GETTING FROM FARM TO FORK:
THE LONG AND SHORT OF IT

Written by

The Economist INTELLIGENCE UNIT

Foreword by Cargill

Moving food from where it's grown to where it's needed

Population growth in Asia is expected to surpass global population growth in the coming decades. Asia will also become vastly more urban than it is today, in line with global trends. Food demand from this growing urban population is likely to shift more towards resource-intensive food, even as resources become increasingly scarce. Higher consumption of resource-intensive food will also lead to overuse of natural resources like water and land. On the other hand, both quality and sustainability of these resources is a growing concern due to degradation and pollution issues. Given Asia's focus on increasing agricultural yields, these factors will have serious implications for countries looking to meet agricultural demand domestically.

The integration and globalisation of supply chains has enormous potential in overcoming these challenges and driving growth in food and agricultural markets. Policy action is also urgently needed to address a range of issues, including agricultural efficiency, food loss and food waste, and the modernisation of food distribution. However, this requires policies that extends beyond agriculture. Adopting a systems mind-set will help assess upstream and downstream policy impacts.

Building a resilient food supply chain is crucial to support wider food security goals in the region. Strong collaboration between Asian countries' public-private sectors across the food systems can help transform agricultural production to meet future food demands. Investing in infrastructure is another key aspect to smoothen functioning of the food supply chains and mitigate impact of climate change.

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1. About the report

This report is part of the Asia Food Systems 2030 series and has been developed by The Economist Intelligence Unit report and sponsored by Cargill. This particular report focuses on trends affecting the supply chain from farm to consumer, including issues around trade, logistics, government policies as well as technology such as e-commerce and ICT. A full explanation of the methodology is contained in the Appendix. This particular report is meant to provide regional context about food systems in Asia and set the scene for subsequent reports. The analysis and content of this report cover the period from June to September 2017.

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For further information, please contact:

Economist Intelligence Unit

Stefano Scuratti, Principal: stefanoscuratti@economist.com

Sumana Rajarethnam, Principal: sumanarajarethnam@economist.com

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2. Executive summary

Rapid income growth and urbanisation will have profound impacts on Asia's food supply chains.[i] Urbanisation, in particular, will contribute to supply- and demand-side imbalances for domestically produced food, as farmers leave rural areas in search of job opportunities in the cities. Without a strong transition plan to manage rapid rural–urban migration across developing Asia, domestic food supply chains will be disrupted. Inadequate infrastructure, for example, could lead to food loss and discourage trade. At the same time, growing fears about food self-sufficiency could impede efforts to supplement domestic food with food from elsewhere. Together, these forces will place Asia's food supply chains under increasing pressure.

This report focuses on how this growing strain on Asia's domestic food supply chains is heightening food security fears and shaping regional trade and policies. The study looks to address the following questions: How can Asian governments improve food supply chains while managing rapid urbanisation and population growth? How are companies and policymakers planning for the future? How do policymakers balance worries about food self-sufficiency and food prices with domestic concerns about protecting farmers?

In order to understand how food supply chains in Asia will function in 2030, this report focuses on:

- Megatrends driving change in food supply chains
- Opportunities for policymakers, the private sector and other concerned stakeholders to manage these trends.

These megatrends, and opportunities to manage them, are summarised below and outlined in more detail in the remainder of the report.

Which megatrends are driving change in food supply chains?

- **Population growth and rapid rural–urban migration will drive demand for more food and for a greater diversity of food, straining domestic food supply chains.**
  According to United Nations (UN) projections, Asia will be home to 4.9bn people by 2030,[1] including nearly half of the world's urban population. As a result of this population growth and rapid urbanisation, food consumption is forecast to more than double on a per-capita basis between 2007 and 2030 in China and South Asia.[2] Diets are also becoming more diverse and more inclusive of higher-value (but increasingly affordable) proteins, fats and sugars. Diverse diets are more resource-intensive, particularly when they include meat, which accounts for 17% of global calorific intake but uses twice that amount of land, water and feed.[3] As urbanisation increases competition for land,

[i] In this report, Asia is defined as East Asia, South Asia and South-east Asia.

water and labour, growing demand for food and increased dietary diversity will put pressure on domestic food supply chains.

- **There will be fewer Asian farmers and those who do farm will be older, affecting domestic food supply.**
  Population ageing in rural areas starts earlier and happens faster than national averages indicate. In Asia, the average age of farmers is already increasing as young people leave the countryside and move to cities in greater numbers. Older farmers find it challenging to access credit, upskilling initiatives and other income-supporting resources, even as overall agricultural employment declines in Asia. Innovations also tend to bypass older farmers, who typically lack the financial capital to invest in new technology or lack the skills to facilitate its adoption,[4] hindering efforts to close efficiency gaps.

- **Resource scarcity and sustainability concerns will affect domestic production, exacerbated in the long term by the impact of climate change.**
  Increased consumption of resource-intensive food, such as meat and milk, will further increase demand for (already scarce) water and land. Significant declines in the availability and quality of arable land have already been observed and are expected to intensify in the coming decade,[5] with the Food and Agriculture Organisation of the United Nations (FAO) estimating that 40% of land in ASEAN countries faces severe degradation.[6] Competition for water will also increase as a result of urbanisation, and 40% of developing Asia is projected to face severe water shortages by 2030.[7] Given Asia's already low yields and the prevailing yield gap, this has serious implications for countries looking to meet agricultural demand domestically. In the long term, these problems are likely to be exacerbated by the impacts of climate change, including more volatile weather, as well as salination and soil erosion due to rising sea levels.[8]

- **The integration of supply chains is already creating challenges for smallholders; meanwhile, geopolitical shifts may drive further regional integration at the expense of global integration.**
  Firms that integrate various stages of food supply chains have a greater ability to trace and track food quality. While smallholders can and do work with large firms, such as suppliers, experts interviewed during the research programme pointed out that it is difficult for smallholders to meet the quality standards demanded by modern retailers and large agri-business firms. The transition to modern retail (which encourages vertical integration) also means that supermarkets want high-quality food in larger volumes, and it can be difficult for individual smallholders to consistently meet these needs due to challenges such as lack of scale and lack of access to training and capital. While supply chain integration is likely to continue, signs of a retreat from globalisation and the proliferation of regional agreements in Asia may pave the way towards shorter, more regional supply chains.

- **Modern and online retail will become increasingly important.**
  Modern retail and vertical integration benefit from concerns about food safety and sustainability. For example, as the average Asian consumer becomes wealthier and food preferences evolve,

supermarkets are able to meet changing requirements and deliver safe, high-quality food products at competitive prices. Asian consumers have also demonstrated a willingness to shop online,[9] suggesting that e-commerce could re-design food supply chains by lengthening them physically but shortening the number of actors within the chain. Experts interviewed as part of this research also highlighted that e-commerce could extend to mom-and-pop stores, facilitated by falling smartphone prices and increased Internet access.

- **Significant food loss in developing Asia will slowly transition to food waste, but greater overall awareness will lead to data-driven solutions.**
  In South Asia and South-east Asia, food loss tends to happen at harvest time and post-harvest, with little waste at the consumption stage.[10] However, as South Asia and South-east Asia develop and invest in infrastructure, the food loss pattern is likely to converge towards that of higher-income Asian countries such as Japan, South Korea and China, where food waste is more common. Interviews conducted during the research programme suggest that food loss and food waste are yet to be fully recognised as systemic issues. However, increased awareness about food loss and food waste has already started to encourage research in this area, including research into how technology can be used as a potential solution.

What are the opportunities for policymakers, the private sector and other concerned stakeholders in managing these trends?

