AUSTRALIAN GRAIN

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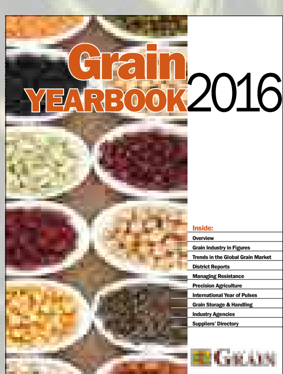

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FRONT COVER:

Pulse crops have been an integral part of human diets for millennia. But in the past 50 years, pulses have not had the same massive, and essential, increases in global production as cereals, rice and coarse grains. This year marks the International Year of Pulses – a time when raising both the awareness and production of these important crops is more important than ever.

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Section 1

Overview

The 2015–16 winter cropping season, for pretty much the entire Australian grain belt, was a wild roller coaster ride. In most regions, crops were planted on time and into good soil moisture and were away to a flying start. But then heavy springtime frosts and dry conditions, compounded by record high temperatures and hot dry winds in early October, took a big toll on crops right across southern Australia.

Fortunately, many northern region growers managed to dodge an 'El Niño bullet' with their farms getting under some crop saving storm rains – but that one general spring rainfall event across the national grain belt, was not to eventuate.

It is a testament to Australian farmers' excellent agronomic skills, combined with tough new grain varieties and state of the art planting and tillage technology, that the nation produced an above average winter crop. More than 39.5 million tonnes of winter grains were harvested in 2015–16. National wheat production tipped the scales at 24.2 mt – the 10 year average is 22.3 mt.

The 2015–16 summer brought with it the usual mixed bag of erratic storm rains and highly variable conditions – but the season delivered around 4.0 mt of grain – slightly under the 4.1 mt, 10 year average.

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Australia area ('000 ha) and production ('000 tonnes) of major winter and summer crops planted for grain during 2015

	NSW		VIC		QLD		WA		SA		TAS		AUSTRALIA TOTAL	
2015–16	**Area**	**Prodn**	**Area**	**Prodn**	**Area**	**Prodn**	**Area**	**Prodn**	**Area**	**Prodn**	**Area**	**Prodn**	**AREA**	**PROD'N**
Wheat	3410	7500	1460	2110	700	1400	5150	8800	2000	4376	8.2	32.8	**12728**	**24219**
Barley	900	1890	960	1300	75.0	155	1350	3250	810	1881	4.8	13.6	**4100**	**8490**
Oats (for grain)	300	360	131	160	18.0	14.9	350	607	60.0	101	3.6	5.6	**863**	**1249**
Triticale	50.0	105	15.8	20.8	0.5	1.0	15.0	17.3	35.0	45.5	0.6	1.3	**117**	**191**
Sorghum#	197	700	0.2	0.5	514	1538	1.0	1.6					**712**	**2240**
Maize#	22.0	188	3.4	33.2	39.2	193	1.0	6.2					**65.6**	**420**
Rice#	30.0	300	0.2	1.8	0.5	3.5							**30.7**	**305**
Canola	560	833	370	350	1.0	1.0	1200	1463	225	296	1.1	1.3	**2357**	**2945**
Sunflowerseed#	11.0	15.5			24.3	29.3	0.7	0.7	0.1	0.1			**36.1**	**45.6**
Soybean#	20.0	42.8	0.6	1.0	11.7	20.1							**32.3**	**63.9**
Peanuts#					7.0	18.8							**7.0**	**18.8**
Cottonseed#	163	477			107	296							**270**	**772**
Lupins	61.7	76.4	33.0	23.7			326	445	69.5	61.3	0.1	0.1	**490**	**607**
Field peas	48.1	72.5	54.0	20.6			22.0	29.3	114	82.1			**238**	**205**
Chickpeas	291	439	12.9	5.3	338	555	2.7	3.2	16.9	11.0			**661**	**1013**
Faba beans	50.0	129	124	69.6	1.2	1.9	3.0	6.3	104	112			**282**	**319**
Broad beans			6.5	3.6					18.0	21.0			**24.5**	**24.6**
Mung beans#	25.0	23.0			55.0	50.5							**80.0**	**73.5**
Navy bean#					5.0	6.0							**5.0**	**6.0**
Lentils	2.6	2.2	100	50.4					130	206			**232**	**258**
TOTAL	**6141**	**13,153**	**3272**	**4150**	**1897**	**4283**	**8421**	**14,631**	**3582**	**7193**	**18.3**	**54.8**	**23,331**	**43,464**

Estimate for summer crop harvested in 2016. Principal source: ABARES.

Farmers' terms of trade from Australian grain production (base year is 1997–98 = 100)

	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17 (forecast)
PRICES RECEIVED (excl GST)							
Wheat	130.1	114.6	158.3	159.8	151.5	150.6	143.1
Barley	135.8	131.7	173.4	167.9	175.7	173.6	178.8
Canola	141.1	133.1	142.1	144.1	130.7	144.3	147.4
Lupins	136.9	118.7	173.5	176.4	149.3	148.2	146.7
Oats	143.2	147.7	172.9	156.0	182.8	184.8	185.5
Sorghum	125.8	111.6	148.9	177.2	177.8	170.9	186.7
TOTAL GRAINS	**126.3**	**115.7**	**147.9**	**149.8**	**146.7**	**148.8**	**144.0**
PRICES PAID (excl GST)							
Fuel & lubricants	211.3	228.2	216.8	221.1	196.8	177.1	167.4
Fertiliser	157.3	165.5	157.9	153.2	154.7	156.3	159.9
Chemicals	110.4	112.6	110.3	113.6	114.7	115.8	118.6
Seed	120.0	116.4	128.0	130.6	130.3	132.9	132.3
Marketing	144.8	154.1	153.5	159.3	152.9	148.5	148.1
Interest paid	122.3	114.9	96.4	85.3	79.7	74.1	77.9
Rates & taxes	149.4	152.9	156.4	160.6	163.4	166.6	170.5
Insurance	173.7	185.8	190.0	195.2	198.5	202.5	207.2
Other overheads (incl. labour)	143.9	148.3	151.7	155.8	158.5	161.6	165.4
Capital items	149.3	153.2	157.0	161.5	164.8	168.5	172.8
TOTAL PRICES PAID*	**144.8**	**147.2**	**145.1**	**145.5**	**146.7**	**149.4**	**152.1**
TERMS OF TRADE	**87.2**	**78.6**	**101.9**	**102.9**	**100.0**	**99.6**	**94.7**

Note: Terms of trade is the ratio of the index of prices received and the index of prices paid by farmers. * Excludes livestock costs, fodder, breeding stock etc. Sources: ABARES, ABS

Wheat prices to remain relatively low

By Christopher Price, ABARES*

*Forecasts and comments based on information available in late February, 2016

AT A GLANCE…

- Wheat prices are projected to remain relatively low over the short to medium term, reflecting plentiful supplies on world markets.
- World consumption of wheat is forecast to be lower in 2016–17, with continued growth in human consumption more than offset by a decline in the use of wheat for livestock feed.
- The importance of the Black Sea region in world trade is expected to increase over the medium term. World wheat prices are likely to be more sensitive to production and export changes in this region.
- Australian production and export volumes are expected to increase gradually over the medium term. The value of exports is expected to be affected by lower international wheat prices (in real US dollar terms) and an assumed gradual appreciation of the Australian dollar against the US dollar.

Modest growth expected in Australian wheat production

The area planted to wheat in Australia is forecast to be largely unchanged in 2016–17 but to have significant regional variation. Area planted to wheat in Queensland and New South Wales is expected to fall, partly reflecting increased chickpea plantings in those states. Area planted to wheat in Western Australia is expected to increase, partly at the expense of lupins. Wheat area in Victoria is expected to increase, following two years of unfavourable seasonal conditions.

Winter crop planting expectations for 2016–17 are based on assumptions about relative returns and climatic conditions leading into and during the planting window.

Australian wheat production is forecast to rise by 1 per cent in 2016–17 to 24.5 million tonnes. An increase is expected in Victoria, following poor seasonal conditions and significantly below average yields in 2015–16. In contrast, yields in Queensland and New South Wales are expected to decline from the above average yields realised in 2015–16.

Beyond 2016–17 the area planted to wheat is expected to increase at an average annual rate of 0.5 per cent. Assuming average seasonal conditions and a gradual increase in yields, Australian wheat production is projected to be around 1 million tonnes higher in 2020–21 than in 2016–17 at 25.5 million tonnes.

Higher Australian export shipments but values to decline

The volume of wheat exports from Australia is forecast to increase by 2 per cent in 2016–17, but the value of exports is expected to decline. The forecast increase in the volume of exports is supported by higher opening stocks and a forecast increase in production. The decline in the value of exports reflects lower international wheat prices. Over the medium term, rising production is projected to support growth in export shipments. But the value of exports is expected to be affected by lower international wheat prices (in real US dollar terms) and an assumed gradual appreciation of the Australian dollar against the US dollar.

Australian wheat exports

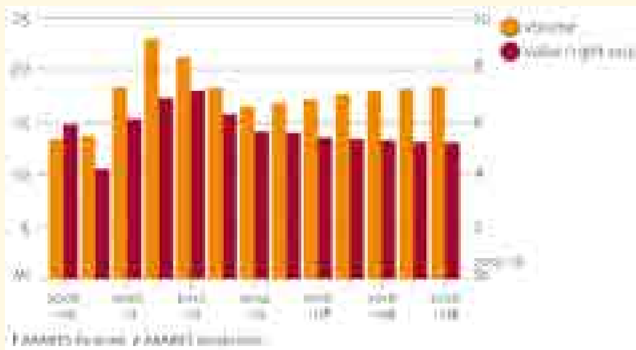
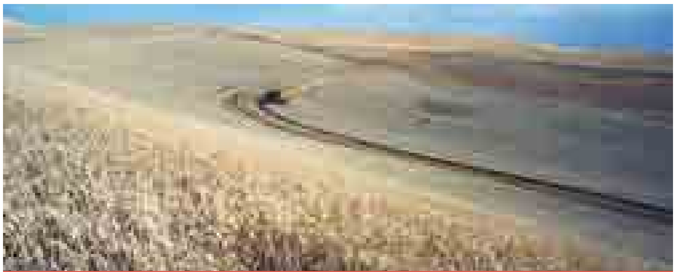


Table 1: Australia and world outlook for wheat

	unit	2013–14	2014–15	2015–16f	2016–17f
World					
Area	million ha	219	223	223	221
Yield	t/ha	3.26	3.24	3.26	3.22
Production	Mt	714	723	729	710
Consumption	Mt	696	710	718	714
Closing stocks	Mt	189	202	213	209
Trade	Mt	156	153	152	154
Stocks-to-use ratio	%	27.1	28.5	29.7	29.3
Price **a**					
– nominal	US$/t	317	266	215	210
Australia					
Area	'000 ha	12613	12155	12728	12733
Yield	t/ha	2.01	1.90	1.90	1.92
Production	kt	25303	23076	24219	24504
Export volume **b**	kt	18336	16571	16933	17267
Export value **b**					
– nominal	A$m	6103	5547	5604	
APW 10 net pool return					
– nominal	A$/t	334	326	316	300

a US no. 2 hard red winter wheat, fob Gulf, July–June. **b** July–June years.
f ABARES forecast.
Sources: ABARES; Australian Bureau of Statistics; International Grains Council.



World wheat production is forecast to fall by three per cent in 2016–17.

Growth in demand for milling wheat is expected to support Australian wheat exports to key markets in South-East Asia, including Indonesia. China is also expected to continue importing modest amounts of high-quality milling wheat despite rising domestic wheat production and stocks.

Australian exports of milling wheat to Asia typically face competition from US and Canadian wheat exports. Competition from these exporters is expected to be strong, with a large increase in the availability of US wheat supplies for export in 2016–17 and steady growth in US and Canadian production projected over the medium term.

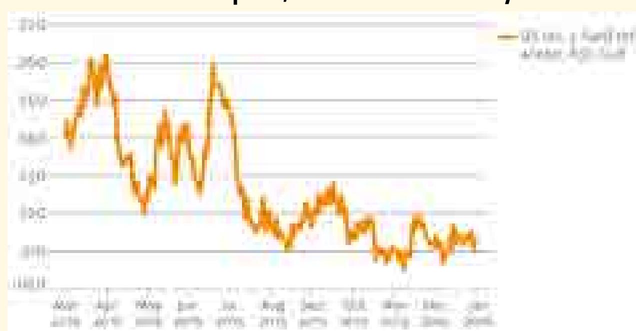
The world wheat price

The world wheat indicator price (US no. 2 hard red winter, fob Gulf) is forecast to average US$210 a tonne in 2016–17, compared with US$215 a tonne in 2015–16. If realised, it will be the lowest annual average price in real terms since 2004–05.

