Russia's war against Ukraine, combined with high general inflation, left little room for improvements in affordability and consequently food security, particularly in a region where the cost of healthy eating is the highest of those covered in this chapter (FAO, IFAD, PAHO, UNICEF and WFP, 2023[13]).

Economic prospects across much of the region have been uncertain for some time and income levels per capita contracted by an annual average of 1.5% over the past decade. Pre-existing structural challenges accentuated the effect of the COVID-19 pandemic and in 2020, per capita GDP declined by 7.1%. Propelled by high commodity prices and the substantial role of trade in the region, GDP rebounded by 5.9% in 2021 and a further 2.7% in 2022, enabling per capita income to surpass pre-pandemic levels. In 2023, the rebound is facing renewed resistance – inflation has reached a 25-year high, inducing interest rate hikes, and global conditions are less supportive. Commodity prices are softening, and global demand is weakening amid tighter financial conditions. Consequently, per capita GDP growth in Latin America and the Caribbean is expected to slow to less than 1% in 2023. Across the diverse range of countries in the region, the magnitude of the rebound and subsequent slowdown differs, depending on the composition of economic activity and the extent of domestic risks that amplify global effects.

In the medium term, per capita GDP is expected to rise by 1.6% p.a., to approach USD 10 500 per capita by 2032. This is only 6% higher than in 2014 and remains 21% below the global average of USD 13 342. On average across the region, households are estimated to spend around 16% of total expenditure on food. This suggests that the current cycle of high food prices, combined with elevated inflation and slower income growth in the short term could impact significantly on food security in the coming decade;[17] In countries with heightened macroeconomic instability, this impact could be even more pronounced.

Agriculture in the region is highly diverse. Farm structures range from , to some 15 million smallholder and family farms responsible for much of the region's food production ((OECD/FAO, 2019[14]). Agriculture and fish production accounts for almost 8% of total GDP. This share increased at the height of the pandemic, thanks to agriculture's robust performance and exemption from lockdown restrictions. The prolonged period of high prices further benefitted agricultural performance, sustaining its share in total GDP. As other sectors continue to recover and agricultural commodity prices normalise, it is anticipated that the share of agriculture and fish production in total economic activity will decline to below 7% by 2032. Short term impediments such as drought in Brazil or Argentina could accelerate this decline.

The region is a major contributor to global agriculture. Between 2020 and 2022, it accounted for 14% of the net value of agriculture and fish production globally and its share in total exports is higher at 17%. The importance of agricultural exports in the region is further underscored by its growing share in total production value, which has risen to 45%. Historic export growth has been aided by greater competitiveness, with total factor productivity increasing by 40% from 2000 to 2019.[18] Despite lower labour input, output growth has been underpinned by rising material inputs, notably fertiliser, which doubled over the period 2000 to 2019. Increasing cost pressure over the past two years, combined with availability constraints in 2022 following Russia's war against Ukraine curtailed historically high fertiliser application rates. With expected growth in the coming decade predominantly export led, input use efficiency and the success of its climate change mitigation and adaptation strategies will be critical to maintain and grow competitiveness, as will global approaches regarding openness to trade and an increased focus on environmental sustainability by some major importers. Despite the region's significant export orientation, several countries in the region are also net importers, such as Panama, El Salvador and most of the Caribbean, but intra-regional trade remains low.

As the biggest net exporter amongst all the regions covered in the *Outlook*, it is paradoxical that some of its major challenges relate to food security. These emanate from affordability constraints, rather than availability, and are underpinned by a combination of income distributional issues and current high prices. A major contributor has been rising poverty over the past decade, exacerbated by disruptions such as the pandemic and macroeconomic instability in many countries. The region's robust export orientation shielded agricultural growth from the macroeconomic challenges, but also made it vulnerable to increasing volatility, tighter financial conditions and weaker import demand globally in the near term. Post-pandemic, an increasing focus on development of domestic supply chains and the heightened awareness of environmental sustainability among some importers may influence trade policy and subsequent export prospects. Other trade related issues arise from increased concentration of exports by destination, which exposes export demand to higher market risks. Further to trade related risks, the sectors adaptation strategies and resilience to climate change impacts will be critical to sustained growth.