- **Resilient food supply chains could be built to support broader food security.**
  To address wider food security issues, supply chain management could focus on diversifying food sources, building resilience to shocks and improving nutritional outcomes. Trade can help to stabilise shocks to domestic supply chains, particularly if imports are strategically diversified in order to lower systemic risk (similar to diversifying a financial portfolio). More forward-looking resilience measures include building climate change measures and disaster risk mitigation into supply chains. For example, APEC has taken steps to secure food supply chains by helping farmers disaster-proof their crops and their farming methods.[11]

- **Public–private partnerships (PPP) could be developed along the supply chain.**
  Collaboration between Asian countries' public and private sectors is critical to transitioning from agricultural production to more market-driven systems that take demand and supply factors into account (such as labour and projected demand). As the FAO has noted, the PPP model also allows governments to handle risks in agri-food more efficiently, including sharing those risks with the private sector where appropriate.

- **Investments in both "hard" and "soft" infrastructure could strengthen the overall food supply chain.**
  Infrastructure failures (such as transport disruptions or the closure of food warehouses) are increasingly disrupting food supply chains in developing Asian countries.[12] The Asian Development

Bank (ADB) estimates that developing Asia will need to invest US$26trn in infrastructure (including the cost of climate change mitigation) between 2016 and 2030.[13] The scale and timeframe of these infrastructure investments provide an opportunity to invest in climate-smart infrastructure and disaster risk reduction, in recognition of Asia's vulnerability to disasters and climate change impacts.

- **Investment in research and productivity improvements can foster sustainable supply-side gains.**

  Against a backdrop of resource scarcity and climate change, "producing more with less" and preserving the livelihoods of smallholders will be key challenges going forward. Global demand for food and other agricultural products is expected to increase by about 60% in the period to 2050,[14] accompanied by competing demand for land and water in an increasingly urban and crowded region. Identifying how to close yield gaps and address climate change concerns (for instance, research to mitigate reduced future rice yields due to soil salinity caused by rising sea levels)[15] will be critical to achieving the required output growth in the future, while also ensuring environmental sustainability.

- **Companies will need to prepare for growing concerns about transparency and quality.**

  As consumers become wealthier and their food consumption patterns change, their interest in food quality and safety is likely to increase. Small-scale farmers and companies in supply chains will need to be able to meet stricter traceability and certification requirements, particularly as large retail chains enter the market and threaten to tilt the balance away from small suppliers.[16]

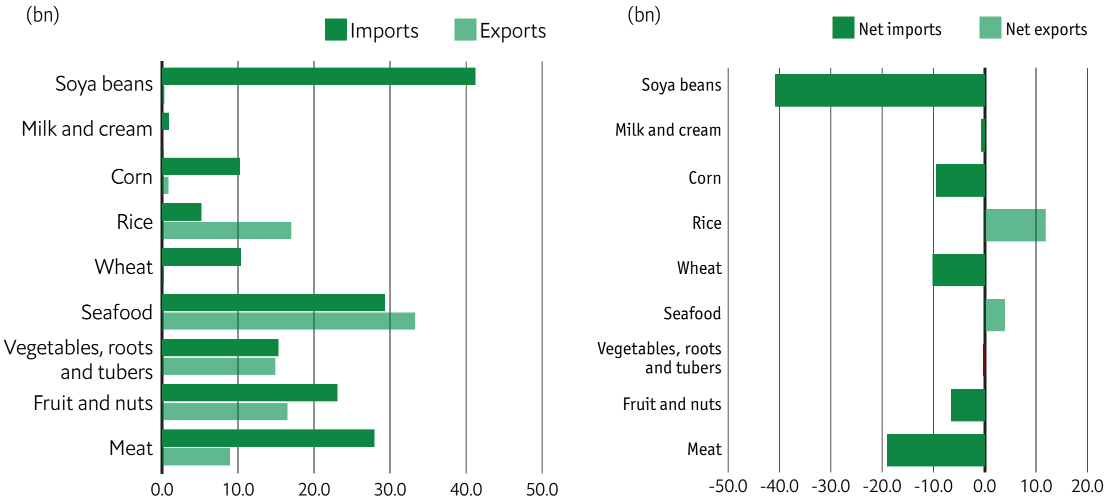
3. Background

Asia plays an important role in the global food chain, accounting for 19% of total global food and agriculture exports, as well as 31% of total food and agriculture imports.[17,18] China is the world's largest importer of soybean (importing 60% of the world's soybean for feed, driven by a surge in meat consumption),[19] and India is the world's largest consumer and importer of pulses.[20] Asia's large and increasingly urban population, and its economic growth, will continue to drive a surge in demand for food across the region. Asia is also a major producer of key agricultural crops: the region produces 90% of the world's rice,[21] and Malaysia and Indonesia produce 85% of the world's palm oil.[22]

Figure 1: Asia is a key exporter and importer of food products

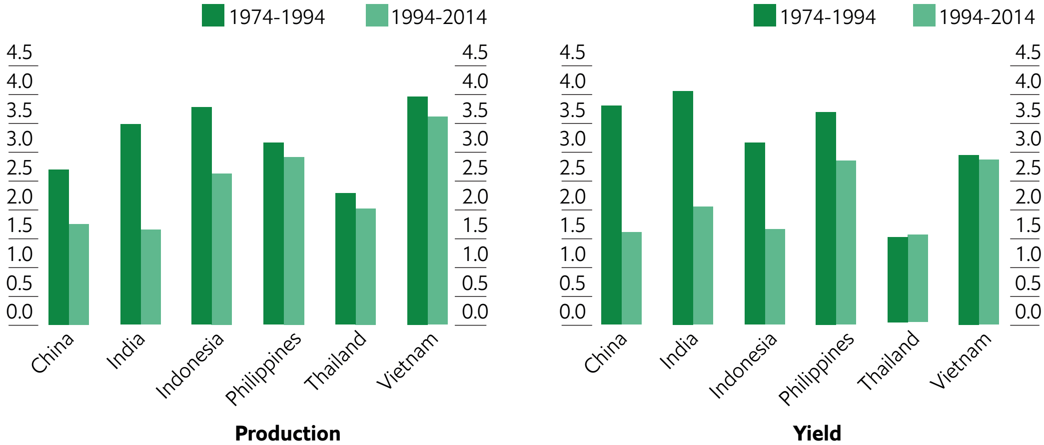
Asia exports significant amounts of food globally, particularly rice, seafood as well as fruit and vegetables

However, Asia is also a major importer, particularly for meat and soya beans



Source: FAOStat.

Figure 2: Growth in cereal production and yield in selected Asian countries
(%)



Source: FAOSTAT, Rabobank Analysis

However, Asia does face challenges. Perhaps most importantly, the region accounts for just one-quarter of the world's arable land[23] but has more than half of the world's population to feed.[24] Declines in arable land, land degradation,[25] declining growth in yields for key staples (Figure 2) and growing competition for water[26] are also limiting agricultural production.

In the coming years, Asia will experience growing demand for more food, and for better-quality food, fuelling the growth of local agri-food companies (in terms of both size and scope). It will also face the challenge of balancing food security with agricultural development and trade liberalisation. In response, Asia will need to increase its imports, invest more in agriculture and achieve sustained yield growth. This raises important questions about how tensions between resource availability, population growth and economic development will affect food supply chains in Asia.

4. Trends and implications

Getting food from farm to fork is now a regional, and sometimes global, affair. The Nutella value chain, for example, sources hazelnuts from Turkey; palm oil from Malaysia, Papua New Guinea and Brazil; cocoa from the Côte d'Ivoire, Ghana, Nigeria and Ecuador; sugar from Europe; and vanilla from the United States and Europe.[27] In Asia, food supply chains are evolving in line with economic development, leading to increasingly integrated food systems and globalised supply and demand. At the same time, however, growth in urban areas is encouraging migration away from rural areas, just as urban consumers diversify their diets and become increasingly concerned about food safety and sustainability. Given these structural changes and supply and demand tensions, what will supply chains look like in 2030?

