

Global Outlook of Animal Sourced-Food Systems to 2050

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Key Messages

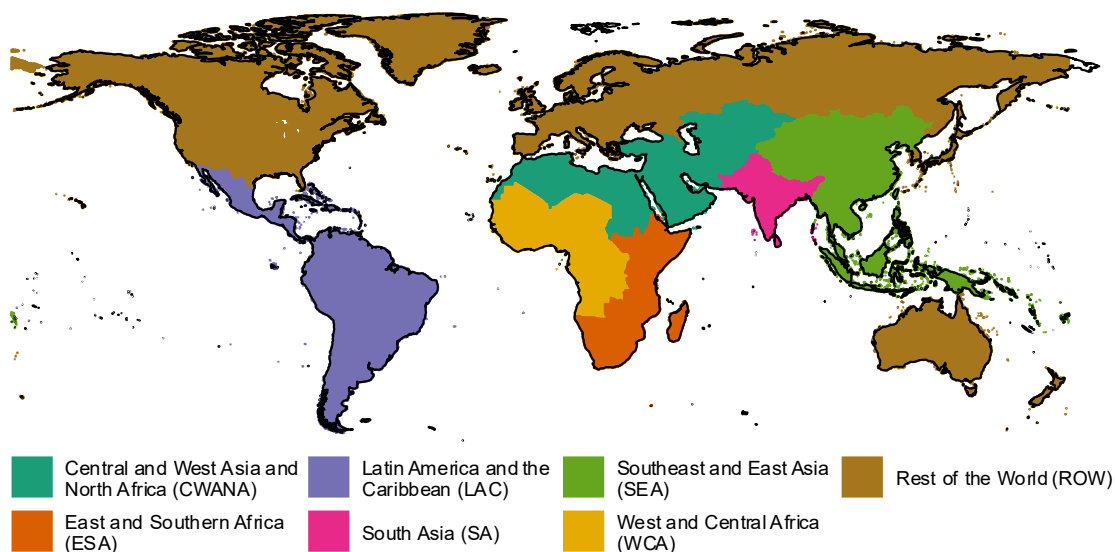
- **Global demand for ASF will continue to grow, particularly in low- and middle-income regions.** ASF demand is projected to increase by around 30% between 2025 and 2050, with the largest increases occurring in South Asia, West and Central Africa, and East and Southern Africa. Rising populations and incomes will remain the primary drivers of this growth, increasing pressure on food systems to deliver affordable and nutritious animal-source foods.
- **Productivity growth will be essential to meeting future demand sustainably.** Nearly two-thirds of projected production growth is expected to come from improvements in productivity rather than increases in animal numbers. This highlights the critical role of technological innovation and transfer (particularly to low-income countries), improved genetics, animal health services, feed efficiency, and better farm management practices. Strengthening agricultural research and development, extension services, veterinary systems, and access to improved technologies will be essential to increasing production while limiting pressure on natural resources.
- **Climate change will increasingly shape the future of animal food systems.** Climate-related impacts on feed availability and crop productivity are expected to intensify, particularly in Sub-Saharan Africa and South Asia. While the projections presented in this study only include the partial indirect impact of climate change on ASF, other work (see Thornton et al. 2022, Godde 2021) has shown that climate change can have large impacts on ASF through reduced feed intake, heat stress and disease.
- **Growing demand will outpace production in several regions, increasing import dependence.** While production is projected to increase substantially, self-sufficiency declines in most regions. West and Central Africa and East and Southern Africa experience particularly large reductions in their ability to meet domestic demand, resulting in higher import requirements.

1. Introduction

Animal-sourced foods (ASF) play an important role in food security, nutrition, livelihoods, and economic development. However, they are already scarce in many low- and middle-income countries (LMICs), and their demand is expected to grow as populations grow, incomes rise, and diets diversify. At the same time, climate change, resource constraints, and environmental sustainability concerns appear as limiting factors, reshaping the future of ASF systems. Understanding how these forces interact, not only today but in the future, is essential for identifying pathways that can support improved nutrition and livelihoods while maintaining the resilience and sustainability of agrifood systems.

This chapter presents a forward looking assessment of selected ASF system outcomes to mid-century with a focus on low- and middle-income regions in accordance with the six CGIAR focus regions (Figure 1).¹ It examines future trends in ASF demand, production, trade, food security and prices over the next 25 years using the most recent projections from IFPRI's International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) model (version 4, Mishra et al. 2026).

Figure 1 Map of the six CGIAR focus regions used in the analysis



Source: Wiebe et al. (2026)

¹ ASF here are defined as beef, pork, lamb, poultry, eggs, dairy and aquatic foods.

Assessing the multiple dimensions of agrifood systems is inherently complex, and projecting these dimensions into the future presents an even greater challenge. Recognizing the constraints associated with measuring and modelling all relevant indicators consistently across countries and regions, we compared our results to those of similar global agrifood systems models, to assess their robustness. Box 1 presents this comparison.

We conducted the baseline assessment following Shared Socioeconomic Pathway 2 (SSP2), a "middle-of-the-road" future in which social, economic, and technological trends follow historical patterns. Assumptions about future changes in temperature and precipitation are taken from the IPCC's Representative Concentration Pathway (RCP) 7.0 as modeled by the MRI-ESM2-0 general circulation model (Eyring et al. 2016, Yukimoto et al. 2019). This choice of reference scenario is consistent with the IFPRI Global Agrifood Systems Outlook to 2050 report where motivation for the choice of scenario can be found (Wiebe et al. 2026). Additionally, we considered optimistic (SSP1) and pessimistic (SSP3) scenarios to highlight the range of potential futures given uncertainties related to the evolution of socioeconomic indicators. The optimistic scenario describes a future of greater international cooperation and sustainable development, whereas the pessimistic scenario describes a future of regional rivalry and slow development. The scenarios, i.e. SSP1-RCP7.0-MRI, SSP2-RCP7.0-MRI, and SSP3-RCP7.0-MRI are hereafter referred to as Optimistic, Reference and Pessimistic.

