

Argentina



Argentina's grains industry: Implications for Australia

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Please note

1. Export and import values often vary depending on the information source — exercise caution when interpreting information presented in this publication.
2. All units cited in this report are metric measurements. Of particular note, the unit tonnes is a metric tonne (i.e. 1000 kilograms).
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In Buenos Aires, the authors (from left) Peter White and Ross Kingwell, with Australia's Ambassador to Argentina, Noel Campbell (far right)



In Rosario, Argentina, Ross Kingwell (far right) with staff from the Rosario Board of Trade. From left: Alfredo Sesé, Emilce Terré, Guillermo Llovera, Silvio Di Vanni and Alejandro Lorenc (interpreter and driver)

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Key findings



Argentina...
produces 125mmt
of grain



...exports 86mmt
of grains and
oilseed products



...representing 15%
share of world
grains trading

Grain production and export

Argentina produces 125mmt of grain or 5% of the world's grain production. Its share of world grains and by-products' trading is 15%, involving exports of 86mmt of grains and oilseed products.

Wheat production and export

Argentina's wheat production is destined to consistently reach around 21mmt towards 2025, with its area planted to wheat possibly increasing by a further 2 million hectares, depending on price incentives. The increase in wheat production will not solely be due to an increased area sown to wheat. Yield increases are likely as more farmers use increased inputs, adopt superior varieties and use improved technologies. Argentina's domestic requirements are likely to remain at between 6mmt and 7mmt, so around 14–15mmt will regularly become available for export compared to the average annual export of only 6.5mmt from 2008–09 to 2014–15. Already in 2018, around 6.1 million hectares is being planted to wheat with anticipated production being 19mmt.

Production and supply chain costs

Argentina's supply chain costs for exported wheat vary due to the distance from a farm to its closest port. For short trucking journeys of 150km, supply chain costs are about 22% of the wheat FOB (free-on-board) price. However, most wheat exported requires a truck journey of closer to 250km and so supply chain costs rise to around 27% of the wheat FOB price. Argentina's farm costs of export wheat production greatly depend on whether farmland is owned or rented. Nonetheless, overall, the per tonne farm cash costs of wheat production in Argentina are low by international comparison. However, affecting costs of production in Argentina are a plethora of government taxes that amount to about half of the cash costs imposed on farmers who own or rent land. When farmland is owned, the full farm costs of wheat production are around US\$129 per tonne (t). Argentinian wheat can be grown and placed aboard ships for about US\$27/t cheaper than Australian wheat.

Wheat breeding

Although policing of plant breeders' intellectual property rights is improving, commercial returns to wheat breeders historically have been constrained by poor enforcement of these rights. Breeders mostly focus on yield rather than grain functionality and quality. While yield advantages will always remain a priority, many Argentinian experts acknowledge that as Argentinian wheat exports re-enter markets or attempt to establish new markets, greater diversity in grain functionality and quality will be required.

Government reform

Argentina's national government has a reform agenda that includes not viewing the grains industry solely as a 'cash cow' to be heavily taxed. The government has embarked on macroeconomic policy reform and infrastructure investment to sustain the export competitiveness of its industries, importantly including the grains industry. Generating macroeconomic stability (especially controlling inflation), attracting foreign investment and improving transport and energy infrastructure are among the policy priorities of the government. For agriculture, reduced export taxes, enhancing productivity and upgrading supply chain infrastructure are already helping to underpin the export competitiveness of Argentina's grains sector.

Industry-good functions

Argentina's grains industry has largely self-funded its industry-good functions. Rather than rely on government funding and action, the grains industry has established and supported its own set of industry-good organisations. Australia could potentially learn from Argentina about how to fund and undertake industry-good functions.

Key implications for Australia's grains industry

Increased wheat competition

Increased wheat exports from Argentina will cause increased direct and indirect competition in Australia's key wheat export markets. The indirect impacts arise as Argentina initially enlarges its exports to the Mercosur trade bloc (see page 17) and other nearby markets, displacing other origin wheat, some of which may be redirected to other markets in which Australia has a stake. Direct competition will arise when Argentinian wheat enters key Australian markets such as those in South East Asia.

Organisational competition

Australian wheat exporters will face not only growing price competition but also intensified organisational competition from Argentinian industry organisations funded to serve Argentina's grains sector and its customers.

Australian industry improvements

Australia needs organisational innovation to ensure its wheat breeding, classification systems, supply infrastructure and trade development activities efficiently align to deliver strategic benefits to all transactional parties, including end users. Australia especially could learn from Argentina about how to fund and undertake some industry-good functions.

Growth in Asian demand

Asia's rapidly growing markets are likely to continue to accept wheat from Australia *and* wheat from other origins, such as Argentina and the Black Sea region, with Australia's market share in some of those markets likely to be diluted.

Remember Argentina, but focus on Black Sea

Argentinian wheat production is a far lesser threat than wheat production in the Black Sea region in the near and longer term. However, the growing importance of Argentinian grain in international grain markets makes it necessary for Australia to monitor and respond to developments there.

Executive Summary



Policy settings

- The policies and actions of the new Macri government in Argentina since 2015, up until September 2018, have stimulated export grain production and encouraged investment in grains industry infrastructure. Despite reimposing export taxes in September 2018, growth in grain production and exports is highly likely, provided political and economic stability are maintained, which is neither easy nor certain given the turbulent political history of Argentina.
- Shortly after taking office in late 2015, President Mauricio Macri eliminated corn and wheat export taxes and reduced the export tax on soybean, the country's main cash crop, from 35% to 30%. He also announced a 5% rebate to producers in the country's northerly provinces, outside the country's main soybean belt, to help offset their higher transportation costs. From January 2018, the export tax on soybean was planned to gradually diminish by 0.5 percentage points per month up until December 2019.
- Macri's government hopes to lift grain output to 150mmt by the end of his first term in late 2019, up from 123mmt before taking office in late 2015. Current and planned investments in road and rail infrastructure are facilitating additional export of grains and are encouraging grain production in northerly and other geographically marginal areas. Maintained government and private investment in research, extension and supply chain infrastructure will also support productivity and efficiency gains, and stimulate additional crop production.
- In early September 2018, facing mounting financial and inflationary pressures, President Macri announced US\$12.9 billion in government spending cuts whilst simultaneously reintroducing a range of export taxes, including taxes on exported grains and oilseeds. Up until 2020 every tonne of exported wheat and corn now pays a 12% tax on its FOB price. However, the tax is a maximum of 4 Argentinian pesos for every taxable US dollar value of the FOB price. Soybeans, oil or meal pay an export tax of 18% (the existing export tax) plus another 12%, subject to a cap of 4 Argentinian pesos per US dollar of value exported. Biodiesel pays an existing export tax of 15% plus a further 12%, subject to the previously stated cap condition.
- Due to rampant inflation and the unreliable nature of the Argentinian peso as a store of wealth, many Argentinians (including farmers) prefer to hold assets other than cash. Hence, land is held tightly and, when sold, attracts very high prices. Although some loosening of the restrictions on foreign ownership of rural land is occurring, tight controls still govern foreign ownership of farmland in the core area of prime cropping land in the provinces of Córdoba, Santa Fe and Buenos Aires. Bringing persistent inflation under control will enhance confidence in the Argentinian currency and encourage further investment by local and foreign businesses in cash-making enterprises rather than asset ownership alone.
- Greater access to foreign credit will help fuel infrastructure investment in Argentina and further support economic growth. Depending on the magnitude and stability of Argentinian economic growth over the next decade, the value of the Argentinian peso against the US dollar should eventually improve, dampening the export competitiveness of Argentinian grains. In the short to medium term, however, the peso will remain weak against the US dollar.
- Policies that support economic growth and lessen income inequality will reduce the need to heavily tax the farm and agricultural export sectors, and lead to a more diversified and resilient economy.
- Long-standing protectionist policies for the manufacture of farm machinery in Argentina have enabled that sector to prosper. Farm machinery manufacture is based around 860 small and medium enterprises (SMEs), with about 10% of these companies being in operation for more than 50 years and almost 90% located in the provinces of Córdoba, Santa Fe and Buenos Aires. These three provinces regularly account for more than 80% of Argentina's production of wheat, corn and soybean. Farm machinery manufacture employs 47,000 skilled workers and is a main source of employment in some small rural centres. Argentinian production of agricultural machinery and equipment accounts for around 80% of all farm machinery used in Argentina.

Environmental advantages and challenges

- Argentina's grains industry enjoys some enduring competitive strengths. An inland waterway provides ocean-going vessels with many berthing opportunities near Argentina's heartland of grain production. Large volumes of grain grow near these inland ports. Moreover, these ports and waterways attract grain from border regions in Paraguay and Brazil. These circumstances ensure Argentina's grains export supply chain costs are far less than those in Canada or in many inland parts of Australia, with grain often travelling less than 300km to a nearby export port terminal.
- Projected climate change is likely to deliver warmer and wetter growing conditions in Argentina's grain-growing provinces. These conditions favour an increase in crop production, although groundwater management, disease and plant pest problems and ongoing climate variability pose persistent challenges. In some situations, greater availability of water will provide opportunities for crop irrigation.
- The likely increase in crop production, combined with the shift away from livestock production over the past two decades, does mean that Argentina is likely to remain an increasingly important exporter of grain. However, farmers' interest in returning to livestock production is currently being rekindled; and if farmers recommit to livestock

production, then less land and a lesser proportion of crop production will be exported than might otherwise have occurred.

- Argentina has a sufficiently large rural population to provide grain farms with adequate low-cost labour. Compared to other grain-exporting nations like Canada, US, EU and Australia, the cost of farm labour in Argentina is relatively low; but not as cheap as in parts of the Black Sea region due to the labour policies of the Argentinian government. Grain production, however, is likely to be increasingly subject to mechanisation and economies of scale that will make grain production increasingly less dependent on farm labour.
- Argentina's farm machinery manufacturing sector is well placed to capitalise on the trend towards greater mechanisation. Argentina also has more than 20 companies that provide global markets with farm machinery electronics and software. The Ministry of Industry and private manufacturers are collaborating to ensure that by 2020, Argentina's domestic production of agricultural machinery will reach US\$2.5 billion (US\$2.5b), involving the annual production of 10,000 seeders, 4000 tractors and 11,000 harvesters.
- The regional location of manufacturers and their frequent interaction with farmers and extension staff ensures that Argentina's machinery improvements strongly focus on farmers' needs. The experience and competency of the manufacturing staff ensures that machines are fit-for-purpose, with ready availability of after-sales service and maintenance.

Market opportunities

- Argentina's preferential access to markets of Mercosur neighbours and their growing populations provide future demand for Argentinian grains and agricultural machinery manufactures. Along with Argentina's growing population, these markets support additional grain production. For example, in November 2017, the Argentinian Ministry of Agroindustry negotiated an agreement with Brazil whereby Brazil would not import an additional 750,000t of wheat without tariffs from countries outside Mercosur, in effect enhancing the price competitiveness of Argentinian wheat in Brazil.
- Argentina enjoys a clear freight advantage over Australia into fast-growing west and south African markets, as Australia does likewise to Indonesia. Increases in shipping rates since early 2016 are helping underpin Australia's freight advantage into South-East Asia, but this is offset by Argentina's lower cost of grain production. Argentina's cost of wheat production is about US\$15/t, on average, less than in Australia.
- Despite Argentina's re-introduction of export taxes on grains in September 2018, depreciation of the Argentinian peso in 2017 and 2018 has increased the appeal of Argentinian grains in many markets. Additionally, the enhanced

international competitiveness of these Argentinian grains, along with a depreciated peso, attracts grain industry infrastructure investments into Argentina. As an example, the world's largest grain port terminal is currently under construction north of Rosario.

- Many key organisations in Argentina, government and private, know that for Argentinian wheat to re-enter markets and to develop new markets, coordinated action is required. They are currently forming that coordination.

Key institutions

- Due to change and inconsistency of government agricultural policy, and corruption in government, Argentina's grains industry has largely self-funded its industry-good functions. The provincial and national Boards of Trade in Argentina have a long and proud history of serving Argentinian agriculture, including its grains industry. These boards facilitate trade by providing a range of informational, technical and legal services. The boards contain representatives of buyers and sellers and operate as respected private businesses with secure funding, as shown by their longevity and influence. Although there are differences between the various provincial boards regarding their portfolio of activities, sizes and funding, nonetheless they all engage in industry-good activity. These organisations are well coordinated, professionally staffed and respected within Argentina.
- An activity consistently well supported by Argentinian governments is agricultural research and extension. The pre-eminent government agency responsible for agricultural research and extension is INTA (Instituto Nacional de Tecnología Agropecuaria). It is a decentralised government agency, under the Ministry of Agroindustry, created in 1956 to provide research and extension services. It has a central headquarters, 15 regional centres, 52 experimental stations, six research centres and 22 institutes of research, and more than 350 extension units. INTA employs 7300 people, of which 3500 are professional staff and one-third have doctorates.

Sectoral value-adding

- Argentina is the world's leading exporter of soymeal with 31.7mmt exported in 2016–17. Argentina is also the world's leading exporter of soy oil, exporting 5.6mmt in 2016–17. Argentina is the world's third-ranked country for soy oil-based biodiesel, producing 2.4mmt in 2016–17.
- The corn-soybean complex dominates agricultural production in Argentina and underpins a massive value-adding sector in soy meal and soy oil production.
- There is also a large wheat milling industry in Argentina. Argentina was ranked ninth in the world as a wheat flour exporter in 2015. It has about 180 flour mills.

Logistical strengths and weaknesses

- The majority of Argentina's exported grain is grown in provinces adjacent to either inland ports at Rosario or central coastal ports. The growth in Argentinian grain production and the ease of access to berths for ocean-going vessels facilitate Argentinian grain exports. In addition, competition for grain among port terminals ensures grain intake fees are kept low.
- By contrast, Argentinian road networks and the expense of trucking grain are major impediments to the international competitiveness of Argentinian grain exports. Two-thirds of national and provincial roads are not paved. Heavy taxation of road transport, via road tolls and licences, combined with relatively high wage rates for the highly unionised workforce of drivers and owners cause road freight rates for grain to be high by international comparison. Moreover, the poor condition of arterial roads means that only small 28–30t loads are conveyed by each truck and trailer. The resulting lack of economies of size contributes to the relatively high unit cost of road transport of grain.
- Over many decades, there has been underinvestment in rail infrastructure and inadequate maintenance of the existing rail infrastructure. Although rail transport rates are often slightly lower than other transport modes, their travel times are much longer and uncertain. For example, moving soybean by rail from Salta to Rosario ports can take more than a week, whereas by truck this same journey takes between 24 and 36 hours.
- Renovation of the Argentinian rail system, however, has commenced. The national government is supporting an extensive renewal of key degraded parts of the Belgrano rail network in the northern grain region. Via planned stages, much of the work will be completed by 2035, or earlier. The first major investment has been a 500km track renewal program of Rosario. This involves US\$2.8b being spent on tracks, locomotives and wagons. Much of these materials come from Chinese suppliers, with Chinese investors also providing a capital loan to be repaid over 20 years with an upfront grace period of five years during which no repayments are required. Of the 500km to be upgraded, 230km were completed by September 2017. The quality of the track upgrade supports heavier wagons that each carry around 65t and so eventually unit trains of 100 wagons (i.e. 6500t) will be possible.
- There are also opportunities for future investment in the upgrade of barge infrastructure and associated waterway improvement. Despite Argentina's extensive river systems, only 5% of its exported grain relies on barge transport.

Plausible futures

- Argentina's predominantly yield-driven growth in both grain production and exports will stimulate further investment in supply chain infrastructure, including investment from locals and foreigners attracted by economies of scale benefits, a weak peso and value-adding opportunities. These investments will further lower the unit cost of rail and port infrastructure services. A greater proportion of grain will be moved by rail and barge in coming years.
- Supply chain cost escalation in Argentina's grains industry could be curtailed by these investments, especially if macroeconomic policy reform proves successful in reducing the country's inflation, restoring confidence in the Argentinian peso and facilitating access to foreign credit.
- Already Argentina has a price advantage against Australian and North American grain, when targeting price-driven markets.
- Argentinian wheat production is destined to increase to around 21mmt within the next decade, with yield improvement and the wheat area increasing by a further 2 million hectares, depending on the relative attractiveness of wheat prices. Noting that Argentina's domestic requirements are likely to be between 6mmt and 7mmt, this suggests around 14–15mmt will regularly be available for export. Hence, Argentina will play a more important but nonetheless minor role in global wheat exports. Its main export focus will remain on Brazil and neighbouring countries.
- Wheat exports will continue to play an important, yet minor role in Argentinian grain and by-product exports. In 2017 Argentina exported 82mmt of grains, protein meals and vegetable oils. Cargill, COFCO and Bunge were the leading exporters and 10 companies were responsible for 88% of the 82mmt exported in 2017.

Politics and instability

- Political decisions can greatly affect many aspects of Argentina's economic and social life — and grain production and export are not immune. Taxes on grain exports and provincial land taxes have been a feature of government policy. These taxation decisions reveal not only the power of the government but also reflect how grain farmers are viewed politically and socially within Argentina.
- Grain farmers in Argentina do not attract the same sympathy from urban voters as their counterparts in Australia or North America enjoy. Argentinian farmers often are viewed as wealthy landowners, better insulated from inflation and whose income is derived from employing poorer farm workers.
- The World Economic Forum's 2017–18 rankings show that inflation, taxation, policy instability, access to finance, restrictive labour regulations, inefficient government and corruption are the main impediments to doing business in Argentina, with inflation being by far the main concern.

Productivity and R&D

- Argentina's principal crop is soybeans, grown on around 20 million hectares each year. By contrast, the area sown to wheat varies from 3.5 to 6.1 million hectares, with wheat yields typically ranging from 2.5 to 4t/ha, and trending upward at a lesser rate than corn or soybean. Input levels on wheat fields are increasing in the aftermath of the lifting, up until September 2018, of the export tax on wheat but wheat yields are still well below their potential. The increasing trend in rainfall in recent years is likely to bring with it challenges of plant disease, insect damage and waterlogging, but overall, more rainfall should be positive for wheat yields.
- The wheat area is approaching its long-term average of 6 million hectares and the expectation is that it will reach 7 million hectares during the next decade. In 2018 it is expected that 6.1 million hectares will be planted to wheat.
- Compared to Australia and North America, wheat R&D in Argentina will continue to focus its efforts more on higher yields rather than grain functionalities for particular markets. However, Argentina is beginning to debate the interaction between yield and grain quality improvement and the ramifications for plant breeding. Policing of plant variety rights is also being strengthened.

Wheat customers

- The main wheat customer for Argentina by far is Brazil. In 2017, 5.1mmt of wheat were exported to Brazil out of a total 12.4mmt of wheat exports. Over the past three years, Argentina has increased its exports to Brazil, displacing US wheat. In addition, following the removal of its export tax on wheat, Argentinian wheat is re-entering many markets. Argentina has identified Mercosur countries such as Brazil and Bolivia as important sources of future demand, along with west and south Africa, where large population increases will drive their future demand for grains like wheat. Many of these markets are currently not key markets for Australian wheat. However, at the lower end of the market, Argentinian wheat has gained acceptance as 'filler wheat' in South-East Asia, thereby placing price and market share pressure on Australian wheat exports to that region.
- Growth in wheat exports from Argentina will be limited. Hence, in South-East Asia, Black Sea wheat is a more enduring threat to Australian wheat exports than Argentina. Black Sea wheat, especially in the short and medium term, is more likely to capture a growing portion of the price-conscious end of this market where, in milling, it is used to bring down the cost of a grist. In the longer term, Africa rather than South-East Asia will represent market growth opportunities for Black Sea and Argentinian wheat.

- As Argentinian export grain supply chains improve their efficiency (through investment in and competition between transport modes and upgrades to permanent grain storage), then Argentina will have greater scope for targeting bulk markets and more specific niches in export markets. Hence, Argentina will place constant price pressure on Australian wheat exports and supply chains in some markets. However, Australia's main competitive pressure will stem from the Black Sea region rather than Argentina, due to the Black Sea region's ability to expand greatly its wheat production and bring grain to port cheaply.
- With the rise of Black Sea and Argentinian wheat flowing in the direction of some Australian export markets, differentiation can act as a defensive and offensive investment. Wheat breeding in Australia, with its longer lead times and path-dependency effects, can develop wheat types attractive to end users and Australian wheat growers. Other activities, such as classification changes, new segregations, more efficient supply chains and industry-good marketing functions, however, are essential competitive complements. To deliver these required changes will require organisational innovation, efficient structural change and the attendant role of industry leadership.
- As wheat from new origins makes inroads into some of Australia's wheat markets, Australian wheat exporters will not only face price competition but will also experience organisational competition. For example, the Canadian International Grains Institute (CIGI) and US Wheat Associates (USW) will be increasingly active in servicing growing Asian demand for wheat. Argentinian organisations also already acknowledge that to re-enter markets and to establish new markets they will have to invest more in grain market development. Currently, Australia has no coordinated response to address this organisational competition. Yet Australian organisational innovation must ensure that Australia's wheat breeding, classification systems, supply infrastructure and grain promotion activity align to deliver strategic benefits to all transactional parties, including end users.
- Grain trades in Argentina are facilitated by ease of access to key information. For example, under taxation law via online reporting, farmers and others are regularly required to divulge their stockholdings of grain. This aggregated information is subsequently widely available to facilitate grain trade. By contrast, stock reporting remains a contentious issue in Australia.

Wheat production

- Argentina's wheat area could increase by up to a further 2 million hectares over the next decade, depending on the relative attractiveness of wheat prices. However, wheat production is projected to increase mostly due to more farmers adopting best practice methods with increased inputs, using superior varieties and adopting improved technologies that boost wheat production. Around 21 million tonnes of wheat are likely to be regularly produced during the next decade. Noting that Argentina's domestic requirements are likely to remain at between 6mmt and 7mmt, this suggests around 14–15mmt will be available for export.
- However, much of the new exportable surpluses will not find their way onto key markets serviced by Australia. Rather, the wheat export market focus for Argentina will mostly be on market opportunities in South America and, in the longer term, west Africa; however, some wheat will occasionally flow into South-East Asia.
- Any changes in wheat production in Argentina, due to climate, technology, politics or policy, will increasingly have some influence on the international wheat trade, thereby directly or indirectly affecting Australian wheat exports. Given that new season wheat crops from Australia and Argentina become available to markets at roughly the same time, and noting the projected increased volumes of Argentinian wheat available for export, it would be prudent for Australia to monitor and report developments in Argentina's grains industry.

Wheat quality

- Better breeding and greater use of best practice crop technologies will improve the quality of Argentinian wheat — especially if end users offer price incentives for wheat quality that are more transparently passed back to farmers.
- Although a main focus in wheat breeding is yield improvement and disease resistance, there is a debate around the need for quality improvement and its associated segregation requirements.
- Argentinian wheat is principally exported as a single grade.

Actions for Australia's grains industry

- Keep committing to R&D for farm-level innovation that drives down the unit cost of wheat production.
- Commit to R&D for supply chain innovation. Upgrade, rationalise and unleash competitive pressure in supply chains to drive down their overall unit costs.
- Learn from Argentina regarding how to efficiently and effectively fund and undertake various industry-good functions.
- Monitor and report changes in Argentina that affect grain markets. Argentinian wheat could form a slightly larger share of the international wheat trade, so it is likely that Argentinian wheat production and exports will affect grain markets.
- Target markets and market segments with differentiated types of Australian wheat. This requires gathering intelligence about the specific characteristics of Australian wheat that are highly valued in different markets or that are required by different end users of wheat. Wheat breeders and those engaged in wheat variety classification can use such intelligence to ensure that the varieties offered to and grown by Australian farmers have traits that not only benefit Australian wheat growers but which serve end users' needs. Committing to being responsive to end users enhances the reputation of Australian wheat and ensures Australia's market share and price premiums are less susceptible to erosion. Such market responsiveness, however, is not the sole responsibility of wheat breeders and variety classifiers. Rather, it requires an integrated strategic commitment by the main stakeholders in Australia's wheat industry to ensure wheat value chains effectively and efficiently serve the entire industry's interest.
- Form an organisation to collect end user intelligence and demonstrate, and communicate, the value of Australian wheat to end users. Industry will and leadership (and a degree of inventiveness) is required to form and sustain such an organisation.
- Don't panic. Australia faces a gradual intensification of competition from Argentinian wheat not an immediate avalanche of grain. In that sense, Australia has time to respond. The more immediate and commercially powerful threat for the Australian wheat industry, however, is Black Sea wheat production, not Argentinian wheat production.

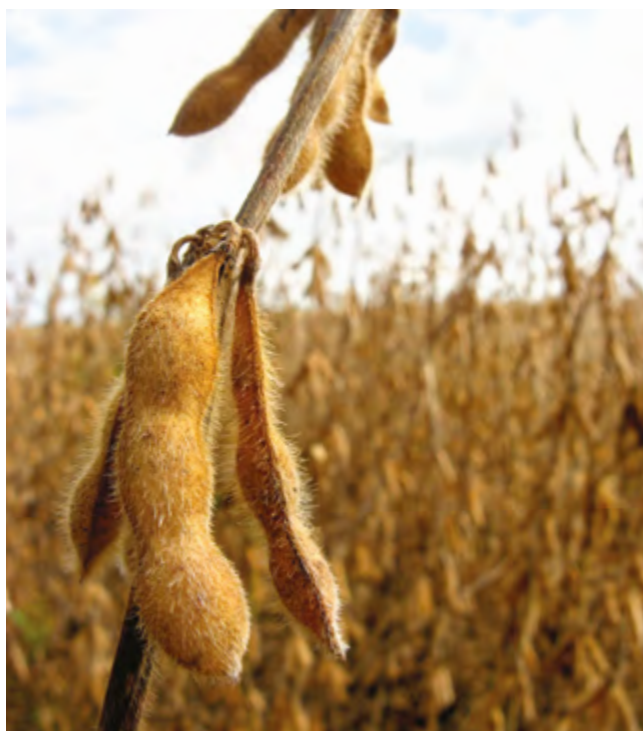
Introduction



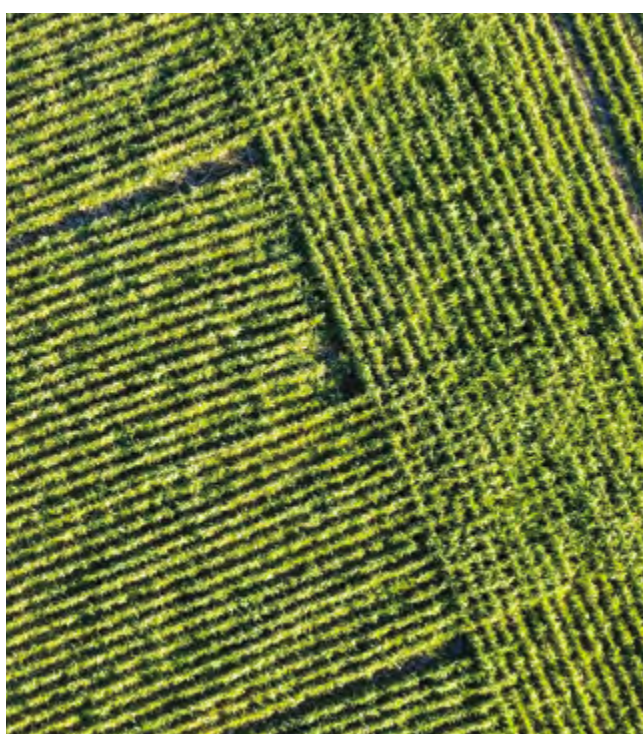
This report, which forms part of AEGIC's *Competitor series*, provides a comprehensive overview of Argentina's changing grain production, logistics and export prowess, with a focus on the implications for the Australian wheat industry. This report complements our previous reports on Canada, Ukraine and Russia and aims to provide description and analysis that informs and guides a strategic response by the Australian grains industry.