2.7.2. Production

Steady and sustained yield growth boosts crops and livestock

Agricultural and fish production in the region is projected to expand by 12% by 2032, markedly slower than in the past. Almost 70% of this growth is expected to come from crop production (+17%), compared to a more muted expansion of 11% in the livestock sector and a contraction of 10% in the value of fish production. Consequently, the share of crops in total production value is set to rise further to almost 60% by 2032, with a further 42% attributed to livestock and 9% to fish.

The region's land abundance contributes to strong crop production growth, which is derived from a combination of expansion and intensification. Total land used for agriculture is expected to rise by 6.3 Mha, reversing a historic trend of decline. This includes a 7.1 Mha expansion in cropland, as well as a small reduction in pasture. Amid rising prevalence of double cropping, the expansion in total area harvested, at 7%, is significantly faster than that of crop land use. Of the additional 13.9 Mha added to total area

harvested by 2032, more than half is dedicated to maize and soybeans, which account for 29% and 22% of the expansion respectively by 2032. The region already accounts for just over half of global soybean production, and this share is expected to rise to 54% by 2032. Consequently, supply fluctuations within the region, particularly Brazil as its biggest producer, can cause substantial world price volatility. This was evident by the sharp increase in soybean prices amid drought conditions in 2021 and, in the face of ongoing climate change, such events may become more frequent. Many countries in the region are already challenged by prolonged drought conditions, which influence productive potential, as well as the prevalence of natural disasters such as wildfires. Under normal weather conditions, the region has ample potential to fill supply gaps resulting from reduced production in Ukraine, but heightened uncertainty from the ongoing war in the Black Sea region further accentuates price responses to weather conditions in the Latin America and Caribbean region. While its contribution to global maize production is smaller than that of soybeans, production growth of 1.5% p.a. is sufficient to push the region's share in total maize production to 19% by 2032, with Brazil contributing more than half.

Further to area expansion, yield gains were instrumental to the regions strong production growth. The region is an intensive user of fertiliser and application rates per hectare increased faster than any other region over the past decade. Recent high prices heightened awareness of optimizing efficiency in fertiliser use and over the coming decade, application rates per hectare are expected to rise by only 4%. Nevertheless, the combination of technological innovation and practices that optimize efficiency support expected yield gains in most major crops, including a 9% gain in cereal yields and a 12% gain in oilseed yields by 2032. This also enables further improvement of 12% in the net value of production per hectare of cropland, as well as a 6% reduction in the fertiliser required per calorie produced.

The region provides 16% of global livestock production and while growth of 1% p.a. is expected to be slower than in the crop sector, it is sufficient to sustain its contribution to global value. Growth prospects are sensitive to the risks posed by animal disease. Among the various meats, poultry is expected to grow the fastest, enabling it to account for just over 60% of additional meat production by 2032. Its short production cycle aids rapid improvements in genetics and feed conversion, supporting growth prospects, while the decline in feed prices relative to meat in the medium term will incentivise expansion. Bovine and pigmeat are expected to grow by 0.9% p.a. and 1.2% p.a. respectively, but the bovine sector is bigger and will account for 22% of additional meat production by 2032. Productivity gains will be instrumental to growth, as an 9% expansion in beef production results from a mere 3% expansion in the beef herd by 2032.

Fish production comprises just 11% of total value in the region and this share is expected to decline to 9% by 2032, due to a 10% contraction in total output. Production is still predominantly derived from captured fisheries, but aquaculture is developing in several countries and by 2032, is expected to contribute 30% of total fish production. Captured fisheries are expected to remain volatile over the projection period, influenced by intermittent *El Niño* effects, which have a strong impact in the region and tends to influence fish used for the production fishmeal and fish oil.

GHG emissions from agriculture are expected to rise by 3% over the coming decade, form both crop and livestock products. By 2032, the region is expected to account for almost 18% of the global emissions from agriculture, higher than its share in total output. Nevertheless, expressed relative to the net value of agricultural production, emissions per unit value of output are set to decline consistently over the next ten years.