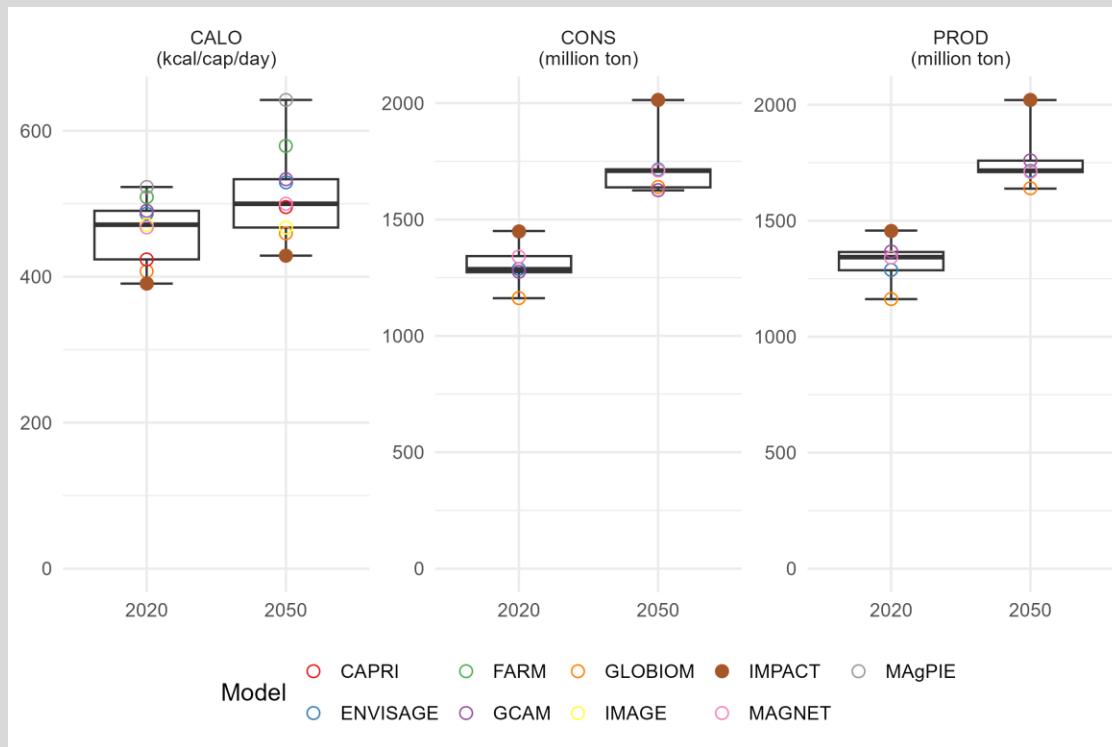
Box 1: Comparison of IMPACT Reference projections

Figure 2 below summarizes the projections of key ASF indicators from IMPACT and other similar global agrifood systems models. Projections across models show an increase in food consumption (CONS), global calorie availability (CALO) and Production (PROD) of ASF between 2020 and 2050. Relative to other projections, IMPACT is characterized by relatively higher projections of aggregate consumption and production growth, but modest projections of per-capita calorie availability.

- Global calorie availability from ASF in IMPACT increases from 391 kcal/person/day in 2020 to 429 kcal/person/day in 2050. The median calorie availability across models increases from 471 kcal/person/day in 2020 to 499 kcal/person/day in 2050.
- IMPACT ASF food consumption increases from 1,451 million tons in 2020 to 2,013 million tons in 2050 in comparison to the median across models which rise from 1,286 million tons to 1,710 million tons globally.
- ASF production globally increases from 1,457 million tons in 2020 to 2,020 million tons in 2050 globally according to estimates from IMPACT with the median across models going from 1,343 million tons to 1,716 million tons globally.

The variation in indicators across models is driven by underlying differences in model structure, calibration of datasets, and native approaches to implementing scenarios. Sundiang et al. 2025, Beier et al. 2025, and Mishra et al. 2025 provide more information on the different models.

Figure 2 Global ASF projections for calorie availability, food demand and production to 2050



Source: Authors based on Sundiang et al. 2025b

Note: CONS is food consumption, CALO is calorie availability, and PROD is Production.

2. Recent global trends in ASF systems and key drivers of change

The global livestock sector has experienced significant changes over the last few decades, driven by rising incomes, urbanization, and population growth. Between 1990 and 2015, average global per capita demand for ASF increased by over 40 kg per year. This growth has, however, been unevenly distributed across commodities and regions. For example, poultry and pork demand rose 106% and 26% while beef and mutton demand has remained largely stagnant; beef demand in Europe and the USA declined while demand in Brazil increased by double digits (Herrero et al. 2023).

To meet rising demand, global ASF production has increased by more than 60% since 1990, with poultry meat nearly tripling in volume. The nature of this production growth varies significantly by economic context. In high-income and temperate regions, production increases have been driven by intensification and higher productivity per animal, often accompanied by a decrease in total animal numbers. Conversely, in regions like Sub-Saharan Africa, production growth is almost entirely the result of expanding animal numbers, as productivity has remained stagnant for decades. While the livestock sector has generally become more efficient - using 62% less land and emitting 46% fewer greenhouse gases per kilocalorie than in 1961 - the aggregate environmental impact continues to rise due to the scale of increased global demand. The trade value of ASF has also expanded dramatically, with global exports nearly tripling between 1990 and 2010, although traded ASF still represents less than 20% of total production value (Herrero et al. 2023).