After a marked change in government and economic policy in 2015, Argentina's grains industry has rapidly changed and Argentinian grain exports have increased. Although planned additional changes in government policy will further strengthen Argentinian grain exports and provide enduring comparative advantage to Argentina's grains industry, the unanticipated reintroduction of export taxes from September 2018 will weaken Argentina's competitiveness. The Australian Export Grains Innovation Centre (AEGIC) examines these developments and reports on their implications, particularly for Australia's wheat industry.

Fortunately for Australia, soybean meal, soyoil and corn are the dominant export grain products of Argentina, rather than wheat. While wheat remains the prime focus in this report, mention is made, where warranted, of relevant changes in production of these other crops as they impinge on wheat exports.



Argentina's grains industry has rapidly changed and Argentinian grain exports have increased.



Country snapshot



Presidential elections at the end of 2015 led to many changes in Argentina's economic policies. The new Macri administration swiftly introduced many reforms, including greater market-based determination of the exchange rate, greater access to international credit, modernisation of import regulations, inflation control and removal of export taxes on main agricultural products. In addition, Argentina held the presidency of the G20 in 2018 and has expressed an intention to join the OECD.

The World Bank (2018) points out that after an economic contraction of 2.8% in per capita real GDP in 2016, the economy recovered with per capita real GDP growth of 1.9% in 2017. However, drought in late 2017 that extended into early 2018 greatly lessened summer crop production. Export earnings were curtailed and when combined with high inflation, the economic consequences have been a fall in real GDP growth in 2018, continuing into 2019.

Although Australia has almost three times the land mass of Argentina, Argentina has a much higher proportion of arable land, such that Argentina has over 80% of the arable area of Australia. In general, the agriculture sector plays a more important economic role in Argentina (Figure 1) with 62.4% of merchandise exports being food exports (Table 1) and 7.6% of the country's GDP being the value-added by agriculture.

Argentina has almost double Australia's population, yet Australia's per capita GDP is four times that of Argentina. Australian exports include much larger volumes of mineral exports.

A product of Argentina's more fertile soils but also due to credit-constraints on farm lending, the application of fertiliser to arable land is currently much higher in Australia.

Although Australia has almost three times the land mass of Argentina, Argentina has a much higher proportion of arable land.

\$57.2bn

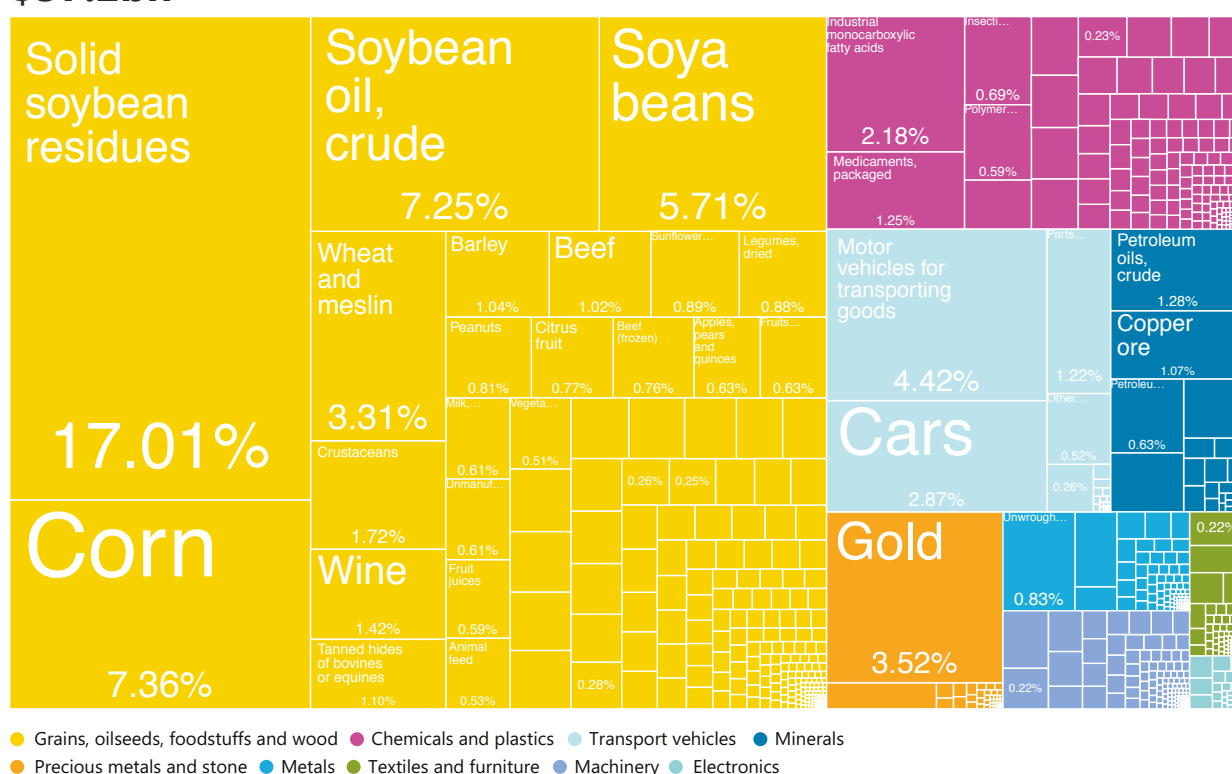


Figure 1 The product composition of Argentina's export revenues, 2016

Source: 'The Atlas of economic complexity', Center for International Development at Harvard University, www.atlas.cid.harvard.edu

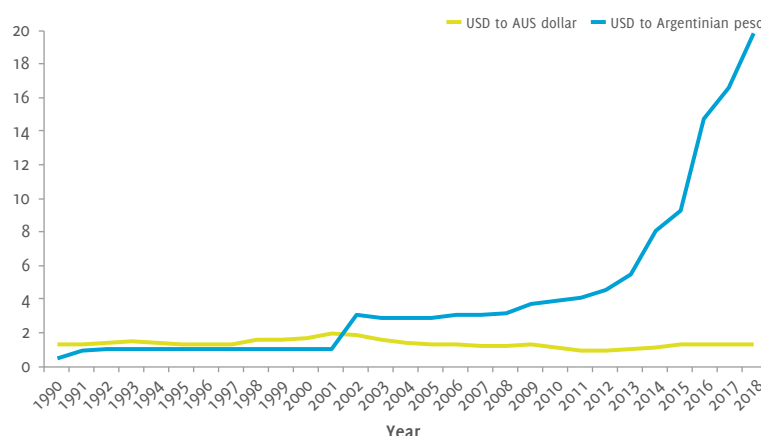
Table 1 Economic indicators for Argentina and Australia in 2017

	Argentina	Australia
GDP (US\$ billion)	545	1259
GDP per capita (US\$)	12,503	51,850
Global competitiveness index (out of 137)	92	21
GDP per capita annual growth (%)	2.9	2.3
Exports (% of GDP)	12	19
Population (million)	44	24
Rural population (% of total population)	8.1	10.4
Rural population annual growth (%)	-0.8	0.2
Agricultural employment (as % of total employment)	2.0	2.6
Land area (million km ²)	2.747	7.692
Agricultural area (as % of land area)	54	53
Arable land (as % of land area)	14	6
Arable land (million ha)	39.20	46.96
Agricultural land irrigated (% of agricultural land)	1.5	0.6
Food exports (% of merchandise exports)	62.4	15.8
Fertiliser use (kg/ha of arable land)	36	54
Agriculture value-added (% of GDP)	7.6	2.6

Source: World Economic Forum (2017), United Nations (2013) and World Bank (2018)

Over much of the past 15 years, and especially since 2013 and in recent years, Argentina has greatly benefited from a devaluation of its currency against the US dollar (Figure 2). This has made many of its agricultural exports more attractive to international buyers. Moreover, the removal of export taxes on key agricultural commodities (e.g. wheat, corn and soybean) up until September 2018 further increased the commercial attractiveness of Argentinian agricultural commodities to international buyers. During 2018 alone, the Argentinian peso halved its value against the USD. Hence, Argentina is like Russia and Ukraine in experiencing a large depreciation in their currency against the US dollar. By contrast, Australia and Canada have not experienced the same degree of depreciation and therefore face greater price competition in international markets, as grains are traded in US dollars.

Although such large depreciations of the local currency do increase the cost of imported goods and services used by the farm sector, in Argentina's case, many of its main inputs for farming — machinery, labour, fertilisers and fuel — are locally produced. Hence, currency movements have unambiguously benefited the Argentinian agricultural industries based on exports or import replacement. Hence, grain export businesses and local farm machinery manufacturers have benefited from the currency depreciation.

**Figure 2** Exchange rates of the Australian dollar and Argentinian peso against the US dollar, 1990–2018

Note: Since early 2018 the Argentinian peso has depreciated much further against the USD, reaching ARS38/USD1 in October 2018.

Source: OECD.Stats (2018), Exchange rates (indicator), <http://stats.oecd.org>

The political environment

The unfortunate history of Argentina is littered with self-serving, corrupted administrations and policy change. Political turbulence, violence, intentional avoidance of transparency and abject failure to commit to sound principles of fiscal and monetary management are the common hallmarks of much of the history of governments in Argentina. Cavallo *et al* (2016), for example, describe how successive governments have forcibly interfered with the statistical reporting of inflation in Argentina resulting in understated and false estimates being generated. The predictable result of such poor governance is Argentina's failure to achieve high levels of per capita GDP and for that GDP to be inequitably spread across its population.

In spite of its natural riches, the legacy of its manifestly poor governments is that at the end of 2017, according to official statistics (INDEC 2018), 25.7% of Argentina's population live in poverty, and 4.8% are in extreme poverty. Many governments favoured policies of taxing agricultural exports and protecting local manufacturing industries. Yet these trade policies attracted much criticism from Mercosur trading partners (see box) due to obstacles impeding intra-zone trade.

Argentina was reluctant to negotiate any international trade agreements and imposed high export taxes on key agricultural industries. Some countries affected by Argentina's non-tariff barriers adopted retaliatory measures (US, China) or successfully sought World Trade Organization (WTO) rulings against Argentina.

However, the election of the Macri government in 2015, the strengthening of its power base in elections in October 2017 and its embrace of rational economic reform are signs that Argentina's economic prospects might eventually improve. In the 2017 elections, 24 of 72 senate seats were the subject of voting, as were 127 seats in the 257-member lower chamber of deputies. The October elections were seen both as a referendum on Macri's two years in office, but also a test of power for his left-leaning predecessor, Cristina Fernández. Macri's Cambiemos (i.e. 'Let's Change') coalition won in 13 out of 23 provinces as well as the capital, Buenos Aires, and will have the biggest bloc in the parliament's congress. His party gained nine seats in the senate and 21 in the lower house of congress, bolstering its legislative power; although his party, Cambiemos, remains a minority bloc.

Its embrace of rational economic reform are signs that Argentina's economic prospects might improve.

Mercosur

Born out of a series of economic cooperation agreements between Argentina and Brazil after their diplomatic rapprochement in the 1980s, Mercosur was founded in 1991 with the signing of the Treaty of Asunción. That treaty brought Argentina, Brazil and Uruguay into a customs union with the ultimate goal of a common market. Later, Venezuela joined Mercosur in 2012 but in December 2016 it was suspended from the trading bloc due to its failure to incorporate standards on trade and human rights into its national laws.

Bolivia is in the final stages of the accession to become another member of Mercosur. Known as Mercosur in Spanish or Mercosul in Portuguese, the group encompasses 295 million people and has a combined GDP of nearly \$3.5 trillion. One of Latin America's largest regional integration projects, Mercosur also counts Chile, Colombia, Ecuador, Guyana, Peru and Suriname as associate members.

Mercosur functions as a customs union and free trade area, and has ambitions to become a common market along the lines of the European Union. However, more than 20 years after its founding, the group still struggles to achieve that goal. Nevertheless, Mercosur remains an economic and political force in the region, uniting South America's two largest economies and providing a potential springboard for Latin American integration.

The 2017 electoral result endorsed Macri's reform agenda and paved the way for him to seek re-election in 2019, as he now faces a divided opposition without a clear leader. He will press forward with labour, tax and pension reforms — although some gradualism may be required due to the current low living standards experienced by many Argentinians. The downside of gradualism is that beneficial outcomes often appear more slowly, which creates its own set of political and economic problems.

One of Macri's priorities will be to introduce tighter fiscal and monetary controls to curb Argentina's rampant inflation (Figure 3), a product of his political predecessors' often self-serving populism and opportunism. In November 2017, persistent core inflation readings of about 1.5% per month forced the Central Bank of Argentina to raise their reference rates for interbank loans by 250 basis points to 28.75%. In mid-2018 the Macri government has turned to the International Monetary Fund (IMF) for financial assistance to stabilise the currency and sustain the reform agenda. Unfortunately for the Macri government, inflation and finance problems became so acute in 2018 that major policy reversals were enacted. In early September 2018, President Macri announced US\$ 12.9 billion in government spending cuts whilst simultaneously reintroducing a range of export taxes,

including taxes of exported grains and oilseeds. Unveiled as short-term measures, every tonne of exported wheat and corn attracted a 12% tax on its FOB price. However, the tax was set to be a maximum of 4 Argentinian pesos for every taxable US dollar value of the FOB price. Soybeans, oil or meal attracted an export tax of 18% (the existing export tax) plus another 12%, subject to a cap of 4 Argentinian pesos per US dollar of value exported. Biodiesel paid its existing export tax of 15% plus a further 12%, subject to the previously stated cap condition.

In October 2018 the IMF provided a further 6.3 billion USD to help stabilise the peso and curb inflation. The unemployment rate which was 8.3% in 2017 has increased to 10.1% in 2018.

Business impediments

The World Economic Forum's 2017–18 report on countries' international competitiveness indicates that several improvements are underway in Argentina to deliver enhanced economic competitiveness, mostly due to the actions of the Macri government since 2015. There is an improved trust in public and private institutions. Technological adoption, business sophistication and greater innovation are underway. And the government is implementing reforms to lessen distortions in market efficiency and deliver greater macroeconomic stability.

Since 2014, Argentina's inflation rate has been persistently high, above 25% per annum (Figure 3). A priority for the Macri government is to combat inflation in order to stabilise the nation's currency and attract additional overseas investment.

It is no surprise, after noting Figure 3, that Argentina's high rate of inflation is a main impediment to business activity. Similarly, the high rates of taxation of businesses (especially agricultural businesses) are a further main discouragement for business investment and activity (Figure 4). Of lesser importance, but still constraining business performance, is instability in government policy and difficulty in accessing financing.

Although ranked much higher than Argentina regarding the ease of doing business, Australia's overall performance is not remarkable. In most categories of performance, Australia does not rank among the top-ranked 25 countries. Australia performs comparatively better in its provision of higher education and training that leads to its ability to produce an adequate pool of qualified workers. Australia also performs well in the development of financial markets, which is driven and mostly underpinned by Australia's stable and well-regulated banking sector. However, restrictive labour regulations, relatively high tax rates, inefficient government regulation and policy instability are main impediments to business operations in Australia. Nonetheless, it needs to be stressed that overall the ease of doing business in Australia is much greater than the situation in Argentina, as shown by Australia being ranked 21st among all countries whereas Argentina is ranked 92nd. As shown in Figure 5, apart from market size, Australia has traits far more attractive for business activity than occurs in Argentina.

Argentina is not well served by the integrity or performance of many of its key pillars for business performance (Figure 5). The macroeconomic environment, the quality of infrastructure and the sophistication and reliability of its financial markets are key weaknesses for operating businesses in Argentina.

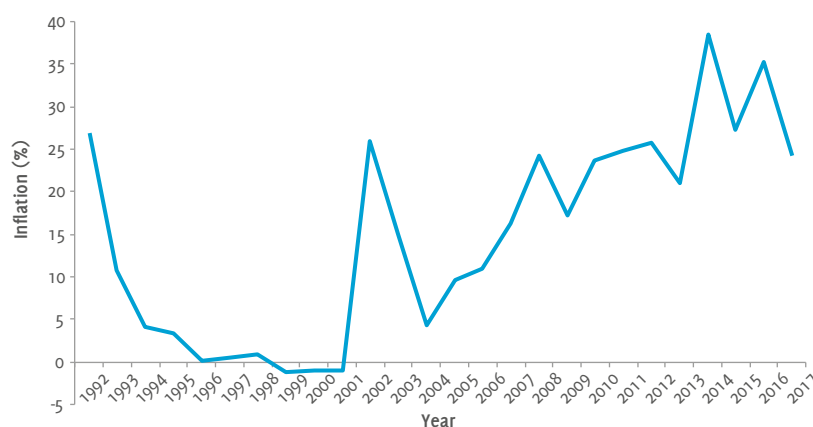


Figure 3 Annual inflation in Argentina (% per annum) since 1992

Source: Inflation estimates from Cavallo (2013) and Cavallo and Bertolotto (2016)

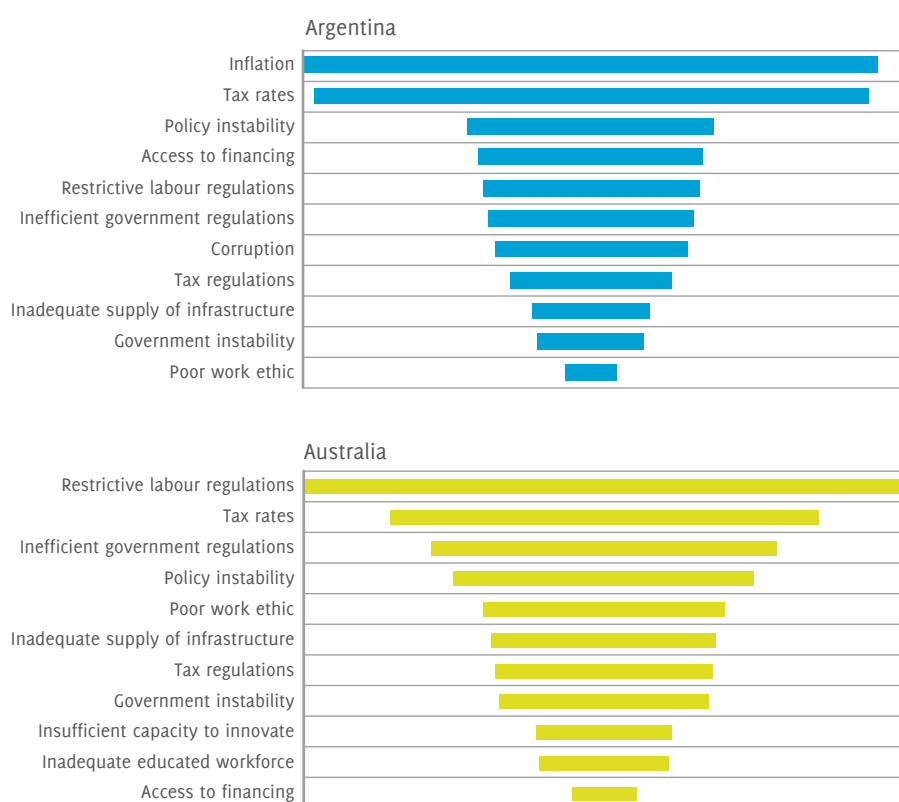


Figure 4 The most problematic factors for doing business in Argentina and Australia

Source: Based on data in the World Economic Forum (2017b)

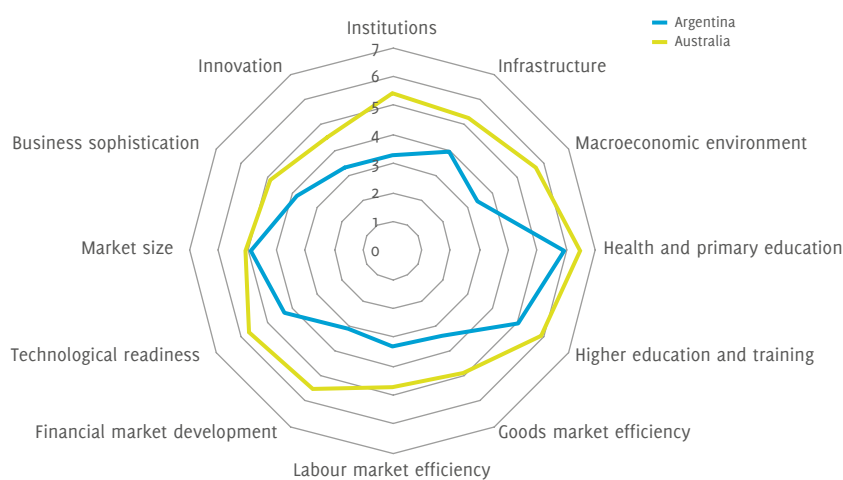


Figure 5 Factors affecting the global competitiveness of Argentina and Australia

Source: International Monetary Fund (2018) 'World Economic Outlook Database'

R&D investment

Regarding expenditure on R&D, Argentina only commits around 0.6% of its GDP whereas Australia regularly commits over 2.1% (Figure 6). Despite having almost half the population of Argentina, Australia has over double the GDP of Argentina and therefore in monetary terms commits far more to R&D than Argentina. In the case of agricultural R&D and more specifically research intensity (i.e. dollars spent of agricultural R&D as a percentage of the gross value of agricultural production), Argentina's agricultural research intensity ranges between 1.2% and 1.5% whereas Australia is closer to 2%. Moreover, Australian governments, federal and state, commit annually around US\$500m in constant dollar terms to agricultural R&D, complemented by about US\$680m in constant dollar terms from industry and private organisations.

Knowledge and innovation became national priorities in Argentina with the establishment in 2007 of the Ministry of Science and Technology. And in 2009 the Secretariat for

Agriculture, Livestock and Fisheries was upgraded to a Ministry, after which the country's agricultural research expenditures grew markedly. The number of agricultural researchers rose by more than half during 2006 to 2013 (See Figure 7). In Argentina, a few universities have started offering a graduate degree in grain postharvest operations. The large influx of early career researchers, combined with the calibre of their training, suggests that over the next one to two decades Argentina will reap the rewards from the research and industry activities of this large cohort.

Argentina's pre-eminent government agency responsible for agricultural research and extension is INTA (Instituto Nacional de Tecnología Agropecuaria). It is a decentralised government agency, under the Ministry of Agroindustry, created in 1956 to provide research and extension services. It has a central headquarters, 15 regional centres, 52 experimental stations, 6 research centres and 22 institutes of research, and more than 350 extension units. INTA employs 7300 people, of which 3500 are professional staff and one-third have doctorates.

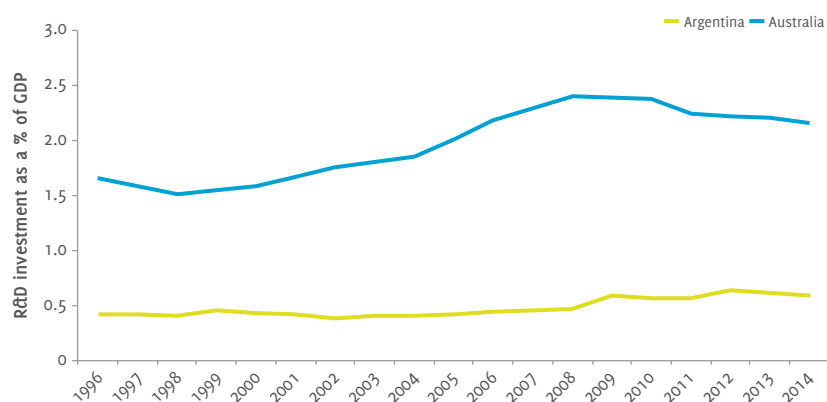


Figure 6 R&D expenditure (% of GDP) in Argentina, 1996–2014

Source: World Bank (2018b)

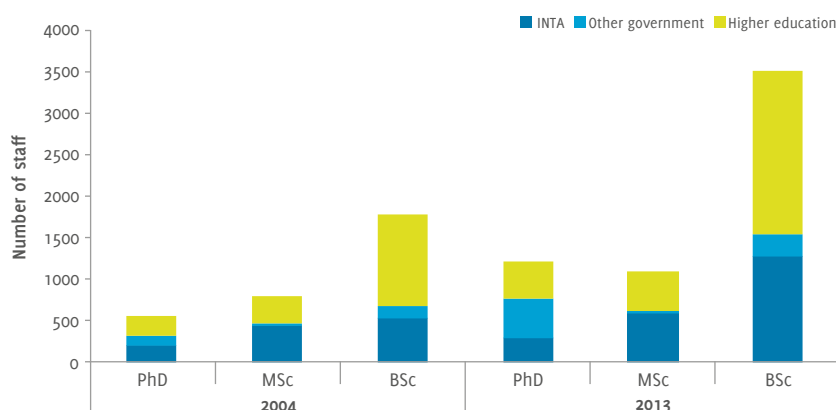


Figure 7 Changes in the number of agricultural researchers in key organisations and sectors, 2004 vs 2013

Source: Based on ASTI (2017)

Labour

In line with Argentina's population growth (Figure 10), its labour force is also growing. Moreover, since the early 2000s the unemployment rate has trended downwards (Figure 8). These are favourable signs supporting the nation's economic growth and facilitating the introduction of economic reform policies. A large proportion of the workforce being employed signals the presence of many job and career opportunities and provides greater social resilience and capacity for structural reforms that affect labour and employment conditions.

However, labour problems are widely acknowledged in Argentina. A large proportion of the workforce (over 30%) is employed in the informal sector, or is under-employed, as there are significant business and taxation costs associated with employing staff. Abuse of union power and the right to strike are commonly reported problems that weaken incentives to invest, and add to the cost and uncertainty of business activity in Argentina. Informal employment arrangements also deprive the government of income tax and social welfare contributions. The increase in the unemployment rate in 2017 is one sign of Argentina's current economic challenges.

Credit

In Argentina, inflation and access to finance cause businesses to face very high interest rates on borrowings (Figure 9). Many Argentinian governments have demonstrated poor financial and fiscal management, exacerbated by a voting public and unionised workforce often unwilling or unprepared to accept required structural and economic change. This poor management and divisive culture have led to persistent high inflation and restricted access to credit, particularly long-term credit.

In businesses like agriculture that depend on purchasing production inputs and machinery, access to credit is important. Expensive credit reduces purchases of inputs and leads to crop yields being lower than otherwise would be the case if interest rates were low.

High interest rates and limited access to long-term loans also limit expenditure on capital inputs, so upgrading farm machinery or purchasing farmland is difficult.