Following several years of rising production, world supplies of wheat have increased and world prices have declined. The world wheat indicator price has trended down from a high of around US$390 a tonne in early 2013. It traded in a range between US$207 and US$217 over the four weeks to early February 2016.

Several factors may put further downward pressure on the price during the remainder of 2015–16 and into 2016–17. Relatively plentiful supplies are likely to continue in some of the major exporting countries, including the US. This is despite a forecast decline in world production in 2016–17. Exports from Argentina are expected to increase, following recent policy developments, which will provide renewed regional competition for US milling wheat exports, particularly to Brazil. A strong US dollar will also continue to affect the competitiveness of US wheat on international markets and US wheat prices (including the world indicator price). A major risk to the price forecast is uncertainty about the Northern Hemisphere winter wheat crop, which will soon emerge from dormancy.

World wheat indicator price, March 2015 to January 2016



The world wheat indicator price is projected to decline further in real terms over the medium term to 2020–21. This reflects assumed productivity gains, increasing exports from relatively low-cost producers in the Black Sea region and Argentina, and an assumed strong US dollar against other floating currencies. Price movements are likely to remain volatile over the medium term, particularly as a result of supply shocks in major producing and exporting countries.

World wheat production

World wheat production is forecast to fall by 3 per cent in 2016–17 to 710 million tonnes. Declines are expected in both area harvested and average world yield. Lower production is expected in the European Union and the Black Sea region, driven by declines in yield from above average levels in 2015–16. Production declines are also forecast in China, the Middle East and North Africa.

In contrast, production is forecast to increase in other major exporting countries, particularly Argentina and Canada.

Total area planted to wheat is forecast to fall by 1 per cent in 2016–17. Significant declines are expected in the US and the European Union in response to plentiful exportable supplies and expected lower returns. In many other producing countries, the relatively low wheat prices provide little incentive to expand the area planted to wheat in 2016–17.

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In Argentina, a recent change in government has led to more agriculture-friendly policies. This is expected to see more Argentinean grain produced – and more exports hitting the world's markets.

Expectations of the area planted to wheat in 2016–17 have also been affected by unfavourable seasonal conditions in some regions. For example, area planted to wheat is estimated to have declined by around 5 per cent in India, where a warm and dry winter followed a poor monsoon season in 2015–16.

Over the medium term to 2020–21, world wheat production is projected to increase by around 1 per cent a year. This mainly reflects assumed productivity growth from, for example, adoption of higher yielding varieties and improved farming practices. The area planted to wheat is expected to increase only gradually towards 2020–21 because of competition from production alternatives – including other crops and livestock production – which may have higher profitability.

Among the major exporters, much of the increase in production is expected to come from growth in the Black Sea region. Production in

the region is projected to grow at an average annual rate of 2 per cent, with growth in both area planted to wheat and average yield. In contrast with some other major exporters, the Black Sea region has potential to significantly increase area planted to crops. This is supported by land availability, relatively low production costs, proximity to major markets in the Middle East and North Africa and continuing weakness in the value of local currencies against the US dollar that would support local currency denominated returns.

In Argentina, production is expected to increase in 2016–17 and over the medium term, reflecting the ongoing effects of recent policy developments. With the Argentine Government's removal of the wheat export tax and quantitative export restrictions and devaluation of the Argentine peso, the area planted to wheat is forecast to increase by almost 40 per cent in 2016–17. Export taxes have also been eliminated or reduced on several other agricultural commodities. A significant expansion in corn production in Argentina is also expected in 2016–17.

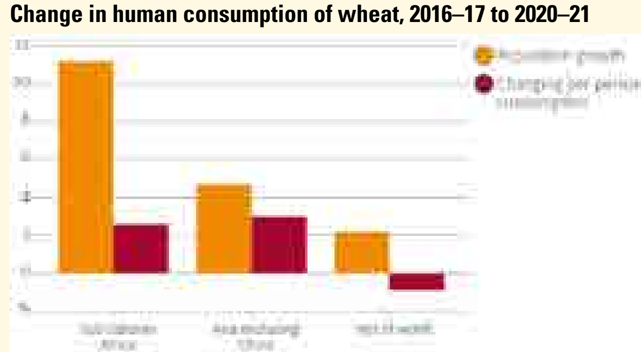
Policy changes favour the expansion of wheat and corn production in the short term, but progressive reductions in the export tax on soybeans will result in a rebalancing in the shares of production between crops in the medium term. But total cropping area in Argentina is expected to grow significantly and growth in wheat area and production is projected over the five years to 2020–21.

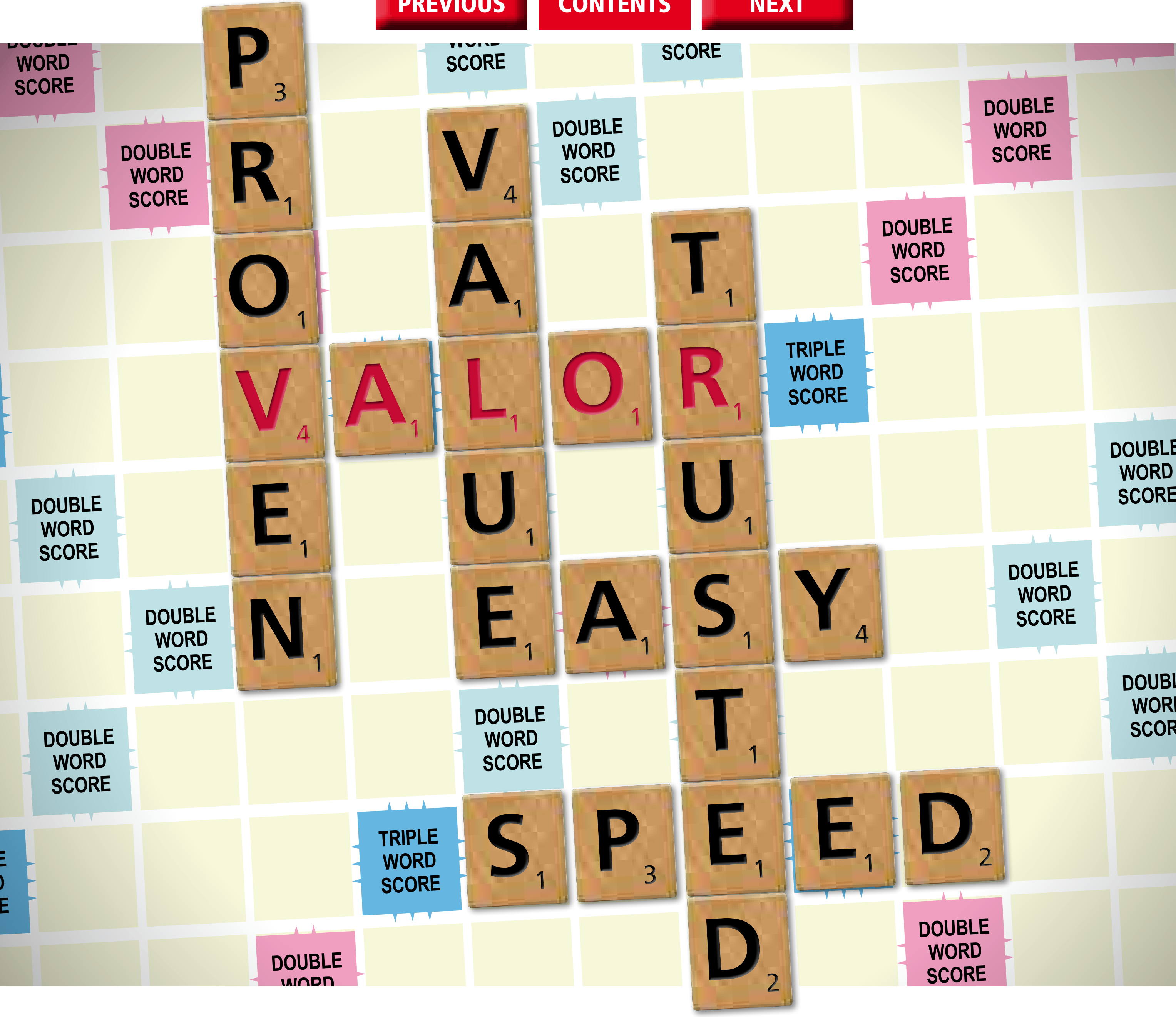
World wheat consumption

World consumption of wheat is forecast to be lower in 2016–17 at 714 million tonnes, with continued growth in human consumption being more than offset by a decline in the use of wheat for livestock feed. Over the medium term to 2020–21, world wheat consumption is projected to grow at an average annual rate of around 1 per cent, with similar rates of growth in the use of wheat for food and livestock feed. Industrial use is also expected to increase slightly but will remain a relatively small proportion of total wheat consumption.

Human consumption accounts for around two-thirds of total wheat use and is expected to increase by around 1 per cent a year over the short to medium term. Human consumption typically increases in line with world population. But changing patterns of consumption around the world will affect the pattern of trade in milling wheat and flour. In many developing countries, particularly in Asia and Africa, consumption of

Change in human consumption of wheat, 2016–17 to 2020–21





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wheat-based foods is expected to rise. This reflects growing total dietary intake and the displacement of traditional staples such as rice and corn.

In contrast, per person consumption of wheat is expected to either be steady or decline in most industrialised countries, including China.

The forecast lower use of wheat for livestock in 2016–17 largely reflects a rebalancing in some major feed-wheat consuming regions, particularly the European Union. This reflects reduced supplies of feed-quality wheat and increased availability of feed alternatives.

Towards 2020–21 world use of wheat for livestock feed is projected to rise, reflecting increased world livestock production. Globally, wheat will continue to compete with alternatives such as corn and other feed grains. Feed use of wheat is likely to continue to be a relatively minor source of livestock feed.

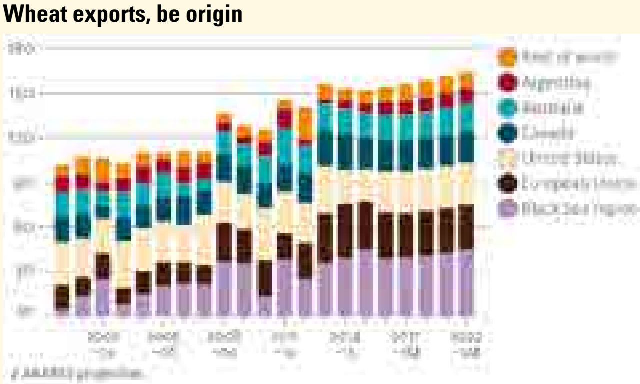
World wheat trade

World trade in wheat is forecast to increase by 1 per cent in 2016–17 to 154 million tonnes. This mainly reflects higher milling wheat imports into the Middle East and North Africa. Import demand from these regions has been limited in 2015–16 because of increased domestic supplies.

Exports from the Black Sea region are forecast to decline by 14 per cent in 2016–17 but would still be the second-largest annual exports on record. The expected decline in export volumes reflects reduced exportable supplies, particularly in Ukraine, following a fall in production in 2016–17. The decline in exports from the Black Sea region is expected to shift the balance of wheat supplies on world markets to other exporting countries, including the US.

Wheat exports from Argentina are forecast to increase by around one-third in 2016–17, compared with 2015–16. This reflects increased production and the elimination of export restrictions. At around 8.7 million tonnes, forecast exports from Argentina would be the highest since 2011–12.

Wheat exports, be origin



Over the medium term, world trade in wheat is projected to increase by almost 2 per cent a year to 164 million tonnes in 2020–21. Growth in trade is expected to be driven by demand for milling wheat and flour, particularly in many developing economies as populations and incomes rise. Growth in feed-wheat trade is expected to be more modest. Some countries without domestic wheat production to draw on will continue to import feed wheat along with other feedstocks. Other major feed-wheat consuming countries and regions are expected to increase domestic production towards 2020–21.

Growth in exports is expected to come mostly from the Black Sea region. Following a forecast fall in 2016–17, export volumes in the Black Sea region are projected to increase at 4 per cent a year to reach 45 million tonnes in 2020–21. Investment in export infrastructure will be required for the region to fully realise its export potential.

Wheat is expected to remain the most traded grain over the medium term, both in terms of the volume of world trade and as a share of world production. With world wheat trade expected to grow more quickly than production over the medium term, the share of world wheat production that is traded will continue its long-term upward trend. With an increasing share of exports from the Black Sea region, world wheat prices will be more sensitive to production and export changes in this region over the medium term.