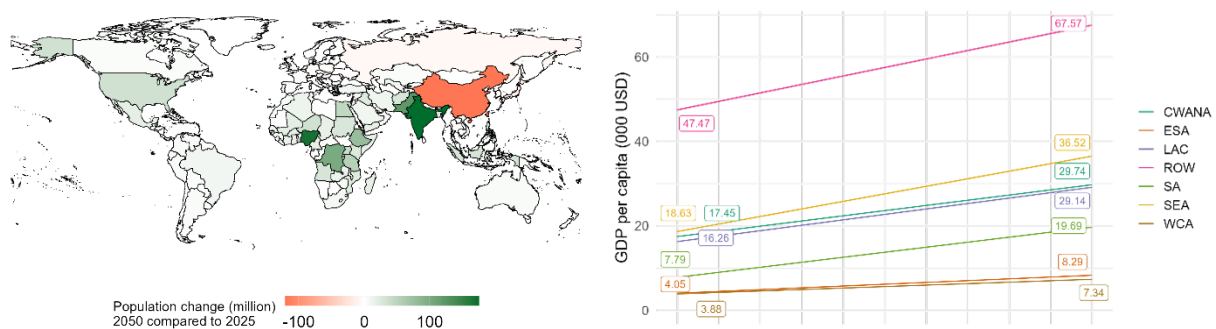
Looking ahead, agrifood systems are expected to be driven by several key megatrends as outlined in ISDC (2023). This section discusses the key drivers for ASF pertaining to the IMPACT model. It is important to note that these assumptions do not account for recent changes due to uncertainties in trade and policy but rather support the analysis of longer-term patterns of change.

2.1 Increasing population and per capita income

There are two megatrends that could put agrifood systems under pressure through increasing demand: growing global population and rising per capita income with the latter changing consumption patterns. Today the global population is around 7.9 billion, and it is projected to reach 9.6 billion under the Reference scenario. While South Asia remains the most populated region, West and Central Africa and East and Southern Africa populations increase at an average annual rate of 2.3% and 1.8% - more than double the global average (0.7%). Southeast and East Asia is the only region with a decreasing population due to low fertility rates and rapid aging (Samir and Lutz 2017). Population growth under the Optimistic (Pessimistic) scenario is estimated to be lower (higher) than the Reference scenario as higher (lower) educational levels lead to lower (higher) fertility rates. Figure 3(a) illustrates the change in total population by 2050.

Population growth will be accompanied by increasing per-capita income according to SSP projections, which could drive per capita demand of ASF (Wiebe et al., 2026). As per capita incomes grow, calorie portion shares from starchy staple foods decrease and food consumption becomes more diversified. In the Reference scenario, global income per capita is projected to increase by 61% between 2025 and 2050. The increase is primarily driven by higher per capita income in Southeast and East Asia and South Asia which more than doubles by 2050 (see Figure 3(b)). Per capita income remains highest in Rest of the World with levels 1.8 and 3.4 times larger than in Southeast and East Asia and South Asia by 2050, and 8.1 and 9.1 times larger than in East and Southern Africa and West and Central Africa.

Figure 3(a) Change in total population; and (b) GDP per capita by region (Reference, 2025-2050)



Source: Wiebe et al. (2026) 2(a) based on IIASA (2024) population projections; (b) based on OECD (2024) GDP projections from SSP Database version 3 (2024) and GLOBE model.

Note: CWANA is Central and West Asia and North Africa; ESA is East and Southern Africa; LAC is Latin America and the Caribbean; SA is South Asia; SEA is Southeast and East Asia; WCA is West and Central Africa; ROW is Rest of the World.

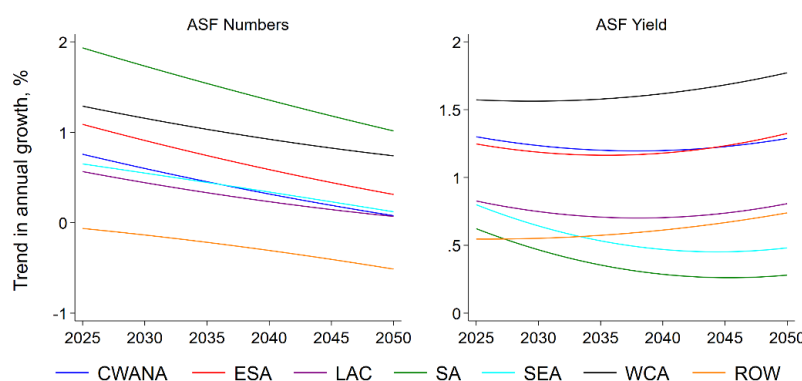
2.2 Climate change, technology, and innovation

Climate change megatrend will put resource use for food production under stress although technology and innovation could relieve some of this pressure. Climate change is expected to lead to higher temperatures, increased precipitation uncertainty and more frequent extreme events across the globe. LMICs will be more negatively affected given existing warmer and drier climate conditions, heavy reliance on rain-fed subsistence farming and low adaptive capacity. Climate change affects ASF systems by reducing livestock productivity, altering feed and water availability, increasing the prevalence of animal diseases, and disrupting supply chains through more frequent extreme weather events (Thornton & Herrero 2015, Godde et al. 2021, IPCC 2023). In this analysis the impacts of climate change on livestock are only accounted for through feed availability and feed prices; the direct impacts of climate change on ASF production are not

accounted for here.² Wiebe et al. (2026) identify southern Africa and parts of North America, North Africa, and southwest Asia as key areas of concern for crop production under the Reference scenario given large changes in both temperature and precipitation. Their results show that climate change negatively affects maize yields (a key feed commodity) in both CGSIX and Rest of the World.

While increased animal numbers played an important role historically, particularly in developing countries, advances in genetics, nutrition, veterinary medicine, and farm management have become increasingly important and account for a large share of productivity gains in modern ASF system (Thornton 2010).³ This analysis includes initial assumptions, informed by expert opinion, on future yield and herd size by commodity and region to capture the long-term trend in technology and innovation (see Figure 4). Initial assumptions indicate positive herd growth across most regions, with total herd size increasing, although the rate of expansion does slow over time as producers achieve higher animal productivity and resource limitations limit further physical herd expansion. Rest of the World is the only region where negative growth is experienced and animal numbers decline. Yield growth remains positive over the period, either increasing or flattening by 2050 driven by technological advancements, biological management, and industrial efficiency. The initial assumptions serve as the starting point for the IMPACT model. Final yield and herd outputs are determined within the model through model interactions.