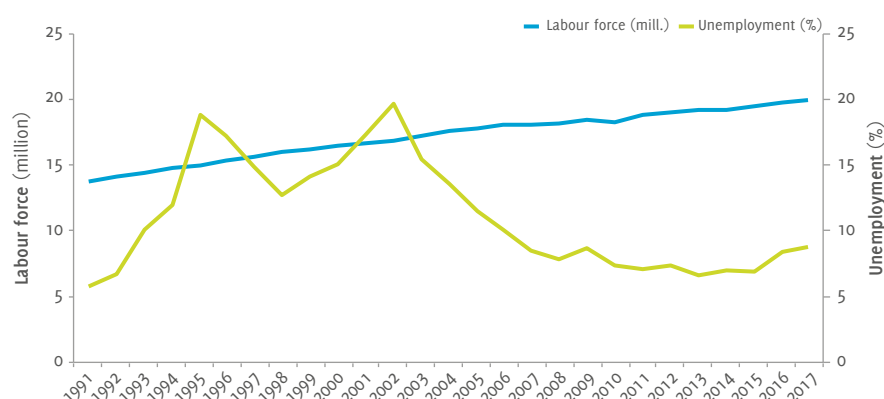


Figure 8 Argentina's labour force and unemployment levels, 1991–2017

Source: World Bank (2018)

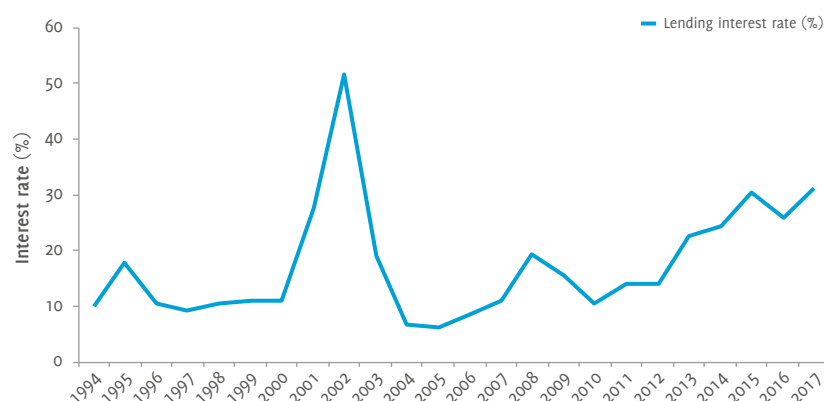


Figure 9 Lending interest rates (% per annum) in Argentina, 1994–2017

Source: World Bank (2018)

Geographic diversity

Argentina has significant differences between regions. Most of its population resides in Buenos Aires and Rosario, with southern Patagonian and many border regions being, by contrast, sparsely populated. Argentina's population continues to grow, supported by immigration from poorer neighbouring countries.

The geographical spread across elevation and latitude provides Argentina with a wide range of climate zones. The large physical size of the country supplies ample agricultural and pastoral land for Argentina's population. In addition, the country is blessed with an endowment of energy and minerals, some of which remain unexploited. The array of climate zones enables Argentina to produce many kinds of agricultural products, including cereals, oilseeds, horticultural crops, peanuts, dairy, beef and sheep products. The volume of these agricultural products is often surplus to domestic requirements and so Argentina is a principal exporter of many agricultural products.

As is typical of a nation's economic development, economic growth delivers a decline in the proportion of the population that resides in rural regions (Figure 10). That is, urbanisation occurs. Hence, although agricultural production and exports are important features of Argentina's economy, nonetheless mechanisation and economies of size often mean employment prospects are greater in urban centres.

The uneven spatial distribution of Argentina's population also is linked to spatially uneven economic activity and skewed wealth distribution. A large proportion of Argentina's population is very poor and underemployment is commonplace. Differences in regional economic prosperity are often attributable to population size differences, different endowments of natural resources and the outcomes of government policy and investment activity. At the close of the second half of 2017, according to official statistics, 25.7% of Argentina's population lived in poverty, and 4.8% were in extreme poverty (INDEC 2018).

The relatively high proportion of Argentina's population in poverty constrains the actions of government. It leaves governments vulnerable to groups who peddle populist sentiments and policies that may not be in the strategic interests of the nation, nor in the long-term interests of those who are currently poor. It means policies that impose initial economic hardship with long lead times to beneficial impacts are difficult to introduce or implement.

The uneven spread of wealth and opportunity within the population results in social tension and causes groups perceived as being wealthy to be politically expedient targets. This has occurred for grain producers. Since February 2002, up until December 2015 and again from September 2018 grain producers have been required to pay export taxes. Yet even before the introduction of export taxes, farmers already regarded themselves as being highly taxed. The introduction of the export taxes made grain farmers more resentful as they saw little return from their increased tax contributions in terms of infrastructure improvements in road, rail and telecommunications.

Argentina is a principal exporter of many agricultural products.

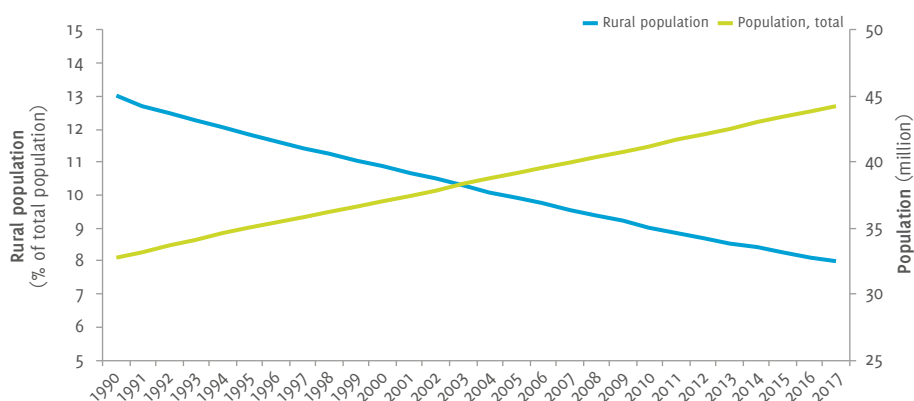


Figure 10 Argentina's population and its rural component since 1990

Source: World Bank (2018)



Argentina's Grains Industry



Argentina produces 5% of the world's grains. World grain production is expected to reach 3168mmt in 2016–17, of which 2597mmt is cereals and 570mmt is oilseeds. Argentinian grain production in 2016–17 was almost 126mmt, equivalent to 5% of the world's cereal and oilseed production.

Argentina also has a 15% share of the world's grain and by-products trading. Globally, 586mmt of grains and by-products were traded internationally in 2016–17, comprising 419mmt of grains, 167mmt of oilseeds, 90mmt of oilseed meals and 77mmt of vegetable oils.

Government policy

The impressive production and trade performance of the Argentinian grains industry has in some years mostly been in spite of government policy, rather than due to favourable government support. For example, hefty export taxes on Argentina's main grains were imposed from 2002, triggering reduced plantings in some years. For several years, corn exports were taxed at 20%, wheat at 23% and soybean at 35%. Beef exports were also subject to a 15% export tax.

However, following his electoral victory in late 2015, President Macri removed the export taxes on wheat and corn and announced that the tax on soybean exports would immediately be lowered to 30%. The Macri government also eliminated export permits for grains and oilseeds – a time and cost saving for exporters. Simultaneously, foreign exchange restrictions were lifted, triggering a further devaluation of the Argentine peso by about 45% on 17 December 2015. This further boosted the competitiveness of Argentinian agricultural exports.

Removal of the taxes on corn and wheat sparked increased plantings of these crops. Shortly after taking office in late 2015, President Macri also announced a 5% rebate to producers in the country's northern provinces outside the country's main soybean belt to help offset their higher transportation costs. Last, from January 2018, President Macri announced that the export tax on soybean would gradually diminish by 0.5 percentage points per month up until December 2019.

These policy changes have had massive impacts on crop production, crop profitability and the international competitiveness of the Argentinian grains industry. The previous policies of taxing the export of key agricultural commodities are starkly different from the policies of most countries (Figure 11).

According to the OECD (2018), the producer support estimate (PSE) is "... an indicator of the annual monetary value of gross transfers from consumers and taxpayers to support agricultural producers, measured at farm gate level, arising from policy measures, regardless of their nature, objectives or impacts on farm production or income." (p.15). Between 2000 and 2016, among OECD countries, on average government policies and activities caused a slight decline in producer support, as measured by the ratio of the value of support to gross farm receipts (Figure 11). However, over much of this period, a marked exception was government policy regarding Argentinian agriculture. First, government policy was mostly a heavy taxation of that sector, worsening its economic position; second, between 2007 and 2014, the PSE ratio worsened.

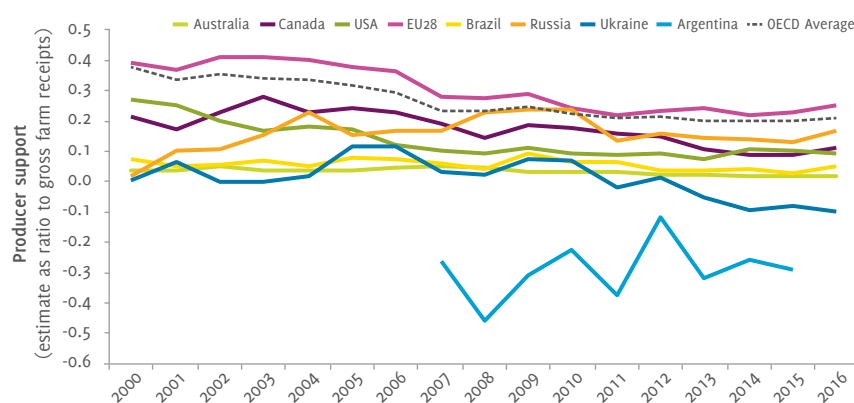


Figure 11 Producer support estimates, 2000–16

Source: OECD.Stats (2018b)

By contrast, almost all of Argentina's export competitors faced favourable support measures, particularly the EU-28 and Russia. Russia, for example, in part due to the favourable government assistance it received, became the world's largest wheat exporter in 2016. By contrast, the agricultural sectors in Australia and Ukraine receive little support, with the Ukrainian sector in fact being a source of transfer payments in very recent years. The clear exception is Argentina, with its farmers being an important source of transfer payments to government and local consumers. Moreover, as previously described, in September 2018 the Macri government reintroduced a range of export taxes on grains and oilseeds.

Another important aspect of Argentinian government policy that directly affects the nature and profitability of farm operations is Argentina's tax policy and tax system. The national government imposes a range of taxes, including income tax, value-added tax, personal assets tax, excise tax, tax on financial transactions and customs duties. In addition, provincial and local governments levy taxes such as turnover taxes, real estate taxes, stamp duties, taxes on vehicles and taxes on public advertising. In late 2017, for example, the Buenos Aires provincial government announced a 50% increase in the farmland tax required to be paid by its farmland owners in 2018. Such an increase is more like a 20% real increase, as the underlying inflation rate in Argentina has been around 30%. These tax increases result from Argentina's provinces and the national government both seeking to reduce their fiscal deficits. Most of the 24 provinces have pledged not to increase their spending faster than inflation but they still need ways to reduce their current budget deficits. Agriculture is perceived to be a profitable sector with a capacity to pay and is therefore a target for government taxation.

Another related aspect of government policy is the treatment of foreign ownership of farmland. In 2011 the Rural Land Law was passed. It imposed many restrictions on foreign ownership of rural land. In July 2013, the government deemed that around 267 million hectares (approximately 95% of the Argentine territory) were 'rural lands' subject to this law. At that time, foreign investors owned more than 15.8 million hectares, representing less than 6% of the total rural lands. In the core grain-growing region (the provinces of Córdoba, Santa Fe and Buenos Aires), a 1000-hectare (ha) limit applied to land ownership by a foreigner or foreign entity.

However, in late June 2016, the executive of the Argentine government enacted Decree 820/2016 to ease some of restrictions imposed by the Rural Land Law. For example, the decree called on all the provinces to review their current foreign ownership limits with the intention to substantially increase the current maximums. Hence, the likelihood is that restrictions on foreign ownership of grain farmland will remain, but they are likely to be less stringent in coming years. Lifting the restrictions will encourage a likely influx of foreign investment.

Another important aspect of government policy concerns farmland transfers upon death of the farmland owner. Although farmland may not frequently be sold, nonetheless inheritance

laws cause land to be transferred across generations in ways that restrict rapid increases in farm size. By law, upon the death of the landowner, 50% of the land goes to the spouse and the remainder goes in equal shares to the children. Hence, if land is not sold prior to the death of the owner, the farmland effectively becomes several smaller lots which usually are rented out or sold on the open market or are sold to a family member(s) so farming can continue within the family. Understandably, with such inheritance laws, succession in farming in Argentina is fraught with difficulty.

Although family sizes in Argentina are shrinking, it remains difficult to divide a farm business between the spouse and children to achieve familial equity while ensuring an economically viable farm remains in the family. Because land is so expensive in Argentina, expanding a farm via land purchase is very difficult and hence most farms are structured around a combination of owned and rented land.

Wheat and corn mills were given a monthly subsidy for the volume of wheat sold in the domestic market. However, these subsidies were removed in 2017. There is a 10% import tariff on wheat and a 12% tariff on imported flour and 16% for its subproducts.

Argentina has a biofuels law that mandates gasoline and diesel to be mixed with bioethanol and biodiesel respectively, at a 10% inclusion rate.

A final important aspect of government policy that affects all businesses, including farm businesses and others in the grain supply chain, is labour policy. To provide social services for workers, there are several additional fees employers must pay when hiring a worker (see Table 2). Payments are required for the worker's pension fund, healthcare, their family, as well as for the general medical system and for workers unemployed. These additional costs represent up to 27% of a worker's base salary, with the worker also required to directly contribute 17% of their salary to help provide some of these same services. In addition, employers are required to take out life insurance for each employee. These employment policies discourage farm owners employing their own staff. Rather it encourages use of contractors, business-to-business arrangements and informal employment arrangements that avoid payments to governments.

Table 2 Additional cost components paid by an employer and employee in Argentina

Cost item	Employer (% of salary) ^a	Employee (% of salary)
Pension fund	10.17 to 12.71	11
Pensioners' healthcare fund	1.50 to 1.62	3
Family allowance fund	4.44 to 5.56	
Unemployment fund	0.89 to 1.11	
Medical care	6	3
TOTAL	23 to 27	17

^a The rates depend on the size of the business owned by the employer.

Institutions supporting agricultural competitiveness

Argentina's grains industry has largely self-funded its industry-good functions. This is not just due to recent political changes in Argentina, but rather due to change and inconsistency of government agricultural policy and corruption in government over many decades. Rather than rely on government funding and action, the grains industry has established and supported its own set of industry-good organisations. For example, the provincial and national Boards of Trade in Argentina have a long and proud history of serving Argentinian agriculture, especially including its grains industry.

Boards of Trade

These boards facilitate trade by providing a range of informational, technical and legal services. The boards contain representatives of buyers and sellers and operate as respected private businesses with secure funding, as shown by their longevity and influence. Although there are differences between the various provincial boards regarding their portfolio of activities, sizes and funding, nonetheless, they all engage in industry-good activity.

These organisations are well coordinated, professionally staffed and respected within Argentina. They engage in some fee-for-service and contract research work and maintain a pool of talented, multidisciplinary staff. Their functions and activities do vary between the organisations and yet includes provision of:

- i. daily bulletins and weekly market updates
- ii. market forecasts
- iii. seven-day and seasonal weather forecasts that draw on a large network of weather stations and satellite imagery
- iv. shipping and truck position statistics
- v. grain balance sheet estimates
- vi. crop yield estimates within and at the end of a production year
- vii. crop condition and weather event impacts
- viii. estimates of areas planted to major crops
- ix. monthly reporting of commercial stocks of the major grains
- x. maintenance and analysis of grain sector statistics
- xi. dispute resolution in grain trades
- xii. grain quality sampling and assessments
- xiii. monitoring of policy changes and their impacts
- xiv. monitoring and investigation of grain transport services
- xv. research on special issues such as farmers' use of modern crop management technologies
- xvi. maintenance of a library of resources concerning the grains industry and grain marketing
- xvii. GIS mapping and satellite imagery services
- xviii. communication and training services.

In Australia, some of these functions reside in different parts of the public or private sector. Some are poorly coordinated or inadequate or at worst are non-existent.

AACREA

Founded in 1960, AACREA (Asociación Argentina de Consorcios Regionales de Experimentación Agrícola) is a not-for-profit organisation that coordinates and supports farmer groups known as the CREA (Consorcio Regional de Experimentación Agrícola).

The main objective of the association is to ensure the effective coordination and functioning of the individual groups' activities for their benefit. AACREA's roles include:

- i. testing and assessing the business efficacy of technology and then transferring it to farmers
- ii. servicing the demands of the CREA groups; supporting their administration, conduct of projects, training and communication requirements
- iii. fostering community development and work with national and foreign experts and research organisations
- iv. compiling and analysing data and information from surveys and experimental trials, then communicating findings to members.

Argentigo

Argentigo is a not-for-profit farmer organisation. Its stated purpose is the promotion and development of wheat and its derivatives, directly and/or in collaboration with official private or mixed bodies, in relation to research, production, processing and internal or external marketing of these products. Its stated mission is to generate and add sustainable value for the wheat chain and society.

Some other main non-governmental and non-profit agribusiness organisations in Argentina are:

- i. The Argentina Rural Society, which was incorporated in 1866. It represents the major agricultural landowners, principally in the province of Buenos Aires.
- ii. The Argentine Agrarian Federation, which was incorporated in 1912. It represents the small and medium agricultural landowners, mainly in the provinces of Córdoba, Santa Fe and Entre Ríos. It also represents very small agricultural landowners in the provinces of Santiago del Estero and Tucumán.
- iii. The Argentine Rural Confederation, which was incorporated in 1943. It is a second-level association with a presence throughout Argentina and includes 13 confederations and regional federations.

- iv. The Inter-Cooperative Agricultural Confederation, which was incorporated in 1956. It represents the agricultural cooperative sector. It is a second-level association formed by 10 federations. Their members produce about 20% of the grain in Argentina. It is also an exporter of grain and one of its members is SanCor, one of the main dairy companies in Argentina.
- v. The Argentina Federation of Agricultural Machinery Contractors, which was incorporated in 1986. It is a second-level association formed by eight associations that represent 3500 owners of agriculture equipment.

INTA

INTA (Instituto Nacional de Tecnología Agropecuaria) is a decentralised state agency under the Ministry of Agroindustry. It was created in 1956 and its main activities are agricultural research and extension with a focus on improving agricultural efficiency and sustainable rural development. It also provides commercial analytical services. Despite heavily taxing its grain export sector, the Argentinian government has historically strongly supported INTA.

The institution has a presence in the five regions of Argentina (Northwest, Northeast, Cuyo, Pampeana and Patagonia) through a structure that includes: a central headquarters, 15 regional centres, 52 experimental stations, six research centres and 22 institutes of research, and more than 350 extension units. INTA is the country's largest agricultural R&D agency and it employed 2181 full-time equivalent (FTE) researchers in 2013.

Grain production in Argentina

Argentina is the world's third-largest producer and exporter of soybeans after the US and Brazil. Argentina produced 55mmt of soybeans (Figure 12) and exported over 10mmt in 2016–17. The country is the world's top exporter of soybean meal and soybean oil. Corn production in Argentina also is increasing, with 50mmt produced in 2016–17 and wheat production reached an all-time high of almost 18mmt in 2016–17. However, in late 2017 severe drought conditions arose, restricting areas planted to soybeans and corn and lessening their harvest yields in 2018. In April, heavy rains further reduced the quality of soybeans being harvested and caused problems with grain sprouting. These adverse conditions reduced grain production by around 30mmt (Figure 12) and constituted a loss of almost 1% of Argentina's GDP.

The severe drought conditions have meant that farmers generated less benefit than they would otherwise normally have expected from the announced decline in the soybean export tax. The tax reduction commenced in January 2018 and by the end of 2019, the export tax would have been 18%.

The areas planted to crops at the end of 2018 and in subsequent years will be affected by the government's re-introduction of grain export taxes from September 2018 onwards.

The role of export taxes in affecting the relative profitability of crops and their crop management is seen in the decline in the area planted to soybean in 2016–17 (Figure 13). Crop gross margins favoured the increased planting of wheat and corn due to the complete removal of their export taxes in late 2015. By contrast, in 2016 and 2017 the export tax on soybeans was only lowered 5% to still be 30%, hence the growing of wheat and corn in 2016 and 2017 was relatively more attractive.

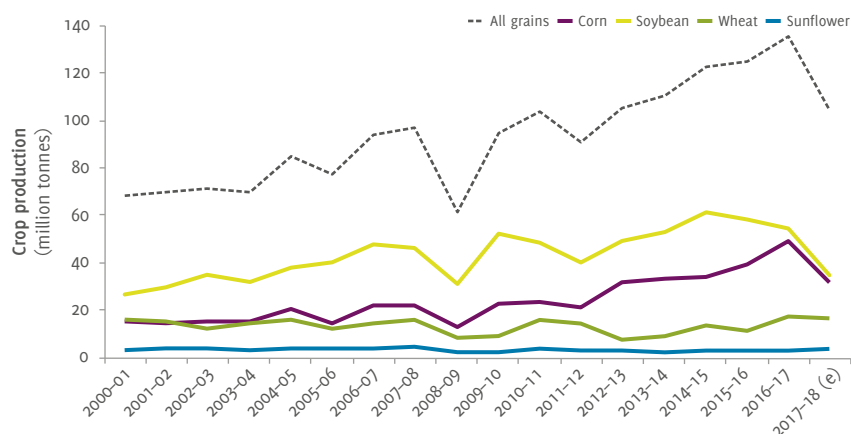


Figure 12 Crop production since 2000–01

Note: 'All grains' includes other crops such as barley, rice, canola, sorghum and groundnuts.

Source: Based on data from the Rosario Board of Trade (2018) and USDA (2018)

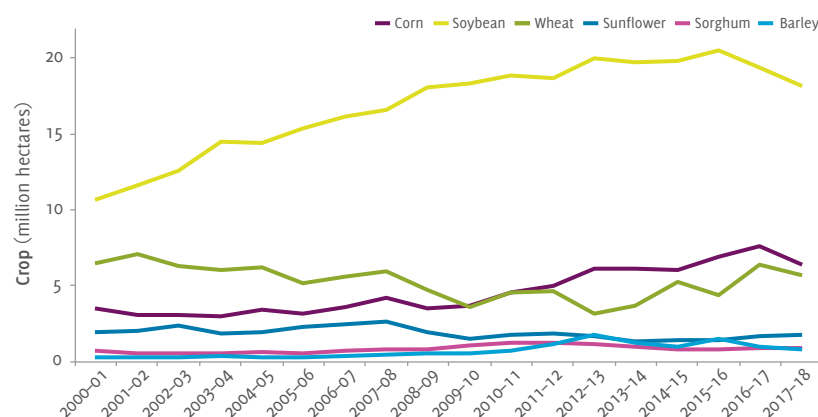


Figure 13 Area sown to main grains in Argentina since 2000-01

Source: Based on data from the Rosario Board of Trade (2018) and USDA (2018)

Between 2000-01 and 2012-13, the annual area planted to soybean greatly increased. Since then, the area has mostly plateaued. By contrast, the area sown to corn greatly increased from 2008 onwards, and it continues to expand. By comparison, the area sown to wheat was in decline up until 2012, after which the area has increased.

Most major grain crops in Argentina have experienced upward yield trajectories since the early 2000s (Figure 14). Corn and wheat yields have enjoyed relatively higher yield increases than other crops and similar yield increases have been observed in other corn and wheat-producing nations like the US, Russia and Ukraine. The rate of increase in wheat yields in Argentina has been about 1.6% annually, which is lower than observed for Canada and Ukraine (about 3% annually) yet similar or slightly higher than Australia and the US (about 1% annually). Although corn yields appear to be subject to greater variability than occurs with soybean or wheat, this is not so, as revealed when de-trended or actual crop yields are compared, and their coefficients of variation are calculated.

Grain production in Argentina is centred mostly in three provinces — Córdoba, Santa Fe and Buenos Aires (Figure 15). These three provinces are the source of around 80% of the nation's crop production (Figure 16) and are served by an extensive river system — the Salado and Paraná rivers (Photo 1) — that link the major cities of Santa Fe and Rosario. Crop production is geographically concentrated, with about 47% coming from within a 300km radius of Rosario, next to the Paraná River. Rosario is about 420km inland from Buenos Aires. Almost three-quarters of the crop production is exported.

The Paraná River runs 5000km through Brazil, Paraguay and Argentina (Photo 1) and is the second longest river in South America. Its name comes from the phrase 'para rehe onáva', meaning 'as big as the sea'. It is connected to the Paraguay River and the Uruguay River that creates the Río de la Plata, running into the Atlantic Ocean. The city, Rosario, houses many large grain terminals and oil crushing plants that export large volumes of product each month. The vicinity is known as the Gran Rosario and it is globally a major source of traded grains, even surpassing the New Orleans Gulf region in the US.

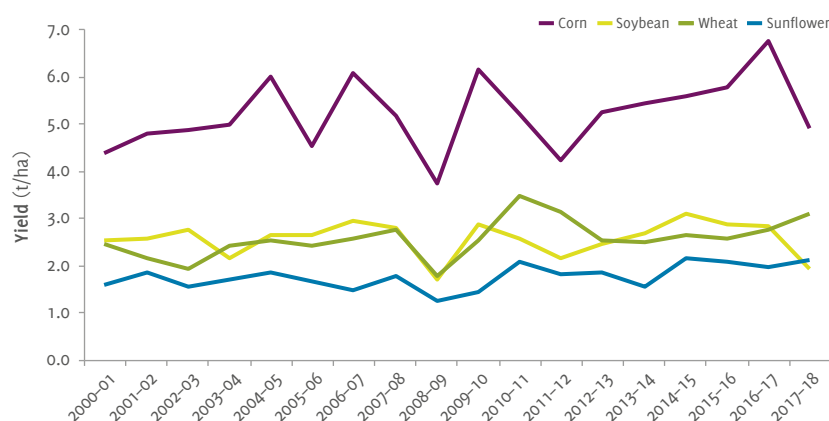


Figure 14 Change in yields of main grain crops in Argentina since 2000-01

Source: Based on data from the Rosario Board of Trade (2018) and USDA (2018)



Figure 15 Provinces of Argentina

Note: The coloured provinces are major grain-producers

Source: Wikipedia, https://upload.wikimedia.org/wikipedia/commons/thumb/c/c1/Argentina_-_mapa_de_las_provincias.svg/908px-Argentina_-_mapa_de_las_provincias.svg.png

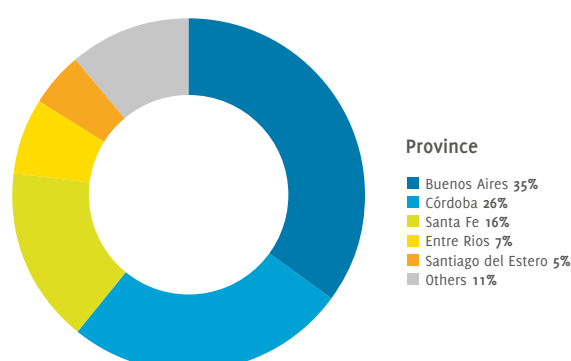


Figure 16 Provincial shares of Argentinian crop production, 2006–07 to 2015–16

Source: Rosario Board of Trade (2018)



Photo 1 Aerial view of the Paraná River floodplain, northern Argentina

Source: Wikimedia Commons, https://commons.wikimedia.org/wiki/File:Paran%C3%A1_River_Floodplain,_Northern_Argentina.jpg

Domestic uses of crops include stock feed in animal industries, flour milling, local oil crushing, biofuel production and retention for seed or storage. Figure 17 displays the relative importance of various end uses of grain in a typical harvest year during the mid-2010s.