4.1 Growing demand from an increasingly urban population will strain existing domestic food supply chains

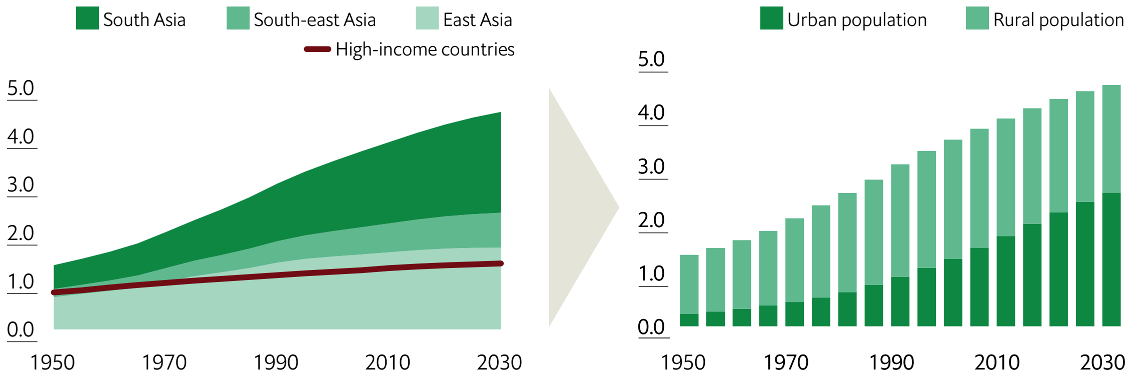
Urbanisation	Resource scarcity	Ageing rural population	Supply chain integration	Modern retail	Food loss and food waste

Population growth is slowing globally, and population growth in Asia will outstrip global population growth in the period to 2050 and beyond (Figure 3).[28] Asia will also become vastly more urban, in line with global trends. In 1980, over 60% of the world's population lived in rural areas.[29] Since then, rural–urban migration has increased drastically, with more than half of the global population now living in urban areas (around 54%, as of 2015). According to UN forecasts, Asia will be home to nearly half of the world's urban population by 2030.

Figure 3: Urban population in Asia[30]

Asia's population will grow by 432 million between 2015 and 2030, driven by growth in South Asia

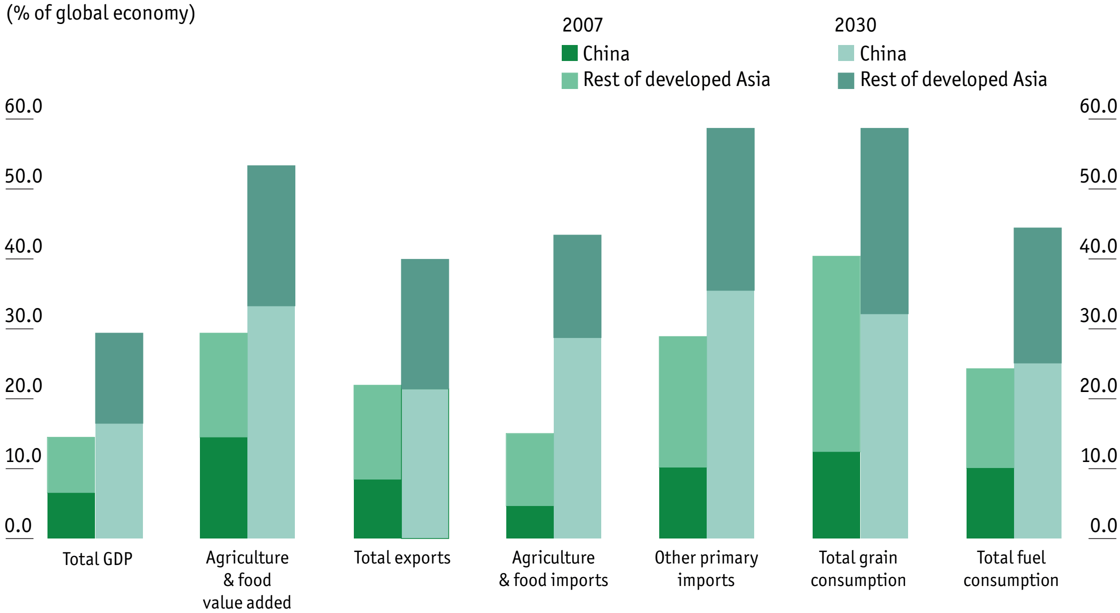
Increasingly, this population growth is driven by the rise in the number of urban dwellers



Strong growth in populations and incomes in Asia will increase domestic food demand, just as resource allocation to rural areas decreases. The UN projects that Asia will be home to 4.9bn people by 2030—up almost 12 percentage points from 4.4bn in 2015.[31] Per-capita food consumption is forecast to more than double between 2007 and 2030 in China and South Asia, and to increase by 79% for developing countries as a group.[32] During the same period, however, food self-sufficiency is forecast to fall considerably in China and South Asia, partly due to rapid increases in city density and declines in agricultural employment. Across Asia, the urban population is already growing significantly faster than the rural population, and the proportion of people in Asia who live in rural areas is projected to fall from 52% in 2015 to 44% by 2030.[33] Traditionally, agriculture has been the main source of income for the rural population in Asia.

Figure 4: Food demands and imports in Asia to 2030

(% of global economy)

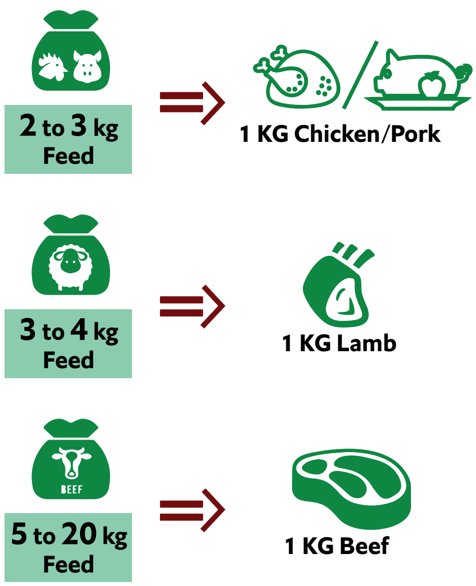


Source: The Economist Intelligence Unit.

Demand will also shift towards more resource-intensive food, even as resources become increasingly scarce. As urban dwellers take up non-agricultural employment and become more time-poor, they will consume more convenient food. As a result, sales of ultra-processed foods in East Asia and South-east Asia will approach the levels currently seen in high-income countries by 2035.[34] As cities become more open and incomes rise, diets will also shift to include higher-value but increasingly affordable proteins, fats and sugars, and the FAO projects that most of the increase in demand for animal protein will come from developing Asia by 2030 and beyond.

This trend has knock-on effects on demand for resources; demand for concentrated feed (which includes wheat, rice and coarse grains) more than doubled in the Philippines, Indonesia and China between 1990 and 2012. Feed prices have increased accordingly and become more volatile. Increased consumption of meat is also much more resource-intensive. For example, it takes 2–3 kg of feed to produce just 1 kg of chicken or 1 kg of pork. The ratio for lamb is between 4:1 and 6:1, and the ratio for beef is between 5:1 and 20:1.[35] One kilogram of beef requires 60 times more water than 1 kg of potatoes, and five times more water than 1 kg of rice.[36]

Figure 5: Resource-intensive consumption of meat



Source: The Economist Intelligence Unit.