Figure 4 Trends in initial ASF number and yield growth assumptions by region, 2025-2050



Source: Authors based on IMPACT v4.1.4. Note: ASF in this figure excludes aquatic foods ⁴

Note: CWANA is Central and West Asia and North Africa; ESA is East and Southern Africa; LAC is Latin America and the Caribbean; SA is South Asia; SEA is Southeast and East Asia; WCA is West and Central Africa; ROW is Rest of the World.

² The impact of climate change on livestock feed excludes sources such as rangeland grasses and crop residues (Msangi et al. 2014) which are important in LMICs.

³ While this holds for lower-middle-income countries in the developing world, productivity in low-income countries has declined, as constraints such as limited access to technology, finance, and infrastructure have hindered the adoption of productivity-enhancing technologies and practices (Shah et al., 2026).

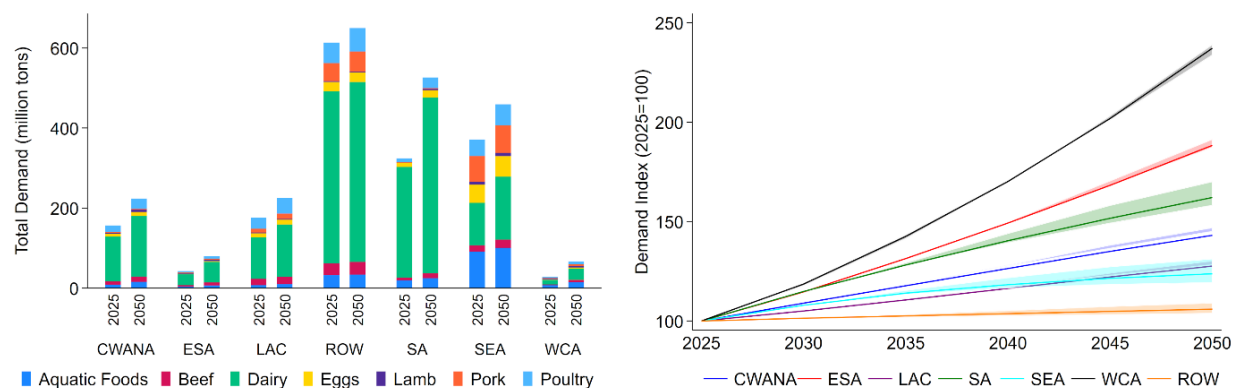
⁴ Aquatic food demand is driven by exogenous income and population growth trends, together with endogenous consumer prices.

2.3 Demand outlook

Global ASF demand is projected to increase 30% by 2050, rising from 1.7 million tons in 2025 to 2.2 million in the Reference scenario. The increase is driven by higher demand in the CGSIX regions as total demand increases by 44% or 482 million tons. The largest increase in demand in the Reference scenario is in South Asia (+200 million tons). Demand, however, grows fastest in West and Central Africa – more than doubling – due to growth in population. By commodity (see Figure 5(a)), the largest increase in ASF demand is for dairy, which increases by 339 million tons over the period, driven by South Asia. In growth terms, lamb and poultry experience the fastest increases, rising by 55% and 43% respectively. Growth in lamb is driven mostly by increased demand in Central and West Asia and North Africa, West and Central Africa and South Asia; and demand for poultry is primarily from Southeast and East Asia and Rest of the World.

Uncertainty in projections because of socioeconomic assumptions are presented in Figure 5(b) where results from the Optimistic and Pessimistic scenarios are presented as bands around the Reference scenario (solid line). By 2050, global demand is 1.7% higher under the Optimistic scenario and -0.7% lower under the Pessimistic scenario. Impacts across regions, however, differ with the largest deviations from Reference occurring in Southeast and East Asia (Optimistic: +6.1%; Pessimistic: -3.7%) and South Asia (Optimistic: +4.9%; Pessimistic: -2.3%). Higher demand under the Optimistic scenario is driven by higher per capita income, while per capita income under the Pessimistic scenario is lower. Central and West Asia and North Africa and Latin America and the Caribbean are the only regions to see higher demand growth under the Pessimistic scenario as well, despite lower per capita income growth, as population increases are higher than in the Reference scenario.

Figure 5(a) ASF demand by region and sub-group; (b) Total ASF demand by region and scenario

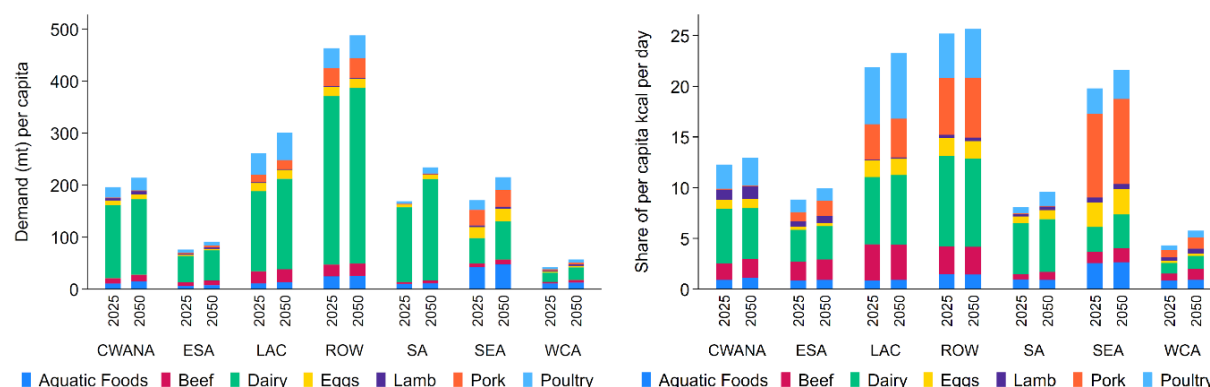


Source: Authors based on IMPACT v4.1.4.

Note: Shaded bands in Figure (b) indicate results for scenarios SSP1-RCP2.6-MRI and SSP3-RCP8.5-MRI. CWANA is Central and West Asia and North Africa; ESA is East and Southern Africa; LAC is Latin America and the Caribbean; SA is South Asia; SEA is Southeast and East Asia; WCA is West and Central Africa; ROW is Rest of the World.