2.7.3. Consumption

Dietary patterns are complex but evolving

A decade of growth in total calorie availability in the region has largely stagnated since 2015. This mirrors movements in per capita income levels, which declined because of macroeconomic instability. More

recently, the pandemic induced recession in 2020 and subsequent increase in food prices further constrained affordability of nutritious food products, resulting in consecutive years of decline in calories available for consumption. By 2032, average per capita intake is expected to reach 3 111 kcal/person per year, but growth is slow at only 3% for the ten-year period. This marks an increase of only 89 kcal/person/day, due to gains in consumption of cereals, meat, dairy and vegetable oil, along with reduced sugar consumption. Despite the decline of 2 kg per person per year by 2032, sugar consumption in the region remains high, at almost 65% above the global average.

In a region challenged by the double burden of persistent food insecurity and malnutrition in all its form, amid rising prevalence of overweight and obesity, the reduction in sugar consumption reflects a shift to increased health awareness, which benefits from the introduction of initiatives such as front of package labelling legislation and sugar sweet beverage taxes. While efforts to induce healthy eating may start to bear fruit, the current cycle of high food prices continues to challenge food security and nutritional quality. Persistently high costs of healthy diets and affordability constraints amongst those on lower incomes affect both the quality and quantity of food intake, despite the positive impact of initiatives such as school feeding programs, which are estimated to benefit up to 37% of the poorer members of the population.

Per capita protein consumption is expected to reach 90g/person/day by 2032, an increase of 3.5g/person from current levels. This gain largely accrues to animal products, which accounts for two-thirds of the growth in protein availability. Meat consumption is expected to rise by 2.9 kg per capita to almost 53 kg/person/year by 2032 – almost 80% higher than the global average. Growth is derived from poultry and pigmeat, where consumption is expected to rise by 0.6% p.a., while a modest decline is expected in bovine meat consumption by 2032. Fish consumption in the region is still low, around half of the global average, but is set to expand by 0.3% p.a., to reach 11 kg/person/year by 2032.

Animal feed use is expected to rise by 13% over the next ten years, faster than meat and dairy production. This comes despite expected genetic improvement that results in better feed conversion ratios and reflects further intensification in livestock production systems, which is integral to growth. More than 60% of additional feed use comes from maize, with an additional 24% from protein meal, mirroring typical ratios in poultry rations and resulting in growth of 15% in maize and protein meal feed use.

The region is also a major contributor to the global ethanol market and by 2032 is expected to raise its share in world production to 31%. Brazil constitutes almost 90% of ethanol production and use in the region. Sustained by its RenovaBio programme, designed to reduce emission intensity as part of its COP 21 commitments, ethanol use is expected to rise by 35% over the coming decade. Its rate of production growth is only marginally slower at 33%, with sugarcane expected to remain the primary feedstock. Consequently, Brazil's share in global ethanol exports could decline to 15% by 2032.

2.7.4. Trade

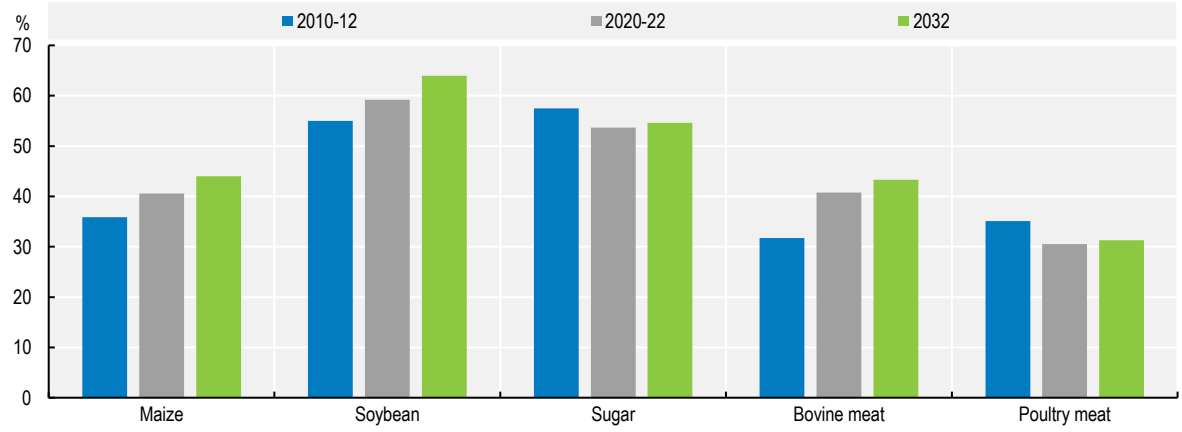
Exports are key to sustained agricultural growth