Cereals

Since the economic turbulence of the late-1980s when poor macroeconomic management by Argentinian governments forced hundreds of thousands of businesses into bankruptcy, there has been a recovery in the area planted to cereals and now more than 10 million hectares are regularly sown to cereals. The imposition of export taxes on the main grains from 2002 triggered reduced plantings in some years. However, the removal of these taxes on corn and wheat in 2015 has sparked resurgence in the planting of these crops. Australia, as a key wheat exporter, has felt the impact of this policy change in some of its main export markets. Figure 18 shows the change in the area planted to cereals in Argentina since 1961.

Figure 19 shows the growth in cereal yield in Argentina since 1961. These yield increases especially reflect growth in corn yields, the principal cereal crop grown in Argentina. Corn production is an increasingly important component of grain production in Argentina, although soybean remains by far the principal crop.

The average annual increase in cereal yield is just over 2% per annum. By comparison to the volatility in the areas sown to cereals, cereal yields are remarkably stable. The uniformity of the growth in cereal yields, dominated by corn, suggests that over the past few decades, despite climate variability in Argentina, crop production methods and varietal improvement, at least regarding corn, have helped underpin yield stability. The re-introduction of taxes on grain exports will lessen farmers' incentives to grow and export wheat. Although in 2018 the large depreciation in the peso against the USD will reward farmers who produce wheat for export.

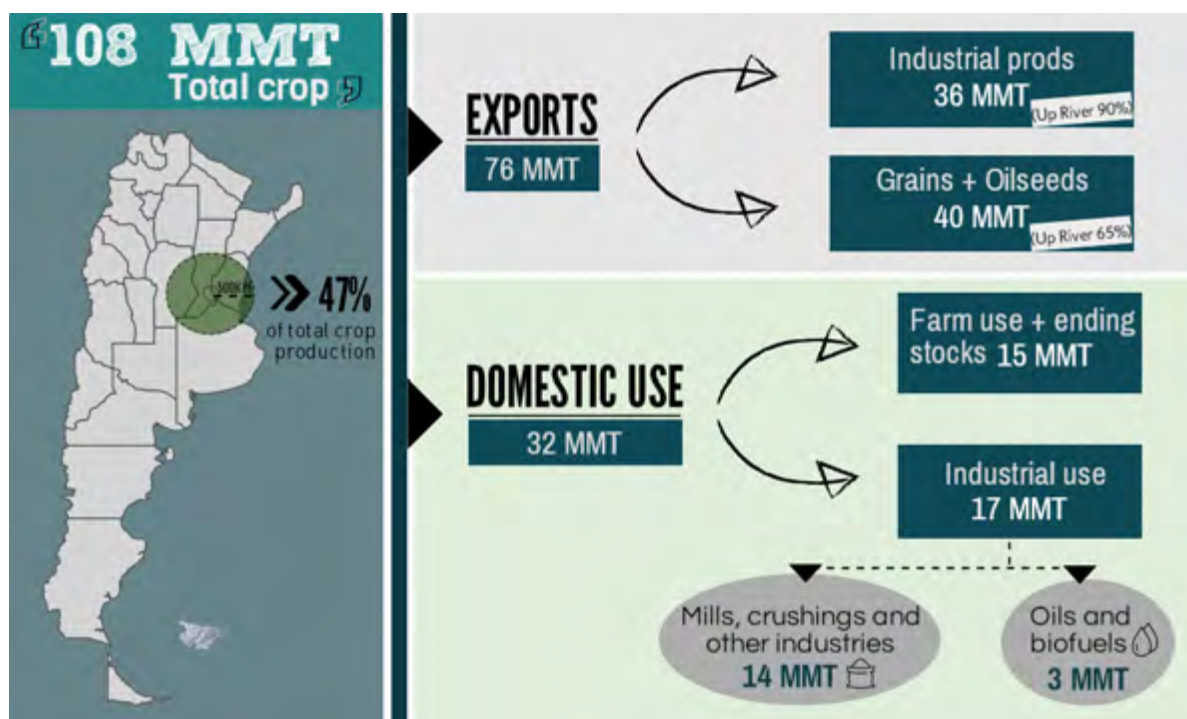


Figure 17 Typical grain flows in Argentina in the mid-2010s

Source: Based on information from the Bolsa de Comercio de Rosario (2017)

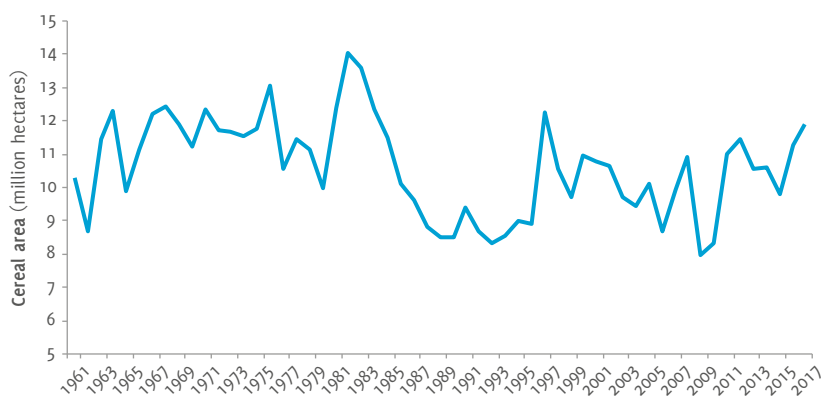


Figure 18 Change in Argentina's cereal area since 1961

Source: World Bank (2018) and USDA (2018)

Soybean, corn and wheat are by far the main crops grown in Argentina, with wheat production over the past few years becoming a growing component of Argentinian crop production, reversing a downward trend in its relative importance during the period from 2000–01 to 2012–13 (Figure 20). Since 2012, wheat production has rebounded at a greater rate than its share of total grain production.

The main wheat-producing regions of Argentina are in the southern parts of Córdoba, Santa Fe and Buenos Aires, and western Entre Ríos (Figure 21). All these main production regions are close to Gran Rosario ports or the southern port of Bahía Blanca. Hence, the trucking distance to port for much of Argentina's wheat production is not far, often less than 250km. The exception is the smaller area of wheat production in Salta, northern Argentina.

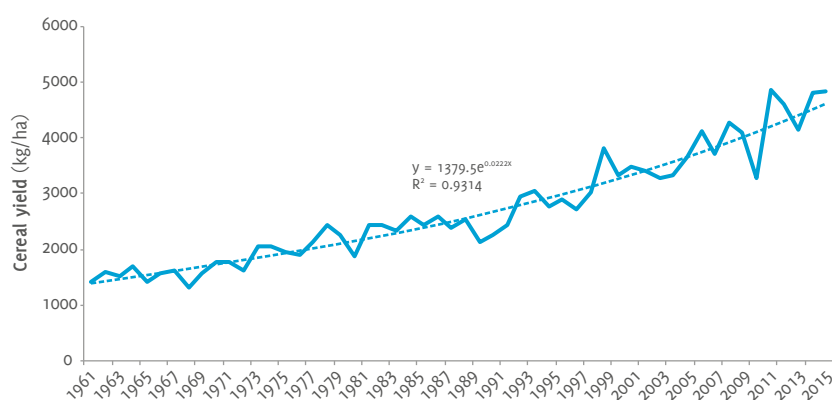


Figure 19 Argentinian cereal yield (kg/ha), 1961–2016

Source: World Bank (2018)



Figure 20 Wheat production since 2000–01 as a percentage of all grain production

Note: 'All grain production' includes other crops such as barley, rice, canola, sorghum and groundnuts.

Source: Based on data from the Rosario Board of Trade (2018) and USDA (2018)

Argentina is re-emerging as an important southern hemisphere producer and exporter of cereals, with wheat production growing and remaining a key feature of Argentinian grain production. Furthermore, its key cereal production regions are not far from high throughput export port terminals. Hence, Argentina now needs to be included in the set of countries that require monitoring by Australia due to its ability to influence grain market prices and export its wheat harvest at the same time as Australia.

Wheat milling

Wheat milling is an important value-adding component of the Argentinian wheat industry. A tonne of flour converted into baked goods multiplies its value around eightfold. Argentina has about 180 flour mills which, according to the Federación Argentina de la Industria Molinera (FAIM), are located as follows: 84 plants in the province of Buenos Aires, 39 in the province of Córdoba, 24 in Santa Fe, 15 in Entre Ríos, six in Tucumán, five in Salta, four in La Pampa, two in San Juan and Jujuy, and one

plant in each of the provinces of San Luis, Santiago del Estero and Chaco. Argentina's production, markets and consumption of wheat flour are listed in Table 3.

The FAIM also report that 29 plants in Argentina have a milling capacity of more than 360t per day, 61 plants between 120 and 360t per day, 49 plants between 34 and 120t per day and 45 plants produce less than 34t a day.

Argentina was ranked ninth in the world as a wheat flour exporter in 2015, forming 3.1% of the world trade in flour by value. However, over 90% of the export trade is solely with Brazil and Bolivia, who are part of the Mercosur group of trading partners with Argentina.

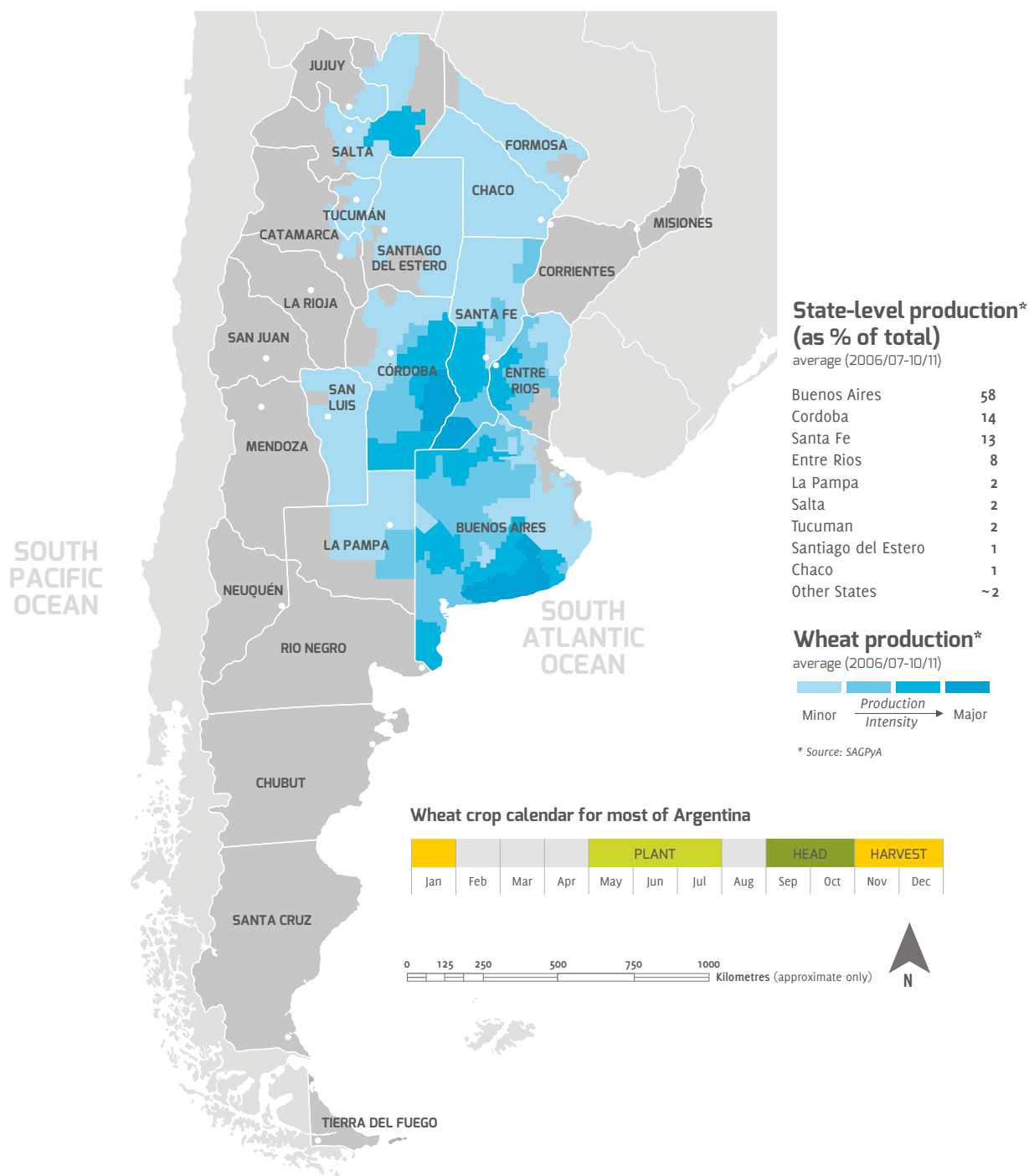


Figure 21 Wheat-producing regions in Argentina

Source: USDA (2011) Available at: www.usda.gov/oce/weather/pubs/Other/MWCACP/Graphs/Argentina/ArgWheatProd_0711.pdf

Table 3 Argentina's production, markets and consumption of wheat flour since 2007

Year	Wheat flour			
	Production (mmt)	Exports (mmt)	Domestic consumption (mmt)	Annual per capita consumption (kg)
2007	4.38	0.95	3.43	87
2008	4.75	1.03	3.72	94
2009	4.70	1.00	3.70	92
2010	4.90	0.90	4.00	98
2011	4.87	1.02	3.85	93
2012	4.63	0.95	3.67	88
2013	3.98	0.28	3.70	88
2014	4.29	0.45	3.85	90
2015	4.38	0.50	3.88	90
2016	4.35	0.63	3.73	86

Source: Federación Argentina de la Industria Molinera (2018)

The milling industry in Argentina mostly has a strong local and nearby market focus. There is little prospect of Argentina, with its limited growth in wheat production over the next decade and mostly small sizes of flour mills, being able to command a large presence in global flour markets. Its most likely future will remain servicing domestic flour demand as well as exporting to nearby Mercosur countries.

Crop and water management

Argentina's Agricultural Applied Technology Survey (AATS) reports farmers' use of inputs and crop management for six major crops in 17 regions. The survey reveals that from 2010–11 to 2014–15 there has been a negative trend in technology use among farmers. The imposition of export taxes combined with a high cost of borrowing and difficulty accessing finance caused many farmers to restrict their use of inputs and restricted their adoption of best practices. Moreover, herbicide-resistant weed problems and problems of flooding and waterlogging worsened.

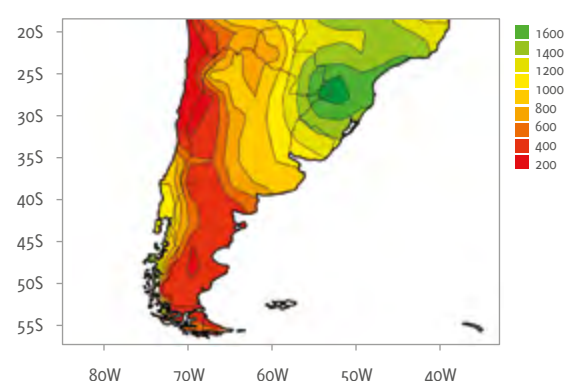
However, following the removal of the export taxes on wheat and corn, there has been a 41% increase in fertiliser applications on wheat (2016–17 compared to 2014–15), including a 25% increase in the rates of application of nitrogen per planted hectare. Note the increase in fertiliser applications for wheat is due to both a greater area planted to wheat but also higher application rates per hectare in 2016–17 of nitrogen and phosphorus. A 14% increase in the volume of fungicides applied also occurred in 2016–17 compared with 2014–15.

If inflation is reduced and access to finance for crop input purchases eases, then more intensive crop management is likely in Argentina, resulting in higher yields and greater areas planted to winter crops like wheat and barley.

Water management

Annual average rainfall in Argentina ranges greatly from 1200mm in the far north-east down to 200mm in the far south and in some far western parts of the country (Figure 22). However, a change in climate seems underway with a trend of greater annual rainfalls, particularly in northern Argentina. An illustration of the change in rainfall is Figure 23 that shows the number of days per decade with precipitation over 100mm in the city of Buenos Aires. The increase in rainfall led Barros *et al.* (2015) to report that, "Since the early 1970s, the main rivers of the Plata Basin, namely the Paraguay, Paraná and Uruguay rivers, which run into the eastern part of Argentina have increased their mean flows, as well as the frequency of their extreme discharges." (p. 154) These researchers report that the Paraná and Paraguay basins have very gentle large-scale slopes such that, during periods of persistent high rainfall, river overflows endure for months. In commenting on the change in climate observed so far for Argentina, these authors also say: "Although observed climate change has favoured the yields of the main crops, the increased frequency of extreme weather events constitutes a growing risk. A number of extreme precipitation events occurred during recent years leading to flooding with important economic agricultural impacts." (p. 156)

Although increased precipitation can lead to the costly problem of flooding, it also allows higher yields of crops in regions of usually lower annual rainfall. Hence, there is the anticipation that grain-growing areas in Argentina eventually will be extended westwards and southwards into currently drier areas. There is also the likelihood that some new crops such as Arabica coffee would increasingly be suited to the wetter, warmer conditions in northern Argentina.

**Figure 22** Average annual rainfall (millimetres), 1976–2000

Source: Extracted from https://upload.wikimedia.org/wikipedia/en/8/86/South_America_Precipitation_Map_%28data_from_1976-2009%29.gif

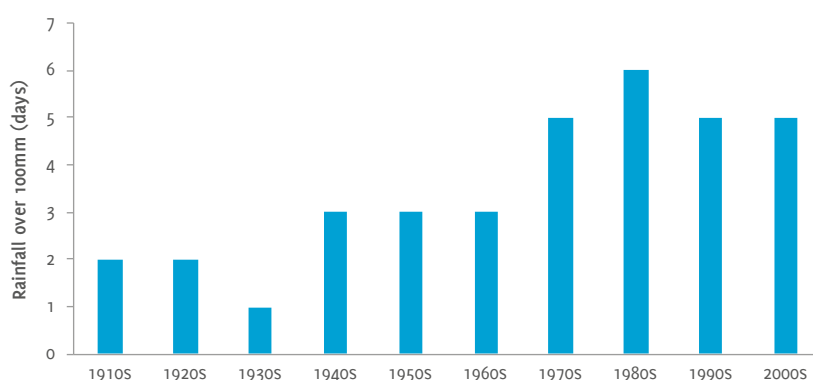


Figure 23 No. of days per decade with precipitation over 100mm in the city of Buenos Aires, 1920s–2000s

Source: Barros et al. (2015)

Any enlargement of transportation infrastructure in northern, western or southern Argentina will only further support crop production under current or future climate. The renewal of the Belgrano rail system in northern Argentina, discussed later in the *Rail and road networks* subsection in the next chapter on the Wheat Supply Chain, is one such example of new infrastructure investment that is already favourably transforming the economics of crop production in that region.

In many of Argentina's principal grain-producing regions, watertables are rising, first due to a changing climate that is increasing rainfall, and second, due to the widespread planting of soybean that uses less rain than falls.

Solutions to this issue of rising watertables include surface drainage, deep drains, mandatory tree-planting on at least 2% (and in some provinces 5%) of the farm area, removal of fallow (e.g. 'Let's turn Córdoba green'), planting less soybean (although soybean is more waterlogging tolerant than corn), and planting more winter cereals, winter pulses and winter cover crops (e.g. wheat and vetch) rather than leaving fields as winter fallow.

The rise in watertables and its seasonal variation is causing a slight increase in soil salinity. However, any problem of salinity is liable to be short-lived once watertables are lowered. The heavy rainfall that occurs in the cropping regions will eventually rinse out the salinity.

The main winter cereal that is planted is wheat. Other crop options — such as canola or grain pulses (peas, chick peas and faba beans) — are far less frequently grown. If Argentina addresses the inadequacies of its seed royalty collection system, then a likely result will be stronger incentives to cereal breeders to breed short-season wheat and barley varieties. If these varieties can be harvested in early December, then soybean will still be planted sufficiently early to not incur marked yield penalties. Usually, for every day of foregone seeding in December, the yield penalty is up to 50kg per day. To avoid this yield penalty, many farmers either opt for fallow that exacerbates the rise in the watertable or they use a cover crop that provides no net cash flow, although it can provide benefits of water use, disease and weed control and supply nitrogen and organic matter for subsequent corn or soybean production.

If Argentina does not address the issue of rising watertables and water management in agricultural regions, then the flooding events that occurred in 2017 are likely to be repeated, especially if projected climate change continues. Already in 2017, 285,000ha of wheat were lost to rain and flooding. Heavy rainfall prevented wheat plantings on 150,000ha in the Buenos Aires agricultural region and 35,000ha in La Pampa. To these losses were added another 100,000ha of wheat already planted but these crops were washed away. Even in previous years, flooding has been a minor yet seemingly worsening problem (Table 4).

Table 4 Areas lost to flooding, 2014–15 to 2016–17

Subzone	2014–15		2015–16		2016–17	
	Area lost ('000ha)	% of total area	Area lost ('000ha)	% of total area	Area lost ('000ha)	% of total area
South central Santa Fe	31.6	3	95	8	95.0	8
Southern Santa Fe	9.5	1	14	1	87.5	9
North-east Buenos Aires	5.0	3	30	2	134.0	9
Northern Buenos Aires	25.0	2	45	4	13.2	11
South-eastern Córdoba	75.0	6	150	12	114.0	10
TOTAL	141.1	3	334	5	443.7	9

The wetter and warmer conditions generally associated with crop production in Argentina pose problems for crops such as wheat. For example, in 2017 yellow rust in wheat (*Puccinia striiformis*) suddenly appeared and colonised the south of the province of Santa Fe and the north of Buenos Aires. In much of this area, wheat is grown under very humid conditions that favour fungal proliferation. Wheat breeding and crop management will likely face the ongoing challenge of disease incidence due to the change in climate that will offer conditions conducive to plant disease. In addition, crop modelling studies (Garcia *et al.*, 2018) reveal that warmer night temperatures will reduce wheat and barley yields by between 2% and 9% for each degree Celsius (°C) increase in the minimum temperature during the critical periods of crop development. A warming of 0.5–1 °C is projected for 2015–39, so in the absence of improvements from plant breeding or agronomy, wheat and barley yields may fall by between 1% and 4% over the next decade.

The issue of rising watertables and flooding in southern parts of Buenos Aires is not solely affecting farm production. Some country elevators and grain storage facilities currently pump out groundwater under their facilities to maintain the structural integrity of their facilities' foundations. In addition, flooding causes road damage that increases repair and maintenance costs and road construction in some regions becomes more expensive to cater for water management.

Combined with the apparent warming and wetting trend is a degree of climate variability that also affects cropping industries. For example, the drought conditions greatly reduced the production of soybean and corn in 2017–18 and exports in 2018. As a result large reductions in machinery sales have occurred, as there have not been sufficient revenues from crop production to justify usual machinery replacement decisions in 2018.

Irrigation

As mentioned above, not only is occasional flooding an issue affecting grain production, but infrequent drought is also a problem. Accordingly, in some dry years and in some regions with marginal rainfall, supplemental irrigation can be of marked benefit. Currently, Argentina has a cultivated area of 2.1 million hectares under irrigation that represents only 5.4% of the national cultivated area. By contrast, the US has 19% of its cultivated area under irrigation.

In Argentina, about 80% of the irrigated area uses simple, inefficient gravitational methods, rather than sprinkler or drip irrigation. With the same amount of water, another 700,000ha could be irrigated if irrigation efficiency were improved through investments in best practices. If constraints on access to finance and energy were lessened to facilitate required investments, another 2 million hectares could be placed under irrigation over the next 15 years. The introduction of irrigation, however, usually causes a change in the mix of crops, with higher value crops being selected for irrigation.

Rented land

Around 60% of farmland in Argentina is rented out based on frequently renewed annual leases. The cost of rent is usually stipulated as tonnes per hectare of soybeans, often at 1.6t/ha or more, depending on the land quality. The reason for such a valuation is that soybeans are sold in US dollars and therefore soybean yield is code for payment in US dollars. The chequered history of the Argentinian peso rightly causes farmers to distrust a payment in pesos as its value is unreliable and changeable, as evidenced by Argentina's high rate of inflation.

Due to the unreliable nature of the Argentinian peso as a store of wealth, many Argentinians (including farmers) prefer to hold assets other than cash. Hence, land is held tightly and is rarely sold, and even then, at relatively high prices. Also, as explained previously, foreign ownership of rural land is restricted, although this is a subject of review. At the time of writing, a single foreign entity or individual could not own more than 1000ha in the 'core area' of prime cropping land in the provinces of Córdoba, Santa Fe and Buenos Aires.

A majority of the farmland in Argentina is owned by a relatively small number of landowners. Their preference is to rent out land rather than sell the land. Moreover, long-term rental agreements are rare. Most are annual rents. Initially, it may seem that a downside of these arrangements is that the renter has no incentive to invest in long-term soil amelioration or soil maintenance activity, such as liming, cover cropping or application of longer lasting fertilisers such as phosphorus-based fertilisers. Moreover, it may seem that the system of annual rents increases the risk of a gradual erosion of Argentine's soil quality, unless soil treatments and rotational land-use practices are made a condition of land rental agreements. Imposing such conditions, however, would reduce the prospect of renters paying the same rents or would reduce the number of renters prepared to accept the rental conditions. As explained below, the profit margins on rented land are already a long way below margins on owned land. However, despite the system of annual rents, in practice, most landowners continue to rent out the same fields mostly to the same renter. Because of this custom, it is in the renter's self-interest to not erode the soil's fertility or neglect sustainability issues regarding crop sequences, as these fields are likely to remain worked by the same renter.

Current land prices in the main grain-producing regions are very high, generally US\$12,000 to US\$20,000 per hectare, depending on the land quality and location. Hence, rental prices reflect those valuations, leading to large differences in returns between land owned versus rented. The Rosario Board of Trade has examined crop margins on lands owned or rented in 2017 and found the gross margins on rented land were usually less than half those on owned land, with rent almost always being the principal cost item (Table 5).

Table 5 Farmers' crop gross margins, 2017

2017–18 season	Early soybean	Early corn	Wheat	Late soybean
Future price next harvest (u\$/qq)	25,2	14,9	16,4	25,2
Yield (qq/ha)	40	96	40	34
Gross income (u\$/ha)	1008	1426	656	857
Agricultural chemicals (u\$/ha)	214	346	187	167
Fieldwork (u\$/ha)	77	56	53	56
Harvest service (u\$/ha)	86	121	56	73
Freight 150km from upriver (u\$/ha)	72	172	75	61
Marketing costs	29	41	22	25
Total costs	478	737	392	381
Gross margin in owned field	530	689	264	476
Taxes in owned field	249	307	123	204
Net margin owned field	281	382	141	272
Rent	369	369	148	221
Gross margin in rented field	162	320	116	254
Taxes in rented field	80	138	53	105
Net margin rented field	81	182	63	149

Note: Due to its Spanish heritage Argentinians report crop yield in metric quintals where one quintal equals 100 kilograms. Hence 25.2qq/ha equals 2.52t/ha
Source: Rosario Board of Trade (2017)

Although land may not frequently be sold, as explained earlier in the section on *Government policy*, inheritance laws cause land to be transferred across generations in ways that restrict rapid increases in farm size. These inheritance laws make familial succession in farming fraught with difficulty. As previously mentioned, splitting a farm business between the spouse and even one or two children creates problems of achieving familial equity while ensuring an economically viable farm remains in the hands of a family member. Because land is so expensive in Argentina, expanding a farm via land purchase is very difficult. Hence, most farms are structured around a combination of owned and rented land.