Per capita global ASF demand increases by 11% between 2025 and 2050 in the Reference scenario. Across CGSIX, per capita ASF demand is 15% higher or more in almost all regions excluding Central and West Asia and North Africa (9.3%) although levels remain well below those experienced in high-income countries (i.e. Rest of the World) (see Figure 6(a)). In terms of per capita kilo calorie availability, an increase in the contribution of ASF is seen across all regions. The largest increases are in Southeast and East Asia (driven by dairy), South Asia (poultry) and West and Central Africa (pork and beef). Aquatic food calorie availability also increases over the period with the largest dietary share increase occurring in Central and West Asia and North Africa (see Figure 6(b)).

Figure 6(a) ASF demand per capita by region; (b) ASF share of daily per capita calories available



Source: Authors based on IMPACT v4.1.4.

Note: CWANA is Central and West Asia and North Africa; ESA is East and Southern Africa; LAC is Latin America and the Caribbean; SA is South Asia; SEA is Southeast and East Asia; WCA is West and Central Africa; ROW is Rest of the World.

ASF are rich in a variety of nutrients that tend to be more bioavailable than those from plant-based foods, and their potential to close micronutrient gaps is well established (Leroy et al. 2023, Beal et al., 2023). In low- and middle-income countries, per capita calorie consumption of ASF is low (less than 15 percent in WCA, SA, ESA, and CWANA) and while it is expected to increase as income rises, the increase is expected to be moderate. The role of ASF as a vehicle for intervention to reduce hunger and micronutrient deficiency in these countries faces constraints, including low production (net ASF imports increase to 2050 for most low- and middle-income countries), high prices (relative to incomes) and higher household food price sensitivity (Headey and Alderman 2019, Paro et al. 2025). Although ASF prices are expected to increase only moderately over the period (Figure 9(b)), prices remain high compared to other food sources. Further research is needed on the pathways linking ASF production and consumption to nutrition outcomes, and on cost-effective, scalable strategies to ease affordability and supply constraints.

2.4 Supply outlook

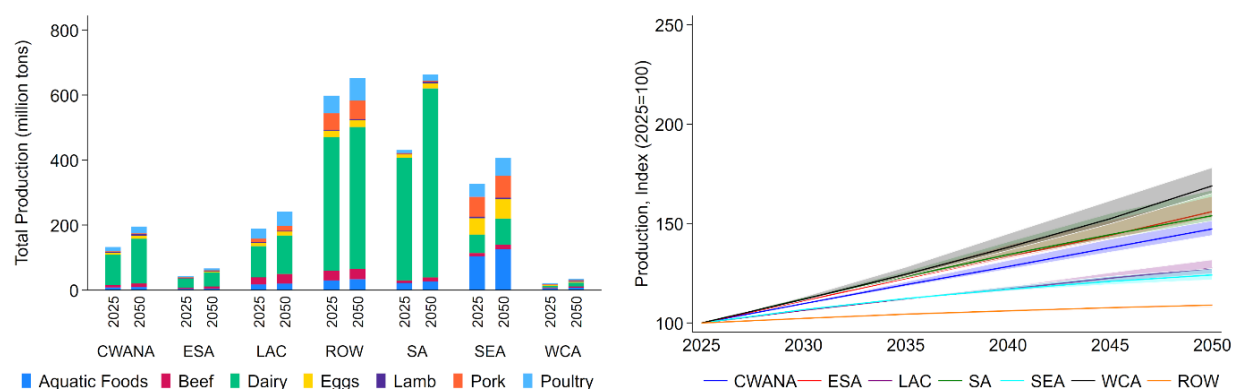
In the reference scenario, total ASF production is projected to increase by 30% between 2025 and 2050 (1% per annum). The change in production is driven by increases in yields which explain 70% of the change. At the aggregate level, animal yields increase by 22% between 2025 and 2050, while animal numbers increase by 8%. Yield changes also drive production increases across ASF commodities, excluding eggs where the change in number of animals is the larger contributor. The latter is held in all regions except Central and West Asia and North Africa and Southeast and East Asia where animal number changes also drive dairy production.

By region, South Asia production increases are largest, rising by 54% (232 million tons) compared to 2025. Growth in production is highest in West and Central Africa with levels increasing by 69% relative to 2025. Production volumes however remain small relative to other regions with total ASF production reaching 34 million tons by 2050 – less than 2% of supply (see Figure 7(a)).

By ASF sub-group, production increases are largest for dairy with volumes increasing by 339 million tons over the period. By 2050, South Asia becomes the largest dairy producer outperforming Rest of the World (the largest producer in 2025). Excluding dairy, the largest ASF producer in both 2025 and 2050 is Southeast and East Asia. By 2050, Southeast and East Asia is the largest producer of aquatic foods, eggs and pork; the second largest producer of poultry and the third largest producer of beef and lamb.

Uncertainty in production is larger than in demand in some regions, as illustrated in Figure 7(b). This result reflects the regional differences in socioeconomic assumptions, specifically population growth and income per capita between the different scenarios. Relative to the Reference scenario, production under the Optimistic scenario is generally higher across regions while it is lower under the Pessimistic scenario. By 2050, total ASF production under the Optimistic Scenario is almost 4% higher than in the Reference scenario and under the Pessimistic scenario it is almost 2% lower. The largest variation in production outcomes resulting from socioeconomic uncertainty is in South Asia where production could be 8.6% higher (Optimistic) or 2% lower (Pessimistic), followed by West and Central Africa (+6%; -2.6%) and East and Southern Africa (+5.4%; -2.1%). The latter are, however, smaller producers of ASF accounting for less than 5% of total production under all scenarios.

Figure 7(a) ASF production by region; (b) Total ASF production by region and scenario



Source: Authors based on IMPACT v4.1.4.