Latin America and the Caribbean is the largest net exporter amongst all the regions included in this Chapter. Exports have been integral to its agricultural growth, reducing its exposure to the macroeconomic instability within the region and improving resilience to exogenous shocks. The share of exports in total agricultural production has increased consistently and is expected to reach 50% by 2032. This follows an expected expansion of 27% in its trade surplus for agricultural products, which will also push its share in global exports to almost 18% by 2032. Brazil is the biggest exporter in the region and the primary driver of growth, but its projected expansion of 1.8% p.a. is significantly slower than the 6% p.a. achieved over the past decade. Other notable contributors to regional export growth include Mexico and Argentina, while exports of fresh fruit from Peru are also expected to rise rapidly.

The region counts amongst the leading global exporters for a range of commodities and by 2032 is expected to sustain a global export share of more than 30% for maize, soybeans, sugar, beef, poultry and fishmeal. In the case of maize, soybeans and beef, expected export growth is sufficient to increase its global market share to 44%, 64% and 43% respectively. Its share of sugar and poultry exports globally is also expected to increase marginally to 55% and 31% respectively, whereas reduced production volumes result in a declining share of the world's fishmeal exports.

The importance of exports to agriculture in the region is underscored by its central position in global trade, as well as the pivotal role of exports in driving production growth. Sustained growth will depend on continued orientation towards open trade in the global market. The disruptions of the past three years exposed vulnerabilities in the global trade system, which resulted in logistical bottlenecks and rising costs. Amid the crises, many exporting countries imposed trade policies that prioritise domestic supply, creating opportunities for the Latin American and Caribbean region, which did not impose restrictions, to gain export market share. At the same time, the development of domestic supply chains has been prioritised in many parts of the world, to mitigate risks of disruption. Over the coming decade, the evolution of trade relations in various parts of the world will influence the region, creating both new opportunities and further risks. While export led growth has served it well in the past, the global market is increasingly volatile and international trade more fragile, with risks of geopolitical fragmentation. Improved internal market integration and functioning of small and medium enterprises, cooperatives and family farms could expand trade within the region, thus diversifying market opportunities and bolstering the sector's resilience.

Figure 2.28. Trends in export market shares of the Latin America and the Caribbean