4.2 Supply-side concerns about resource scarcity and sustainability are major constraints, particularly against the backdrop of climate change

Urbanisation	**Resource scarcity**	Ageing rural population	Supply chain integration	Modern retail	Food loss and food waste

Changing food consumption patterns, rapid urbanisation and rural outmigration mean that urban demand for agricultural products will increase just as domestic resources allocated to agriculture decrease, leading to demand–supply imbalances that challenge food security.[37] The Asia–Pacific region already has the world's lowest per-capita water availability[38] and declining arable land per capita and faces resource stress.[39]

Urbanisation increases competition for scarce land and resources, decreasing resources for agriculture. The increased consumption of resource-intensive food (such as meat) will further increase demand for both water and land. However, significant declines in the availability of arable land have already been observed and are only expected to intensify in the coming decade.[40] While there is room to expand cropland globally, the bulk of this potential cropland lies in Latin America and sub-Saharan Africa, with little room for expansion in East Asia and South Asia.[41] Any expansion of cropland also raises valid sustainability concerns, given that agriculture is a key drive of deforestation. Urbanisation will also increase competition for water. Agriculture is currently the main user of fresh water, but by 2030 Asia is projected to need 65% more water for industrial use, as well as 30% more water for domestic use, potentially reducing the availability of water for agriculture.[42] Forty percent of developing Asia is projected to face severe water shortages by 2030.[43]

The quality and sustainability of resources in Asia are also a concern because of degradation and pollution issues. Declines in soil quality have already been observed and are only expected to intensify.[44] In ASEAN countries, for example, the FAO estimates that 40% of land faces severe or very severe degradation.[45] Estimates also suggest that more than 50% of cultivated land in China has already degraded, and India faces an estimated loss of 5bn billion tonnes of soil every year through erosion.[46] Salt degradation, which affects soil properties and reduces crop productivity, has also affected major areas such as the Yellow River Basin, the Indo-Gangetic Basin and the Indus Basin.[47] Although irrigation has driven agricultural growth in Asia (particularly South Asia), it has been sourced mainly from groundwater, stressing groundwater sources past sustainable limits.[48] Given Asia's already low yields and the prevailing yield gap, these declines have serious implications for countries looking to meet agricultural demand domestically. In the long term, the impact of climate change is likely to exacerbate these problems. For instance, rising sea levels are expected to increase salinity and land loss in the low-lying deltaic regions in Asia.[49, 50]

4.3 An ageing rural population will affect domestic food supply as employment shifts away from agriculture

Urbanisation	Resource scarcity	**Ageing rural population**	Supply chain integration	Modern retail	Food loss and food waste

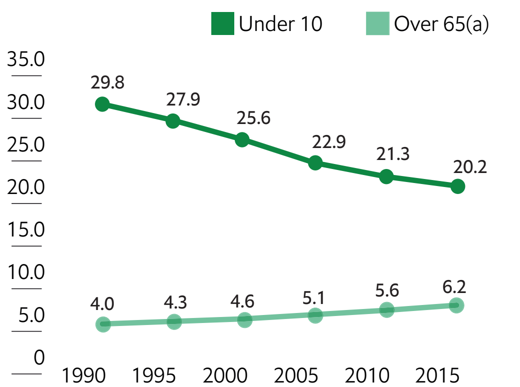
By 2030, 66% of people in Asia will be 65 or older.[51] In today's high-income countries, an ageing population is seen as a sign of developmental success, reflecting longer life expectancies, improved nutrition, more sophisticated public and private health and social services, and workforce income growth that is sufficient to support a dependent elderly population.[52] However, ageing in rural areas starts earlier and grows faster than national averages indicate,[53] and in Asia, the strong links between rural employment and agriculture mean that this trend will have significant consequences for domestic food production.

There are fewer farmers in Asia, and they are getting older. Across Asia, the average rural population is decreasing in size. Historically, the agricultural sector has been the primary source of income and employment for the economically active rural population in Asia. Across the last four decades, however, agriculture's share of employment has declined by 20% across the region, and agriculture is no longer the largest contributor to GDP in any Asian economy.[54] Between 2015 and 2030, the number of people aged between 15 and 24 in low- and middle-income countries is expected to increase from 1bn to 1.2bn (a 20% increase), and the majority of these young people are expected to live in South Asia and sub-Saharan Africa, particularly in rural areas.[55]

Despite this population increase, limited employment opportunities in the agricultural sector and industry's growing GDP contributions in all Asian economies[56] mean that a more rapid rate of outmigration is very likely. Existing farmers are also ageing quickly as young people leave for the cities.

Figure 6: Rural population and ageing farmers in Asia

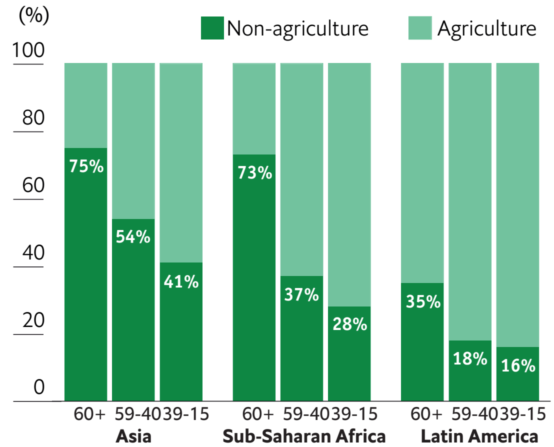
Rural population ageing in Asia
(%)



(a) Due to the lack of sufficient disaggregated data for sub-Saharan Africa for the over 65, data for the over 55 is used for this region

Source: HelpAge International.[61]

Distribution of older and younger people's employment by region and sector



Globally, the average age of farmers has risen to 60.[57] In the Philippines, the average age is 57 years old,[58] and in Japan, the average age is 70.[59] Approximately 75% of individuals over 60 in Asia report agriculture as their main source of income.[60] This has implications for the composition of the rural labour force, patterns in agricultural production, social organisation within rural communities and land tenures.

Without significant investment in research and development (R&D) and extension work, or greater acceptance of the need for trade, domestic food supplies will become more expensive or simply insufficient. Asia faces significant declines in arable land and available water resources,[62] which means that any increases in productivity must come from technology. Low skill levels among ageing farmers have been identified as a key reason behind efficiency gaps,[63] but older rural farmers also face discrimination in accessing credit, upskilling initiatives and other income-supporting resources. Agricultural innovations have also tended to bypass older farmers, who typically lack the financial capital to invest in new technology or the skills to facilitate its adoption.[64] If older farmers continue to lack access to credit and technology, this will jeopardise governments' efforts to attain self-sufficiency targets. In response, governments may resort to distortionary market interventions (such as stockholding and price floors), which are short-term and expensive solutions.

4.4 Supply chains are increasingly integrated, but signs of a retreat from globalisation may slow integration and drive regionalisation instead

Urbanisation	Resource scarcity	Ageing rural population	**Supply chain integration**	Modern retail	Food loss and food waste

In line with the developmental roadmap followed by today's advanced economies, food systems and the agricultural sector have become more capital-intensive and better integrated with other economic sectors through global markets. In Asia, the growth of high-value agriculture and the development of institutions for vertical integration present both opportunities and challenges for small-scale farmers in developing low- and middle-income countries.[65] The integration and globalisation of supply chains has enormous potential to drive growth in food and agricultural markets.

Experts interviewed during the research programme highlighted that vertical integration in food supply chains can endanger smallholders, who typically lack the necessary infrastructure or supporting services to participate. Increased transparency and traceability requirements can also burden unprepared smallholders. This restructuring of agricultural supply chains and growth in high-value agriculture in Asia is increasingly driven by shifts in consumer demand and dietary preferences.[66] However, recent political and economic events have pointed to a growing anti-globalisation tide, which may negatively affect integration.

Increasing interest in food safety and quality will drive vertical co-ordination and integration. Agri-business firms that integrate the manufacturing, distribution and retail stages of food supply chains have a greater ability to trace and track food safety risks. This has implications for price-setting, quality standards and overall logistics, all of which benefit companies with economies of scale and encourage vertical integration. Integration often requires procurement modernisation, which typically relies on "just in time" or flexible production (where producers produce more when demand is high, and absorb surpluses when demand is low).[67] To meet these requirements, suppliers need up-to-date access to demand and price data, as well as the capital to scale up or scale down production based on market demand. This is heavily capital-intensive and is therefore challenging for smallholders.