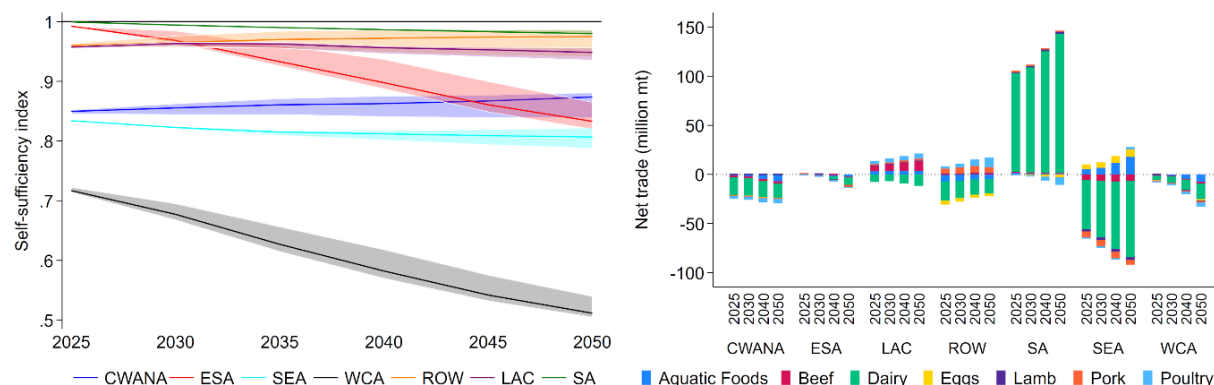
Note: Shaded bands in Figure (b) indicate results for scenarios SSP1-RCP2.6-MRI and SSP3-RCP8.5-MRI. CWANA is Central and West Asia and North Africa; ESA is East and Southern Africa; LAC is Latin America and the Caribbean; SA is South Asia; SEA is Southeast and East Asia; WCA is West and Central Africa; ROW is Rest of the World.

Based on demand preferences, only two of the regions assessed (namely Central and West Asia and North Africa and Rest of the World) experience a small increase in self-sufficiency⁵ over the projected period (see Figure 8(a)). In all other regions, the ability to meet demand decreases. The starkest decline is in West and Central Africa where production is only able to meet 51% of demand by 2050 compared to 72% in 2025. East and Southern Africa also sees a decline in self-sufficiency with the ability to meet demand, decreasing from 99% in 2025 to 83% in 2050. South Asia remains the most self-sufficient region in the CGSIX. Higher production uncertainty is also reflected in the self-sufficiency index.

The stronger increase in demand relative to production in the Reference scenario results in an increase in imports across most regions (see Figure 8(b)). The largest increases are in West and Central Africa and East and Southern Africa primarily due to increased dairy imports. Southeast and East Asia remain the largest net importer with net imports increasing by 16%. Rest of the World is the only region to see a decrease in import dependence with net imports decreasing by 17.5 million tons as poultry exports increase and dairy imports decrease. Latin America and the Caribbean and South Asia remain net exporters supported by beef and dairy respectively. Net exports in Latin America and the Caribbean and South Asia increase by 54% (3.3 million tons) and 29% (30.1 million tons) respectively.

⁵ Self-sufficiency here is calculated as the weighted sum of production/demand for each ASF sub-category, where production/demand for each sub-category cannot exceed 1. Excess production is not included in the self-sufficiency calculation.

Figure 8(a) Total ASF self-sufficiency by region and scenario; (b) ASF Net trade by region and sub-group



Source: Authors based on IMPACT v4.1.4.

Note: Self-sufficiency is calculated as the weighted sum of demand/production for each ASF sub-category, where demand/supply for each sub-category cannot exceed 1. Shaded bands in Figure (a) indicate results for scenarios SSP1-RCP2.6-MRI and SSP3-RCP8.5-MRI. CWANA is Central and West Asia and North Africa; ESA is East and Southern Africa; LAC is Latin America and the Caribbean; SA is South Asia; SEA is Southeast and East Asia; WCA is West and Central Africa; ROW is Rest of the World.

The increase in ASF production leads to a rise in the demand for feed. Global feed demand increases by 40% (612 million mt) between 2025 and 2050, accounting for nearly 20% of total demand for these crops which rose by 33% over the period.⁶ This contributes to the 6% per cent increase in world cereals prices between 2025 and 2050 projected by Wiebe *et al.* (2026). Maize remains the most important grain for feed, accounting for two-thirds of the increase in overall feed demand. Efforts to increase domestic ASF production and demand should consider potentially strong indirect effects, including on the prices of cereals, land allocation, and competing demand from households.

2.5 Prices

Relative to 2025 ASF prices are expected to be 1.2% higher in the reference scenario by 2050 (see Figure 9(a)). The rise in prices is driven by faster demand growth in the short- to medium-term. Between 2025 and 2040 demand increases at an average annual growth rate of 1.2%. ASF prices begin to taper post 2040 as smaller demand increases are experienced, particularly in South Asia and Southeast and East Asia. Upward price pressure on ASF is driven by poultry, dairy and beef prices which increase by 5.3%, 6.1% and 2.8% by 2050 with declining pork

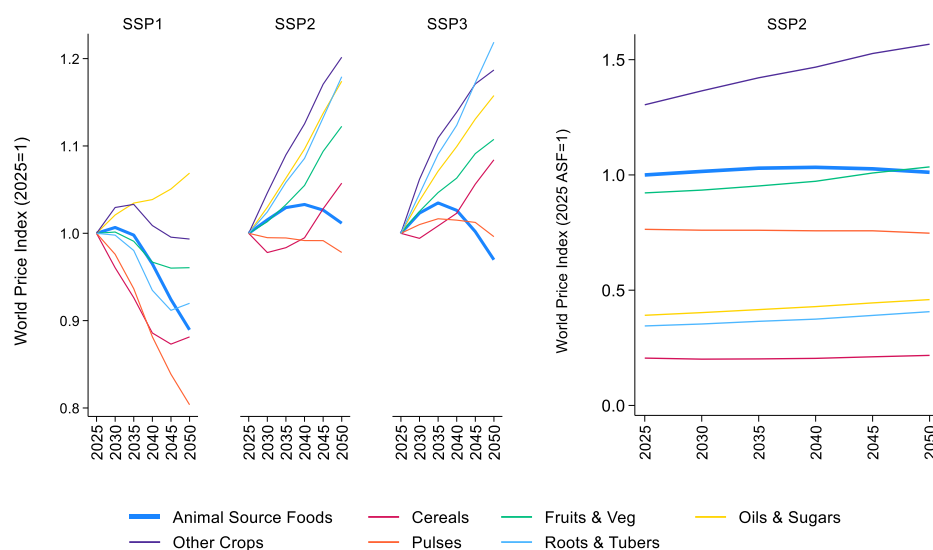
⁶ Crop demand here only includes crops used for feed.

prices (-14.6%) providing some downward relief. Detailed price projections can be found in Wiebe et al. (2026).