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

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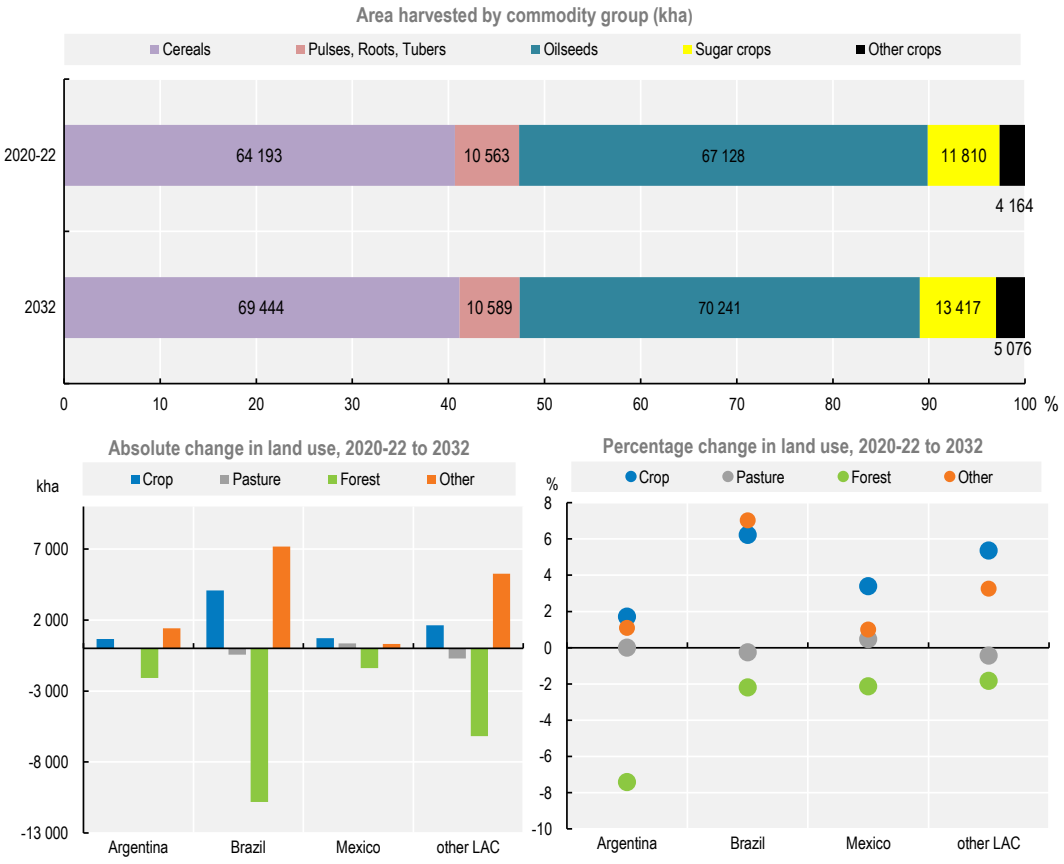
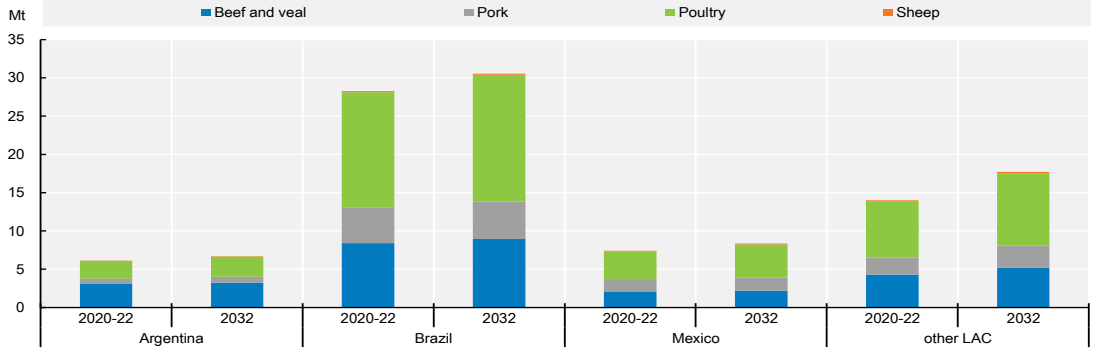
Figure 2.29. Change in area harvested and land use in Latin America and the Caribbean