World wheat trade

World wheat stocks

World wheat closing stocks are expected to remain relatively high in 2016–17 and over the medium term. The world stocks-to-use ratio is forecast to decline in 2016–17 to just over 29 per cent, compared with an average of 27 per cent over the past decade. Over the medium term, world production and consumption are projected to grow at broadly similar rates, with world closing stocks projected to decline only gradually.

Stocks in China are expected to continue increasing in 2016–17 and over the medium term, with closing stocks in China projected to account for around 60 per cent of the wheat held outside major exporting countries by 2020–21.

World wheat closing stocks

The combined stocks of the major exporting countries are forecast to decline by 6 per cent in 2016–17 and remain largely unchanged over the medium term. The expected decline in 2016–17 largely reflects the drawdown of exportable supplies in the US and the European Union. ■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Coarse grain outlook to 2020–21

By Kyann Zhang, ABARES*

*Forecasts and comments based on information available in late February, 2016

AT A GLANCE…

- The world indicator prices for corn and barley are forecast to fall in 2016–17.
- Following consecutive years of strong production, world stocks of coarse grains are at their highest level on record. This trend is expected to continue in 2016–17.
- World coarse grain prices are projected to fall in real terms over the medium term.
- Australian exports of coarse grains are forecast to fall in 2016–17.

Australian area and production

Total area planted to coarse grains in Australia is forecast to decline by 4 per cent in 2016–17 to 5.6 million hectares. This is mainly a result of a fall in area planted to barley in favour of additional area planted to canola, reflecting anticipated better returns from canola. Yields for barley are expected to return to the five-year average of 2.2 tonnes a hectare. This would be 2 per cent higher than in 2015–16 but leave overall barley production in 2016–17 largely unchanged from the year before.

Area planted to grain sorghum is forecast to fall in 2016–17, following a reduction in Chinese demand for Australian grain sorghum exports. More grain sorghum is expected to be consumed by the domestic livestock sector as feed in 2016–17 in response. But this increase is not expected to offset the fall in overseas demand.

Over the medium term, area planted to coarse grains is projected to fall slightly in 2017–18, before recovering from 2018–19 to around 5.6 million hectares in 2020–21. Barley yields are projected to increase by around 1 per cent a year, but planted area is expected to remain relatively stable. This reflects productivity growth resulting from improved farming practices. Total barley production is projected to rise by 1 per cent a year and reach 8.7 million tonnes in 2020–21.

But area planted to grain sorghum is projected to fall by 4 per cent in 2017–18 in response to falling export demand and lower returns and to then remain relatively stable towards the end of the projection period.

Exports

Total coarse grain exports are forecast to fall by 3 per cent to 7 million tonnes in 2016–17, following a decline of 6 per cent in 2015–16. This is because of an expected fall in demand for barley from China and Saudi Arabia – two of Australia's largest export destinations.

Since 2013 China has been the largest importer of Australian barley, taking around 59 per cent of Australian barley exports in 2014–15. In late 2015 the Chinese Government implemented import restrictions on feed grain, which is expected to lower imports.

Exports of barley to Saudi Arabia have been affected by the Saudi Government continuing to encourage livestock producers to use alternative feed to barley, citing concerns over nutritional value.

In 2014–15 around 97 per cent of all Australian grain sorghum exports went to China. This fell to around 60 per cent in November 2015 as a result of import restrictions. In 2015–16 as a whole, grain sorghum export shipments are forecast to decline by 20 per cent to 966,000 tonnes.

In 2016–17 exports of Australian grain sorghum to other regions – including Japan, the Middle East and South-East Asia – are expected to increase. Exports of grain sorghum are forecast to fall by around 14 per cent to 829,300 tonnes, which would be close to the average level of grain sorghum exports in the five years to 2013–14.

Australian coarse grain exports are projected to increase gradually over

Table 1: Outlook for coarse grains

	unit	2013–14	2014–15s	2015–16f	2016–17f
World					
Area	million ha	323	321	321	320
Yield	t/ha	3.97	4.04	3.94	4.00
Production	Mt	1282	1296	1264	1277
corn	Mt	991	1007	968	982
barley	Mt	145	141	146	144
Consumption	Mt	1230	1267	1264	1257
corn	Mt	946	976	974	975
barley	Mt	141	142	143	141
Closing stocks	Mt	211	243	245	261
Trade	Mt	164	182	161	159
Stocks-to-use ratio	%	17.2	19.2	19.4	20.7
Corn price **a**					
– nominal	US$/t	219	174	165	160
Barley price **b**					
– nominal	US$/t	242	204	180	177
Australia					
Area total	'000 ha	5193	5704	5857	5595
Production total	kt	12226	12161	12372	12424
Export volume	kt	8127	7743	7282	7034
Export value					
– nominal	A$m	2573	2693	2372	2303
Price – nominal					
feed barley **c**	A$/t	233	252	247	257
malting barley **d**	A$/t	250	282	282	294
grain sorghum **e**	A$/t	300	301	289	316

a US no. 2 yellow corn, fob Gulf, July–June. **b** France feed barley, fob Rouen, July–June. **c** Feed 1, delivered Geelong. **d** Gairdner Malt 1, delivered Geelong. **e** Gross unit value of production. **f** ABARES forecast. **s** ABARES estimate.
Sources: ABARES; Australian Bureau of Statistics; United Nations Commodity Trade Statistics Database (UN Comtrade); US Department of Agriculture.


Crusader
CROSS SPECTRUM
WEED CONTROL
WITH PLANTBACK FLEXIBILITY

the projection period to 7.6 million tonnes in 2020–21, mainly reflecting growing world demand for feed grain in the livestock sector. Export destinations such as Japan – which was a major importer of Australian coarse grains but was largely priced out of the Australian export market by China from 2013–14 – are expected to increase imports from Australia.

Towards the end of the projection period, Japan is projected to become the largest importer of Australian barley and grain sorghum. Most of this will be consumed as livestock feed.

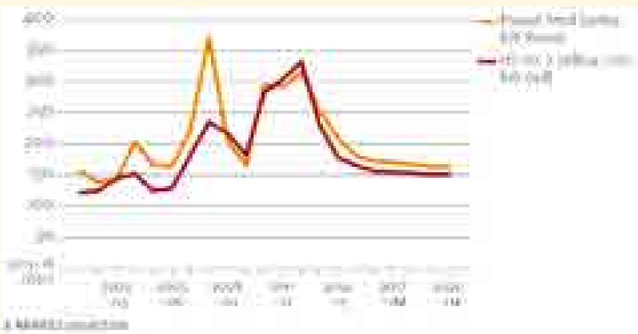
Exports of feed grain to China are projected to fall, but demand for barley in the manufacture of malt and for grain sorghum in the production of liquor is projected to remain strong over the projection period.

World coarse grains outlook in 2016–17

The world coarse grains indicator price (US no. 2 yellow corn, fob Gulf) is forecast to fall by 3 per cent in 2016–17 to US$160 a tonne. The world indicator price for barley (France feed barley, fob Rouen) is forecast to average 2 per cent lower in 2016–17 at US$177 a tonne. These falls reflect abundant world supply of coarse grains and relatively weak demand in some sectors of the market.

Following consecutive years of strong production, current world stocks of coarse grains are at their highest level on record. This trend is expected to continue in 2016–17, as returns from planting coarse grains in the major export regions of the US and the European Union are expected to be more favourable than those from alternative crops such as soybeans. In China, the domestic reserve price for corn was lowered by 11 per cent in late 2015. But the returns under this reserve price remain above those for other crops and the fall in the domestic price is expected to have only a limited effect on production decisions.

World coarse grain indicator prices



In Argentina, the devaluation of the peso commenced in December 2015 when it was floated by the new Argentine Government. If the devaluation persists, it is expected to improve the competitiveness of Argentine corn on the world market. Around the same time, restrictions on Argentine grain exports in place since 2007 were lifted. This is expected to provide incentive for domestic producers to increase production of coarse grains, particularly corn, as exports from Argentina are forecast to increase. The combination of these factors is expected to place downward pressure on world corn prices.

The rate of growth in US coarse grain consumption is expected to slow from that achieved in the decade to 2014–15, particularly for corn in industrial use, because potential for further expansion in the US ethanol industry is bound by infrastructure limitations. Crude oil prices are expected to remain relatively low in the next few years, which is expected to put downward pressure on ethanol prices. This in turn will dampen the price of corn.

Demand for coarse grains for livestock feed has been on an upward trend since 2009–10, reflecting increasing demand for livestock products in developing countries. This is expected to be the main source of growth in world coarse grain consumption over the outlook period to 2020–21.

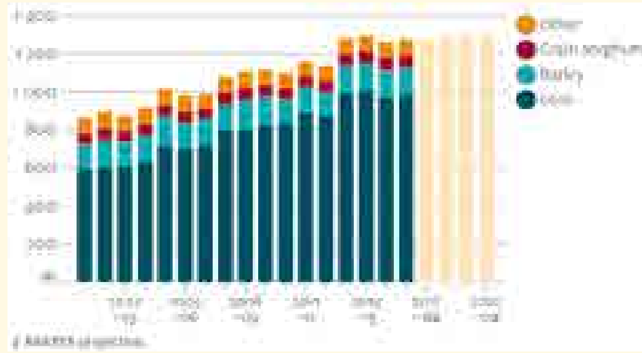
Over the medium term (to 2020–21), world coarse grain prices are forecast to recover in nominal terms as growth in production slows in response to changing market conditions. Demand for coarse grains is expected to increase over the outlook period to 2020–21, driven primarily by a growing demand for livestock feed and, to a lesser extent, by demand for grain in food as world population and incomes rise.

World coarse grain stocks are projected to grow slightly in the near term but to start falling towards the end of the projection period. This will also provide some support for coarse grain prices. In real terms coarse grain prices are projected to decline gradually, with corn averaging US$154 and barley averaging US$166 in 2020–21.

Production

In 2016–17 world production of coarse grains is forecast to rise by 1 per cent to 1.28 billion tonnes, with strong growth in world corn production more than offsetting a slight fall in world barley production.

World coarse grain production



World coarse grain production is forecast to remain largely unchanged in 2017–18 despite lower prices. This is because of a lack of suitable alternatives in some areas currently planted to coarse grains. In particular, production in the US Corn Belt is expected to remain high.

Over the remainder of the projection period to 2020–21, world coarse grain production is projected to continue growth of around 0.5 per cent a year, reaching 1.3 billion tonnes in 2020–21.

Corn

World corn production is forecast to increase by 1 per cent in 2016–17 to 982 million tonnes. This partly reflects a return to average yields in the European Union after adverse seasonal conditions resulted in lower than anticipated production in 2015–16. Production in the European Union in 2016–17 is forecast to increase by 17 per cent to 66 million tonnes.

In Argentina, area planted to corn is forecast to increase by 16 per cent in 2016–17 to 3.7 million hectares, with producers seeking to take advantage of the Argentine Government decision to remove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Since 2013, world coarse grain production has exceeded 1.2 billion tonnes each year. With an ever-increasing world population, forecasts are that this is the new 'floor' for global coarse grain production.

export restrictions and taxes on corn. World corn prices are quoted in US dollars, so the devaluation of the local currency is beneficial to Argentine producers because it provides incentives for expansion in corn production. Average yields in Argentina are expected to fall slightly from 2015–16, but overall production is expected to increase by around 3 million tonnes.

Corn production in Brazil is forecast to fall by around 1 per cent in 2016–17. In the past two years, the Brazilian corn crop has been boosted by record harvests of its safrinha (second-season) crop. In 2016–17 yields of this second crop are expected to return to average. At the same time, increased competition from Argentina and lower world prices are expected to lead to a reduction in area planted for both crops.

In the US, area planted to corn is expected to increase by 2 per cent, reflecting favourable returns relative to soybeans, which compete with corn for similar resources. Despite this increase, overall production is expected to remain largely unchanged because yields are assumed to return to the long-term average after particularly high levels in 2014–15 and 2015–16.

Production of corn in China is forecast to remain mostly unchanged in 2016–17. In September 2015 the Chinese Government lowered the reserve price of corn by 11 per cent and expressed its intention to lower this price further in the near future. Under this new reserve price, returns from growing corn remain favourable relative to other crops and as a result production is expected to increase.

World corn supply

World corn production is projected to decline in 2017–18, as lower prices are expected to lead to a contraction in area planted. A further reduction of the corn reserve price in China is expected, which will lower the relative returns of planting corn and is expected to lead to a fall in corn production in China. Corn production in Argentina in 2017–18 is expected to increase further in response to export deregulation. But this will be more than offset by falls in production from other major producers, including the US.

Over the medium term, corn production is projected to increase from 2018–19 onwards to around 1 billion tonnes in 2020–21 as a result of a projected increase in corn consumption in line with a growing world population, improved world income growth and an increased demand for meat (which will lead to higher grain use).