Silo bags

In Argentina, silo bags (Photo 2) are a key component of crop management, facilitating grain harvest and selling. They have been a transformative innovation giving farmers more control over when their grain is sold. Each bag holds between 200 and 250t of grain. Each year about 45mmt of grain is stockpiled in silo bags in Argentina.

Mostly, soybeans are stored in silo bags, although corn and wheat are also sometimes stored. The problem with storing wheat is the potential impact of high moisture in the grain. Grain is usually stored for less than four months. Silo bag storage allows farmers to depend less on peak transport costs at harvest. It helps avoid more expensive delivery to upcountry elevators.

The system of silo bags serves Argentinian farmers well for a range of reasons. Soybeans are a more reliable and durable store of wealth than a cash asset of pesos and therefore act as a natural hedge against inflation. The value of soybeans is set

by movements in the US dollar and international grain market activity rather than by the monetary policy of an Argentinian government. Silo bags make the Argentinian farmer less constrained in their selling strategy. They can sell whenever they judge an attractive price is on offer in the market. They can deliver direct to port and thereby avoid paying elevator handling fees. They can blend on-farm to avoid dockages or rejections of loads that otherwise might be associated with direct delivery from off the header. Silo bags allow farmers to avoid high transport costs at harvest that otherwise would occur if all farmers needed to move grain to port or into upcountry storage at harvest. Farmers' use of silo bags also allows port terminal operators to more easily manage the flow of grain into their facilities and more evenly spread the trucking logistics task across the months after harvest. However, 2–3% more loss of grain occurs in silo bags compared to steel silos.



Photo 2 Silo bags in a field in Santa Fe

Locally produced farm machinery

A comparative advantage for Argentina is its long-standing commitment to agricultural engineering and technology. Its manufacturing protectionist policies have enabled growth in regional manufacture of a broad range of agricultural equipment, including sprayers, seeders, tractors and harvesters (Photo 3). The sector comprises around 860 SMEs, with about 10% of these companies being in operation for over 50 years in the country. Almost 90% are located in the provinces of Santa Fe, Córdoba and Buenos Aires. These three provinces regularly produce more than 80% of Argentina's wheat, corn and soybean production. This farm machinery manufacturing sector employs 47,000 highly skilled workers and is a main source of employment in some small rural centres. Direct and indirect employment is around 80,000. This employment is distributed geographically in the following way: Santa Fe (43%), Córdoba (32%), Buenos Aires (18%) and 7% in other provinces.

Argentinian production of agricultural machinery and equipment accounts for around 80% of all farm machinery used in Argentina. The government's protectionist policies, such as local content rules, have caused multinational equipment manufacturers to now use more than 50% local components in their gear. Combine harvesters and tractors dominate agricultural machinery sales, followed by agricultural implements and seed drills that represent 20% of sales on average. Domestic sales of these products are higher than agricultural machinery imports.

Farm machinery manufactures are exported to more than 50 countries. The main destinations are: Bolivia, Uruguay, South Africa, Kazakhstan, Venezuela, Brazil, Italy, Russia, Paraguay, Ukraine, Guatemala, Australia, Mozambique, Namibia and Romania. In addition, silo bags and related equipment are exported from Argentina to more than 50 countries, mainly Brazil, Uruguay and South Africa. The estimated annual value of these national exports is US\$50 million.

Argentina has more than 20 companies that provide the global market with electronics and software to transform agricultural machines to be intelligent, self-guided, self-regulating, hyperconnected with the web cloud and linked to databases that process information to allow machines to improve their performance.

Argentina's Ministry of Industry and the agricultural machinery private sector in Argentina are collaborating to ensure that by 2020 domestic production of agricultural machinery will reach US\$2.5b, involving the production of 10,000 seeders, 4000 tractors and 11,000 harvesters. By contrast, in 2010, the level of production was 3800 seeders, 600 harvesters and 2150 tractors.

In 2016 farm machinery sales within Argentina were worth US\$1.98b or 0.4% of the domestic GDP that year. According to Calzada and Di Yenno (2018), in the first nine months of 2017, sales increased to US\$2.23b. These 2017 sales in pesos equate to a 79% increase compared to the same period in 2016.



Photo 3 An Argentinian manufactured self-propelled sprayer

Agricultural machinery manufacture is estimated to provide direct employment for 40,000 workers (mostly skilled workers) and a further 50,000 indirect jobs. The average workforce of an agricultural machinery business is around 60 employees.

The regional location of the manufacturers and their frequent interaction with farmers and extension staff ensures that machinery improvements are rapidly tailored to farmers' needs. The experience and competency of the manufacturing staff also ensures that machines are fit-for-purpose, with ready availability of after-sales service and maintenance.

As grain farming increasingly will be machine-dependent with in-built technologies to facilitate crop production, it follows that the Argentinian grains industry will extract further competitive advantage from having experienced and skilful local machinery manufacturers. Moreover, as crop production grows in Argentina, it means these local suppliers have a growing domestic market on which to base their sales targets and forays into international markets.

However, a downside of having many local farm machinery manufacturers who mostly focus on local sales is that their economic fortunes often mirror those of the farm production sector. Hence, in 2017–18, when widespread drought restricted soybean and corn production, farmers and machinery owners reacted by curtailing their expenditure on new machinery. The result was a downturn in machinery sales that affected employment and profits in the machinery manufacturing sector throughout Argentina.

Telecommunications infrastructure

Despite the technologically advanced farm machinery manufacturing and farm machinery software sector in Argentina, Argentina's farming regions, like those in Australia, suffer from poor connectivity. A survey by CREA (Consortios Regionales de Experimentación Agrícola) in 2014 found 40% of respondents had no access to the internet on their farms. The inadequate quality of electronic communication infrastructure is an impediment to farmers' use of state-of-the-art farm machinery and software. Eventually, the need for investment in this infrastructure will become a priority, but seemingly for the next few years, rail and road infrastructure will be the more pressing priority.

Farmers' adoption of precision agriculture will be limited by the poor quality of connectivity infrastructure. Despite the economic wealth generated by the farm sector, the political priority in communications infrastructure tends to be towards the most populous cities like Buenos Aires and Rosario.

Argentina and Australia's grain production

Argentina annually plants around 38 million hectares to summer and winter crops. By contrast, around 22 million hectares are sown annually to grain crops in Australia. Since 2000 there has been a general increase in summer rainfall across Australia, and a corresponding decrease in winter rainfall, leading to shifts in rainfall zones and planting patterns, although winter cropping still predominates. In Argentina, the change in climate has been a general increase in rainfall, particularly for summer crops.

Soybean is the main crop grown in Argentina by far, whereas wheat remains the main crop in Australia. Soybean and sunflower are the most important oilseed crops grown in Argentina, with very little planting of winter canola. By contrast, canola planting has increased rapidly in Australia over the past decade and barley remains a key cereal in Australia, whereas barley is a minor crop in Argentina, albeit that Argentina still exports around 1.3mmt of malting barley. Barley is a relatively more important crop in the province of Buenos Aires.

Although both important grain exporters and having grain-producing regions spread over the same southern latitudinal range, Argentina and Australia nonetheless produce and export a mostly dissimilar mix of crops (Figure 24)

In both countries, wheat is a winter crop. In Argentina, wheat is required as a rotational complement to corn and soybeans where double-cropping is practised. The additional role of wheat is to use soil water (and rain) and thereby help restrict any rise in water tables. The wheat harvest begins in mid-November. Farmers can receive revenue by trucking wheat to port during harvest. This means they need not yet sell their soybeans that remain in silo bags. In December/January, sunflower (mostly grown in the northern parts of Argentina) can then be sold; again, preventing the need to sell soybean. In Australia, wheat dominates crop plantings mostly due to its adaptation to a wide

array of seasonal conditions and export market opportunities in nearby South-East Asian countries such as Indonesia.

In Argentina, 90% of wheat grown is bread wheat based on hard red varieties and only 5–6% is durum wheat. A small proportion of white wheat is grown for some specific uses. By contrast, Australian wheat production is based around white wheat production. Wheat production in both countries suffers from weather and climate events. In both countries, there is a risk of heat during flowering and drought. Argentinian wheat production is more exposed to flooding while frost damage is more prevalent in Australia.

A single main crop — soybean for Argentina and wheat in Australia — dominates both countries. To date, the annual rate of increase in wheat yields in Argentina outstrips that recorded for Australia — 1.6% per annum in Argentina versus 1.0% per annum in Australia (Figure 25). The increasing divergence in yields is a benefit to Argentinian wheat farmers and of concern for Australian wheat farmers, especially as the latter group principally depends on wheat production as their main source of income. The coefficient of variation in de-trended yields is similar in both countries at around 28%.

Wheat: a winter crop

In Argentina, particularly in the southern parts of Buenos Aires and south-eastern La Pampa, wheat is planted in winter as the main crop, as in Australia. However, in Santa Fe and Córdoba, wheat is planted as a winter crop to be a rotational complement to the summer crops of corn or soybean. In these areas where double-cropping is practised, the main focus of crop production is on corn and soybean production.

Aside from helping restrict the rise in watertables, the growing of wheat facilitates weed control in subsequent summer crop phases of rotations. Also as mentioned above, trucking wheat to port during harvest provides cash flow and prevents farmers being forced sellers of their soybeans that remain in silo bags; soybeans being the main cash crop.

Supporting the lift in wheat yields in Argentina in recent years has been the removal of the export taxes on wheat up until September 2018. This has boosted the profitability of wheat production and encouraged farmers to increase their rates of application of fertilisers and thereby spend more on crop management.

Of concern to Australia's wheat industry is the prolonged greater rate of increase in wheat yields in Argentina. Of further concern is the untapped potential to further increase yields in Argentina. Merlos *et al* (2015) report a 41% yield gap for Argentinian wheat, where the gap is the difference between the water-limited yield potential and actual wheat yields. The gap is far less in Australia. Merlos *et al* (2015) estimate that Argentinian wheat production could increase by at least 5.2mmt if its sizeable yield gap was halved. Changes to crop agronomy and field practices could lessen the yield gap in Argentinian wheat production.

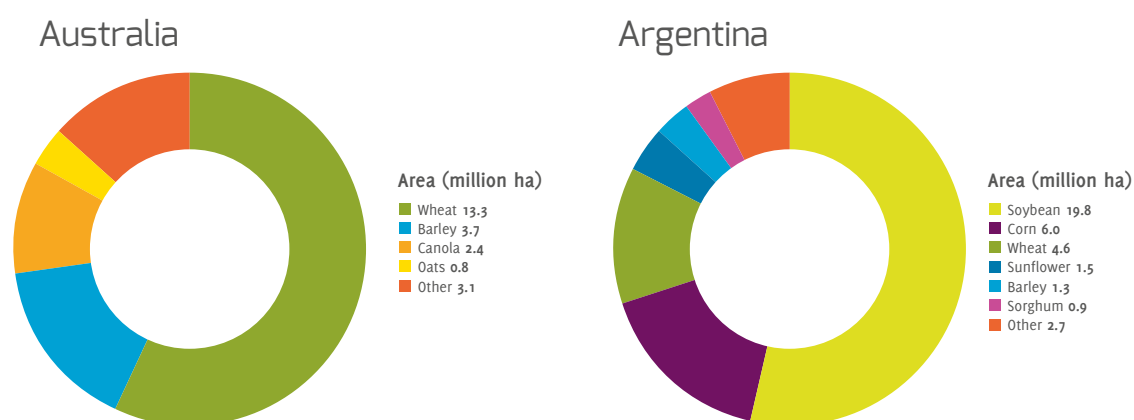


Figure 24 The area sown to major grain and oilseed crops in Australia and Argentina (million hectares)

Note: Numbers are in million hectares based on the average for the five years to 2015–16.

Source: FAOSTAT (2018)

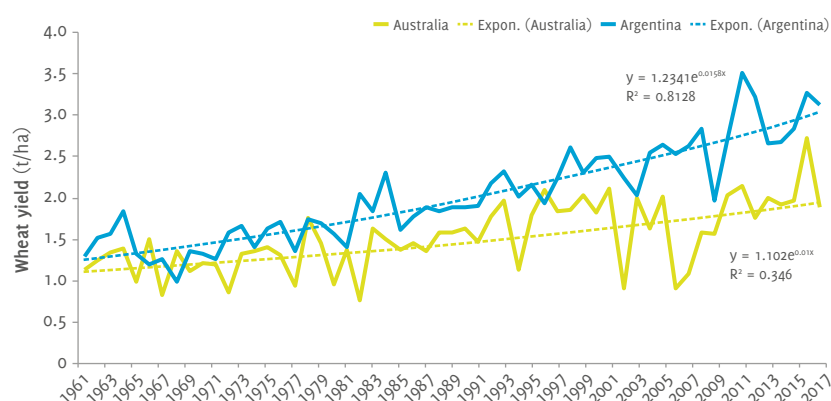


Figure 25 The yield of wheat in Argentina and Australia, 1961–2017

Note: Expon = exponential

Source: FAOSTAT (2018); La Federación de Centros y Entidades Gremiales de Acopiadores de Cereales; ABARES (2017)

Wheat breeding in Argentina

INTA is the main wheat breeder (Photo 4) and supplier of wheat varieties in Argentina, although there are around seven other companies that breed new wheat varieties. Klein and BUCK are two local breeding companies that have been in operation for more than 100 years. From eight to 12 varieties are formally assessed for release each year. Half the varieties currently assessed are direct introductions from France. There is a need for a high turnover of varieties as the moist, warm conditions often associated with wheat production are conducive to evolving rust resistance.

Hard red spring wheat varieties are the main focus of breeding activity. There are small areas sown to durum and white wheats. Yield improvement and disease tolerance are the main focus of breeding efforts. There is a move to develop shorter season wheats that can be harvested earlier in order to lessen the clash with the usual early sowing of soybeans, and to avoid heat stress in the wheat at flowering and during grain filling.



Photo 4 INTA wheat breeders and agricultural scientists in a field at Marcos Juarez



Photo 5 Wheat breeding plots at Marcos Juarez in 2017

Varietal classification requires breeders to supply comparative yield and grain quality data from field trials (Photo 5) conducted over two or three years. Seed quality assessments must be conducted in official laboratories. Most of the varieties approved and released are hard red spring varieties but some hard white and some soft white varieties are also released.

Breeding activity is mostly financed through seed royalties. However, only around 15% of crop area is planted with purchased seed so seed royalties only apply to 15% of seed use. Mostly, farmers do not declare or do not know the varietal pedigree of what they plant on around 70% of their crop area. Impure seed and the resulting unevenness in a harvested crop is commonplace.

Since 1998, bread wheat cultivars from Argentina have been classified based on their commercial and industrial quality performance as Quality Group (QG) 1, cultivars with extra-strong gluten suitable for blending; QG 2, cultivars adapted to traditional baking (Photo 6) (fermentation time longer than 8 hours); and QG 3, cultivars suitable for direct baking methods (fermentation time less than 8 hours) (Cuniberti and Ottamendi 2004). Many of the French varieties initially were ending up in grade 3 but now there has been a change where many of those varieties are classified into grade 2.

The Instituto Nacional de Semillas (INASE) (i.e. National Institute of Seeds) was created in 1991 and is responsible for plant variety protection in Argentina. Argentina became bound by the 1978 Act of the UPOV Convention on December 25, 1994. INASE is the government body responsible for the application of Law No. 20.247/73 on Seed and Phytogenetical Creations and its regulatory decree no. 2183/91. The purpose of this law is to promote efficient seed production and marketing, to assure farmers regarding the identity and quality of the seed they acquire and to protect the ownership of plant breeding intellectual property.

In order to comply with this, INASE's main objectives are to:

- i. apply Law No. 20.247/73 on Seed and Phytogenetical Creations
- ii. exercise policing power derived from the implementation of this law
- iii. certify the quality of any plant variety intended for planting or propagation
- iv. protect and register the intellectual property of seeds and material resulting from plant breeding and biotechnology activity.

INASE are trying to control the use of registered seed varieties and enforce the legislation by matching INASE records to those of the tax department that regularly receives information about the stocks and qualities of grain held by a farmer. When a farmer buys seed legally, the accompanying documentation must be registered with INASE who in turn can crosscheck with taxation records. Some successful prosecutions against some larger farmers who have illegally avoided seed royalty payments is signalling to other farmers their need to honour the laws regarding use of varietal seed.



Photo 6 Scientific display of wheat quality impacts on sample loaves of bread

Wheat quality in Argentina

The wheat quality receival standard (Table 6) in Argentina applies bonuses and discounts to wheat based on its protein, with any bonuses for protein only applying if the test weight is at or above 75kg per hectolitre (hl). If farmers deliver wheat with protein above 11.5%, they receive a bonification payment of up to 2% (on a volume basis) and a discount if the wheat is below 11.5% protein. For example, if a farmer delivers wheat of 12.5% protein, they will get a 1% bonification in volume. If they deliver 13.5% protein, they will get 1% bonification. Above 13.5% and they still only receive the 2%. However, the bonus for protein is not always paid, and if paid, it is not always enough to offset the cost of the inputs (e.g. nitrogenous fertiliser) necessary to obtain it.

The discounts applying to lower protein wheat are as follows:

- i. less than 11% down to 10% protein, a 2% discount
- ii. less than 10% down to 9% protein, a 3% discount
- iii. less than 9% protein, a 4% discount.

Despite the protein payment system, most wheat breeding programs emphasise yield improvement which, when combined with current input technologies, is leading to Argentinian wheat displaying a decrease in protein levels, especially during years with highly favourable growing conditions. In addition, local and Brazilian millers have expressed their concerns about the quality of a recently launched high-yielding variety of French origin and would prefer it to be segregated due to its inferior bread-making quality. Nonetheless, in 2017, despite concerns over the protein levels of wheat receivals, the bread-making functionality of Argentinian wheat was acceptable.

There is an active debate in Argentina regarding the relative importance of yield versus quality. In other words, similar to what is occurring in Australia: do we focus on increasing yield at the expense of quality, or do we improve quality, even if it means restricting yield growth?

Table 6 Receival standards for Argentinian wheat of grades 1–3

Grade	Test weight (kg/hl)	Maximum tolerances for the grade						Insect-chewed kernels (%)	<i>Melilotus</i> sp. (seed count/100g)	Moisture (%)	Insects and arachnids
		Foreign material (%)	Burned & heat-damaged (%)	Total damaged (%)	Grain carbon (%)	Yellow berry kernels (%)	Shrunken & broken kernels (%)				
1	79	0.2	0.5	1.0	0.1	15	0.5	0.5	8	14	Free
2	76	0.8	1.0	2.0	0.2	25	1.2				
3	73	1.5	1.5	3.0	0.3	40	2.0				

Note: hl = hectolitre

Wheat Supply Chain



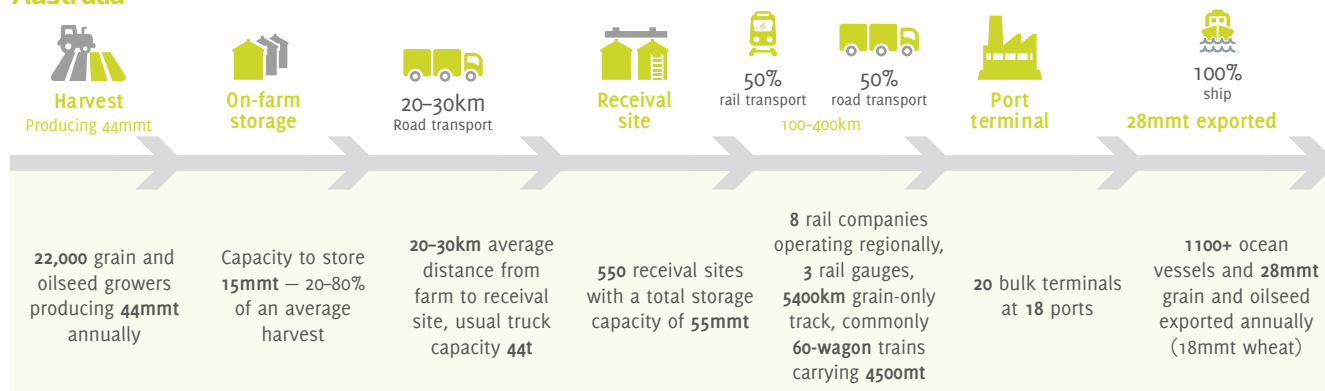
Overview

The general characteristics of Argentina's export grain supply are shown in Figure 26 and are contrasted against Australia's supply chain. The key steps in each country's supply chain are similar. However, there are some important differences in the magnitudes of crop volumes, crop portfolios, transport modal shares and storage capabilities.

Both supply chains have a strong emphasis on grain export. More than three-quarters of crop production in each country is exported. A main difference is the greater volume of grain that passes through the Argentinian grain supply chain, its strong dependence on a huge fleet of small trucks to transport grain from farms to port terminals (Figure 27) and its much greater emphasis on value-adding via crushing, flour milling and biofuel installations. About 83% of the wheat in Argentina goes to port by truck, 13% by rail and only 4% by barge. Grain production in Argentina is centred mostly in three provinces: Córdoba, Santa Fe and Buenos Aires (see earlier Figure 15).

Argentina's principal port terminals are in the Gran Rosario region whereas Australian port terminals are dotted around the coastline adjacent to grain-growing regions. A much higher proportion of grain production is moved to port by rail in Australia and grain export via containers is a relatively more important feature of grain export, especially from south-eastern seaboard ports.

Australia



Argentina

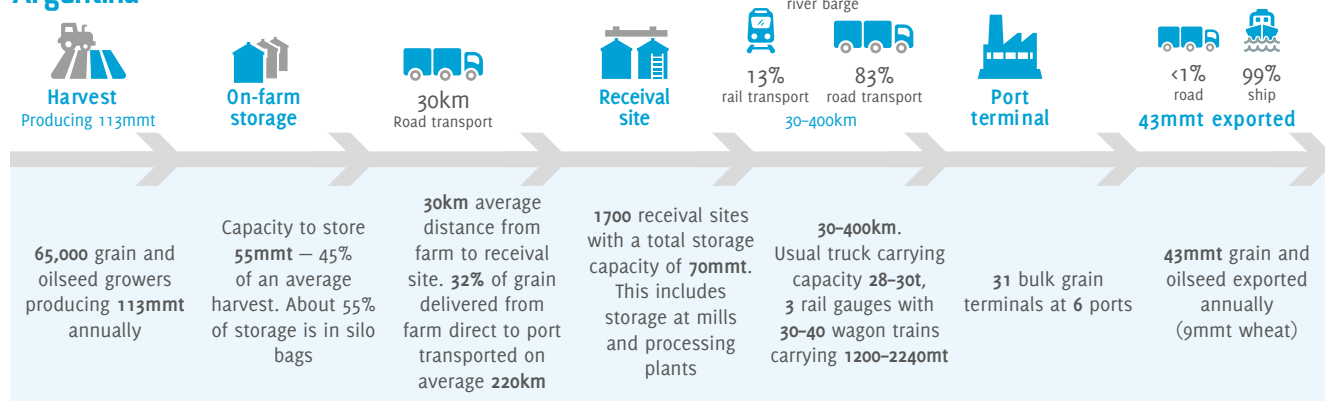


Figure 26 Comparison of the export grain supply chains of Australia and Argentina

Source: AEGIC

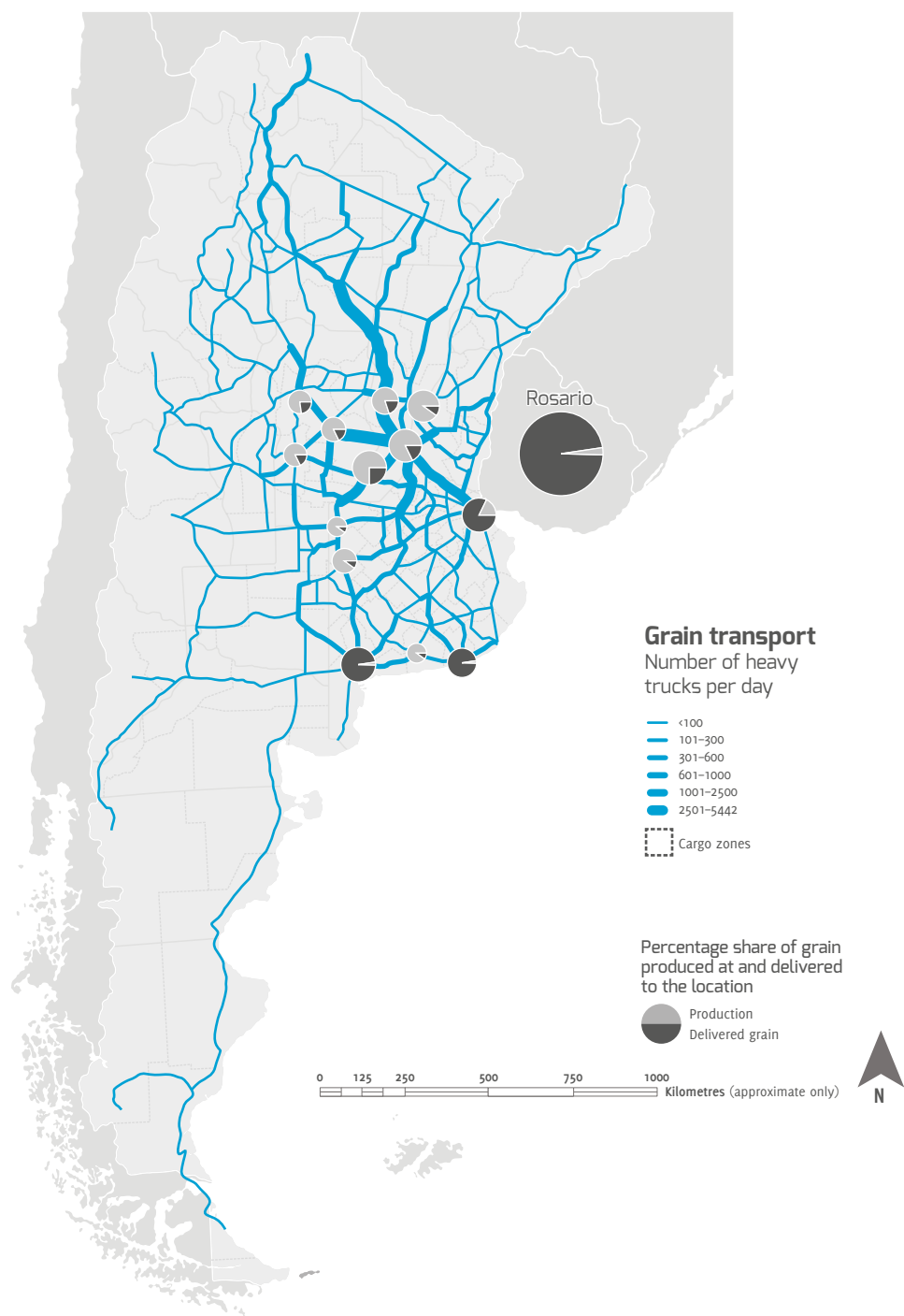


Figure 27 Number of heavy trucks per day delivering grain on various routes in Argentina

Source: Bergero (2017)

The Gran Rosario ports are the main source of exports of vegetable oil and protein meals (Figure 28) and more than 60% of grain exports. In 2016 and 2017 these ports were responsible for 66mmt and 68.7mmt respectively of exports or around 80% of the national agricultural total.