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

StatLink https://stat.link/ycoxit

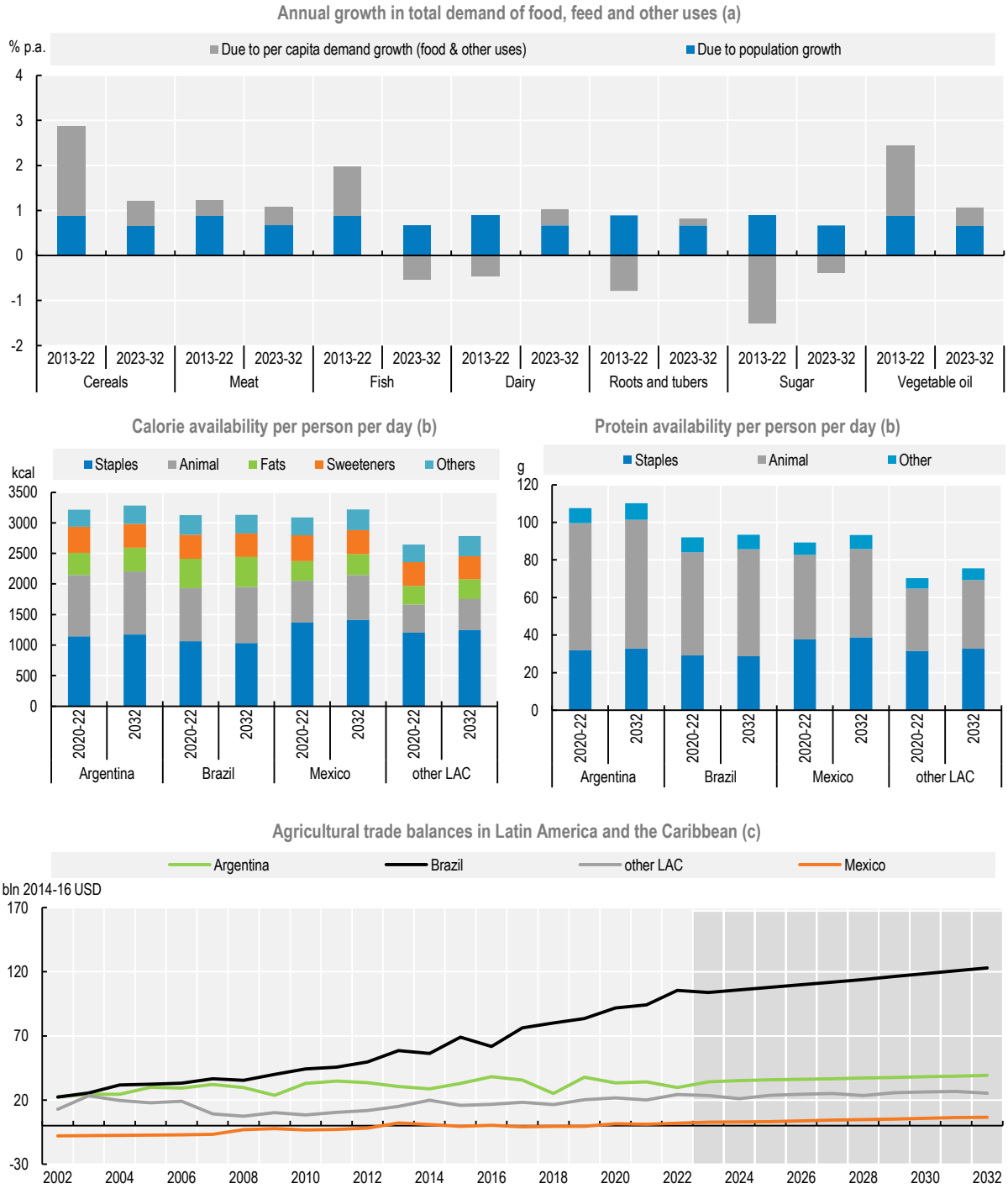
Figure 2.30. Livestock production in Latin America and the Caribbean



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

StatLink https://stat.link/ed61fl

Figure 2.31. Demand for key commodities and food availability in Latin America and the Caribbean