Barley

World production of barley in 2016–17 is forecast to decline by 1 per cent following an expected return to average yields. Falls in production in the European Union are expected to more than offset increases in Australia, Canada and the Black Sea region.

In the European Union, production is forecast to fall by 2 per cent in 2016–17 as yields return to average after reaching an all-time high in 2015–16. Area planted to barley is forecast to remain largely unchanged from the previous year.

Barley production in the Black Sea Region is expected to increase by 4 per cent in 2016–17 – following a poor season in 2015–16, when seasonal conditions led to lower yields and a fall in harvested area.

Barley production over the medium term is projected to increase, assuming favourable seasonal conditions and average yields. This is in response to rising demand for barley in both feed and food use. Feed barley consumption in the livestock sector is projected to grow as world livestock production expands. Increased world consumption of beer is expected to lead to growth in demand for malting barley.

Consumption

World consumption of coarse grains is projected to fall by 1 per cent to 1257 million tonnes in 2016–17, resulting from weaker demand for coarse grains in the industrial and livestock sectors. World consumption is projected to resume growth in 2017–18 and continue to increase through the remainder of the projection period. This mainly reflects increasing demand for feed grains in world livestock production. Food use of barley is also expected to grow but at a slower rate, largely reflecting the increase in demand for barley in the manufacture of malt in beer production.

Corn

World consumption of corn is forecast to increase by less than 1 million tonnes in 2016–17, the lowest year-on-year growth in more than 20 years. This is largely a result of the slowdown in corn consumption for industrial purposes, as growth in US ethanol production slows considerably compared with the previous decade.

At the same time, demand in the European Union for corn as livestock feed is expected to be weak in 2016–17 because of the abundance and relative low price of feed wheat in the region.

In the US, corn consumption is forecast to increase by less than 2 per cent to 306 million tonnes. Over the past decade, growth in US corn consumption has been strong. This is primarily a result of the US Government Renewable Fuel Standard (RFS) programme, which requires that a minimum volume of biofuels be blended into the US automotive fuel supply. Concerns have emerged recently that the specified volume exceeds the level that can be practically used for automotive fuel because most motor vehicles in the US cannot accommodate fuel with more than 10 per cent ethanol content. The RFS programme ensures US

SECTION 1 OVERVIEW

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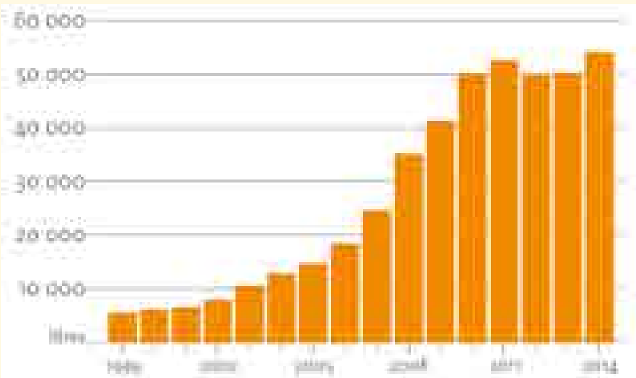
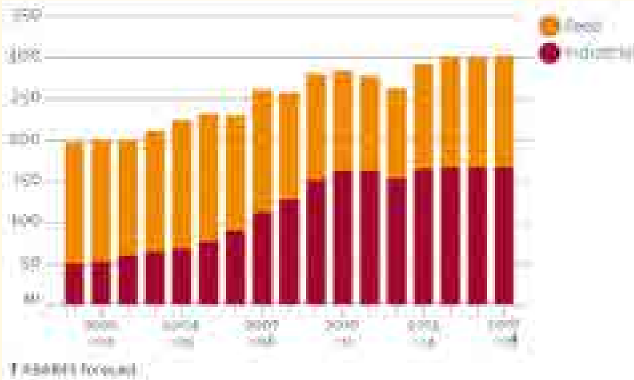
consumption of ethanol will continue to increase, but the rate of growth in production of ethanol has noticeably slowed since 2010. It is expected to remain relatively low over the projection period.

Consumption of corn as livestock feed in the US is forecast to increase in 2016–17 because of expected increases in production of beef, pork and broiler meat. Growth in US corn consumption over the medium term is expected to be primarily driven by demand from the livestock sector.

Ethanol production, United States



Corn consumption, United States



Consumption of corn in the European Union is forecast to fall by around 1 per cent in 2016–17, mainly as a result of an expected fall in use of corn as livestock feed because of the abundance and relative low price of feed wheat.

Corn consumption in China is forecast to increase by 2 per cent to 218 million tonnes in 2016–17. This reflects an expected increase in use of corn in livestock feed following Chinese Government measures implemented in late 2015 to restrict imports of alternative feed grains such as barley and grain sorghum.

Over the medium term, world consumption of corn is projected to

increase by less than 1 per cent a year to 1011 million tonnes by the end of the projection period. The main driver of this is growth in world livestock production in response to growing world population and evolving dietary demands resulting from higher incomes, especially in developing countries.

Barley

World consumption of barley is forecast to fall by around 1 per cent to 141 million tonnes in 2016–17. In the Black Sea region, consumption of barley as feed grain is expected to rise by 4 per cent in 2016–17 as domestic production of barley in the Russian Federation and Ukraine recovers from the poor season of 2015–16.

In China, consumption of barley is forecast to fall by 4 per cent to 8.4 million tonnes in 2016–17. This is primarily a result of lower use of imported barley as feed grain following the import restrictions implemented in November 2015. Demand for malting barley remains strong in China, and consumption is expected to increase in 2016–17.

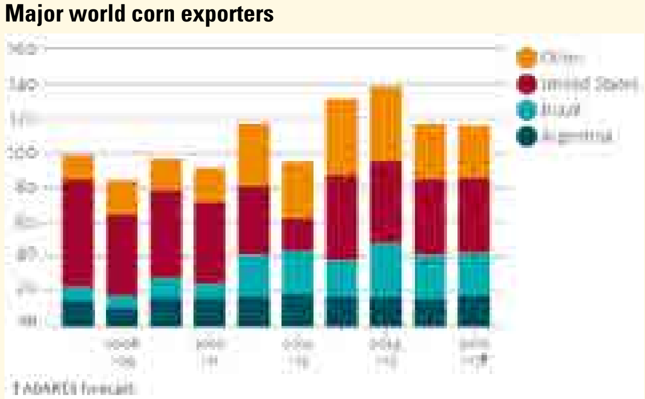
Over the medium term, consumption of barley is projected to increase by less than 1 per cent a year to 144 million tonnes in 2020–21. This growth is expected to be driven mostly by demand for malting barley as a result of increasing world beer consumption. Demand for barley in livestock feed is expected to remain relatively unchanged during the projection period.

Trade

World trade in coarse grains is forecast to fall by 1 per cent to 159 million tonnes in 2016–17. World trade of corn is forecast to remain largely unchanged in 2016–17 at 116 million tonnes. Supply of corn available for export is expected to increase in 2016–17 but demand for corn imports is not expected to follow the same trend. As a result world corn stocks are expected to rise.

In Argentina, the removal of the export quota system on corn and the devaluation of the peso at the end of 2015 are expected to lead to an increase in availability and competitiveness of Argentine corn on the world market in 2016–17. Exports from Brazil and the US are forecast to fall slightly in 2016–17 as a result of increased competition from Argentina.

Major world corn exporters



Demand for corn imports is expected to fall in 2016–17. In 2015–16 the European Union imported 16 million tonnes of corn – the highest volume on record – in response to a decline in domestic production.

In 2016–17 yields are assumed to return to average and imports into the region are expected to fall. In contrast, imports into South Africa are expected to increase in 2016–17 as domestic production is forecast to fall short of consumption. But expected falls in the rest of the world would outweigh this increase.

Over the medium term, world trade in corn is projected to increase – primarily reflecting increased demand for livestock feed. Japan is expected to remain the world's largest destination for corn exports, with projected imports of 16.2 million tonnes in 2020–21.

World trade in barley is forecast to fall by 1 per cent in 2016–17 to 27 million tonnes. This reflects a 13 per cent fall in expected demand for imported feed barley into China, assuming import restrictions implemented by the Chinese Government in November 2015 remain in place.

Over the medium term, world trade in barley is projected to grow at around 1 per cent a year to 29 million tonnes in 2020–21. This mainly reflects expected growth in world demand for barley in the manufacture of malt. Demand for barley for use in feed grains is also projected to grow but at a slower rate than that for use in malt production.

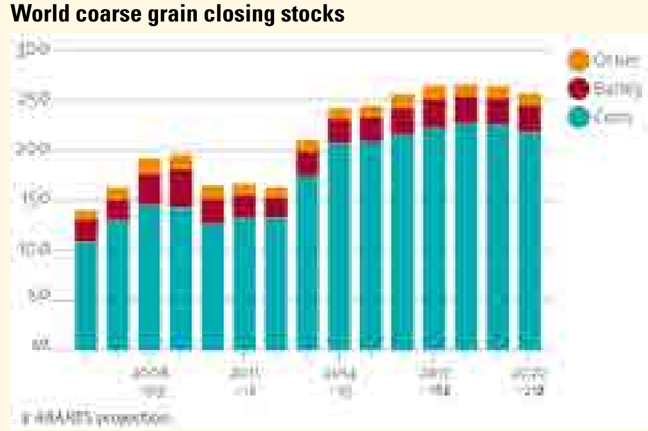
Stocks

World coarse grain closing stocks are forecast to increase by 6 per cent in 2016–17 to 261 million tonnes as production in coarse grains continues to outpace consumption. Stocks are expected to increase in China and the European Union, while a slight fall is expected in the US as a result of strong demand for feed grain.

World corn closing stocks are forecast to increase by 4 per cent in 2016–17 to 217 million tonnes. Closing stocks in the European Union are expected to increase by 2 per cent in 2016–17 following a forecast significant fall in 2015–16. In China, corn stocks are also expected to grow as production remains high. But expected higher use of domestic corn in livestock feed is expected to limit this increase.

World closing stocks of barley are forecast to increase by 10 per cent in 2016–17 to 27 million tonnes, partially reflecting the fall in demand for barley imports into China. In the Black Sea region, stocks are expected to increase slightly as domestic production recovers from a poor season in 2015–16.

World coarse grain closing stocks



Over the medium term, world coarse grain stocks are expected to continue increasing but at a slower pace than in 2013–14 and 2014–15. Towards the end of the projection period, stocks are expected to fall slightly in response to projected consumption growth. ■

World oilseed prices under pressure

By David Mobsby, ABARES*

*Forecasts and comments based on information available in late February, 2016

AT A GLANCE…

- The world oilseed indicator price is forecast to average lower in 2016–17 as a result of high carry-over stocks and higher soybean meal closing stocks.
- World vegetable oil stocks are forecast to decline in 2016–17 but then rise.
- World oilseed prices are projected to decline in real terms over the medium term.

Higher canola plantings in 2016–17

The area planted to canola in Australia is forecast to recover in 2016–17 following a contraction in plantings in 2015–16 – the lowest level in five years. High barley prices and less than favourable planting conditions resulted in reduced area planted in 2015–16. For the 2016–17 season (planting to begin in April), canola prices are expected to remain favourable compared with barley prices.

Assuming an average yield of 1.3 tonnes a hectare, Australian canola production is forecast to increase by 11 per cent to 3.3 million tonnes.

Area planted to canola over the medium term is expected to increase but at a rate of only 0.4 per cent a year. Without significant price incentive to expand canola at the expense of competing winter crops, canola area is projected to account for 12 per cent of total Australian winter cropping area. Production is projected to rise by around 1 per cent a year to 3.4 million tonnes in 2020–21.

Canola exports expected to rise in 2016–17

Australian canola exports are forecast to rise by 8 per cent in 2016–17 to 2.3 million tonnes, reflecting higher expected production. For 2016–17 exports to the European Union are forecast to increase to 1.8 million tonnes because of lower canola production from Ukraine (Australia's main competitor for canola exports to the European Union) and steady import demand from the European Union.

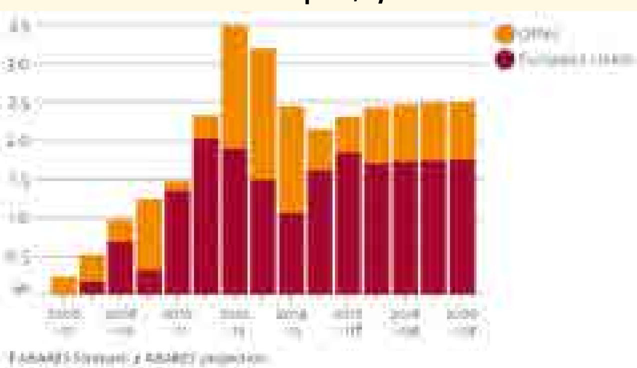
EU demand for canola imports is expected to remain strong over the

Australian canola production

medium term. Exports from Ukraine are projected to remain constant, limiting competition pressure for Australia's largest export market.