As grain production in Argentina increases, the intention of government and industry is that an increasing proportion of grain production will move to port via rail. In 2016 there was a record use of rail transport for grain, with 12mmt being moved on rail, and grain accounted for 65% of the total rail freight transported. However, despite or perhaps due to upgrades of the northern rail system in 2017, the rail transport of grains actually decreased by almost 6% in 2017 compared to 2016.

In 2017 there was a large increase in the use of barges to transport grain from Paraguay and Bolivia to Gran Rosario ports. About 6.45mmt of grain was shipped by barge in 2017.

Total costs

Cost

The total cost of producing a tonne of wheat, delivering it to port and loading the grain onto a ship is around US\$27 less in Argentina than in Australia (Table 7). Argentinian wheat production benefits from more fertile soils, more rainfall and the widespread rotational inclusion of a profitable, genetically modified pulse crop (soybean) that for many years has facilitated weed control. Although both countries enjoy a geographic advantage of their wheat-producing regions being not too distant from port terminals (unlike the situation in Canada or parts of the US), nonetheless the freight from upcountry to port cost is slightly less in Australia due to its superior rail and road infrastructure. The quality of on-farm and upcountry storage and handling infrastructure also tends to be greater in Australia, adding to the expense of its supply chain but potentially providing greater control over the specifications and quality of the grain received. This bestows on Australian farmers a potential price advantage through quality segregation but not a cost advantage.

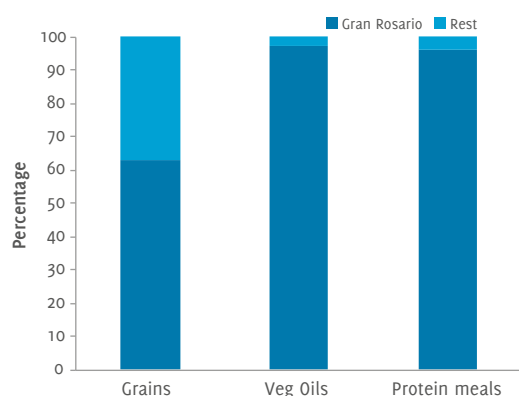


Figure 28 Gran Rosario (or up-river) and other source's shares of key grain-based exports

Source: Bolsa de Comercio de Rosario (2017)

Table 7 Total supply chain costs in Argentina and Australia (US\$), 2017

	Argentina ^a		Australia ^b	
	Cost (US\$/t)	% of supply chain cost	Cost (US\$/t)	% of supply chain cost
Cartage to bin	2.3	5	6.1	11
Storage	1.1	2	3.9	7
Upcountry handling	10.3 ^c	21	8.1	15
Transport to port	23.0	47	18.4	33
Handling at port	5.0	10	-	-
Shipping	7.1	15	16.9 ^d	30
Levies	-	-	2.2	4
Supply chain cost	48.8	27	61.4	30
Production cost (wheat)	129.2	73	144.0	70
TOTAL COST (\$/t)	178.0		205.4	

^a Note the following key assumptions and data sources underpinning these estimates (in US\$/t):

- a cost of \$4/t for a 15km transport journey from the farm to the elevator
- a \$5/t intake charge by the local elevator
- 3-month free storage followed by 1% per month charge after that (by volume) (assume 6 months' storage)
- a commission on sales of 3.5% for the out-take fee paid by the farmer
- a road freight charge of \$23/t to port for a 200km journey

^b Note the following assumptions and data sources underpinning these estimates (in US\$/t):

- a cost of \$7.65/t for a 30km transport journey from the farm to the elevator
- a \$9.08/t intake charge by the local elevator
- 3-months storage, free in Western Australia but attracting a monthly charge in other states
- a commission on sales of 3.5% for the outtake fee paid by the farmer
- a freight charge of \$18.4/t to port for a rail journey of 220km.

^c Part of the cost of handling is incurred by the farmer who loads wheat into and out of silo bags. We assume that 32% of the wheat harvest goes to port via silo bags or other types of farm storage. The cost of loading grain into and out of silo bags is assumed to be \$11/t. Another 57% of grain delivered to port is assumed to be via country elevators, many of which are cooperatives that offer free storage for three months. They charge for intake and outtake as previously outlined. Another 11% of grain that goes for export is assumed to leave farms directly off harvesters into trucks.

^d Includes handling at port and shipping costs.

The total cost of producing a tonne of wheat, delivering it to port and loading the grain onto a ship is around US\$27 less in Argentina than in Australia.

In both countries, the cost of production forms close to 70% of the total FOB price of wheat, although Argentina has the twin benefits of cheaper farm production and a cheaper supply chain. For both countries, further reductions in supply chain costs are possible through improvements in rail, road and port infrastructure or greater competition governing their use. In addition, Argentina could benefit from a further deepening of its river channel to allow carriage of larger wheat cargoes or via river infrastructure investments to allow greater use of barge transport.

Efficiency

Unlike the Russian or Australian wheat supply chains, the Argentinian supply chain experiences a less significant peak load problem at harvest. The longitudinal spread of wheat production in Argentina generates a cascading harvest whereby grain is first harvested in northern regions, followed by later harvests in the most southerly regions. This cascade lessens geographical simultaneous demand for harvesting equipment and trucking of grain and enables an extended use of the existing fleet of harvesters and trucks. Moreover, the allocation of trucks to port terminals ensures an orderly supply of grain from farms and upcountry storage each day of the wheat harvest.

Wheat is not the principal crop of Argentina so the size and profitability of the trucking fleet, upcountry storage and port terminals are mostly determined by the size of the summer crops, soybean and corn, that are harvested in the March to June period. Accordingly, there are ample numbers of trucks to move the wheat harvest in November and December.

The Argentinian truck fleet benefits from year-round work due to the different timings of the summer and winter crops as well as from farmers' reliance on silo bags that allows grain (especially soybean) to be trucked from farms in any month. By contrast, most grain in Australia is produced as a winter crop and the harvest of crops is compressed into a few months each year, concentrating the demand for trucks and rail services and upcountry grain storage. In Australia, most grain is moved off farms into regional storage during harvest, using contract cartage and the farmers' own trucks but this creates peak load pricing, especially in seasons with bumper crops.

An added advantage of Argentina's winter and summer crop production is that upcountry storage is better utilised, as part of the storage of corn and soybean can be cleaned out to receive the wheat harvest and vice versa, thereby allowing a more efficient use of grain storage facilities.

Farm costs of wheat production

Estimating a nation's cost of wheat production is extremely difficult. Typically, a broad range of farm cost structures exists, from high-cost to low-cost production systems. Each country's wheat crops are grown in different climatic conditions, on different soil types, in different rotations, on different farm sizes, with differing technologies, under different weed and pest burdens. Hence, in practice, a wide range of production costings exist within in each country, and sometimes not all costs are well documented, further complicating costs comparisons. Hence, the costs presented in this report are best interpreted as being broadly indicative of key or typical differences.

Rabobank (2014) examined farm gate variable costs of wheat production in several wheat-producing nations and listed those costs for Argentina, Australia, US, Canada, Ukraine and France in US\$ per tonne as \$138, \$146, \$140, \$142, \$136 and \$143, respectively. In short, among those countries, Australia displayed the highest variable costs of production while Argentina was one of the lowest. However, following the removal of the export tax on Argentinian wheat, Argentinian farmers have intensified their use of inputs for wheat production.

Möllman (2015), Zimmer (2015) and Herbert (2017) also report the costs and returns of wheat production on case-study farms in various wheat-growing countries. These authors mostly examine grain production before 2016 and so exclude the impact of the removal of the wheat export tax on Argentinian farmers' behaviour. However, survey evidence from CREA shows farmers increasing their inputs for wheat production in 2016 and more especially in 2017. In the period of taxing the export of wheat, Möllman and the other authors show that wheat production was not commercially attractive for many grain growers in Argentina, especially relative to soybean and corn production. Hence, although Argentina was identified as a low-cost supplier of wheat, the profit margins per tonne of wheat produced were low or non-existent in some years. Following the removal of the export tax and the subsequent increased expenditure on inputs, the cost of production has risen but so has the profit margin from wheat production.

The current cost of production per tonne for Argentinian wheat, inclusive of fixed costs and supply chain costs, is roughly US\$20/t less than Australian wheat (Table 7 and Table 8). Table 8 includes taxes emanating from farmland ownership in Argentina, as the magnitude of those taxes greatly affects Argentinian farmers' overall costs. Although Australian farmers do face some similar types of taxes, they are not of the same magnitude. The main business taxes paid by Australian farmers are income taxes, yet Australian farmers have access to farm management deposits and other tax-minimising options that allow them to tax-average and smooth out or reduce tax payments, such that many Australian farmers pay relatively little income tax compared to some other Australian businesses or salary earners.

Table 8 Estimated costs of export wheat production per hectare in Argentina and Australia, 2017 (US\$)

	Argentina	Australia
Yield (t/ha)	4	2.1
Seed	\$18	\$17
Fertilisers	\$132	\$71
Chemicals	\$55	\$64
Machinery maint./Fuel	\$127	\$94
Labour	\$13	\$21
Variable costs	\$349	\$267
<i>Other fixed</i>	<i>\$168</i>	<i>\$36</i>
Total costs (\$/ha)	\$517	\$303
Total costs (\$/t)	\$129	\$144

Sources: Planfarm/Bankwest (2016 & 2017); Agri benchmark (2016 & 2017); Herbert (2017a,b); Rylko and Zimmer (2017); Rosario Board of Trade (2017); other industry sources

Often inter-country comparisons of commodity production only compare variable costs of production, yet there can be marked differences between countries in their fixed costs (or in the taxation of the commodity's production). Ideally, full costs of production (i.e. variable and fixed costs) need to be compared, as all those costs need to be covered for a wheat producer to remain in business beyond the short term. For example, the USDA (2017) examined wheat production costs and returns per planted acre, excluding government payments over the period 2009–16. Their analysis included operating (variable and fixed) and imputed costs and they found that only in one year over the eight years were returns positive.

Costs per hectare are different between Argentina and Australia due to the higher-yielding environment in Argentina's principal wheat-producing region. However, the overall costs per tonne are also different, with Argentina's variable costs per tonne being lower. When taxation of owned land is included, however, the overall cost per tonne is less different. Yet Argentinian wheat still remains around US\$15/t cheaper at the farm gate and around US\$27/t cheaper when loaded on to a vessel.

Land-based taxes greatly add to an Argentinian farmer's costs of production and, on average, a typical Argentinian farmer rents out much more land than her Australian equivalent. Sixty per cent of the area operated by an Argentinian farmer is rented, whereas an Australian farmer often leases less than 15% of the area they operate. Most Australian farmers maintain business equities over 85%, so they own outright most of their land. Before buying extra land, they typically lease that land to assess its suitability. In Argentina, the cost of land rental and associated taxes usually mean that the profit from wheat production is much higher on owned land versus rented land.

What is not apparent in the cost comparison between Argentina and Australia is the variance in the cost of production within each country, both spatially and temporally. The cost per tonne is heavily influenced by the yield, so where there is variability in the yield, there is also variability in the cost per tonne of production. However, both countries have a similar coefficient of variation in de-trended wheat yields at around 25%. An inference is that wheat producers in both countries face similar volatility in their production costs per tonne. Low-yielding years will cause relatively high unit costs of production, and so farmers could incur losses in such years as the wheat they sell on export markets will attract a price mostly determined by wheat available from cheaper or more climatically reliable origins. Conversely, in bumper years both countries have especially low unit costs of production and are likely to be more easily price competitive in export markets.

Grain storage and elevators

In Argentina, there is about 40–60mmt of storage capacity on-farm, with more than half this being silo bags and the remainder steel silos. There is a further 70mmt of grain storage in upcountry elevators, warehouses, ports, and feed and flour mills.

About half of the wheat produced is transported to port shortly after harvest. The remainder goes to warehouse storage (including mills) or remains slightly longer in farm storage (silo bags and steel silos). Soybeans are the principal grain stored in silo bags, with that grain often being stored for up to eight months or longer. Eighty per cent of corn harvested needs to be dried.

Country elevators in Argentina are owned and operated either by an independent business, a cooperative or an integrated grain export or grain processing business. Independent elevators are operated by their individual owners. Cooperatives are jointly owned by farmers and integrated firms own and operate the remaining elevators. Due to elevator bankruptcies during the 1990s, many farmers use cooperative elevators or others owned by large integrated businesses such as Cargill or Louis Dreyfus. Most cooperatives belong to the Agricultores Federados Argentinos (AFA), and the Asociación de Cooperativas Argentinas (ACA) also operate port elevators. Turnover rates (annual volume/storage capacity) are considerably higher in Argentina than in Australia or the US because of the comparatively smaller storage capacity at Argentinian country elevators. Also, the flow of summer and winter grain production facilitates higher turnover rates in storage facilities and port terminals in Argentina.

Argentinian country elevators typically include vertical steel silos (Photo 7) of either welded carbon steel or bolted galvanised steel because they are less expensive than slip-formed concrete silos. Considerable flat or horizontal storage is used at Argentinian ports or processing plants. The metal silos found at country elevators have a conical, gravity discharge floor that allows them to be emptied without the use of additional labour. Elevators include a leg (a vertical, continuous belt) that includes buckets which lifts grain for subsequent routing via gravity-feed spouting to bins, dryer, railroad car or truck.

Tower dryers are typically used to dry Argentinian grain. A variety of truck unloading mechanisms are found in Argentinian elevators. Older facilities require that trucks discharge their grain via doors on the truck/trailer grain beds, which are opened after the truck enters the unloading area. More modern facilities that require faster discharge rates have platforms that elevate trucks and their trailer to 35 degrees (Photo 8). These facilities can unload about 600t per hour.

Grain stocks reporting

In Argentina, farmers are required by law to provide online assessments of their stock holdings of grain. Farmers need to supply information about the type of grain stored (e.g. soybean or wheat), whether the grain comes from owned or rented land, the year the stored grain was produced, the GPS location of the storage and the purchase invoice of the silo bags (if the grain is stored in silo bags). Similarly grain handlers and elevators are also required to report their stocks.

After aggregation, this information is made available regularly to buyers and sellers of grain in Argentina. Almost the opposite currently occurs in Australia, although previously this was not the case. Currently, there is no requirement for farmers or other participants in the wheat supply chain to reveal information regarding their stocks of wheat. Hence, traders must impute or estimate by various means what qualities and quantities of wheat may be available for sale or purchase in different regions of Australia.

Elevation and storage

The cost components of upcountry elevation and storage in Australia are highly variable, depending on the location and ownership of the facility. In general, facilities charge less for outturn than intake, and storage often is free for the first month or more. Drying of wheat is rare in most harvests of wheat in Australia, as the months of harvest are typically hot and dry in most regions. By contrast, overly moist wheat can occasionally be a problem in Argentina with up to 10% of the harvest usually requiring drying, even more in some harvests. In Australia, upcountry outturn costs are often reflected in port terminal fees rather than as separate upcountry outturn fees, as the same companies that provide the upcountry storage also own and operate the port terminal to which the grain flows.



Photo 7 A typical country elevator in the province of Córdoba



Photo 8 Truck and trailer unloading at an Argentinian grain port terminal at Rosario

Table 9 lists the main cost components of upcountry storage and handling. Argentina is shown to have slightly lesser costs in most components other than elevator storage.

Upcountry storage in Australia benefits from low-cost, mostly horizontal storage that is relatively cheap to construct and which faces little risk of weather damage. Moreover, key receival sites have large-capacity intakes and are often situated on main rail lines with high outturn capacities. Their downside is that farmers face longer journeys from their farms to take advantage of these primary sites and so road freight costs are greater. By contrast, upcountry elevator sites in Argentina are smaller and often reliant on steel silos with limited storage capacity. The large truck fleet in Argentina, however, ensures higher turnover of grain at these sites, albeit subject to scale inefficiencies in loading these trucks.

Table 9 Cost of storage and handling in Argentina and Australia, 2017

Process	Argentina		Australia	
	US\$/t	% of section cost	US\$/t	% of section cost
Handling (receival fee)	5	-	\$8.1 ^a	-
Drying ^b	~\$0.3	-	<\$0.1	-
Storage ^c	1.9	-	3.9	-
Elevator outturn	6.5	-	-	-
Cartage	4	22	6.1	34
Storage	1.9	11	3.9	21
Handling	11.8	67	8.1	45
TOTAL (cartage, storage & handling)	17.7		\$18.1	

^a includes elevator intake and outturn net of rebates.

^b around 10% of the wheat harvest, on average, requires drying by the farmer or the elevator, usually at a cost of around \$3/t.

^c Typically, cooperative storage and handlers who are often the main suppliers of those services provide a period of free storage to attract grain to their facilities. The cost of the storage is subsequently paid for in grain sales commissions and handling fees.

Elevator to market/port

Mode of transport

Argentinian grain trucks typically transport 28–30t in a truck/trailer combination (Photo 9) with about one-third of the cargo carried by the truck and the remaining two-thirds by a three-axle trailer.

In Argentina, most grain is hauled by truck/trailer combinations. A comparison of the road freight costs over different distances is presented in Table 10. The shaded regions describe the range of distances where road freight is most prevalent. A key difference between Australia and Argentina is that rail freight often replaces road transport on journeys of more than 300km due to the lower cost of rail on such longer journeys. By contrast, due to the poor quality of the Argentinian rail system, often grain is carted by truck over particularly long distances.



Photo 9 Truck and trailer in queue for unloading at an upcountry elevator in Argentina

Table 10 Road transport costs in Argentina and Australia, 2017 (US\$/t)

(km)	Argentina (\$)	Australia ^a (\$)
50	10	9.38
100	14	13.1
200	23	21.4
300	35	27.4
400	40	34.9
500	43	42.4
700	48	57.4
900	56	72.4

^a All the Australian rates include a fixed cost of loading at \$4.88/t. The shaded regions indicate the range of distances where road freight is most prevalent.

Analysts at the Rosario Board of Trade estimate that about 8.7mmt of grain are carried by trucks from Argentina's northern grain region to Gran Rosario port terminals. Calzada and Corina (2017) estimate the road freight charge is \$65/t for such routes involving distances of around 1150km. These same authors indicate that road freight rates are very high by comparison to trucking rates in Brazil or the US.

The FADEEAC (Federación Argentina de Entidades Empresarias del Autotransporte de Cargas) commissioned an analysis of the tax impact on costs and fees in freight transport and found that freight rates on average comprise:

- i. taxes, other charges on freight and toll transport (37.4% share of the final freight rate)
- ii. wages (15.8% share of total freight cost)
- iii. fuel (15.2% share)
- iv. operating and structural costs (18.7% share)
- v. capital asset (vehicle) depreciation (7% share)
- vi. the carrier's rent (6% share).

Road freight in Argentina is subject to substantial taxation. Many toll booths are located on main highways (Photo 10) and are main sources of revenue collection. In other countries, road construction and maintenance are funded from general taxation, yet in Argentina differential user-pay charges occur on main highways (see Photo 10) and, in the case of grain transport, those costs are largely passed back onto farmers due to the highly unionised road freight service. The strength of the trucking union also enables wage rates in that sector to be high relative to general wages in the Argentinian economy. Hence, road freight rates in Argentina are more expensive than in some other countries such as the US or Brazil.



Photo 10 Road tolls for different types of vehicles using the main highways in Argentina

In Australia, road freight rates are also high, by international comparison, but for different reasons. Although road tolls do not apply on most major highways used by grain trucks, nonetheless fuel is subject to both an excise tax and a goods and services tax. An excise tax of 39.5 cents per litre (Australian currency) applies to diesel or petrol fuel, to which is added an additional 10% goods and service tax. Hence, fuel is relatively expensive in Australia. By contrast, the combined magnitude of all local, state and federal taxes on fuel in the US amount to only 14.7 cents per litre of diesel.

The greater per capita GDP wealth of Australia relative to Argentina translates into wage rates generally being higher in Australia. These higher wage rates translate into higher costs for many types of goods and services, including transport services. The net effect is that road freight rates in Australia and Argentina are high by international comparison.

In Australia, large grain trucks with trailers, known as B-doubles, became widely used throughout most grain-growing regions in the 1990s. These truck combinations, plus even larger units known as B-triples and road trains, lowered the cost of road transport of grain. In Argentina, larger truck combinations are known as bitrains. Under Argentinian law, semi-trailer or trailer trucks cannot exceed a loaded weight of 45t, which means a normal load of wheat of 32t. New legislation in 2018 allows bitrains to carry a loaded weight of up to 75t, which is equivalent to a normal load of wheat of 53t. Despite the cost savings associated with use of bitrains, Argentinian analysts currently estimate that by 2026, 98% of the truck journeys will still be made with traditional trucks carrying a total of 74.2mmt, while bitrains will only transport 3.1mmt (Calzada and Sesé, 2018). If greater uptake of bitrains is accommodated in Argentina, then further cost savings in their supply chains is possible.

Rail and road networks

A widely acknowledged limitation to the further efficiency of the grains sector in Argentina is its reliance on an immense fleet of small trucks. Only 28–30t of grain are carried in each truck and trailer, and many of the trucks are older than 15 years. Depending on their intake capacity and time of year, export grain terminals can receive anywhere from 1200 to more than 2000 trucks per day. The size of trucks is mostly limited by the quality of the regional road system.

To lower the per tonne cost of grain transport from farm to port as grain volumes grow will require substantial investments in better quality roads and larger trucks, contemporaneous with major investments in below-rail and above-rail infrastructure and changes to port terminals' intake infrastructure. As the wealth of the grains sector grows, and as the Argentinian economy gradually stabilises and grows, then undertaking these long-lived capital investments becomes more feasible and commercially attractive via a combination of government funding and toll roads or access arrangements.

As shown in Table 11, more than 80% of grain is transported by truck. The rail and barge systems only move 13% and 5% respectively of the transported grain. More than 2.6 million truck journeys to port, principally to the Gran Rosario region, occur each year. There are also more than 2900 vessels that take grain from Argentinian ports to international customers.

The rail system is being upgraded. The grand plan is for 80mmt to be transported on rail by 2030, an ambitious ninefold increase in the current volume on rail. It is presupposed that the current rail network could accommodate 19mmt, so the 80mmt target represents a fourfold increase in potential handling capacity. An accompanying problem for the upgrade of the rail system is that many existing grain terminals in the Gran Rosario region either do not have rail access or have inadequate access, so ensuring these terminals can accommodate more rail traffic will be a difficult problem to fix.

Grain is railed to port terminals in unit trains usually comprising 30–40 wagons in length. Carrying capacity is up to 50t per wagon on a wide gauge line and up to 40t on a narrow-gauge line. The northern grain region of Argentina has narrow gauge, the west, wide gauge, and there is standard gauge in the north-east. Recently, imported new wagons are larger, each carrying 56t. Hence, currently a unit train transports between 1200 and 2240t. These are small unit trains in comparison to unit trains on the standard gauge network in Australia and much smaller than the 10,000–12,000t unit trains that move grain from the prairies to the port of Vancouver in Canada.

The Rosario Board of Trade have reported that the 'Belgrano Cargas' railway system (Figure 29) across Argentina's north and north-west was degraded due to inadequate maintenance, greatly reducing its carrying capacity. For example, in the late 1980s, already into its downturn, the rail system carried about 4mmt. By 2016, despite the increase in grain production, this figure had dropped to 1mmt.

Rail transport rates, before the upgrade, were often slightly lower than other transport modes but the travel times were much longer and uncertain. For example, shipping soybean by rail from Salta to Rosario ports often took more than a week, whereas by truck this same journey took between 24 and 36 hours.

Northern Argentina produced 17.1mmt of grain in 2016 on 6 million hectares, and is one of the few producing areas with expansion potential of around 1.3 million hectares. Renovation of the General Belgrano rail system is underway. The national government is supporting an extensive renewal of key partially degraded parts of this rail network. Much of the work is planned to be completed by 2035, or earlier.

The first major investment is a 500km track renewal program north of Rosario. This involves a US\$2.8b investment in tracks, locomotives and wagons from Chinese sources. Chinese investors also are providing a capital loan to be repaid over 20 years with an upfront grace period of five years during which no repayments are required. Of the 500km to be upgraded, 230km were already completed by September 2017. The quality of the track upgrade supports heavier wagons that each carry around 65t (Photo 11) and eventually unit trains of 100 wagons (i.e. 6500t) will be possible.

More than 80% of grain is transported by truck.

Table 11 Grain transport by mode to port terminals in 2016 in Argentina

	Unit	PORT			
		Gran Rosario	Bahía Blanca	Other	Total
Quantity of bulk agricultural product	mmt	69.8	10.2	10.1	90.1
By transport mode					
Rail	mmt	9.2	3		12.2
Barge	mmt	4.5			4.5
Truck	mmt	56.2	7.2	10.0	73.4
No. of units that arrived					
Trucks (28t loads)	no.	2,005,485	256,489	360,721	2,622,695
Rail wagons (47t per wagon)	no.	194,718	65,563	426	258,707
Barges (1500t each)	no.	3031			3031
Ocean vessels	no.	2180	376	349	2905

Source: Bergero et al (2017)



Figure 29 General Belgrano railway in Argentina

Source: Wikipedia: see https://upload.wikimedia.org/wikipedia/commons/2/29/Belgrano_railw_map.jpg



Photo 11 New larger capacity rail wagons near Rosario

Aside from the immediate 500km upgrade, there are plans to renovate 1093km of rails in the Belgrano Cargas system with financing from the China Machinery Engineering Corporation, CAF-Latin American Development Bank and Argentina's National Treasury. The investment in the upgrade of the Belgrano rail system is already triggering investments in grain storage and elevators on this line in its northerly parts. In return for investing in the upgrade, the government is limiting the benefits of the rail concession to the current owner of the line and is, in effect, introducing open access conditions to allow multiple users of this infrastructure. This should foster competitive rail rates and, due to lesser transport costs and faster journey times, grain production will become more lucrative in the northern regions. In turn, this will shift Argentina's grain belt northwards and encourage construction of more northerly port terminals and even additional investment in river dredging to facilitate shipping. These more northerly port terminals are likely to offer cheaper intake rates as they will have access to cheaper riverfront land that can accommodate rail loops, without issues of urban encroachment or truck congestion that will become issues of greater concern in some ports at Rosario.

In January 2018, eight new locomotives manufactured by China's CRRC Qishuyan were delivered to serve on the upgraded Belgrano line. These locomotives are part of the package of 107 locomotives and 3500 rail cars purchased and are being brought to Argentina as part the upgrade of Argentina's rail system. The new locomotives will allow a faster and safer movement of grain.