ASF prices remain high compared to other food commodities throughout the period thus affecting the ability of households, particularly in low- and middle-income countries, to significantly increase their share of ASF consumption (see Figure 9(b)). For most of the period ASF is the second most expensive food commodity, although by 2050 fruits and vegetables are marginally more expensive. Pulses are 25% cheaper over the period, though their value as a substitute depends on the target nutrient, given differences in bioavailability between plant- and animal-source foods.

ASF prices in the Optimistic and Pessimistic scenarios are lower by 2050 than in the base scenario although the trends are similar with prices rising in the short-term before slowing in the medium to longer-term (see Figure 9(a)). In the Optimistic scenario, prices are lower despite higher demand as global cooperation leads to an easier diffusion of technologies, enabling more countries to enjoy higher animal yields. This allows more ASF to be traded on world markets, leading to a comparative easing of global prices. The ASF price trend in the Pessimistic scenario is driven by lower demand, as comparatively lower income growth dampens demand for ASF in several markets. Demand in this scenario is also affected by rising ASF prices in the short-term – by 2030, ASF prices are higher under the Pessimistic scenario than in the base scenario - which further reduces demand for ASF in the medium to longer-term.

Figure 9 Projected world price trends by (a) commodity group and scenario; (b) commodity relative to 2025 ASF



Source: Authors based on IMPACT v4.1.4.

3. Discussion and implications

This chapter presents a baseline outlook for the global ASF system to 2050. The analysis shows rising ASF demand, particularly in low- and middle-income regions, over the period driven by population and increases in income per capita. While production is also expected to increase over the period, driven largely by yield gains, the pace of expansion is projected to be uneven across regions with the need for imports rising, particularly in Africa. ASF prices are projected to increase moderately by 2050; however, they remain relatively high when compared with other food commodities, highlighting continued constraints in access and consumption among lower-income populations. Rising ASF production also has notable impacts on other parts of the agrifood system such as feed crops, contributing to higher demand and upward price pressures for these crops. This is an important finding and highlights the need for further analysis of ASF impacts, including on resources such as land and water, to better understand the impacts on the broader agrifood system and affordability. Continued investment in productivity-enhancing technologies, infrastructure and innovation will be important to support sustainable increases in ASF production and help meet growing demand.

The outlook for the global ASF system is closely linked to evolving assumptions about socio-economic and environmental conditions. This is illustrated by the two alternative socio-economic futures presented in this chapter, i.e. the Optimistic (i.e. SSP1) and Pessimistic scenarios (i.e. SSP3). The results from these scenarios highlight the sensitivity of the ASF system to population and income assumptions. Climate change adds further uncertainty to these trajectories. While this analysis captures part of the indirect impact of climate change on ASF through feed availability and prices, further work is needed to account for its full direct and indirect effects on livestock systems. At the same time, future changes in diets will influence the scale and composition of ASF demand, particularly as countries balance nutritional needs, affordability and environmental sustainability, as, for example, outlined in Gibson et al (2026). Understanding how these interacting socioeconomic, climate and dietary changes shape future ASF systems will be important for identifying pathways that can support food and nutrition security while limiting pressures on natural resources.

References

- Beal, T., Gardner, C.D., Herrero, M., Iannotti, L.L., Merbold, L., Nordhagen, S. and Mottet, A. (2023). Friend or Foe? The Role of Animal-Source Foods in Healthy and Environmentally Sustainable Diets. *The Journal of Nutrition*, 153(2): 409-425. <https://doi.org/10.1016/j.tjnut.2022.10.016>.
- Beier, F., Dietrich, J., Heinke, J. et al. (2025). Planetary boundaries under a land-based climate change mitigation scenario with a food demand transformation: a modelling study. *The Lancet Planetary Health*, 9(10). [https://doi.org/10.1016/S2542-5196\(25\)00087-7](https://doi.org/10.1016/S2542-5196(25)00087-7).
- Chan, CY., Tran, N., Hoong, Y., Sulser, T.B. and Aung, YM. (2025). What do we know about the future of aquatic foods in global agrifood systems? In *What do we know about the future of food systems?* eds. Keith Wiebe and Elisabetta Gotor. Part Three: What Do We Know About the Future of Selected Food Commodities? Chapter 29: 172-176. Washington, DC: International Food Policy Research Institute. Available: <https://hdl.handle.net/10568/175523>.
- Enahoro, D.K., Mason-D'Croz, D., Herrero, M., Mensah, C. and Baltenweck, I. (2025). What do we know about the future of animal-source foods and food systems? In *What do we know about the future of food systems?* eds. Keith Wiebe and Elisabetta Gotor. Part Three: What Do We Know About the Future of Selected Food Commodities? Chapter 28: 166-171. Washington, DC: International Food Policy Research Institute. Available: <https://hdl.handle.net/10568/175515>.
- Eyring, V., Bony, S., Meehl, G. A., Senior, C. A., Stevens, B., Stouffer, R. J., and Taylor, K. E. (2016). Overview of the Coupled Model Intercomparison Project Phase 6 (CMIP6) experimental design and organization, *Geosci. Model Dev.*, 9, 1937–1958. <https://doi.org/10.5194/gmd-9-1937-2016>.
- Gibson, M., Sundiang, M., Mason-D'Croz, D., et al. (2026). Food systems transformation would reshape global agriculture. *Nature* 657(8130): 156-163. <https://doi.org/10.1038/s41586-026-10775-2>.
- Godde, C.M., Mason-D'Croz, D., Mayberry, D.E., Thornton, P.K., and Herrero, M. (2021). Impacts of climate change on the livestock food supply chain; a review of the evidence. *Global Food Security*, 28. <https://doi.org/10.1016/j.gfs.2020.100488>.
- Headey, D. and Alderman, H.H. (2019). The Relative Caloric Prices of Healthy and Unhealthy Foods Differ Systematically across Income Levels and Continents. *J Nutr*, 149(11):2020-2033. <https://doi.org/10.1093/jn/nxz158>.
- Herrero, M., Mason-D'Croz, D., Thornton, P.K. et al. (2023). Livestock and Sustainable Food Systems: Status, Trends, and Priority Actions. In: von Braun, J., Afsana, K., Fresco L.O. et al., editors. *Science and Innovations for Food Systems Transformation*. Cham (CH): Springer; 2023. https://doi.org/10.1007/978-3-031-15703-5_20.