Growing exports from Canada are expected to limit Australia's market share in China and Japan.

Volume of Australian canola exports, by destination



The value of Australian canola exports is forecast to rise by 13 per cent in 2016–17 to $1.4 billion. Export prices are expected to be supported by a rise in world prices and forecast continued import demand from the European Union.

The value of Australian canola exports in 2020–21 is projected to be $1.2 billion (in 2015–16 dollars), with small increases in export volumes being largely offset by falling export prices.

World price to fall

The world oilseed indicator price (US no. 2 soybeans, fob Gulf) is forecast to fall by 2 per cent in 2016–17 to average US$355 a tonne. Despite a forecast second year of lower production, soybean prices are expected to average lower because of record high carry-over stocks from 2015–16 and an anticipated increase in world soybean meal stocks.

Table 1: Outlook for oilseeds

	unit	2013–14	2014–15s	2015–16f	2016–17
World					
Oilseeds					
Production	Mt	505	536	529	527
Consumption	Mt	494	516	517	532
Exports	Mt	133	147	148	152
Closing stocks	Mt	78	96	108	103
Indicator price **a**	US$/t	547	418	362	355
Canola indicator price **bc**	US$/t	521	424	420	430
Protein meals					
Production	Mt	282	294	301	312
Consumption	Mt	277	293	299	309
Exports	Mt	82	85	88	94
Closing stocks	Mt	13	15	17	21
Indicator price **bd**	US$/t	555	427	343	321
Vegetable oils					
Production	Mt	171	175	178	183
Consumption	Mt	166	172	178	184
Exports	Mt	70	72	74	76
Closing stocks	Mt	19	19	18	17
Indicator price **be**	US$/t	985	808	742	840
Australia					
Oilseed production	kt	5160	4305	3849	4553
Oilseed exports	kt	3672	2617	2269	2444
Area	'000 ha	2721	2824	2357	2527
Production	kt	3832	3447	2945	3271
Export volume **g**	kt	3194	2445	2146	2308
– nominal	A$m	1929	1349	1252	1420
Price **h**	A$/t	529	482	547	589

a US no.2 soybeans, fob Gulf. **b** In 2015–16 US dollars. **c** Rapeseed, Europe, fob Hamburg, July–June. **d** Soybean meal, cost insurance and freight, Rotterdam, 45 per cent protein. **e** Soybean oil, Dutch, free on board ex-mill. **f** ABARES forecast. **g** July–June. **h** In 2015–16 Australian dollars. **h** Delivered Melbourne, July–June. **s** ABARES estimate. **z** ABARES projection.
Sources: ABARES; Australian Bureau of Statistics; United States Department of Agriculture

This in turn is expected to weigh on the price of soybeans because soybeans are a relatively high meal-bearing oilseed.

Expected abundant supplies of protein meals and assumed productivity growth (for example, from the adoption of higher yielding varieties and improved farm practices) will result in the world oilseed

World oilseed indicator price, US no. 2 soybeans, fob Gulf

indicator price declining in real terms over the projection period to 2020–21. Despite world closing stocks falling, world supply is expected to grow by an average of 1.5 per cent a year. But the stocks-to-use ratio is expected to fall given projected rates of consumption growth.

A forecast increase in vegetable oil prices is expected to encourage crushing of oilseeds for vegetable oil in the short term. At projected rates of oilseed crush, a surplus of protein meal will lead to increasing protein meal stocks. This is expected to place downward pressure on world protein meal prices and, consequently, soybean prices.

The world canola indicator price (Europe rapeseed, fob Hamburg) is forecast to rise by 3 per cent in 2016–17 to average US$430 a tonne. A forecast consecutive year of production decline is expected to result in closing stocks falling to their lowest level since 2012–13. Canola has relatively high oil content, so its prices are expected to be supported by forecast higher vegetable oil prices in 2016–17.

Over the medium term, palm oil production is projected to increase and an increased supply in world vegetable oil markets is expected to lead to lower world canola prices in real terms.

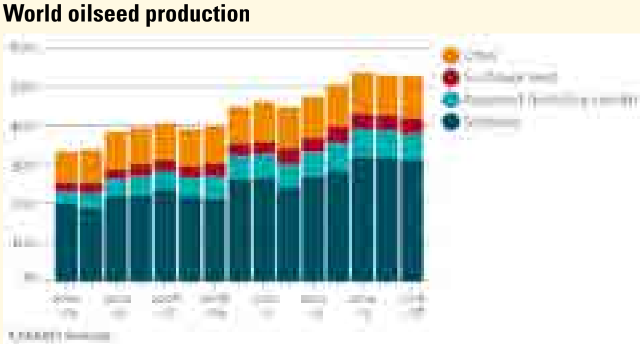
World vegetable oil prices are forecast to rise in the short term, reflecting forecast relatively low world vegetable oil production growth in 2016–17. This is because of lower forecast South-East Asian palm oil production as a result of El Niño.

Growth in world vegetable oil production is forecast to be 3 per cent in 2016–17, compared with the average of 4 per cent over the five years to 2014–15. World vegetable oil stocks are expected to fall to meet the forecast 4 per cent increase in consumption.

Oilseed production to fall in the short term but then rise

World oilseed production is forecast to fall marginally in 2016–17 but still be the third-largest on record at 527 million tonnes. World soybean production and world canola production are both forecast to fall by 2 per cent. In contrast, world production of cottonseed and sunflower seed are forecast to increase because of expected higher plantings.

World oilseed production



World soybean production is forecast to fall in 2016–17 to 311 million tonnes, largely reflecting a decline in world soybean plantings.

Total plantings are forecast to decline in the short term, partly reflecting producers in the United States and Argentina switching area to grain production because of relatively higher returns for those crops. Over the medium term, soybean production is projected to increase by around 2 per cent a year to reach 342 million tonnes by 2020–21.

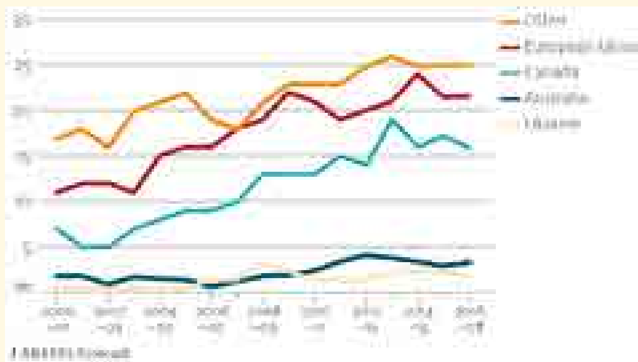
US soybean production in 2016–17 is forecast to fall because of an expectation of higher returns from producing corn. Over the medium term, area planted to soybeans is expected to remain constrained by a slight decline in total cropping area and competition for land from corn.

In Argentina, area planted to soybeans is forecast to decline marginally in 2016–17. This is in response to the removal of export taxes and quantitative restrictions on cereals, which are expected to make grain production more profitable in the short term.

But soybean export taxes will be reduced annually by 5 percentage points from the current rate of 30 per cent. This is expected to lead to area planted to soybeans rising by more than 2 million hectares by the end of the projection period.

World rapeseed (including canola) production is forecast to fall in 2016–17 to a four-year low of 67 million tonnes, with production in Canada and Ukraine expected to decline.

World canola production



Over the medium term, world oilseed production is projected to rise by 2.3 per cent a year to reach 577 million tonnes in 2020–21. Growth is largely the result of higher soybean production, which is expected to increase by 31 million tonnes between 2016–17 and 2020–21.

The outlook for higher soybean production largely reflects a significant increase in soybean production in Latin America. This region is expected to account for around two-thirds of the increase in world soybean production over the medium term. Soybean production in Argentina, in particular, is expected to rise strongly following recent policy changes liberalising exchange rates and removal or reduction of agricultural export taxes.

Production of other oilseeds, such as rapeseed (including canola) and sunflower seed, is expected to increase by a combined 19 million tonnes towards 2020–21. This forecast increase mainly reflects higher yields because strong competition for land from cereal crops will limit planting area. Canola production is expected to increase by 1.7 per cent a year to reach 72 million tonnes in 2020–21. Production increases are expected to come largely from Canada and India.

Oilseed consumption

World oilseed consumption (mainly for crush) is forecast to rise by 3 per cent in 2016–17 to 532 million tonnes. Forecast higher soybean crush in Latin America, the United States and China is expected to drive total consumption in 2016–17.

Soybean crush in China is forecast to rise again in 2016–17 to reach 90 million tonnes. Over the projection period, a shift to larger-scale livestock production should encourage higher rates of soybean meal use and ensure continued growth of soybean meal consumption in China over the projection period. Soybean oil produced from projected crush is expected to be consumed domestically to meet forecast growing demand for human consumption of vegetable oil.

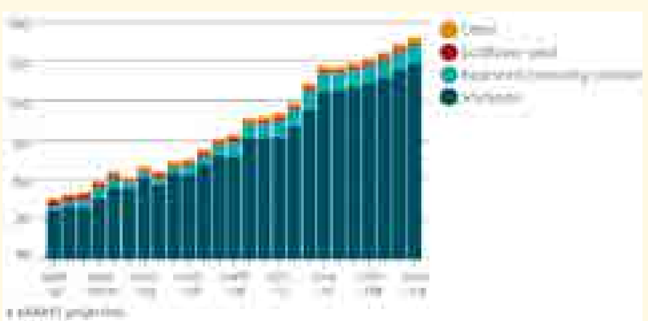
Oilseed crush is also projected to rise significantly in Latin America, particularly in Argentina. Soybean crush in Argentina is forecast to rise in 2016–17 to 45 million tonnes. The recent sharp devaluation of the Argentine peso and a 5 percentage points reduction in export taxes on soybean oil and soybean meal in 2016 are expected to encourage higher crush and export of these products.

Over the projection period, a scheduled reduction in export taxes of 5 percentage points a year across soybeans and soybean products (which in January 2016 were 30 per cent and 27 per cent, respectively) should continue to favour soybean crush and export of soybean products to 2020–21.

World rapeseed (including canola) crush is expected to rise moderately over the projection period. This will be largely driven by increased crush in Canada and India, while limited growth is expected in the European Union. Canola crush in Canada is expected to be supported by demand for canola oil and meal from the United States.

Crush in the European Union is projected to remain largely unchanged at around 24 million tonnes a year, with limited upside potential for further vegetable oil consumption.

World oilseed trade



Oilseed trade growth to slow over medium term

World oilseed exports are forecast to increase by 3 per cent in 2016–17, largely on account of higher soybean exports. Over the medium term, soybean exports are expected to continue to rise largely to meet rising Chinese import demand.

Exports of other oilseeds – for example, rapeseed (including canola) and sunflower seed – are projected to rise gradually over the projection period but are expected to remain small compared with soybean exports.

Despite a large forecast increase in production in major oilseed exporting countries, an expected rise in crush demand in these countries is expected to limit oilseed supplies for export. World oilseed trade is projected to grow annually by 1.5 per cent over the medium term, compared with 9 per cent for the five years to 2015–16.

Higher domestic consumption in the United States and Argentina will result in Brazil becoming the major exporter of soybeans over the medium term.

Brazilian soybean exports are expected to fall in 2016–17 because of increased competition on world markets and higher domestic consumption. Over the projection period, exports are projected to rise. Export growth is projected at a lower rate than the previous decade, with Brazil's large and growing domestic crushing industry expected to limit the supply for export. Despite this, Brazilian soybean exports are projected to rise by around 3 per cent annually towards 2020–21.

China is expected to increase imports over the projection period but at a much lower rate than the previous decade. China is expected to remain the world's largest soybean (and oilseed) importer over the projection period, accounting for around 65 per cent of world soybean imports.