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 https://stat.link/p5ytk9

Table 2.7. Regional Indicators: Latin America and the Caribbean Region

	Average			%	Growth [2]	
	2010-12	2020-22 (base)	2032	Base to 2032	2013-22	2023-32
Macro assumptions						
Population ('000)	595 669	654 446	704 792	7.69	0.89	0.66
Per capita GDP[1] (kUSD)	9.59	8.73	10.49	20.14	-1.47	1.58
Production (bln 2014-16 USD)						
Net value of agricultural and fisheries[3]	355.5	437.7	488.9	11.69	2.00	1.01
Net value of crop production[3]	161.2	206.7	241.9	17.02	1.85	1.23
Net value of livestock production[3]	150.0	183.2	203.9	11.30	1.99	0.99
Net value of fish production[3]	44.3	47.8	43.1	-9.82	2.76	0.06
Quantity produced (kt)						
Cereals	201 006	286 237	336 493	17.56	3.71	1.36
Pulses	7 401	7 212	7 944	10.15	-0.25	1.18
Roots and tubers	14 532	14 084	15 040	6.79	0.02	0.84
Oilseeds[4]	5 422	6 626	7 072	6.73	3.57	0.74
Meat	47 210	55 817	63 302	13.41	1.63	1.16
Dairy[5]	9 218	10 334	11 507	11.34	0.34	0.98
Fish	15 702	16 869	15 204	-9.87	2.69	0.05
Sugar	56 385	56 249	64 632	14.90	-0.40	1.14
Vegetable oil	21 311	27 837	32 955	18.39	1.91	1.21
Biofuel production (mln L)						
Biodiesel	5673.36	9278.75	11576.23	24.76	5.50	1.48
Ethanol	26 855	35 237	46 834	32.91	2.08	2.32
Land use (kha)						
Total agricultural land use	658 646	650 774	657 098	0.97	-0.10	0.09
Total land use for crop production[6]	150 296	155 801	162 905	4.56	0.42	0.33
Total pasture land use[7]	508 350	494 973	494 193	-0.16	-0.26	0.01
GHG Emissions (Mt CO2-eq)						
Total	1 027	1 095	1 128	3.01	0.78	0.16
Crop	98	106	112	5.98	1.75	0.60
Animal	910	959	983	2.54	0.59	0.10
Demand and food security						
Daily per capita caloric food consumption[8] (kcal)	2 867	2 927	3 012	2.91	0.07	0.26
Daily per capita protein food consumption[8](g)	80.5	83.7	87.1	4.1	0.2	0.3
Per capita food consumption (kg/year)						
Staples[9]	151.1	148.0	150.7	1.80	-0.16	0.17
Meat	46.9	49.7	51.9	4.31	0.46	0.37
Dairy[5]	15.9	15.9	16.5	3.68	-0.42	0.33
Fish	10	11	11	1.77	0.13	0.29
Sugar	44	38	37	-4.18	-1.27	-0.39
Vegetable oil	17	18	18	2.95	0.11	0.18
Trade (bln 2014-16 USD)						
Net trade[3]	88	153	194	26.76	..	..
Value of exports[3]	161	248	305	22.88	4.19	1.70
Value of imports[3]	74	95	111	16.63	3.15	1.19
Self-sufficiency ratio[10]						
Cereals	102.7	112.8	113.6	0.72	1.32	0.23
Meat	111.0	112.4	112.7	0.23	0.39	0.09
Sugar	211.5	226.2	245.5	8.56	0.65	1.04
Vegetable oil	122.6	125.5	129.7	3.34	-0.65	0.15

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 2004-06. 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 Production / (Production + Imports - 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.

References

Chamberlin, J., T. Jayne and D. Headey (2014), "Scarcity amidst abundance? Reassessing the potential for cropland expansion in Africa", *Food Policy*, Vol. 48, pp. 51-65, https://doi.org/10.1016/j.foodpol.2014.05.002. [6]

FAO (2022), *Ukraine: Impact of the war on agriculture and rural livelihoods in Ukraine*, FAO, https://doi.org/10.4060/cc3311en. [9]

FAO, IFAD, PAHO, UNICEF and WFP (2023), *Regional Overview of Food Security and Nutrition – Latin America and the Caribbean 2022*, FAO, https://doi.org/10.4060/cc3859en. [13]

FAO, IFAD, UNICEF, WFP and WHO (2022), *The State of Food Security and Nutrition in the World 2022*, FAO, Rome, https://doi.org/10.4060/cc0639en. [8]

Fuglie, K. (2015), "Accounting for growth in global agriculture", *Bio-Based and Applied Economics*, Vol. 4/3, pp. 201-234, https://doi.org/10.13128/BAE-17151. [12]

Jayne, T. et al. (2016), "Africa's changing farm size distribution patterns: the rise of medium-scale farms", *Agricultural Economics*, Vol. 47/S1, pp. 197-214, https://doi.org/10.1111/agec.12308. [5]

Kelly, M. (2016), "The Nutrition Transition in Developing Asia: Dietary Change, Drivers and Health Impacts", in *Eating, Drinking: Surviving, SpringerBriefs in Global Understanding*, Springer International Publishing, Cham, https://doi.org/10.1007/978-3-319-42468-2_9. [3]