Increased supply chain integration and the transition to modern retail will negatively affect ill-prepared smallholders. Private standards imposed by supermarkets frequently exceed national standards.[68] Experts interviewed during the research programme also noted that supermarkets want high-quality food in large volumes, which can be difficult for individual smallholders to consistently deliver. Supermarkets are aware of these constraints and have become cautious about working with smallholders as a result. Smallholders still work with large firms, such as suppliers, but experts interviewed during the research programme pointed out that it is difficult for them to consistently meet the required standards. For example, the number of suppliers to TOPS (a Thai supermarket chain) decreased from 250 to 60 after a supply chain improvement programme, implemented in 1998, mandated that suppliers were certified under the Ministry of Agriculture's food safety programme.[69, 70]

Smallholders' inability to meet modern retailers' stringent food quality and safety requirements, and to enable vertical supply chain integration, has prompted regional giants (such as the CP Group and San Miguel Foods Group) to develop their own supermarket-type supply chains and retail outlets.[71] To protect their place in modern retail, smallholders will need to focus on long-term structural improvements, such as professionalising farming, adopting technology and securing land rights (particularly in Asia, where a lack of clear land rights can impede increased productivity). Farmers will not be incentivised to invest in the long-term capital improvements needed to meet higher standards if they do not own their land.

However, integration may pivot from globalisation to regionalisation. Recent events such as Brexit, the rise of nationalistic, anti-establishment political movements in Europe that are against open markets and free trade, and the withdrawal of the United States from the Trans-Pacific Partnership Agreement (TPPA) are symptomatic of a growing desire to "reverse" globalisation. This may undermine global integration and multilateralism, particularly given the earlier failure of the Doha round and the existence of high trade barriers in the agricultural sector. The complexity of global supply chains means that anti-globalisation sentiment, as well as uncertainty over trade agreements (for example, about potential changes or overlaps in rules of origin), will affect wider investment decisions, incentivising companies to localise or regionalise part of their supply chains.[72]

In the long term, the opening of markets and the shift to rules-based trade are likely to continue. As markets adjust, this shift may drive a multi-polar world, with several regional blocs. Recent focus in Asia has been on bilateral agreements and regional trade agreements, such as the Regional Comprehensive Economic Partnership (RCEP), which create preferential blocs outside of multilateral arrangements. Regionalisation such as this may have China as a focal point—the Belt and Road Initiative (BRI) initiative has 900 infrastructure deals planned, worth US$890bn.[73]

4.5 Modern retail penetration will increase due to urbanisation and food safety concerns, but may move away from physical supermarkets

Urbanisation	Resource scarcity	Ageing rural population	Supply chain integration	**Modern retail**	Food loss and food waste

Drastic changes in developing nations' retail and distribution sectors have taken place in a single decade of rapid globalisation (1990–2000) and value chain integration, similar to the changes that took place 50 years ago in the North American retail sector.[74] Supermarkets supported by large-scale manufacturers are now major players across the agri-food economy in Asia and the Pacific, and retail chains are likely to gain momentum as more middle class consumers emerge and urban conurbations develop.

Growing concerns about food safety and sustainability (prompting calls for greater traceability and transparency) benefit modern retail and vertical integration. In more developed countries, interest in greater transparency and traceability around food reflects concerns about sustainability.[75,76] In developing Asian countries, however, concerns about food traceability tend to relate to food safety issues, such as the illegal use of salbutamol (a drug used to treat asthma and breathing problems) in hog farming in Vietnam,[77] or the use of unregulated chemicals and fertilisers in Cambodia.[78] Greater regulatory oversight and the emergence of wealthier, more aware consumers will continue to drive this trend. Increased urban density also creates scope for modern retail chains. The increasing importance of modern retail benefits companies with economies of scale, particularly those that are vertically integrated.[79, 80]

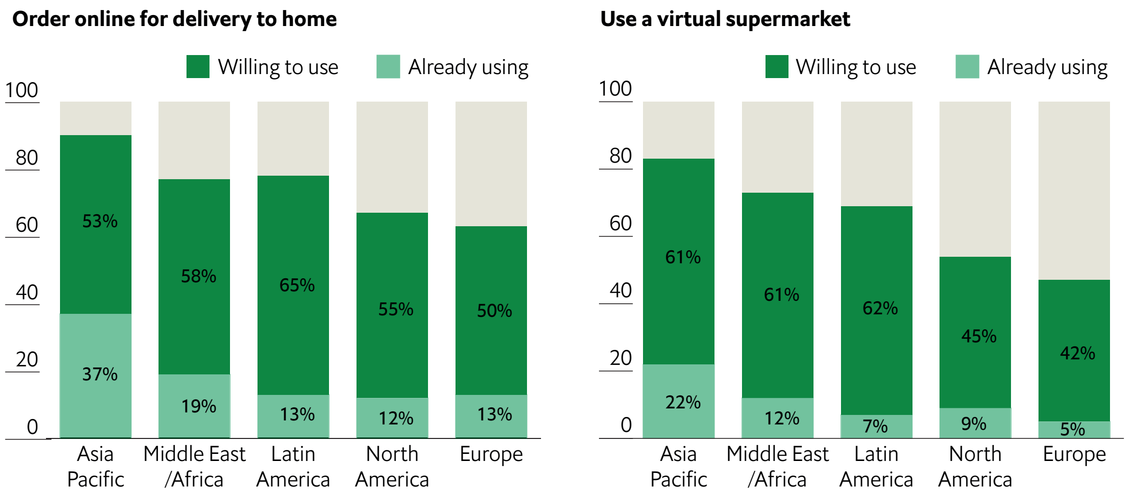
Modern retail penetration is increasing in Asia, branching out beyond urban areas and developed countries. The Asian retail market is changing rapidly as supermarket chains branch out beyond mature markets and move into smaller and less-affluent countries, and from urban to rural areas.[81] Evidence from the retail and consumer products sector across Asia and the Pacific suggests that retailers such as Carrefour, Tesco, H&M, Sun Art, 7-Eleven, FamilyMart, and many others are beginning to target tier 2 and tier 3 cities, seeing an opportunity for top-line growth.[82, 83]

In areas where supermarkets have taken over the food retailing system, the entire food system—from farm to fork—has been affected. For increasingly wealthy and sophisticated Asian consumers, supermarkets hold the promise of higher-quality food that meets safety expectations and is competitively priced. For example, the introduction of supermarkets has solved the global problem of keeping animal-based products chilled thanks to on-site deep-freeze facilities, allowing cheap and safe milk to become available for the first time in many countries (for example, Brazil).[84] Supermarkets have also brought niche markets to cities in response to evolving consumer demand. For example, neighbourhood supermarkets such as Sheng Siong and NTUC FairPrice in Singapore now have dedicated sections for organic food products.[85]

Modern retail is likely to shift online (at least partly) and towards multi-channel retail. Emerging e-commerce markets are developing quickly, and Asia has become the dominant regional market, driven by the growth of e-commerce in China (which overtook the United States as the world's largest e-commerce market in 2013).[86] The National Bureau of Statistics reported that Chinese online sales grew by one-third in 2015, reaching RMB3.88trn. According to a Nielsen survey on online grocery shopping, 37% of all Asian consumers have already used online shopping, and another 53% are willing to do so. In mature markets such as Japan, South Korea, Singapore and China, opportunities for food retailers to reach consumers online are particularly significant, due to factors such as population size, high levels of smartphone penetration, and the development of e-commerce, enabling a culture of online shopping.[87]

The rise of e-commerce could re-design the food system, lengthening supply chains physically and cutting people out of the supply chain. Companies such as OpenTaste act as a large global farmers' market, connecting consumers with farmers and manufacturers directly.[88] The use of e-commerce in food by companies such as Amazon and Walmart has been a focus of considerable discussion,[89] but experts interviewed during the research programme highlighted that e-commerce may not be limited to modern retail, and that mom-and-pop stores could leverage falling smartphone prices and increased Internet access to capture a share of the market for themselves.