Oilseed stocks to decline over projection period

World oilseed closing stocks

World closing stocks of oilseeds are expected to fall in 2016–17, reflecting both a decline in world production and an increase in crush. World oilseed stocks are projected to decline over much of the projection period, falling from the forecast record level of 108 million tonnes in 2015–16 to 98 million tonnes in 2020–21. ■

Section 2

The grain industry in figures

- All figures and tables presented in this Yearbook have been derived from a combination of ABARES, ABS, Pulse Australia, International Grains Council and USDA sources.
- For Australian and other southern hemisphere winter crops the year listed is generally the calendar year the crop is planted and harvested.
- Australian summer crop figures are for the harvest in the following calendar year.
- For northern hemisphere crops, a figure for 2015 for example, is an estimate for the crop harvested in the 2015–16 financial year.
- (Mt = 1,000,000 tonnes) (Kt = 1000 tonnes)

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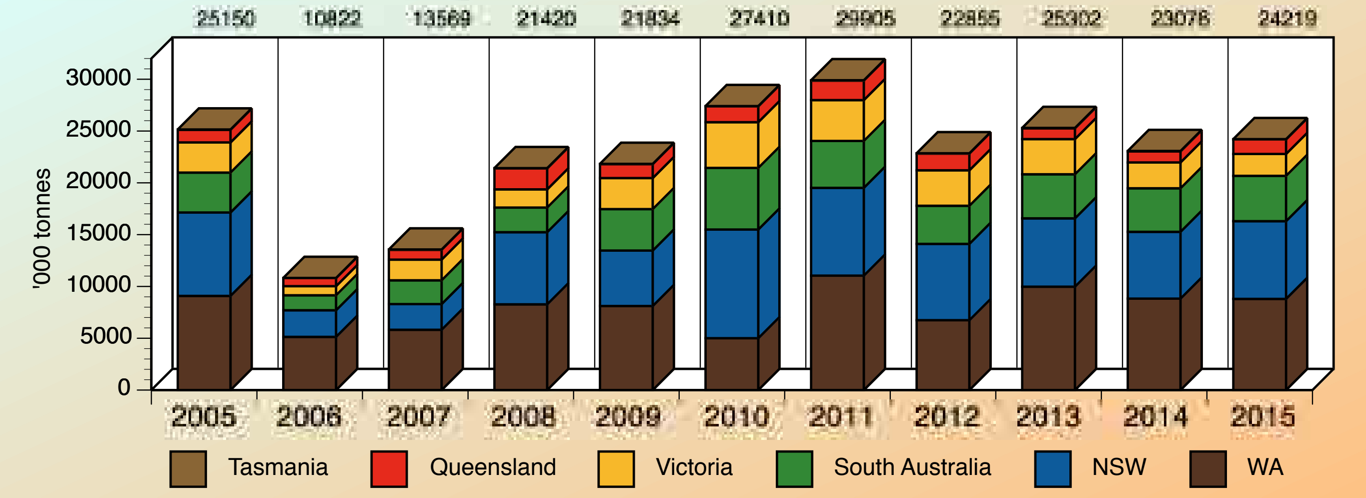
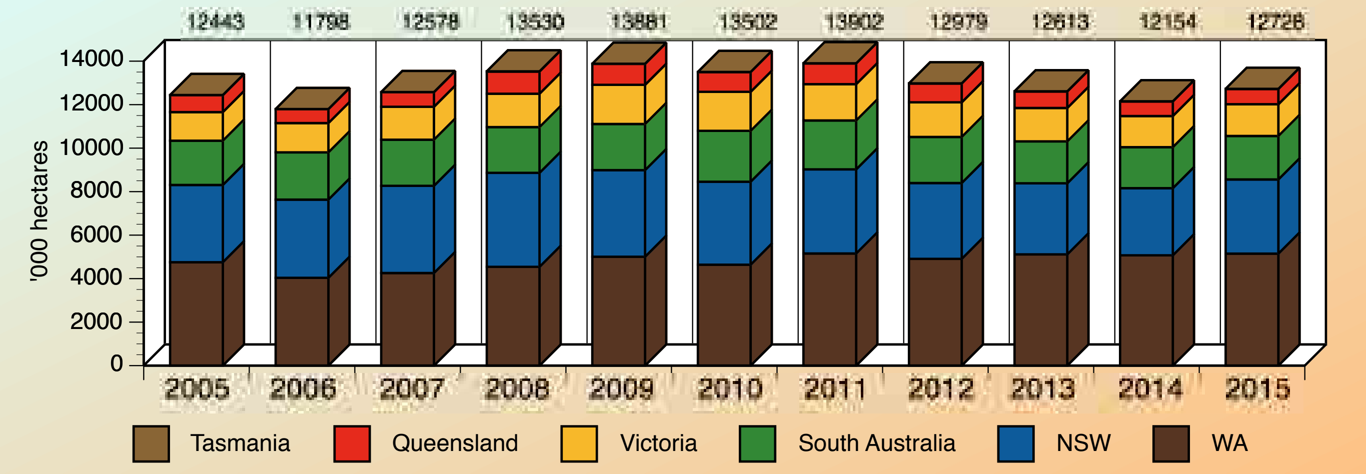
Colliers INTERNATIONAL

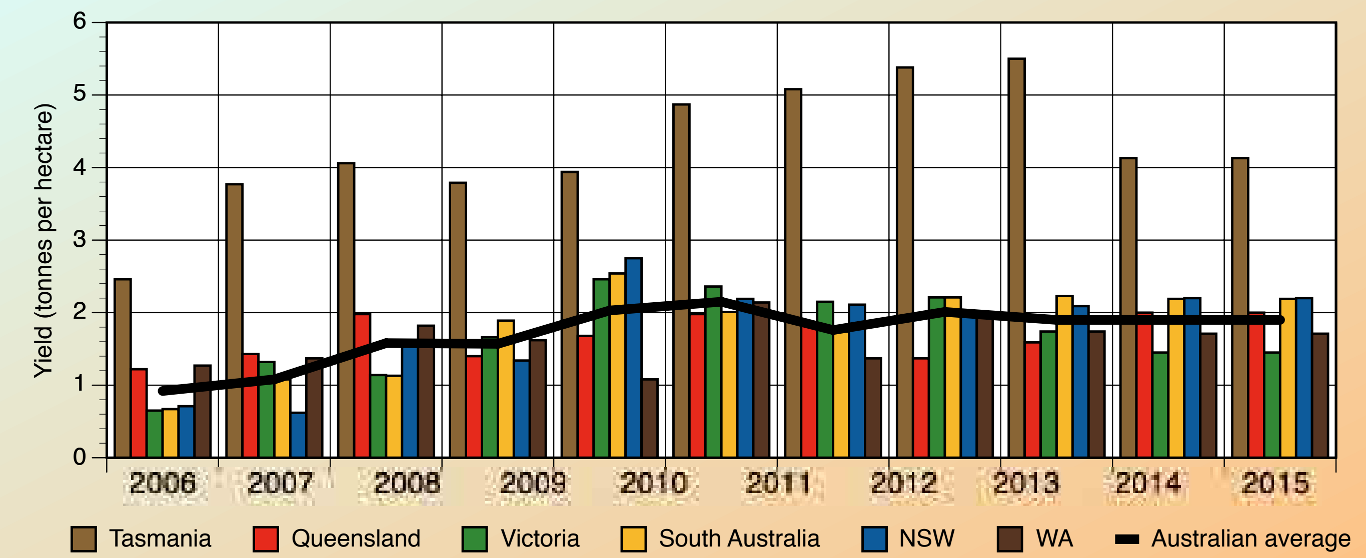
Total Australian wheat production



Total Australian wheat area



Average Australian wheat yields by state



Australian wheat production, domestic disposal and exports (Kt)

	2011	2012	2013	2014	2015
Opening stocks	9114	8029	5789	6113	5696
Production	29905	22855	25302	23076	24219
Availability	39019	30884	31091	29189	29915
Total domestic use	6334	6451	6642	6922	7230
Stockfeed, Human, Indus	*5685*	*5820*	*6035*	*6286*	*6600*
Seed	*649*	*631*	*608*	*636*	*630*
EXPORTS					
Wheat (incl. grain & flour)	24656	18644	18336	16571	16933
MAJOR DESTINATIONS					
China	1872	1235	1491	930	na
Japan	1293	1178	882	904	na
Korea, Rep. of	2343	1496	910	1048	na
Malaysia	894	855	957	906	na
Thailand	1442	475	387	466	na
Indonesia	4066	4424	3720	4377	na
Egypt	618	514	275	427	na
Iran	208	1292	849	269	na
Iraq	522	1771	959	155	na
United Arab Emirates	180	182	40	99	na
Yemen	841	722	1070	928	na
Kuwait	320	320	436	381	na
Saudi Arabia	349	409	377	13	na
Oceania (NZ, Fiji, PNG)	864	785	845	902	na
CLOSING STOCKS (Kt)	**8029**	**5789**	**6113**	**5696**	**5752**

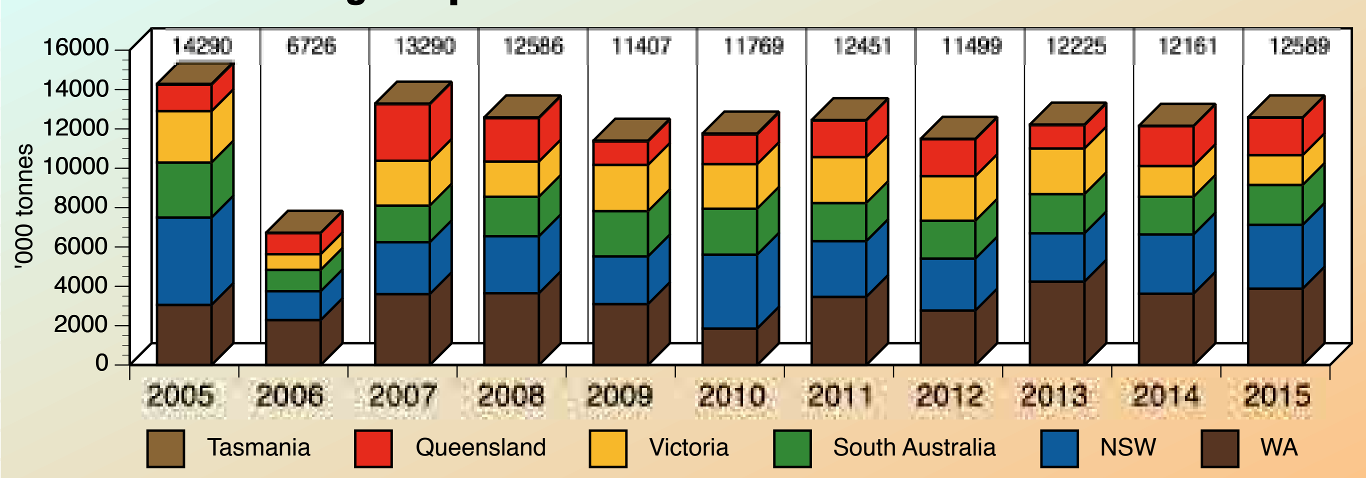
Wheat production & area by state

		2011	2012	2013	2014	2015
NSW:	Prod. (Kt)	8473	7365	6596	6449	7500
	Area ('000 ha)	3868	3487	3269	3088	3410
Vic:	Prod. (Kt)	3943	3423	3396	2491	2110
	Area ('000 ha)	1669	1592	1536	1431	1460
Qld:	Prod. (Kt)	1886	1614	1036	1066	1400
	Area ('000 ha)	953	866	758	670	700
WA:	Prod. (Kt)	11045	6744	9977	8824	8800
	Area ('000 ha)	5156	4909	5115	5071	5150
SA:	Prod. (Kt)	4525	3679	4254	4202	4376
	Area ('000 ha)	2249	2119	1927	1886	2000
Tas:	Prod. (Kt)	32	30	43	44	33
	Area ('000 ha)	7	6	8	8	8