Hume, D.A., Whitelaw, C.B.A., and Archibald, A.L. (2011). The future of animal production: improving productivity and sustainability. *Journal of Agricultural Science*, 149(Supplement S1): 9–16. <https://doi.org/10.1017/S0021859610001188>.

IPCC [Intergovernmental Panel on Climate Change]. (2023). *Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, 184 pp. <https://doi.org/10.59327/IPCC/AR6-9789291691647>.

Leroy, F., Smith, N.W., Adesogan, A.T., Beal, T., Iannotti, L., Moughan, P.J. and Mann, N. (2023). The role of meat in the human diet: evolutionary aspects and nutritional value. *Anim Front*, 13(2):11-18. <https://doi.org/10.1093/af/vfac093>.

Mishra, A., Gabriel, S., Cenacchi, N., Dunston, S., Hartley, F., et al. (2026). The International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT): Model documentation for version 4. Modeling Systems Technical Paper 4. Washington, DC: International Food Policy Research Institute. <https://hdl.handle.net/10568/182731>.

Mishra, A., Sulser, T., Gabriel, S. et al. (2025). Affordability and nutritional challenges for the future of EAT diets: an economic modelling analysis. *The Lancet Planetary Health*, 9(10). <https://doi.org/10.1016/j.lanplh.2025.101325>.

Msangi, S., Enahoro, D., Herrero, M., Magnan, N., Havlik, P., Notenbaert, A. and Nelgen, S. (2014). Integrating livestock feeds and production systems into agricultural multi-market models: The example of IMPACT. *Food Policy*, 49(2): 365-377. <https://doi.org/10.1016/j.foodpol.2014.10.002>.

Paro, F.R., Davour, R., Acosta, D., Mechlowitz, K., Tiwari, C., and McKune, S.L. (2025). Improving Nutrition Security in Low- and Middle-Income Countries and the Role of Animal-Source Foods. *Annual Review of Animal Biosciences* 13:371-388. <https://doi.org/10.1146/annurev-animal-111523-102149>.

Samir, K.C. and Lutz, W. (2017). The human core of the shared socioeconomic pathways: Population scenarios by age, sex and level of education for all countries to 2100, *Global Environmental Change*, 42: 181-192. <https://doi.org/10.1016/j.gloenvcha.2014.06.004>.

Shah, W. U. H., Hao, G., Yasmeen, R., Wu, J., Cai, S. and Xu, X. (2026). Livestock production efficiency, technological heterogeneity, and total factor productivity dynamics in the world's top 50 livestock-producing countries. *Journal of Agriculture and Food Research*, 30, 103168. <https://doi.org/10.1016/j.jafr.2026.103168>.

Sundiang, M., Diniz Oliveira, T., Mason-D'Croz, D. et al. (2025). Bundling measures for food systems transformation: a global, multimodel assessment. *The Lancet Planetary Health*, 9(10). <https://doi.org/10.1016/j.lanplh.2025.101339>.

Sundiang, M., Diniz Oliveira, T., Mason-D'Croz, D. et al. (2025b). Code and data for "Bundling Measures for Food Systems Transformation: a global, multimodel assessment". <https://doi.org/10.5281/zenodo.17289084>.

Thornton, P.K. (2010). Livestock production: recent trends, future prospects. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 365(1554): 2853-2867. <https://doi.org/10.1098/rstb.2010.0134>.

[Thornton, P.K.](#) and Herrero, M. (2015). Adapting to climate change in the mixed crop and livestock farming systems in sub-Saharan Africa. *Nature Climate Change*, 5: 830-836. <https://doi.org/10.1038/nclimate2754>.

Thornton, P.K, Nelson, G., Mayberry, D., and Herrero, M. (2022). Impacts of heat stress on global cattle production during the 21st century: a modelling study. *The Lancet Planetary Health*, 6(3). [https://doi.org/10.1016/S2542-5196\(22\)00002-X](https://doi.org/10.1016/S2542-5196(22)00002-X).

UN [United Nations], Department of Economic and Social Affairs, Population Division. (2024). *World Population Prospects 2024*. <https://population.un.org/wpp/>.

Wiebe, K., Cenacchi, N., Dunston, S., Gabriel, S., Hartley, F., Mishra, A., Robertson, R., Rosegrant, M.W., Sulser, T.B., Thomas, T.S. and Willenbockel, D. (2026). *Global Agrifood Systems Outlook to 2050*. Washington, DC: International Food Policy Research Institute.

Yukimoto, S., Kawai, H., Koshiro, T. and Ishii, M. (2019). The Meteorological Research Institute Earth System Model version 2.0, MRI-ESM2.0: Description and basic evaluation of the physical component. *J. Meteor. Soc. Japan*, 97: 931-965. <https://doi.org/10.2151/jmsj.2019-051>.



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