Figure 7: Consumers in Asia and their use of e-commerce



Source: Nielsen [90]

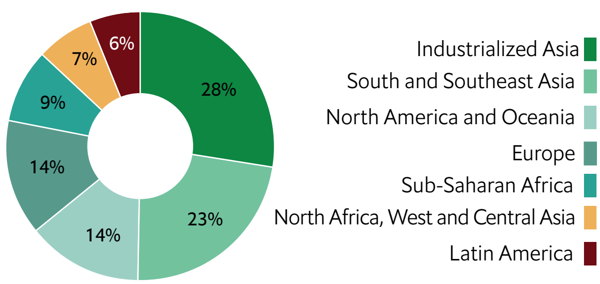
4.6 Significant food loss in developing Asia will slowly transition to food waste, but technology and data potentially offer solutions

Urbanisation	Resource scarcity	Ageing rural population	Supply chain integration	Modern retail	**Food loss and food waste**

The FAO defines food loss and waste as a "decrease in [the] quantity or quality of food". Although the distinction between food loss and food waste is not clear cut, food loss generally occurs due to inadequate technology, weak infrastructural support, technical skills deficiencies or knowledge gaps, poor logistical support or malfunctioning markets. Food waste (whether intended or unintended), on the other hand, is usually the result of choice or negligence, leading to the removal of food that is otherwise fit for consumption.[91]

Food loss is still a major issue in many developing Asian countries, particularly where road conditions are poor and there is a lack of post-harvest infrastructure. The evidence indicates that about 670m tonnes of food are lost or wasted every year in high-income countries, and about 630m tonnes are lost or wasted in low- and middle-income countries. Together, these account for one-third of all edible food produced and initially intended for human consumption.[92]

Figure 8: Global food loss and waste, by region 93
(100% = 1.5 quadrillion kcal)

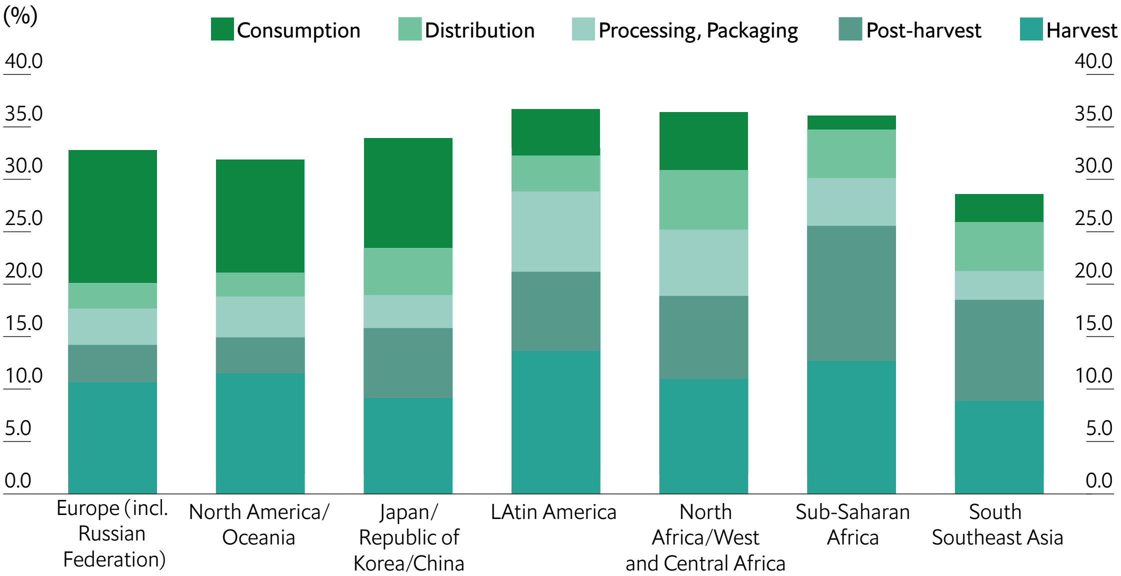


Note: Number may not sum to 100 due to rounding.
Source: World Resources Institute.

Investment in infrastructure and economic development is likely to lead to a slow but gradual shift from food loss to food waste. The causes of food loss and food waste differ greatly by region (Figure 8).[94] In South Asia and South-east Asia, food loss tends to happen at harvest time and post-harvest, with little waste at the consumption stage. The reverse is true for higher-income countries, where the bulk of waste occurs at the consumption stage.

In lower-income countries, the majority of food losses occur upstream, at harvest time or post-harvest, due to poor logistics (for example, a lack of cold chain technology in a tropical climate), insufficient or inadequate infrastructure (such as proper storage), or simply poor handling techniques. As South Asia and South-east Asia develop and invest in infrastructure, their food loss patterns are likely to converge with those of Japan, South Korea and China.

Figure 9: Distribution of food losses and waste along the supply chain, by region95



Note: Initial production is edible part originally intended for human consumption.
Source: FAO.

There is growing awareness of the need to reduce food loss and food waste, and improved data and new technology may offer solutions. Interviews conducted during the research programme suggest that food loss and food waste are yet to be recognised as systemic issues in Asia. Farmers have a low level of awareness about food waste and food loss.[96] It can also be costly to reduce food loss, with interviewees highlighting that the benefits of reducing food loss and food waste need to be balanced against the economic costs of such a reduction. Efforts to reduce food loss and food waste are also hindered by imperfect measurements and a lack of standardised definitions for what constitutes food loss and waste.[97]

However, awareness of food loss and food waste is increasing (albeit from a low base), and this is already encouraging research into the scope of the problem, as well as efforts to find technological solutions. Recent research on the scale of the problem (such as the FAO's 2011 paper on global food loss and waste),[98] as well as new work focused on addressing the problem (such as the Global Food Logistics Innovations Map),[99] reflect this growing recognition. New technology such as Winnow has already been implemented in The Business Sofitel Bangkok Sukhumvit, reducing waste by half by automatically measuring what is being thrown away through machines installed in the dining restaurant.[100]

5. Barriers to moving food and agriculture have implications across the food supply chain

Food is not efficiently reaching those in need. Globally, 1bn people suffer from hunger, despite global food production statistics indicating that enough food is produced in a year to feed each person 2,700 calories and 75 grams of protein per day.[101] In many ways, production itself is not the problem; the difficulty lies in distribution, as food is not always grown where it is needed most.[102] Trade can help to mitigate distribution issues by improving access to food, lowering costs and mitigating shocks to the supply chain,[103] but barriers to the movement of food and agriculture across Asia frustrate these efforts.

Non-tariff measures (NTMs) are high, particularly in the agriculture sector. Globally, tariffs have decreased. In Asia, however, most tariffs are linked to trade in agricultural commodities,[104] and NTMs for agricultural commodities are particularly high. For example, Malaysia and the Philippines have tariffs of 7.8% and 10.9%, respectively,

Figure 10: NTM measures imposed in Asia-Pacific

Source: APEC Business Advisory Council, University of Southern California, Marshall School of Business; UNCTAD TRAINS.

for agricultural products, and NTMs of 44.8% and 34.3%, respectively, in terms of ad valorem equivalent tariffs.[105] By contrast, for manufacturing products, Malaysia and the Philippines have tariffs of 3.1% and 2.8%, respectively, and NTMs of 22.1% and 15.4%, respectively, in terms of ad valorem equivalent tariffs.[106]

The food trading environment has become more challenging.[107] According to research by the University of California's Marshall School of Business (which interviewed 421 stakeholders across Asia and the Pacific),[108] sanitary and phytosanitary (SPS) measures are frequently used to impede trade through discriminatory enforcement, and technical barriers to trade (TBT) have the highest negative impact in terms of time and cost. Procedural obstacles are most frequently encountered, due to a lack of compliance capabilities. Pressure points for businesses include:

- Higher transaction costs
- Increased operational expenditure and food prices
- Decreasing competitiveness.