Law, C., I. Fraser and M. Piracha (2020), "Nutrition Transition and Changing Food Preferences in India", *Journal of Agricultural Economics*, Vol. 71/1, pp. 118-143, https://doi.org/10.1111/1477-9552.12322. [2]

OECD/FAO (2019), *OECD-FAO Agricultural Outlook 2019-2028*, OECD Publishing, Paris/Food and Agriculture Organization of the United Nations, Rome, https://doi.org/10.1787/agr_outlook-2019-en. [14]

Reardon, T. et al. (2014), *Urbanization, Diet Change, and Transformation of food supply chains in Asia*, Michigan State University, Global Center for Food Systems Innovation, https://www.fao.org/fileadmin/templates/ags/docs/MUFN/DOCUMENTS/MUS_Reardon_2014.pdf. [4]

Tarasuk, V. and A. Mitchell (2020), *Household food insecurity in Canada, 2017-18*, Toronto: Research to identify policy options to reduce food insecurity (PROOF), https://proof.utoronto.ca/wp-content/uploads/2020/03/Household-Food-Insecurity-in-Canada-2017-2018-Full-Reportpdf.pdf. [11]

UN DESA (2020), *World Population Ageing 2019*, United Nations, New York, https://doi.org/10.18356/6a8968ef-en. [1]

UN WWDR (2022), *World Water Development Report 2022: Groundwater: Making the invisible visible*, United Nations, New York, https://unesdoc.unesco.org/ark:/48223/pf0000380721. [7]

Weersink, A. et al. (2021), "COVID-19 and the agri-food system in the United States and Canada", *Agricultural Systems*, Vol. 188, p. 103039, https://doi.org/10.1016/j.agsy.2020.103039. [10]

Notes

[1] Australia, China, Japan, Korea, and New Zealand.

[2] 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*.

[3] This analysis assumes the EU-27 as one integral region.

[4] 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.

[5] The old age dependency ratio is calculated that the over 65 population divided by 15-64 population.

[6] 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*.

[7] Fuglie, K. (2015), "Accounting for growth in global agriculture", *Bio-based and Applied Economics*, Vol. 4 (3): 221-254 (updated to 2019, USDA).

[8] See “Southeast Asia, Prospects and Challenges” in the *OECD-FAO Agricultural Outlook 2017-2026*.

[9] Source OECD-FAO interpolated for 2018-20 from the database of the Global Trade Analysis Project (GTAP) 2011, using food expenditure and GDP data used in this *Outlook*.

[10] ESCAP-World Bank trade cost database: https://www.unescap.org/resources/escap-world-bank-trade-cost-database. Summarised in Tralac report: https://www.tralac.org/resources/infographics/15537-intra-africa-non-tariff-trade-costs-for-the-period-2015-2019.html.

[11] Middle East: Saudi Arabia and Other Western Asia. Least Developed: North Africa Least Developed. North Africa: Other North Africa. For mentioned regions, see summary table for regional grouping of countries.

[12] Source OECD-FAO interpolated for 2018-20 from the database of the Global Trade Analysis Project (GTAP) 2011, using food expenditure and GDP data used in this Outlook

[13] Fuglie, K. (2015), “Accounting for growth in global agriculture”, *Bio-based and Applied Economics*, Vol. 4 (3): 221-254 (updated to 2019, USDA, regional aggregation of countries).

[14] For mentioned regions, see summary table for regional grouping of countries.

[15] Source: OECD-FAO interpolated for 2018-20 from the database of the Global Trade Analysis Project (GTAP) 2011, using food expenditure and GDP data used in this *Outlook*.

[16] Other LAC: Chile, Colombia, Paraguay, Peru and South and Central America and the Caribbean. For mentioned regions, see Summary table for regional grouping of countries.

[17] Source OECD-FAO interpolated for 2018-20 from the database of the Global Trade Analysis Project (GTAP) 2011, using food expenditure and GDP data used in this *Outlook*.

[18] Fuglie, K. (2015), "Accounting for growth in global agriculture", *Bio-based and Applied Economics*, Vol. 4 (3): pp. 221-254 (updated to 2019, USDA).