After the upgrade of the Belgrano Cargas system, the San Martin rail line, west of Buenos Aires, will be upgraded and renovated. This will allow grain to flow to ports in Rosario and to other southern ports. It will reduce the cost of moving grain and other agricultural products from inland Argentina to these ports. The farming systems in these southern and westerly regions are often more cereal dominant.

Port operations and shipping

Grain production in Argentina is centred in three provinces — Córdoba, Santa Fe and Buenos Aires — that are served by an extensive river system; the Salado and Paraná rivers that link the major cities of Santa Fe, Rosario and Buenos Aires. These three provinces are the source of around 80% of the nation's crop production.

Almost three-quarters of the nation's crop production is exported, with most exports moving via port terminals in the Gran Rosario region. These inland grain port terminals also attract grain from Paraguay, Bolivia and southern Brazil, thereby lowering these ports' unit costs of operation due to size economies while additionally providing value-adding blending opportunities. To illustrate, according to information from the Ministry of Agroindustry and Customs data (Bergero *et al*, 2017), Gran Rosario ports received 4.5mmt of Paraguay and Bolivia products by barge during 2016. River infrastructure upgrades in coming years and further investment in barges will facilitate access to grain in these nearby countries and boost exports from Gran Rosario port terminals (Photo 12). Moreover, especially for the soybean industry, access to greater volumes will help underpin further investments in soybean crushing and oil refining businesses, allowing additional value-adding processes to extract greater value from the refined oil end products such as glycerine.

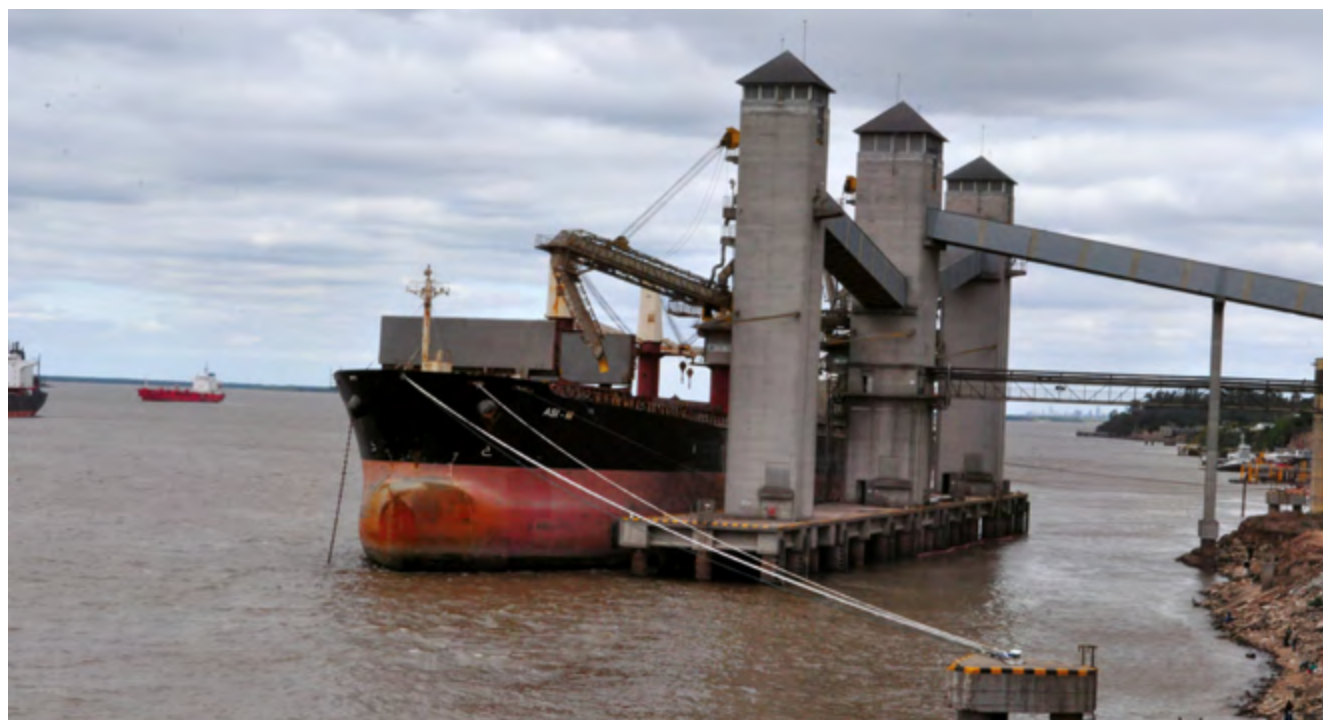


Photo 12 Grain loading at a Rosario port terminal

Land expansion opportunities in northern Argentina and the economic stimulus to spend more on inputs due to the lifting of grain export taxes will lift grain production. Larger volumes of grain will encourage greater investment in value-adding activity. Already five ethanol plants based on corn have been constructed and are operational. In addition, a range of local and international firms is co-locating at export grain terminals to use early stage processed products of soybean and corn processing to manufacture more advanced products. GM enzyme technology in the future will increase the array of commercial products generated as value-added products of soybean and corn processing.

As part of the effort to increase productivity in the agricultural export sector, the government has been seeking ways to reduce port fees. For example, in September 2017, a union that represents dock workers, after government pressure, accepted

competition from rival companies after decades of monopoly practice. Also in November 2017, the cost of docking services in Rosario, currently set at about \$108,000 per vessel, will fall by about 70% after December, following an announcement by Jorge Metz, national undersecretary of ports and waterways in Argentina's transport ministry. Hence, although subject to change, the port and shipping costs in Argentina and Australia are listed in Table 12, showing that the cost of port services is less in Argentina, further supporting their export competitiveness.

The Paraná River's shipping canal is maintained at 34 feet from the ocean to the port of San Martín, 35km north of Rosario. Jan De Nul, a privately owned, Luxemburg-based company, was awarded a contract in 1995 to provide and maintain dredging services on the Paraná River. The contract ends in 2020. The company wants to renew this contract and has suggested

Table 12 Port handling costs in Argentina and Australia (US\$)

	Argentina		Australia	
	Bulk (\$/t)	Activity cost (% of total)	Bulk (\$/t)	Activity cost (% of total)
Port terminal intake	5.0	41	6.6	41
Vessel nomination/survey	2.5	21	3.7	23
Vessel loading	3.1	26	4	25
Other	1.5	12	1.8	11
TOTAL	12.1		16.1	

deepening the river channel to 36 feet. However, that would likely mean an increase in the river use toll, (currently \$3 per net tonne), which ultimately would mostly be passed on to farmers.

The additional two feet of depth would allow vessels to carry several thousand tonnes more cargo to load in Rosario. Larger cargoes would reduce shipping costs as currently large ships top up their Rosario cargo with more cargo from a deep-water Atlantic port before heading into international waters. Avoiding two-port loading reduces shipping times and costs. The Rosario Board of Trade favours deepening the channel.

Port availability

Both countries have ample numbers of ports as outlets for grain. The numerous Gran Rosario ports, with their many different owners, ensure sufficient contestability for grain. By contrast, in Australia, in some grain-exporting regions there is often the same owner of multiple port terminals in that region, with a risk that those terminals could operate as spatial monopolies. Accordingly, the Australian Competition and Consumer Commission (ACCC) developed, monitors and enforces a mandated Port Terminal Access (Bulk Wheat) Code of Conduct. The purpose of the code is to regulate the conduct of port terminal service providers to ensure that exporters of bulk wheat have fair and transparent access to port terminal services. The need for the code does indicate that some grain port terminals in Australia face little exposure to competition that otherwise would force change to the efficiency and pricing of their port services.

Port to destination

Shipping rates have increased since early 2016, while grain prices have decreased in real terms. Hence, sea freight as a share of calculated CIF values (cost, insurance, freight) has risen sharply and the Dry Baltic Index has been on an upward trajectory since early 2016 (see Figure 30). The index in late 2017 reached heights not seen since 2011, although remaining

well below the peaks of much earlier years. The main driver of the historic bubble in shipping rates in 2009 and 2010 was linked to commodity prices, particularly oil and minerals. Many ships were ordered during these bubble years. Upon entering service these new ships have helped keep the index depressed, until recently.

If shipping rates climb further in 2018, then the advantages of geographical proximity to major wheat customers becomes more forceful. In short, this would bestow further advantages to EU and Black Sea wheat being exported to north African markets. South-East Asian markets would be more easily served by Australian suppliers and north Asian markets would become more attractive to Canadian and Pacific north-west US wheat marketers.

Table 13 illustrates shipping rates and journey durations for wheat from Argentina, Australia and Canada travelling to Asian ports. When wheat prices are low, the cost of shipping becomes a more important consideration when choosing the source of wheat to import.

Table 13 Shipping rates and journey duration US\$ for 40,000t wheat shipments (as at 24/11/2017)

	Rosario	Kwinana	Vancouver
Cost/t (US\$)			
Indonesia: Jakarta	65	28	52
China: Shanghai	70	62	36
Vietnam: Vung tau	72	42	47
Journey time (days)			
Indonesia: Jakarta	35	10	30
China: Shanghai	35	20	23
Vietnam: Vung tau	38	14	27

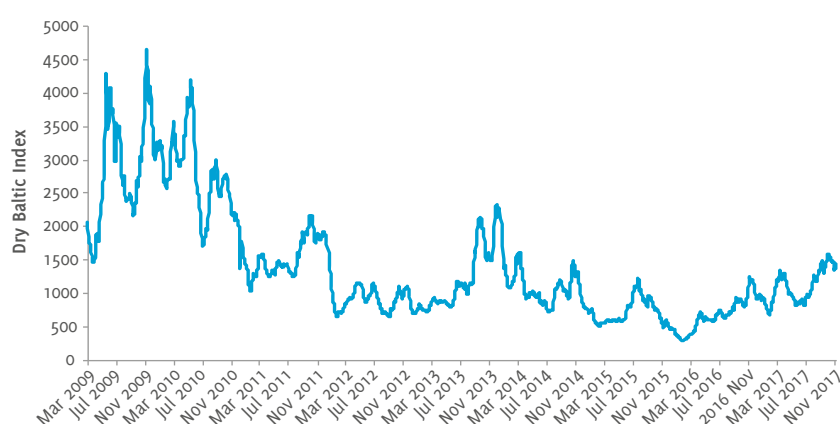


Figure 30 Baltic Dry Index since 2009

Source: Based on data from Lloyds International. See Tjakra (2017)

Grain exports



Export makeup

Argentina is a major exporter of world grains. It is the world's:

- i. leading exporter of soymeal, with 31.7mmt exported in 2016–17
- ii. leading exporter of soy oil, exporting 5.6mmt in 2016–17
- iii. third-ranked country for corn and soybean exports, selling 27.5mmt of corn and 8.5mmt of soybean in 2016–17
- iv. third-ranked country for soy oil-based biodiesel, producing 2.4mmt in 2016–17.

Argentina's ability to become a price-competitive supplier of exportable surpluses of many grains, like soybean, corn and wheat, makes it an attractive source of these grains for many traders. Hence, a score or more of trading houses have established storage and port terminal facilities in Argentina. Competition between these trading houses places bid pressure on grain prices to the advantage of Argentinian grain producers.

Corn production in Argentina is increasing, with 50mmt tonnes produced in 2016–17, although wheat production reached an all-time high of almost 18mmt in 2016–17. However, by far the most important crop produced by Argentina is soybean. It is subject to a range of value-adding activities that further boost its economic importance.

For Australia, nonetheless, it is the magnitude and price competitiveness of Argentina's exports of wheat that are of most concern.

The relative and greater importance of wheat in Australia is revealed in the volume and value of wheat that Australia exports compared to Argentina.

Argentina and Australia's wheat exports

The relative and greater importance of wheat in Australia is revealed in the volume and value of wheat that Australia exports compared to Argentina. From 2000 to 2006, Argentina regularly exported around US\$1.3b of wheat, mostly to its South American neighbours, principally Brazil (Figure 31). From 2007 to 2014 was a period of volatility in exports, including a low of around US\$0.6b to a high of almost US\$3b. Since 2014, in the aftermath of the removal of the 23% export tax on wheat, exports are recovering, reaching US\$1.84b in 2016 and US\$2.36b in 2017. The magnitude of the increase in 2017 meant that wheat generated the second largest increase in foreign exchange earnings for Argentina among all products, with only the export increase for automobile vehicles being greater in that year.

As shown in Figure 31, Argentina's South American neighbours, principally Brazil, are the main buyers of its wheat. Argentinian wheat is displacing US wheat in Brazil. The US share of wheat imports by Brazil has declined from around 25% down towards 5%, while Argentina's share has grown from 55% to 85%. In 2017, 5.1mmt of 12.4mmt of wheat exports were sent to Brazil. Another neighbour, Chile, purchased 0.25mmt in 2016 and increased its imports to 0.86mmt in 2017 – a 244% increase.

Among African countries, Algeria stands out as an importer of Argentinian wheat. In 2016 Algeria imported 0.15mmt, while in 2017 it imported 1.6mmt – a tenfold increase. Since 2016, Asian markets also have become more prominent. Markets have emerged in Vietnam, Indonesia, Korea and Malaysia. There are at least 10 different trading houses that export Argentinian wheat to each of these countries and no one company has a dominant share of Argentinian wheat exports to any of these Asian markets.

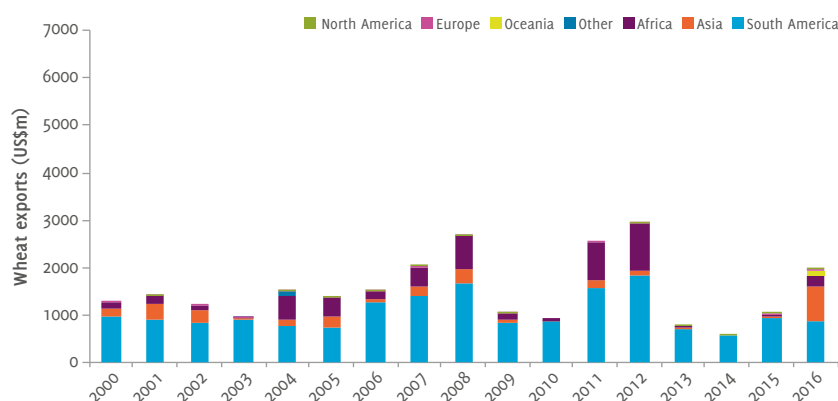


Figure 31 The destinations and value of Argentinian wheat exports, 2000–16

Source: Based on data from 'The Atlas of economic complexity', Center for International Development at Harvard University, www.atlas.cid.harvard.edu

Since 2000, the value of Australia's wheat exports has been highly volatile, affected by the size of harvests and international price spikes (Figure 32). The cessation of the millennium drought in eastern Australia in the late 2000s enabled larger volumes of wheat to be available for sale on international markets, plus farming systems became increasingly cereal dominant over much of the period, fuelling potential exports of wheat. The emergence of Indonesia as a major wheat buyer also provided Australian wheat exporters with a valuable nearby growing market.

The geographical fortune for Australia has been that it remains one of few southern hemisphere sources of wheat, adjacent to a growing region of wheat consumption, namely south-east and eastern Asia. Australia's proximity to South-East Asia bestows on it a transport advantage and so Australia has focused its wheat export operations on Asia, particularly South-East Asia. In a way, Indonesia for Australia serves as the equivalent of Brazil for Argentina. The importance of the wheat trades with these two countries, Brazil and Indonesia, is highlighted in Figure 33 and Figure 34.

Economic and trade considerations give Argentina a comparative advantage to export wheat to Brazil and other nearby South American countries. Similarly, but not to the same degree, Australia has a comparative advantage in exporting wheat with desired functionality to some south-east and east Asian countries.

The production and export of wheat from Argentina is set to grow over the next decade, stimulated and supported by investment in infrastructure. Much of the additional exports will initially flow to nearby South American markets, especially Brazil, but eventually more could head towards Asia and Africa,

the principal sources of wheat demand growth over coming decades. If these flows of grain, along with flows from the Black Sea region, enter Asian markets in which Australian wheat has a reasonable stake, then their availability will limit either price premiums or market volumes for Australian wheat. Australian wheat exports will likely face a lessening market share of growing wheat markets in Asia. In 2017, for example, Argentina exported 0.68mmt to Vietnam, an important export destination for Australian wheat. Vietnam was Argentina's fourth largest export destination for wheat in 2017.

Already, Argentinian wheat stocks at the end of 2017–18 are estimated to be only 0.2mmt and asking prices for 2018 season Argentinian wheat are signalling to Argentinian farmers their need to increase the area planted to wheat in order to provide exportable volumes for grain traders. Initial growing conditions in Argentina in 2018 favoured greater plantings of wheat and so 6.1 million hectares were planted to wheat in 2018, the highest planted area in a decade. Hence, Argentina is likely to deliver larger volumes of wheat for export in 2019.

Many grain industry organisations, including government agencies, in Argentina realise that as Argentinian grain exports increase, then it is likely that Argentinian grain will be re-entering markets or entering markets for the first time. These groups are aware that they will need to invest time and resources to facilitate access to those markets and develop further markets. Accordingly, Australian wheat exporters will not only face commodity price competition but will also face organisational competition. Several organisations in Argentina see part of their future role is to enable market access and ensure market development to facilitate grain export from Argentina.

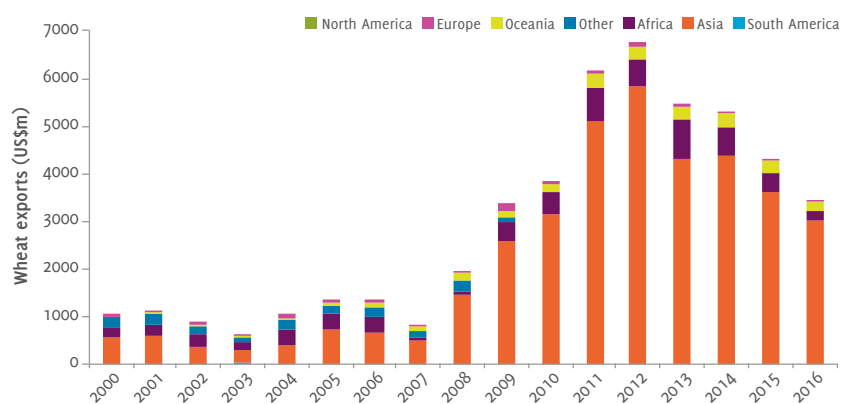


Figure 32 The destinations and value of Australian wheat exports, 2000–16

Source: Based on data from 'The Atlas of economic complexity', Center for International Development at Harvard University, www.atlas.cid.harvard.edu

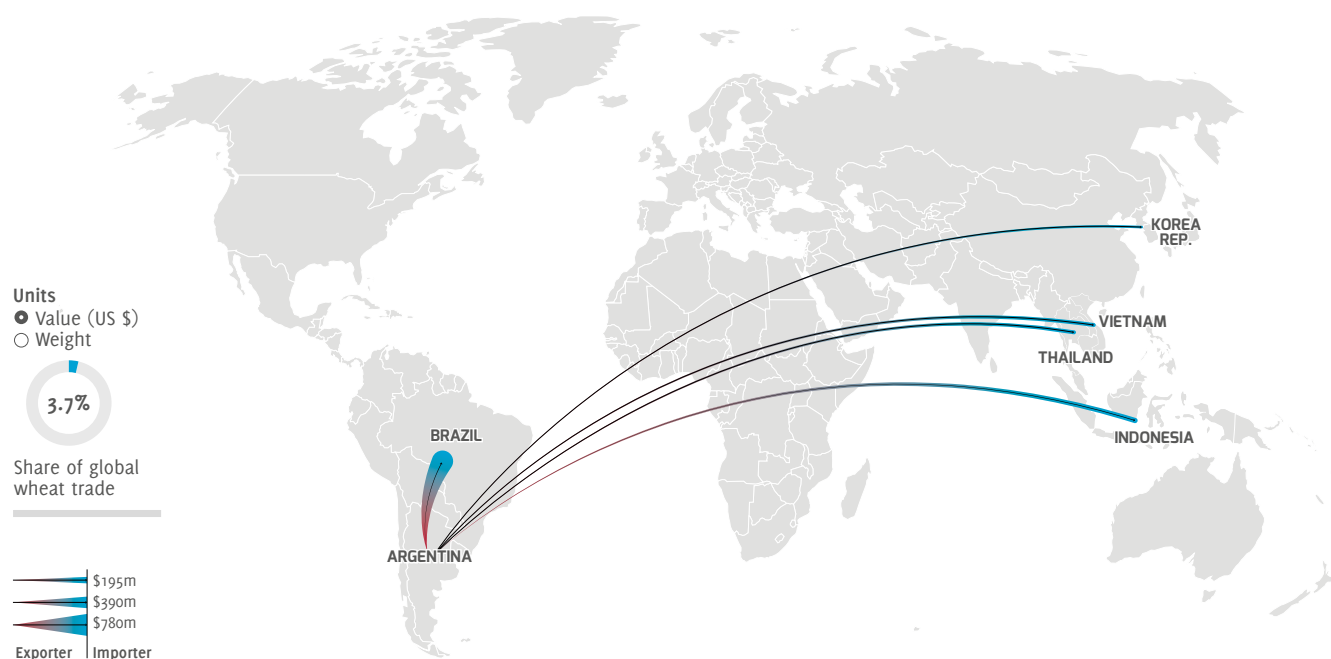


Figure 33 Main destinations of Argentinian wheat exports, 2016

Source: Chatham House based on Comtrade (2017)

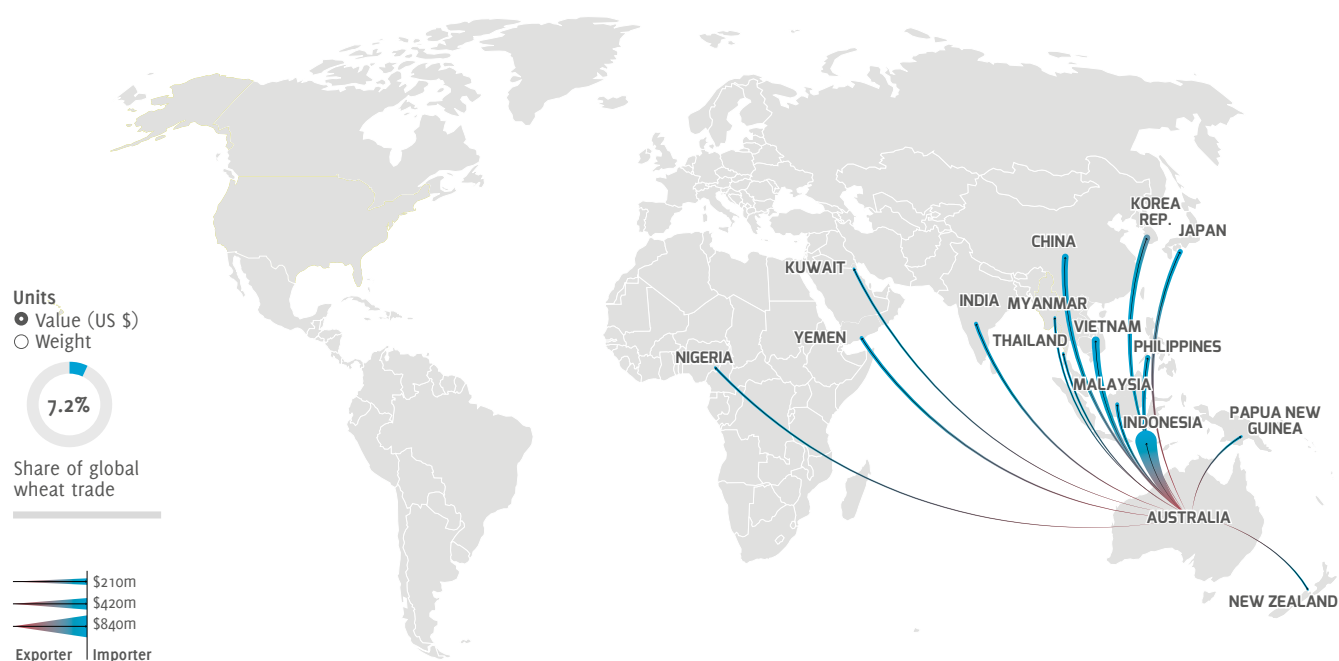


Figure 34 Main destinations of Australian wheat exports, 2016

Source: Chatham House based on Comtrade (2017)



Table 14 shows that thus far in the decade of the 2010s Russia has established itself as major wheat exporter and is emerging as the world's largest wheat exporting nation. However, Argentina has gone from being almost absent from international wheat markets in 2012–13 and 2013–14 when only 3.6mmt and 2.3mmt respectively was exported, to exporting 13.3mmt in 2016–17 and close to 12mmt in 2017–18.

Nonetheless, relative to other wheat exporters, Argentina remains a minor player, being a source of less than 8% of the global wheat trade. Argentina particularly benefits from its neighbour, Brazil, regularly importing 5–7mmt.

Table 14 Wheat exports from major wheat exporting countries (mmt)

Country	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18 ^f
Russia	18.4	18.6	38.6	21.6	11.3	18.6	22.8	25.5	27.8	36.0
Ukraine	13	9.3	11.6	5.4	7.2	9.8	11.3	17.4	18.1	17.0
Kazakhstan	5.7	7.9	6.2	11.8	6.3	8.1	5.5	7.6	7.4	7.5
Australia	14.8	14.8	18.7	24.7	18.7	18.6	16.6	16.1	22.6	16.0
Argentina	6.8	5.1	9.5	12.9	3.6	2.3	5.3	9.6	13.3	11.9
Canada	18.8	19	16.6	17.4	19	23.3	24.1	22.1	20.2	22.5
EU-27	25.3	22.1	22.9	16.7	22.7	32	35.4	34.7	27.3	27.0
US	27.6	23.9	35.1	28.6	27.5	32	23.3	21.2	28.7	25.9

Note: f = forecast

Source: USDA World agricultural supply and Demand estimates reports (e.g. USDA 2018b)



Future prospects for the Argentinian wheat industry



Long-range predictions are fraught with danger. Sometimes the imagined future is a simple extrapolation of the recent past. Other times, special weight is given to an apparent emerging trend that is assumed to continue, only later to be shown as an anomaly. Even when a prediction appears accurate, the trend supporting the prediction can change, giving way to a new trend that then requires a revised prediction.

The accuracy (and therefore reliability) of a forecast tends to diminish as the time horizon is extended and often much ‘noise’ can surround a prediction. This is particularly the case for a country like Argentina where government policy is so influential yet historically has also been highly changeable.

Plausible scenarios for Argentina need to encompass Argentina’s recent past but also consider current and planned developments that are likely to affect its future grain production. Accordingly, Argentina’s wheat production towards 2025 is likely to increase based firstly on its wheat area expanding by up to a further 2 million hectares, depending on relative prices. Secondly as more farmers adopt best practice methods, with increased use of inputs, superior varieties and improved technologies, wheat yields will increase. Around 21 million tonnes of wheat are likely to be produced regularly by the end of the next decade. Noting that Argentina’s domestic requirements are likely to remain at between 6 and 7mmt, this suggests around 14–15mmt could be regularly available for export some year after 2025.