The unique nature of agricultural products amplifies the impact of delays. Agricultural products are perishable and are sensitive to time and temperature. FieldFresh Foods estimates that internationally, the desired food freshness is about seven days. However, produce in India can deteriorate in quality within 24–48 hours of harvest, due to inadequate infrastructure and the lack of a complete cold chain.[109]

Border compliance also takes time. The World Bank estimates[110] that border compliance takes over 280 hours in India and 90–100 hours in Indonesia and China, all of which affects the freshness of agricultural products. (To provide some context, border compliance takes about 19 hours in Hong Kong and 35 hours in Singapore.) Agricultural products also face unique logistical and regulatory challenges. Concerns about food safety, for example, mean that certain tests are necessary, and this can lead to high intra-regional trade costs, as in the ASEAN.[111]

Poor infrastructure makes it difficult to transport and store food, driving costs up and increasing food loss and food waste. Domestic efforts to link smallholders to markets depend on good transport links and rural–urban connectivity. Low-quality and low-density rural road networks have an adverse impact on the cost of agricultural inputs and the quality and value of outputs, with lack of access ensuring limited potential for marketing crops.[112]

In Indonesia, for example, there are considerable differences in the price of rice between producing and consuming regions, due to poor maintenance of infrastructure, cargo insecurity and topography.[113, 114] In interviews conducted as part of this study, experts explained that it is not economically viable to trade or even move food from inland areas if road transport networks are poor, port capacity is insufficient or there are no storage facilities. A 2011 report by the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) observed that suppliers of fresh fruits and vegetables in Thailand lost about US$96.4m a year due to spoilage and poor storage.[115]

6. Opportunities and challenges

6.1 Building resilient food supply chains can support wider food security goals

Supply chain management can focus on diversifying food sources, building resilience to shocks and improving nutritional outcomes to address wider food security concerns. The surge in demand for food products in Asia has made it more difficult for most countries to remain self-sufficient, particularly China. At the same time, wealthier and more urban consumers are consuming a more diverse diet, and no single country can have a comparative advantage in producing everything. Food sources in the supply chain (whether domestic or imports) should be diversified to lower systemic risk (similar to financial portfolios).[116] Trade can be a cost-effective way to stabilise shocks to domestic supply chains if imports are timely and accessible.[117] Imports also allow countries to better match supply (which is seasonal) with demand (which is much less seasonal), and the geographical diversity of imports helps to reduce disease and pest supply risks.

Forward-looking resilience measures include building climate change and disaster risk mitigation measures into supply chains. For example, APEC has recently taken steps to secure food production and supply chains by helping producers in high-risk areas move to disaster-proof crops and farming methods.[118]

Food security and supply chain considerations mean that policy efforts should extend beyond agriculture and health. Policy action is needed to address a range of issues, including agricultural efficiency, food loss and food waste, and the modernisation of food distribution. However, these issues require policy action that extends beyond agriculture. Adopting a systems mind-set will help to assess upstream and downstream policy impacts. For example, tackling food loss requires investment in infrastructure such as warehouses, improved transport links, and the extension of R&D work to farmers.

6.2 Public–private collaboration across the food supply chain can foster food security

Collaboration between Asian countries' public and private sectors is critical to adopting a broader approach to food security. PPPs are needed to champion the transformation of agricultural production in order to meet the food and employment demands of the future. For example, the FAO promotes the idea of a Food Policy Council, consisting of a wide range of stakeholders such as the government, commodity associations, farmers' co-operatives and the tourism industry. Stronger partnerships with the private sector and capacity-building activities in agribusiness and value chain promotion deserve consideration.[119] Private-sector support could also be provided through technology creation, adoption, deployment and knowledge transfer, facilitated through incremental investments in research and upskilling. Smallholders also require strong support to help them increase their output and productivity, with the end goal of integrating themselves into broader value chains. Collaboration with the private sector can also contribute managerial skills, knowledge base and entrepreneurial spirit.[120]

PPPs can help governments to manage risk across food supply chains more efficiently. In developing countries, PPPs can help agricultural sectors transition to more market-driven systems that take demand and supply factors into account, such as labour and projected demand. As the FAO has noted, the PPP model allows governments to decide how to handle risks in agri-food—that is, whether to keep the risk, share the risk, or even offload the risk to the private sector, depending on stakeholder capabilities and the project lifecycle.[121] Agri-PPPs have been found to reduce commercial risk for the private sector through fiscal incentives and institutional measures designed to reduce transaction costs, such as exclusive purchase rights for raw materials. Government contributions (such as the provision of extension services and supporting infrastructure, or the use of government facilities) also create a more enabling business environment. PPPs can also help to professionalise farm operations: experts interviewed during the research programme highlighted that partnerships with firms are critical for smallholders to build capacity in meeting international standards.

6.3 Investing in both hard and soft infrastructure can smooth supply chains, with the long-term aim of mitigating factors such as the impact of climate change

Regardless of the length or shape of food supply chains, they need supporting infrastructure to function efficiently. Critical infrastructure failures (such as disruptions of roads/railways/air traffic, or trade infrastructure disruptions such as closure of food warehouses) are increasingly disrupting food supply chains in developing Asian countries.[122] For this reason, it is important for policymakers in developing nations to invest in high-quality hard infrastructure, such as roads, railways, ports, airports, electricity, storage, warehousing, etc. In addition to ensuring the smooth functioning of food supply chains, returns on investment include reduced trade and logistical costs.

In the context of Asia's low- and middle-income countries, resource allocation towards soft infrastructure development[123] is also critical to the smooth functioning of food supply chains, and to the eradication of discouraging non-trade barriers. This includes investment in a country's legal and political effectiveness, law enforcement capabilities and institutional capacity.

Investment in infrastructure could be forward-looking, particularly in terms of being climate- smart and integrating disaster risk reduction. The ADB estimates that developing Asia will need to invest US$26trn in infrastructure (including the cost of climate change mitigation) between 2016 and 2030.[124] Typically, investment in infrastructure lags behind growth and has long gestation periods of five to ten years.[125] New investments and the replacement of ageing infrastructure therefore provide space for forward-looking considerations, such as climate-smart agricultural investment and disaster risk reduction. Asia is one of the world's most disaster-prone areas,[126] and climate change could exacerbate these disasters. The impact of these disasters can be mitigated through investment in agricultural measures such as raised seed beds and proofing of storage areas,[127] or investments in climate-proof rural infrastructure, such as elevated road embankments and relocated upstream water intake and treatment works.[128]

6.4 Sustainable supply-side improvements can be prioritised through productivity gains and R&D investments

Breakthroughs in resource-use efficiency and productivity gains will be critical to achieving the necessary output growth while avoiding environmental degradation. Global demand for food and other agricultural products is expected to increase by around 60% in the period to 2050.[129] Demand will also undergo structural changes due to population growth, population ageing and urbanisation.[130] Experts interviewed during the research programme highlighted that while potential yields will be affected by climate change, average yields in Asia are already below the maximum, and closing these yield gaps will be instrumental to increasing resource-use efficiency. Research on climate change mitigation will also be important, given Asia's vulnerability. For example, a one-metre rise in sea level could wipe out prime rice production areas in low-lying deltas and coastal areas, such as the Mekong River Delta and the Ganges basin. Rising sea levels would also contribute to soil salinity and reduce rice yields.[131]

Investments in agriculture infrastructure and R&D spending are essential, particularly in low- and middle-income Asian countries. Over the past few decades, agricultural yield growth seems to have stagnated, despite technological advances.[132] Research could help the sector to achieve its future output and sustainability-related goals. Agricultural subsidies could also be revised to prevent the misalignment of prevailing agricultural price incentives and supporting structures, and to encourage the transition to sustainable agriculture.[133] Food losses and food waste could be reduced through investment in better post-harvest infrastructure and training, helping to achieve the sustainable development goal (SDG) of cutting per-capita global food waste by 50% and reducing food losses by 2030.[134] Constraints such as ageing farmers can also be overcome through the increased use of automation, as in Japan (which aims to introduce more than 20 types of robot into agriculture and the food industry).[135]