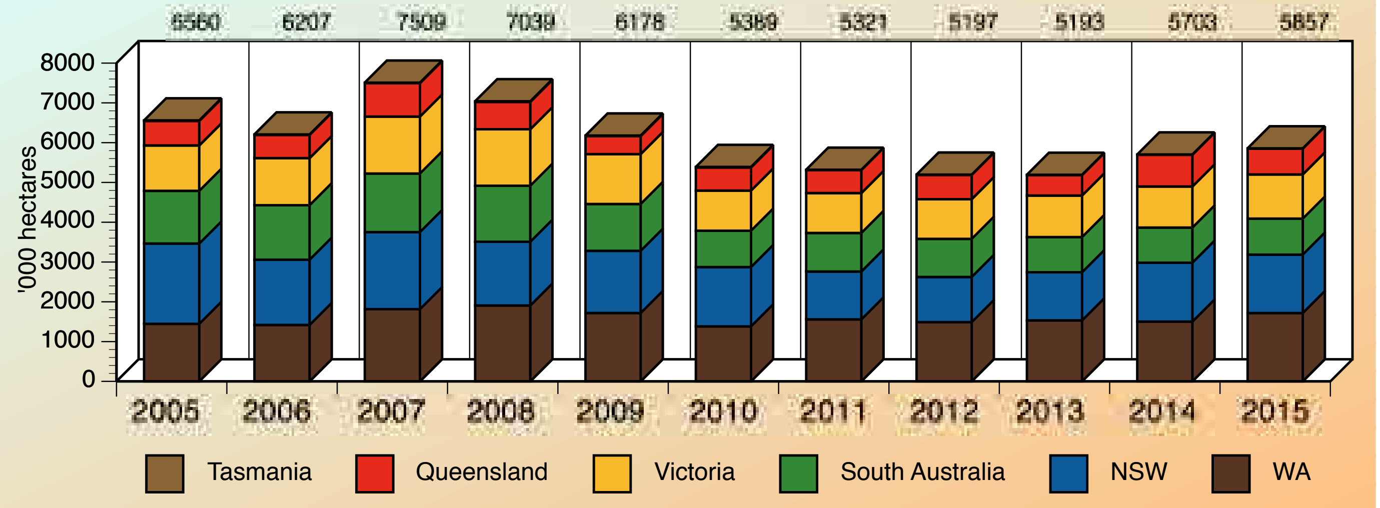
Barley production & area by state

		2011	2012	2013	2014	2015
NSW:	Prod. (Kt)	1425	1286	1486	1793	1890
	Area ('000 ha)	673	619	715	860	900
Vic:	Prod. (Kt)	2005	1952	2036	1327	1300
	Area ('000 ha)	831	854	919	882	960
Qld:	Prod. (Kt)	191	170	180	240	155
	Area ('000 ha)	80	90	106	124	75
WA:	Prod. (Kt)	2761	2252	3556	3040	3250
	Area ('000 ha)	1246	1215	1258	1255	1350
SA:	Prod. (Kt)	1816	1794	1892	1756	1881
	Area ('000 ha)	881	861	810	786	810
Tas:	Prod. (Kt)	23	17	25	17	14
	Area ('000 ha)	6	5	6	5	5

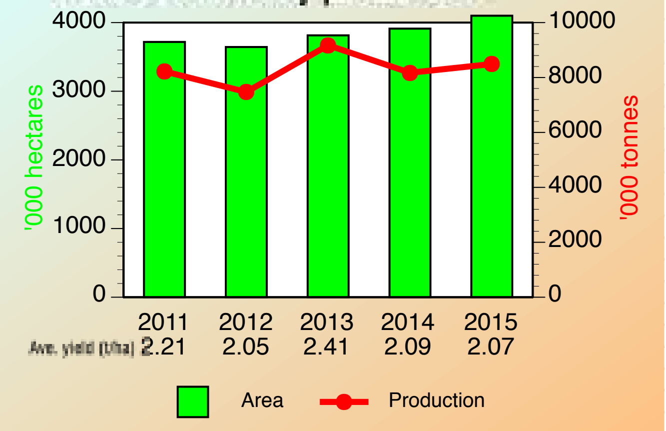
Australian coarse grain production (includes barley, oats, triticale, sorghum and maize production for grain)



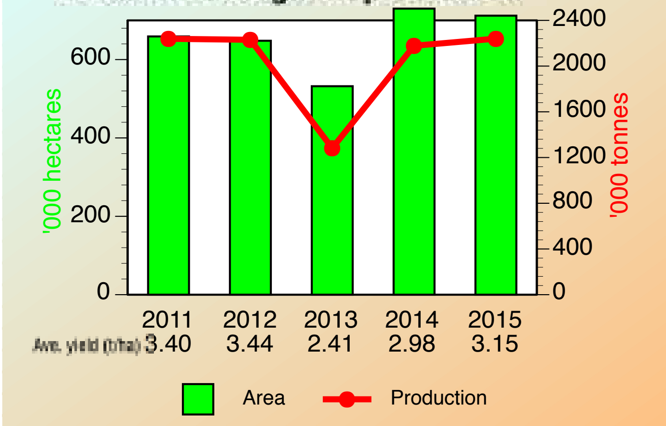
Total Australian coarse grains area (includes barley, oats, triticale, sorghum and maize production for grain)



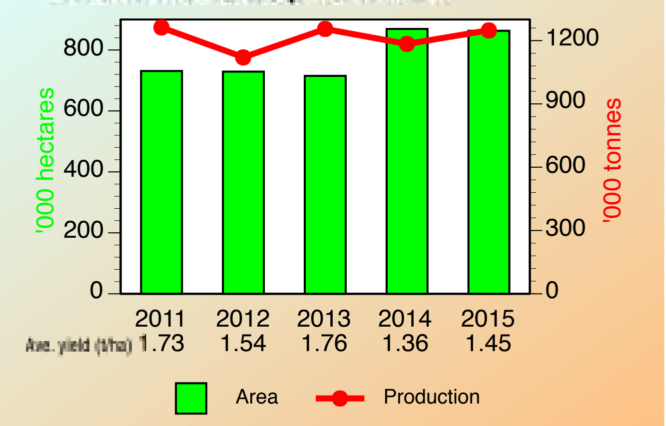
Australian barley production



Australian sorghum production



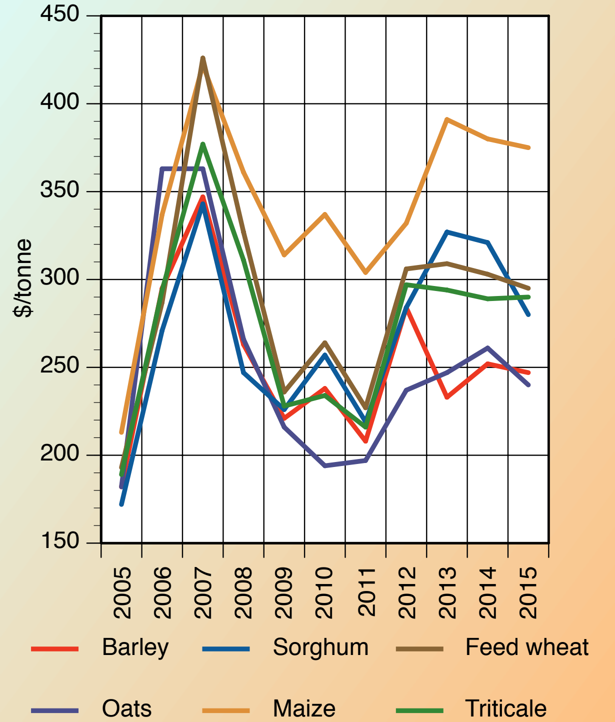
Australian oats production



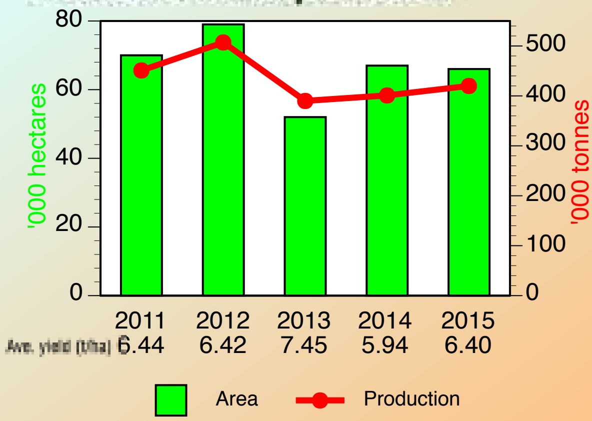
Supply and disposal of Australian coarse grains (Kt)

	2011	2012	2013	2014	2015
BARLEY					
Production	8221	7472	9174	8173	8490
Domestic use & stocks	1653	2307	2050	1965	2627
Exports	6568	5165	7124	6208	5863
OATS					
Production	1262	1121	12355	1184	1249
Domestic use & stocks	1099	921	12136	912	861
Exports	163	200	219	272	388
SORGHUM					
Production	2239	2229	1282	2178	2240
Domestic use & stocks	1127	938	581	973	1274
Exports	1112	1291	701	1205	966
MAIZE					
Production	451	506	390	401	420
Domestic use & stocks	383	372	307	343	355
Exports	68	134	83	58	65
TRITICALE					
Production	285	171	126	225	191
Domestic use & stocks	285	171	126	225	191
TOTAL (production), Kt	**12451**	**11499**	**12225**	**12161**	**12589**

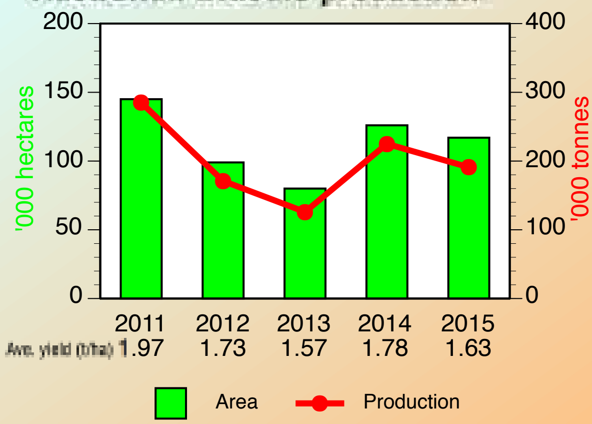
Australian coarse grains domestic feed prices ($/tonne delivered capital city)



Australian maize production



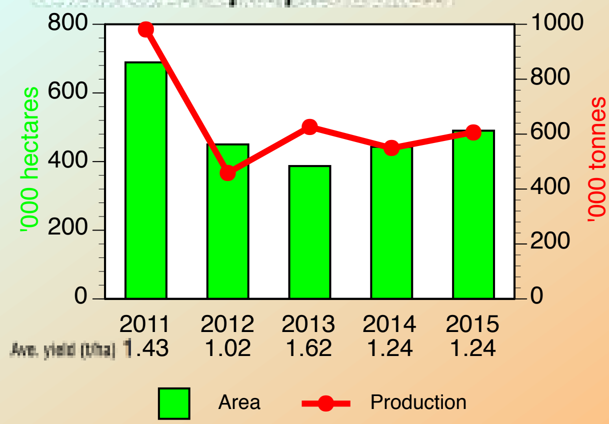
Australian triticale production



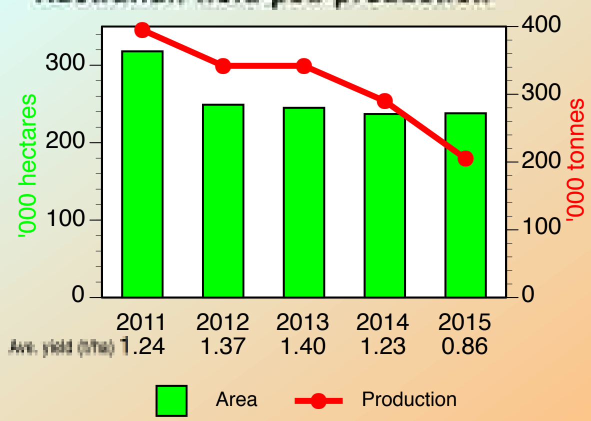
Supply and disposal of Australian pulses (Kt)

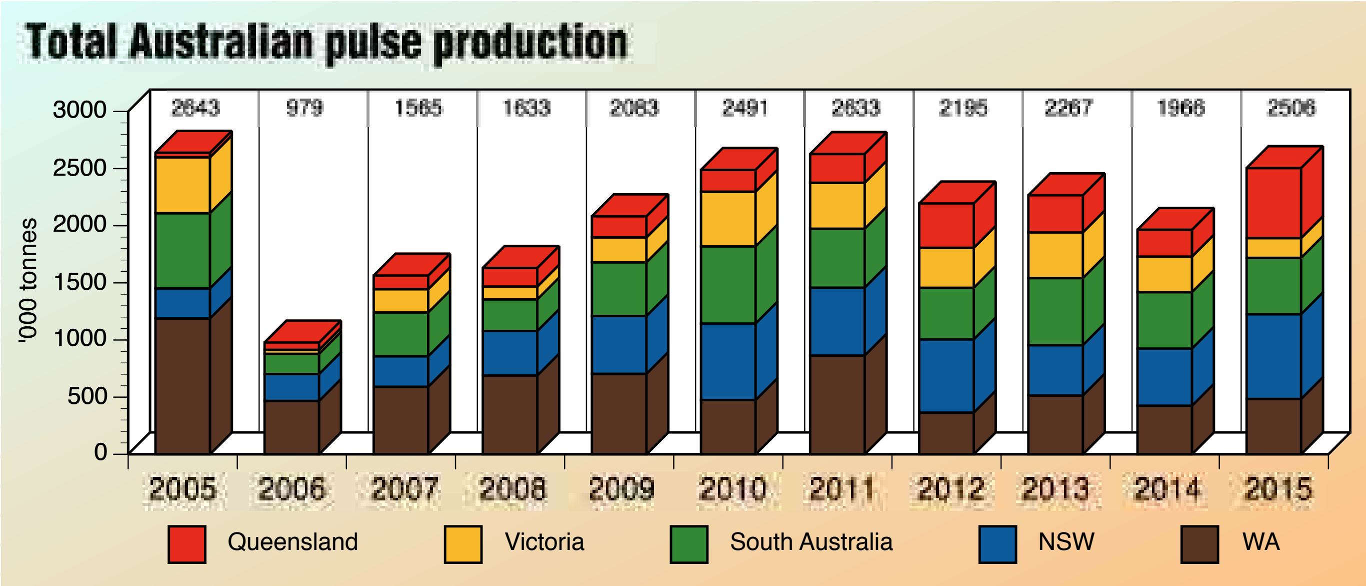
	2011	2012	2013	2014	2015
LUPINS					
Production	982	459	626	549	607
Domestic use & stocks	416	290	310	299	346
Exports	565	169	316	250	261
FIELD PEAS					
Production	342	320	342	290	205
Domestic use & stocks	130	145	175	124	64
Exports	215	177	169	168	141
CHICKPEAS					
Production	673	813	629	555	1013
Domestic use & stocks	93	1	0	3	4
Exports	581	853	629	663	1007