The destinations being developed for Argentinian wheat exports are likely to first include Mercosur countries, especially Brazil, but eventually also sub-Saharan Africa, such as Nigeria, and other regions such as southern Africa and South-East Asia. If Argentina views west Africa as a strategically important current and longer term market, given its relative proximity to Argentina, then Australia may benefit from that focus as less Argentinian wheat will find its way onto South-East Asian markets already serviced by Australian wheat. Certainly, the population growth in South America will provide market expansion opportunities for Argentinian wheat. Nonetheless, due to Argentina’s low cost of wheat production and the longer term likelihood that its supply chain costs will be lower, then its wheat, along with Black Sea region wheat, will be attractive to purchase by some price-conscious South-East Asian customers, conditional on changes in sea freight.

In the shorter term, it is likely that Argentina will strongly focus on exporting wheat and wheat flour to Brazil and other nearby Mercosur countries such as Chile due to their ease of entry, a product of the negotiated trade treaty that underpins Mercosur.

Argentina’s reliability as a wheat exporter may improve, conditional on a few factors:

- i. the peso remaining sufficiently devalued to ensure Argentinian wheat exports remain attractive to overseas’ buyers
- ii. investments in export grain infrastructure continuing to keep pace with export volumes — not just wheat but also the main grains, corn and soybeans
- iii. investments in wheat breeding and adoption of modern crop technologies increasing

- iv. climate change impacts and climate variability do not weaken Argentina’s ability to export wheat
- v. domestic economic policies sustaining the profitability of grain production.

While yield and production variability are important features of a country’s grain sector, even more important to global grain markets is the volatility of a country’s exportable surplus. Argentina’s population is not rapidly increasing and there is unlikely to be any further increase in per capita flour consumption, which at around 80kg per capita is already high by international comparison. Hence, with a stable domestic consumption of around 6mmt of wheat, additional Argentinian wheat production will need to be exported, either in bulk or as flour. Argentina has a comparative advantage in supplying flour to neighbouring countries but not beyond those, so it is more likely that exports of bulk wheat will increase. As the Argentinian area and yield of wheat increases, Argentina will become a more reliable, albeit minor, exporter of wheat. Argentina will be able to invest in longer term trade relationships with key customers, such as Mercosur countries and perhaps some strategically important west African countries. However, climate variability (droughts and floods) will prevent Argentina being able to commit a large proportion of its average export volume to long-term trade deals. Hence, for many wheat markets Argentina will remain an opportunistic exporter.

Argentinians are aware that as their wheat production increases they will need to invest in additional market development and promotion. Many in the Argentinian grains sector, and government circles, know that under the former export grain policies Argentina withdrew from many wheat export markets. Yet these Argentinians now know that, to re-enter those markets and to develop new markets, coordinated action is required. Many staff in industry and government realise that Argentina can offer more than wheat product, including crop technologies and farming equipment. They are aware that greater differentiation of Argentinian wheat is likely to be required to better serve future customers’ needs. Already some key private organisations are supporting not-for-profit small companies and associations to foster market access for Argentinian grains.

If president Macri is re-elected for another term after 2019, policies that support the country’s economic prospects may be forthcoming.

The peso is likely to remain depreciated against the US dollar for some more years, making the export prices of Argentinian wheat attractive to overseas buyers. The profitability of wheat production for Argentinian farmers is likely to remain an incentive for enhanced crop management and adoption of best practices.

Implications for Australian wheat exports



Key markets

Argentina and Australia both have key but geographically different markets for their wheat exports. For Argentina, the main market is Brazil whereas Australia's main market is Indonesia. However, if wheat exports from Argentina increase, then the issue for Australia is: will Argentina export more wheat to markets already serviced by Australia?

The recent year of 2016 provides some useful indications of what might become increasingly commonplace provided Argentina eventually removes the export taxes on its wheat, reimposed in September 2018. Table 15 lists the top-20 customers for Argentina and Australia in 2016. These countries represent 97% and 94% respectively of all wheat export sales by each of these countries in 2016.

In 2016 Argentinian wheat exports were 13.3mmt, a level likely to be typical of annual wheat exports over the next decade. Where was that wheat exported? The concerning answer for Australia was that 40% of the value of Argentina's wheat exports was to markets that were among Australia's top-20 markets. The list of countries included Indonesia, Vietnam, the Republic of Korea, Philippines, Nigeria, Thailand, Italy and Bangladesh. The volume of Australian wheat exports that went to those same markets was 51% of the value of Australia's wheat exports.

Although Australia and Argentina did not share some markets in their top-20 wheat customers in 2016, such as Brazil, Japan, Chile, China, Ecuador, Malaysia, South Africa, New Zealand and Kenya, nonetheless large proportions of their exports did flow to the same markets. Moreover, as both countries are southern hemisphere suppliers of wheat, their new season wheat becomes available to customers at the same time, forcing greater head-to-head competition in some markets.

The data in Table 15 are only for a single year (2016) and cannot reflect the spatial changes in global demand for wheat that will occur over the next decade. For instance, population and income growth in South America will favour more wheat flowing to those markets from Argentina. Hence, the pattern of export displayed in Table 15 is a potentially over-stated dire case where 40% of Argentinian wheat is regularly directed to markets in which Australia is also a supplier.

Table 15 The top-20 wheat markets (by value) for Argentina and Australia in 2016

Argentina's top-20 wheat customers	Share of Argentinian wheat exports (%)	Australia's top-20 wheat customers	Share of Australian wheat exports (%)
Brazil	42.0	Indonesia	20.2
Indonesia	13.3	Vietnam	9.2
Thailand	7.9	China	9.0
Vietnam	6.9	Rep. of Korea	7.1
Rep. of Korea	5.0	Philippines	6.1
Bangladesh	3.1	Japan	5.8
Philippines	2.7	India	5.5
Chile	2.4	Malaysia	5.2
Egypt	1.9	Yemen	4.7
Morocco	1.5	Nigeria	2.8
Algeria	1.4	New Zealand	2.7
Colombia	1.4	Thailand	2.6
Ecuador	1.3	Myanmar	2.4
Italy	1.3	Kuwait	2.2
US	1.1	Papua New Guinea	1.8
South Africa	0.9	UAE	1.6
Kenya	0.9	Other Asia, nes	1.5
Sudan	0.8	Italy	1.5
Nigeria	0.6	Bangladesh	1.3

Note: nes = not elsewhere specified

Source: Based on data from Comtrade (2017)

Argentina's premier markets are likely to remain Brazil and other nearby South American nations, with any further increases in Argentinian wheat exports opportunistically being sold elsewhere. It remains likely, nonetheless, that some of those other markets will be ones shared with Australian wheat exports. Of some concern to Australian wheat producers is that in early 2018 the asking prices for Argentinian wheat to be delivered in December 2018 or January 2019 at Rosario's cash market (i.e. for the forthcoming 2018 harvest) was already US\$190/t, the same value for delivery in July 2018. That is, exporters were willing to give up the normal seasonal decline in prices in order to make sure they acquired grain for the next marketing year. Drought conditions in parts of the US in 2018 were limiting US wheat production in 2018 and the Australian 2017 and 2018 prospective harvests were below average, resulting in an expansion of the range of potential export destinations for Argentinian wheat. Indicative of the strong demand for Argentinian wheat, export commitments in early 2018 were already a record 7mmt and the ratio between these commitments to estimated total exports for the marketing year was the highest in seven years. Responding to price signals in 2018, Argentinian wheat farmers have planted 6.1 million hectares to wheat, the largest area in many years and a production of 19.1mmt is projected for 2018.

Kingwell *et al.* (2016) have previously reported, with some concern, that Australia's share of wheat imported into most countries on Australia's top-20 list is falling. These researchers also reported that Russia's share of wheat imported into most countries on Russia's top-20 list was rising. The same, but not as strongly, is likely to apply to Argentina as it gradually increases its exports of wheat. To illustrate, Argentina has already increased its market share of wheat imported by Brazil. An implication of the increased role played by Russian and Argentinian wheat in some wheat markets is that eventually their wheat will either displace some Australian wheat (even in markets currently on Australia's list of top-20 importers of Australian wheat) or Australia's share of wheat imported by those countries will further diminish. Evidence is already emerging of this displacement commencing in markets like Indonesia. Moreover, even if Russian and Argentinian wheat does not directly compete against Australian wheat, it is possible that wheat of other origins (e.g. Canada, EU, US) displaced from markets due to Russia's and Argentina's increased market share could then find its way onto markets principally or partially served by Australian exporters. In short, the emergence of Black Sea origin (Russia, Ukraine, Kazakhstan) and Argentinian wheat exports is likely to have direct and indirect consequences for Australian wheat exporters.

Export growth

Australia has benefited greatly from increased demand for wheat in its nearby markets (e.g. Indonesia, Vietnam), despite losing some market share in recent years. In the medium term, if affordable greater volumes of wheat exports emanate from the Black Sea and Argentina, and some of that volume increasingly enters Australia's main wheat markets, then eventually

Australia's declining market share will affect the value and size of Australia's wheat industry. Already Russian authorities have signalled that towards 2030 they see Morocco, Indonesia, Philippines, South Korea, China and Algeria as prospective buyers of their wheat. Some of those countries are currently main markets for Australian wheat. Argentina is at the early stages of the design, coordination and signalling of its future wheat marketing, so its market development intentions are not yet fully formed. However, based on recent marketing behaviour, some Argentinian wheat will find its way onto South-East Asian markets.

As stated in a previous subsection of this report, many key organisations in Argentina, government and private, know that to facilitate Argentinian wheat re-entering markets and to develop new markets, coordinated action is required. They realise that Argentina can offer affordable wheat but also crop technologies and farming equipment. They are aware that greater differentiation of Argentinian wheat is likely to be required to better serve future customers' needs. The various provincial boards of trade are also aware that in coming years the mandate of their activity may need to be enlarged to better support trade facilitation. Already some key private organisations are supporting not-for-profit small companies and associations to foster market access for Argentinian grains.

Yield and production trends

The difference in wheat yield trends between Australia and Argentina is of concern. As already shown in Figure 25, since the early 1960s average wheat yields in Argentina have increased by 1.6% per annum. By contrast, over the same period, Australian wheat yields have only increased on average by 1.0% per annum. Yet, as previously discussed, there are deficiencies and impediments to wheat breeding in Argentina and only recently has the export tax on wheat been lifted to stimulate purchase of production inputs to further lift yields. Nonetheless, despite those weaknesses, the Argentinian wheat industry has improved its wheat yields at a greater rate than has occurred in Australia. If these yield trends continue, then wheat yields will increasingly diverge between Argentina and Australia. A stimulus to further yield improvement in Argentina is that, unlike the situation in Australia, a large yield gap still applies to wheat yields in Argentina (Merlos *et al.*, 2015). Argentinian farmers and researchers thereby face more favourable commercial incentives compared to their Australian counterparts to improve water use efficiency.

An implication is that provided there are no offsetting shifts in areas planted to wheat or climate-induced limitations on yield increases in Argentina, then increasingly greater volumes of wheat from Argentina will be available for export and some of that volume could enter markets currently serviced by Australia. Furthermore, currently it is projected that global changes in climate are more likely to facilitate grain production in Argentina and worsen the prospects for wheat production in many parts of southern Australia where a drying trend is already being observed (Hochman *et al.*, 2017).

If greater volumes of grains are grown in Argentina, then this will help lower the unit cost of transport and handling in Argentina and thereby further help underpin its international competitiveness in grain export. Australia is not facing the same increases in volumes of grain exports. Therefore, Australia is unlikely to reap the same cost savings from its logistics and handling infrastructure.

Furthermore, a key difference between Argentina and Australia is the large financial commitment that the Argentinian government is prepared to make in long-lived transport infrastructure (road and river-based infrastructure) in order that its grain export sector sustains its international competitiveness. By contrast, state and federal governments in Australia have allowed the erosion of regional rail services while improving investment in rural roads. A corollary for Australia is that its export grain supply chains are now more expensive than otherwise would be the case if better maintained, higher capacity rail networks (well integrated with road networks) were in place.

Wheat quality

One offsetting advantage that favours Australian wheat in some less price-conscious markets is the functional advantage of Australian wheat over Argentinian wheat in making noodles. Japanese udon and ramen are perhaps two end products for which Argentinian wheat has the lowest probability of market uptake, whereas the prospects for Argentinian wheat are greater in the price-sensitive segment of the Asian baking market.

The functional advantages of Australian wheat, in some markets however, cannot alone prevent Argentinian wheat from making further inroads into some of those markets, as evidenced by the growth in Argentinian imports in South-East Asia in recent years. In these markets, Australia's historical ASW and GP wheat exports are becoming increasingly imperilled, and even APW market share is being lost to cheaper alternatives. To illustrate, Australian wheat was priced out of Indonesia for much of late 2017 into 2018. Also in 2016, Argentinian wheat emerged as an important supplier to Indonesia. Offsetting this decline in market share is a continued upward trend in shipping freight rates in 2017 and 2018.

With their need for extensible wheat and balanced dough properties, several South-East Asian markets support a finite premium for Australian wheat. However, this advantage is thinning, resulting in Australian wheat being priced out of some of these markets from time to time.

Noodle production is less forgiving of quality shortcomings so the extensibility of Australian wheat for noodle production creates a natural barrier to entry that protects market share to some degree — although this barrier is not substantial.

Responses and actions for Australia

Compared to South-East Asian demand, the occasionally large volume of Australian wheat that has historically been imported by Middle East and North African (MENA) countries will increasingly be a rare occurrence. Larger volumes of affordable

Black Sea and east European wheat will ensure they dominate import market share in most MENA countries. Conversely, the more rapidly growing Asian markets are more likely to continue to accept Australian *and* Black Sea and Argentinian wheat, even though Australia's market share in some of these Asian markets is likely to be gradually diluted by Argentinian and Black Sea region wheat.

With the projected rise in Argentinian wheat exports, some of which will flow into Australia's export markets, what are useful responses or actions by the Australian grains industry?

Productivity gain

A first competitive response of Australia is to ensure, to the degree it is possible, that Australian wheat is affordable. Although the Australian wheat industry is relatively powerless to affect the exchange rate for the AUD, it can act to increase the productivity of wheat production, thereby lowering the unit cost of wheat, and it can act to ensure its supply chains operate cost-effectively. Hence, committing to R&D that delivers farm-level innovations that drive down the unit cost of production is essential, as is the upgrade, rationalisation and unleashing of competitive and collaborative pressure in supply chains that drive down their overall unit costs.

Intelligence gathering

Another action is to ensure that the Australian grains industry is well informed about developments in Argentina. Grain production from Argentina will form a larger, albeit minor, share of the international wheat trade, so there is an increased likelihood that the region will affect grain markets. Importantly, the Argentinian wheat harvest occurs at the same time as Australia's and new crop buyers will simultaneously be looking to Argentina and Australia at certain times of the year. Australian sellers need to be informed about the size and quality of any future Argentinian wheat harvest.

Product and market differentiation

Another action is to build on the commercial effectiveness of Australia's end point royalty system that supports wheat breeding (Kingwell and Watson, 1998; Kingwell, 2001; Kingwell, 2005; Gray *et al.*, 2017). The financing of wheat breeding in Australia relies on end point rather than seed royalties. Accordingly, breeders are strongly incentivised to ensure their varieties are widely grown. To achieve adoption of their varieties, a breeder must ensure that their variety, first, is high yielding and, second, that the variety receives a quality grading that attracts a high price. Although the achievement of high yield is unambiguously beneficial for wheat producers and the breeders, the price signal between end-user requirements, wheat grading and required quality traits in a wheat variety is less clear.

To support targeted market differentiation, underpinned by aligned wheat breeding, there is a need to gather intelligence about the specific characteristics of wheat that are highly valued in different markets, or which are required by different end users of Australian wheat. Wheat breeders and those engaged in wheat variety classification and segregation can use such intelligence to ensure that the varieties offered to and grown by Australian farmers have traits that not only benefit Australian wheat growers but which serve end users' needs. Committing to being responsive to end users will enhance the reputation of Australian wheat and ensure Australia's market share and price premiums are less susceptible to erosion.

Such market responsiveness, however, is not the sole responsibility of wheat breeders. Rather, it requires an integrated strategic commitment by the main stakeholders in Australia's wheat industry. For example, for breeding companies to commit to breeding varieties with qualities suited to end-users' needs requires a commercially attractive route to market. If existing grain handlers and exporters are not prepared to accommodate or help design such a pathway to market, or have no mechanism to adequately share in the value of that market transaction, then such quality-focused developments are unlikely to succeed. In addition, even when a new variety with superior quality traits is developed, the utility of that variety needs to be demonstrated and verified by end users to form and underpin any price premium or greater rate of inclusion in blend ratios.

Organisational innovation

Argentina's grains industry has largely self-funded its industry-good functions. Rather than rely on government funding and action, the grains industry has established and supported its own set of industry-good organisations. For example, the provincial and national Boards of Trade in Argentina have a long and proud history of serving Argentinian agriculture, especially including its grains industry. By contrast, the funding and efficient provision of industry-good functions for the Australian grains industry, since the deregulation of its wheat marketing, has lacked sectoral leadership and coordination. In Australia, the provision of industry-good functions is fragmented across organisations, lacks coordination and clarity of leadership, and lacks security of funding. State and federal governments, due to budgetary pressures and a declining importance of the rural vote, are diminishing their real funding support for various grains industry-good functions. In such an environment, Australia would do well to learn from the success of Argentina's organisation and funding of its industry-good functions (a country with a quarter of the per capita GDP of Australia).

In Argentina, the issue of whether to mandate the reporting of wheat stocks has already been resolved, as has the need to coordinate action surrounding market access and promotion. By contrast, in Australia there is still debate or industry confusion about some of these same issues.

Australia may not be well placed to match additional price competition from Argentinian wheat but it certainly could commit to redressing its institutional weaknesses regarding the funding and efficient provision of industry-good functions.

Don't panic

Another implication of the findings is that the strong growth in demand for wheat in several of Australia's nearby markets ensures that Australia has some time to respond to any possible mounting challenge from Argentina, as export volumes into Asia from Argentina gradually increase. As was pointed out in AEGIC's previous reports on Ukraine and Russia (Kingwell *et al.* 2016a & 2016b), Australia faces a tide of grain, not a tidal wave of grain. In that sense, Australia has some time to respond. However, the cost of failing to respond is also equally obvious. Establishing exactly how Australia's wheat industry should respond needs to be underpinned by sound analyses of the ways in which Australian wheat is used and is valued in different markets or segments of markets in each Asian economy. Only through detailed and strategic analyses of these market opportunities is it possible to prioritise actions required of the Australian wheat industry.

Status quo is insufficient

The challenges currently emanating from Argentina and more importantly the Black Sea and east European regions, are unlikely to dissipate. As these countries embrace modern crop technologies and become increasingly open to investment in their agricultural sectors and related supply chains, additional competitive pressures will be unleashed. In 2016 Argentina exported 3.8mmt to South-East Asia and South Korea, of which 1.4mmt went to Indonesia. Competition from Argentina will intensify in 2018 as the area planted to wheat expands to 6.1 million hectares and more expenditure on production inputs occurs. Wheat production in 2018 is already projected to be 19.1mmt, which implies about 13mmt tonnes will be available for export at the same time as Australian wheat becomes available.

Despite Australia remaining a higher cost source of wheat, it will continue to display advantages from which it will benefit. Australia's domestic demand growth is modest. Hence, as Australian wheat yields increase, sizeable exportable surpluses will remain available to overseas wheat buyers. The reliability and ease of purchasing grain from Australia, and the fact that only Australia and Argentina are southern hemisphere main sources of wheat exports, ensures that these origins offer risk-spreading advantages for countries such as Japan, Indonesia, Korea and China who are prepared to pay for their food security by importing foodstuffs. Furthermore, the regulatory and production methodologies applicable to Australian wheat provide food safety and resource sustainability credentials that could be a future influence upon wheat purchasing decisions in a few markets. All of these strategic and long-lasting advantages add to the appeal of Australian wheat.

If wheat exports from Argentina increase, then the issue for Australia is: will Argentina export more wheat to markets already serviced by Australia?

Conclusion



Argentina is already a world powerhouse of grain export. Its share of world grains and by-products trading is 15%, involving exports of 86mmt of grains and oilseed products. Although soybean and corn are its main grains by far, nonetheless wheat forms an important and increasing role in its farming systems as the main winter crop option.

Argentina's wheat production is projected to increase to around 21mmt over the next decade, with the wheat area increasing by a further 2 million hectares. The increase in wheat production will not solely be due to this increase in area sown. Rather, yield increases are likely as more farmers use increased inputs, adopt superior varieties and use improved technologies, especially in the aftermath of removal of wheat export taxes at the end of 2015.

Noting that Argentina's domestic wheat requirements are likely to remain at between 6 and 7mmt, around 14–15mmt will regularly be available for export compared to the average annual export of 6.5mmt from 2008–09 to 2014–15. A further concern for Australia is the difference in wheat yield trends between Australia and Argentina. Since the early 1960s up until 2016, average wheat yields in Argentina have increased by 1.6% per annum. By contrast, over the same period Australian wheat yields have increased by only 1.0% per annum. Yet, as outlined in this report, there are deficiencies and impediments to wheat breeding in Argentina and only recently has the export tax on wheat been lifted to stimulate purchase of production inputs to further lift wheat yields. Nonetheless, despite those weaknesses, the Argentinian wheat industry has improved its wheat yields at a greater rate than has occurred in Australia. If these yield trends continue, then wheat yields will increasingly diverge between Argentina and Australia. An implication is that, provided there are no offsetting shifts in areas planted to wheat or climate-induced limitations on yield increases in Argentina, then increasingly greater volumes of wheat from Argentina will be available for export to some of the same markets currently serviced by Australia.

Argentina's supply chain costs comprise around 27% of the wheat FOB price and mostly depend on the distance the wheat needs to be trucked from a farm. Argentina's farm costs of export wheat production greatly depend on whether land is owned or rented, yet overall the per tonne farm cash costs of wheat production in Argentina are low by international comparison. However, a plethora of government taxes that amount to about half of the cash costs are imposed on farmers who own or rent land. When farmland is owned, the full farm costs of wheat production are around US\$129/t. Currently, Argentinian wheat can be grown and placed aboard ships for about US\$27 a tonne cheaper than Australian wheat.

In Argentina, the previously poor enforcement of wheat breeders' intellectual property rights is improving, which will enhance wheat breeding efforts and investments. Currently, breeders mostly focus on yield rather than grain functionality and quality. While yield advantages will always remain a priority, many Argentinian experts now acknowledge that as Argentinian wheat exports re-enter markets or attempt to establish new markets, greater diversity in grain functionality and quality will be required.

Argentina's new government has a bold reform agenda that includes viewing their grains industry as an engine of economic growth rather than a 'cash cow' to be always heavily taxed. The government has embarked on macroeconomic policy reform and infrastructure investment to sustain the export competitiveness of its industries, especially including the grains industry. Generating macroeconomic stability, particularly controlling inflation, attracting foreign investment and improving transport and energy infrastructure, are among the policy priorities of the new government. For agriculture, removal of export taxes, enhancing productivity and upgrading supply chain infrastructure have helped underpin the grain sector's export competitiveness, although the re-introduction of export taxes will impede growth in grain exports.

Implications for Australia's wheat industry

Australia has some cause for concern. Already 40% of Argentinian wheat exports are directed to markets in which Australia is also a supplier. Although Argentina's premier market is and is likely to remain Brazil, the magnitude of the projected increase in Argentinian wheat production and export suggests that much of the increase in production will need to find markets elsewhere; and on current indications, some of those markets will be ones shared with Australian wheat exports.

As the quantity of Argentinian wheat exports increases and its grain logistics network modernises, it should be assumed, at least in the short and medium term, that Argentinian wheat will remain price competitive against Australian wheat in many markets.

In some Asian markets, Australia enjoys the advantages of freight proximity and growth in size of the import demand for wheat. These markets are likely to continue to accept Australian *and* Black Sea or Argentinian wheat, even though Australia's market share in some of those Asian markets is likely to be gradually diluted. The strong growth in demand for wheat in several of these markets near Australia ensures that Australia has some limited time to respond to the mounting challenge of cheaper origins like Argentina.

The Black Sea countries and Argentina together are responsible for about 35% of global wheat exports. Hence, any changes in their wheat production, most especially in the Black Sea region, due to climate, technology, politics or policy, have the capacity to greatly influence the international wheat trade, thereby directly or indirectly affecting Australian wheat exports. Hence, the Australian grains industry needs to be well informed about developments in these countries, mostly in the Black Sea region but also extending to include Argentina. Argentinian wheat production and exports of wheat are projected to increase over the next decade and those exports come onto the market at the same time as the Australian wheat crop.

As previously argued by Kingwell *et al.* (2016b), to ensure Australian wheat growers benefit from the growth in wheat demand in Asian markets (despite the enhanced competition from Black Sea and Argentinian wheat) there is a need for greater intelligence to be gathered about the specific characteristics of Australian wheat that are either highly valued in key markets or that are required by different end users. Such information, if made available to Australian wheat breeders and those engaged in wheat variety classification and segregation, can ensure that the varieties offered to and grown by Australian farmers have traits that not only benefit Australian wheat growers but also serve the needs of those end users. Committing to being responsive to end users will enhance the reputation of Australian wheat and ensure Australia's market share and any price premiums are less susceptible to erosion.

Over the next decade, Australian wheat is likely to face not only price competition from Argentinian wheat but also additional institutional competition from Argentina, regarding market access and market development. In addition, Argentina appears to benefit from how it funds and organises its industry-good activities. Its grains industry largely self-funds these functions, rather than mostly relying on government funding and action. Argentina's grains industry has established and supported its own set of industry-good organisations, interfaced with government agencies and policies. Hence, in Argentina the issue of whether to mandate the reporting of wheat stocks has already been resolved, as has the need to coordinate action surrounding market access and promotion. By contrast, in Australia there is still debate or industry confusion about some of these same issues, including how best to fund and coordinate the various industry-good functions. Australia may not be well placed to match additional price competition from Argentinian wheat, but it certainly could commit to redressing its institutional weaknesses regarding the funding and efficient provision of industry-good functions. Australia could learn from Argentina about how to fund and undertake industry-good functions.

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Acronyms

AACREA	Asociación Argentina de Consorcios Regionales de Experimentación Agrícola
AATS	Agricultural Applied Technology Survey
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ACA	Asociación de Cooperativas Argentinas
ACCC	Australian Competition and Consumer Commission
AEGIC	Australian Export Grains Innovation Centre
AFA	Agricultores Federados Argentinos
CIF	Cost, insurance and freight
CIGI	Canadian International Grains Institute
CREA	Consorcios Regionales de Experimentación Agrícola
FADEEAC	Federación Argentina de Entidades Empresarias del Autotransporte de Cargas
FAIM	Federación Argentina de la Industria Molinera
FOB	Free-on-board
IMF	International Monetary Fund
INASE	Instituto Nacional de Semillas
INTA	Instituto Nacional de Tecnología Agropecuaria
MENA	Middle East and North Africa
PSE	Producer support estimate
US	the United States of America
USDA	United States Department of Agriculture
USW	US Wheat Associates
WTO	World Trade Organization

Abbreviations

ha	hectare
km	kilometre
mmt	million metric tonnes
mt	metric tonnes
t	tonnes



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