6.5 Prepare for increased transparency and quality concerns

Companies in food supply chains should prepare for the shift towards traceability and certification requirements. Millennials are more likely to indicate a willingness to pay for "green" labels and traceability,[136] and they will be a key demographic for retailers in the period to 2030. Environmental issues such as deforestation, responsible sourcing and food miles have been common topics in developed countries for some time, but they are now becoming popular (albeit at a slow pace) among consumers in Asia as well. New technology such as blockchain can help companies to monitor and track their supply chain more efficiently.[137]

Company-level shifts in favour of increased transparency will have cascading effects on small-scale farmers and small to medium-sized companies. As consumers become wealthier and change their food consumption patterns, their interest in food quality and safety is likely to increase, and small suppliers may struggle to meet their requirements. Large retail chains' entry into the market also tends to tilt the balance away from small suppliers.[138] Australian experience cautions that smaller farmers can be excluded from modern retail growth and experience lower returns unless efforts are made to integrate them into larger supply chains.[139]

7. Appendix: Research approach

The term "food system" can be defined in different ways. At its simplest, a food system covers "end-to-end" activities, from production to consumption, and even disposal. More broadly, it covers "the governance and economics of food production, its sustainability, the degree to which we waste food, and how food production affects the natural environment.[140] The FAO defines a food system as encompassing all the stages of keeping us fed: growing, harvesting, packing, processing, transforming, marketing, consuming and disposing of food.

For the purposes of this report, we have defined a food system as including "all activities in the food supply chain, from production, processing and packaging to logistics, distribution, consumption and disposal, as well as policy considerations such as the environment, health, governance, sustainability and supporting infrastructure and institutions."

Asia is also defined differently in various publications and databases. In this report, Asia refers to South Asia, East Asia and South-east Asia, unless otherwise stated. Middle East countries (which are sometimes known as West Asia countries) are not included.

7.1 Overview

The objective of this research was to analyse food-related trends along the value chain (from production to waste) and to draw out underlying themes that will be critical in 2030 and themes that are particularly relevant to Asia. For this reason, our methodology focused on identifying a list of key trends through a literature review, and then narrowing the list of over 90 trends down to key thematic issues for Asia, based on our internal analysis and expert input (gathered via interview). Each thematic issue was then explored to develop a consistent narrative for Asian countries.

7.2 Triangulating themes

We identified more than 90 trends along the various parts of the food value chain, based on the literature review and the environmental scan.[ii] A PESTLE analysis was then carried out to categorise these trends, and to ensure that the list of trends was comprehensive. An internal discussion was held to validate and review the PESTLE analysis, and to identify the 30 major and consistent trends (based on the literature review).

An online questionnaire focused on the shortlisted trends was then developed and shared with the experts who were being interviewed for the study. We ran concurrent interviews with these experts to obtain their views on the overall food system(s) in Asia, as well as underlying trends. The interviews provided deeper insight into critical research issues and topics, ensuring that the study incorporated the latest thinking and expertise of those working directly in this field. The insights from the interviews and the results from the questionnaires were then analysed to draw out the themes.

Figure 11: Research programme phases

1 Conduct literature review	2 Conduct environmental scan	3 Conduct expert interviews	4 Map trends to themes
•The research team first defined the term "food system" for the purposes of this report. •Based on this definition, we traced a value chain for food. •We then conducted an extensive literature review to gather current thinking on food systems.	•We conducted an environmental scan to identify trends, drivers and weak signals. •We utilised a political, economic, sociological, technological, legal and environmental (PESTLE) analysis framework to classify and deep-dive these findings. •We carried out a detailed scan of the macro-environment of the region, and identified future expectations regarding how the environment will evolve.	•This phase supplemented the research findings by assessing the following two questions for each trend: 1. How **critical** is the trend to 2030? 2. How **relevant** is the trend in Asia? •We conducted semi-structured interviews with experts. •A survey of trends from Phase 2 was also sent to the experts for their input.	•Expert input was mapped against trends gleaned from internal research. •We then drew out the key themes by identifying commonalities among the trends. •As a final step, we developed consistent narratives for exploration. •The narratives focus on the implications of the trends and themes for food systems, as well as the challenges for stakeholders.

Figure 12: Steps in triangulation of themes

Long list of 90 micro and macro trends	• Based on literature review and environmental scan • Mapped to food supply chain
Internal discussion	
List of 30 trends	• Shortlisted to common and/or recurring trends
Expert interviews and input	
5 themes	• Themes mapped by identifying key trends to underlying, common platforms

Source: The Economist Intelligence Unit.

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● Precise outcomes, reliable data: Powered by our rigorous approach to data standardisation, economic analysis and forecasts, Market Explorer offers precise comparisons between potential markets in terms of size and nature of opportunity. Users have the option to view income at purchasing power parity (PPP) in addition to perceived annual market exchange rates.

● Evidence-based, actionable results tailored to your requirements: Adjust rankings according to your appetite for risk or return by refining and weighting results by adding 15 external environment indicators.

● Fast, user-friendly and with a choice of reporting: In just a few simple steps you can have access to tailored market opportunities and forecasts with your choice from a range of reporting options.

● Support from our team of experts when you need it: We'll always be on hand to provide training and customised support when you need it.

For more information please visit eiu.com/market-explorer

Access China

Access China is a unique service that will help your business to succeed in China. It is the only single source of data, analysis and forecasts for all 31 provinces and 292 of China's largest cities, providing you with a comprehensive understanding of China today, but more importantly giving you confidence that you will still understand China in ten and twenty years' time.

What will Access China allow you to do?

- Benchmark in detail provinces and prefectures of China using consistent and comparable data.
- Understand the market potential for your products and services in any location within China.
- Investigate operating costs, infrastructure development and labour markets to help you to make investment decisions.
- Monitor what other businesses are doing in various regions.
- Gain a forward-looking perspective on how fast China's cities and its regions are growing.
- Feed reliable data into your own China business strategy models.

Who should use Access China?

- Organisations that require an understanding of how the Chinese market works, or are already operating in or looking to enter the Chinese market.
- Companies already operating in China that need to benchmark their performance in particular provinces and assess the market potential for products and services in any region or city.
- Government agencies can use Access China to assist trade mission efforts and exporting companies, and as a research tool for understanding China's internal and external dynamics.
- Academic institutions use Access China to help faculty and students conduct detailed political, economic, and business research across China.

To request a demonstration of how Access China could benefit your organisation, please get in touch.

Americas
Tel: +1 212 698 9717
Email: americas@eiu.com

Asia
Tel: +852 2802 7288
Email: asia@eiu.com

Europe, Middle East & Africa
Tel: +44 (0) 20 7576 8181
Email: london@eiu.com

LONDON
20 Cabot Square
London
E14 4QW
United Kingdom
Tel: (44.20) 7576 8000
Fax: (44.20) 7576 8500
Email: london@eiu.com

NEW YORK
750 Third Avenue
5th Floor
New York, NY 10017
United States
Tel: (1.212) 554 0600
Fax: (1.212) 586 1181/2
Email: americas@eiu.com

HONG KONG
1301 Cityplaza Four
12 Taikoo Wan Road
Taikoo Shing
Hong Kong
Tel: (852) 2585 3888
Fax: (852) 2802 7638
Email: asia@eiu.com

GENEVA
Rue de l'Athénée 32
1206 Geneva
Switzerland
Tel: (41) 22 566 2470
Fax: (41) 22 346 93 47
Email: geneva@eiu.com

SINGAPORE
8 Cross Street,
#23-01 Manulife Tower
048424, Singapore
Tel: (65) 6534-5177
Fax: (65) 6428 2630
Email: singapore@eiu.com