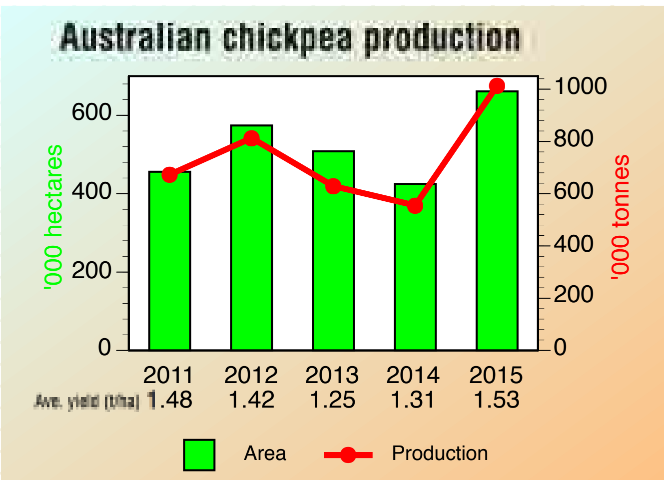
Australian lupin production

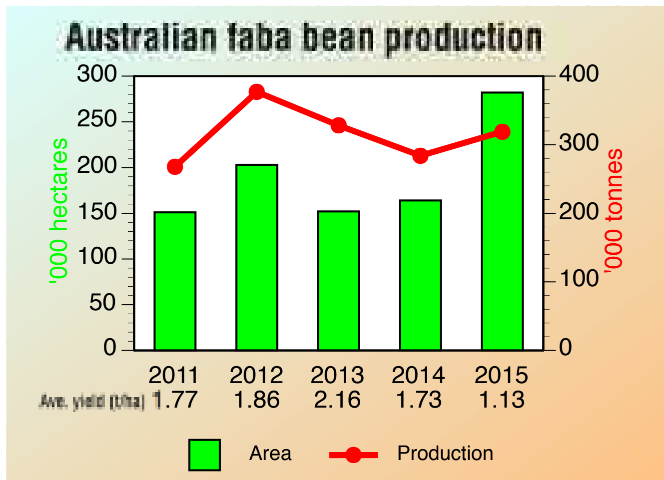


Australian field pea production

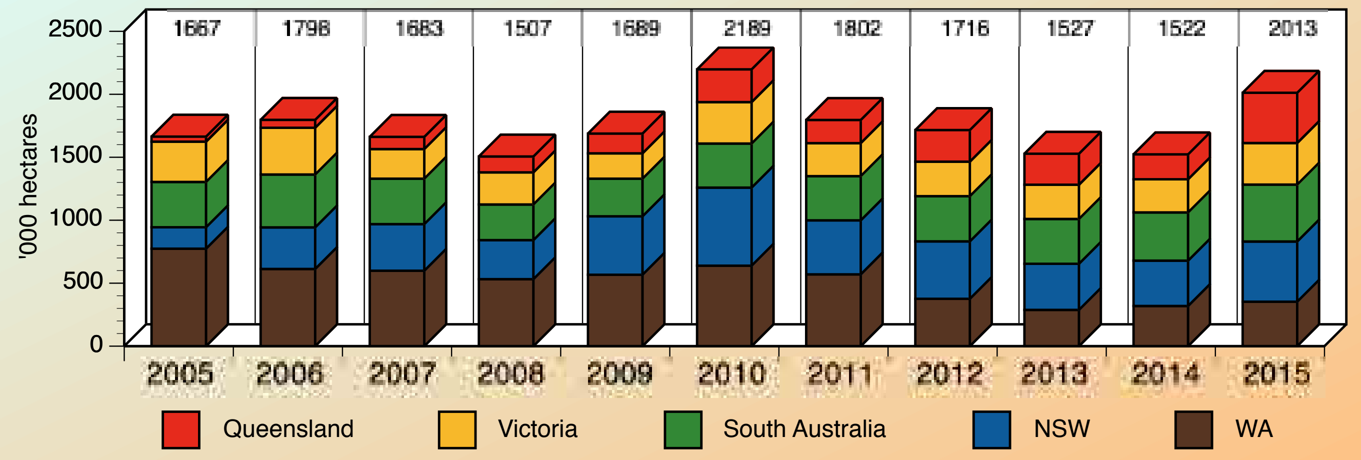



Total Australian pulse production
'000 tonnes
3000
2500
2000
1500
1000
500
0
2643 979 1565 1633 2063 2491 2633 2195 2267 1966 2506
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Queensland
Victoria
South Australia
NSW
WA

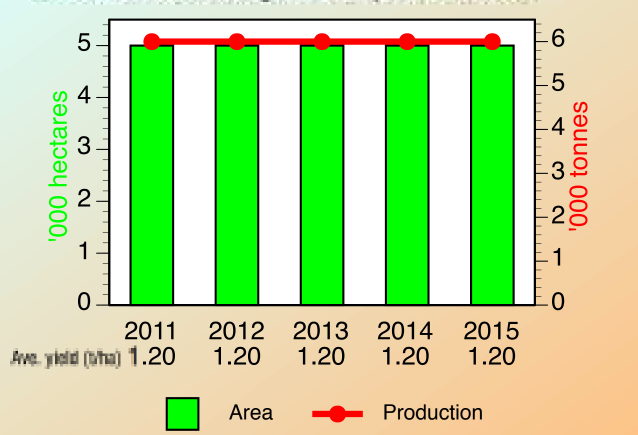

Australian chickpea production
'000 hectares
600
400
200
0
1000
800
600
400
200
0
'000 tonnes
2011 2012 2013 2014 2015
Ave. yield (t/ha) 1.48 1.42 1.25 1.31 1.53
Area
Production


Australian faba bean production
'000 hectares
300
250
200
150
100
50
0
400
300
200
100
0
'000 tonnes
2011 2012 2013 2014 2015
Ave. yield (t/ha) 1.77 1.86 2.16 1.73 1.13
Area
Production

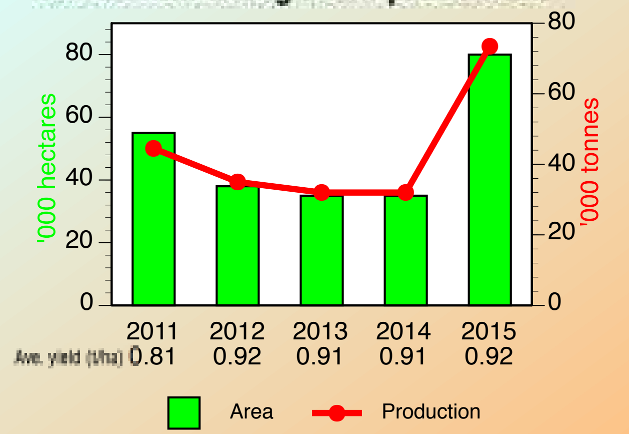
Total Australian pulse area



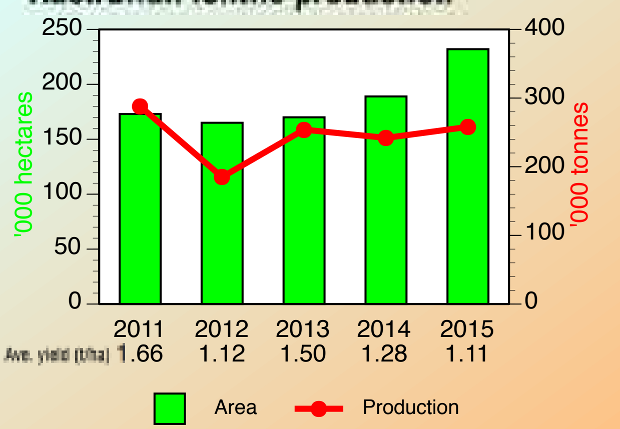
Australian navy bean production



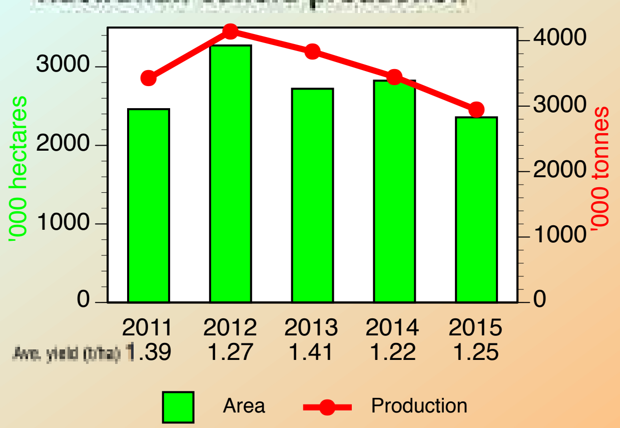
Australian mung bean production

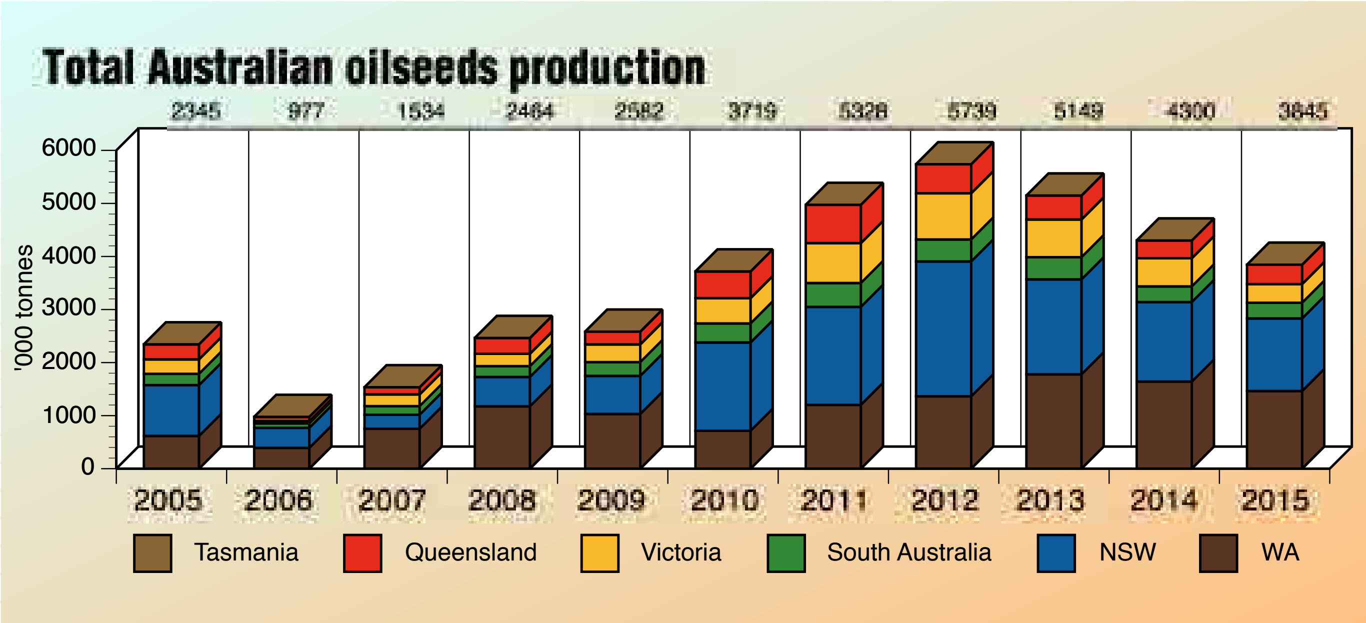


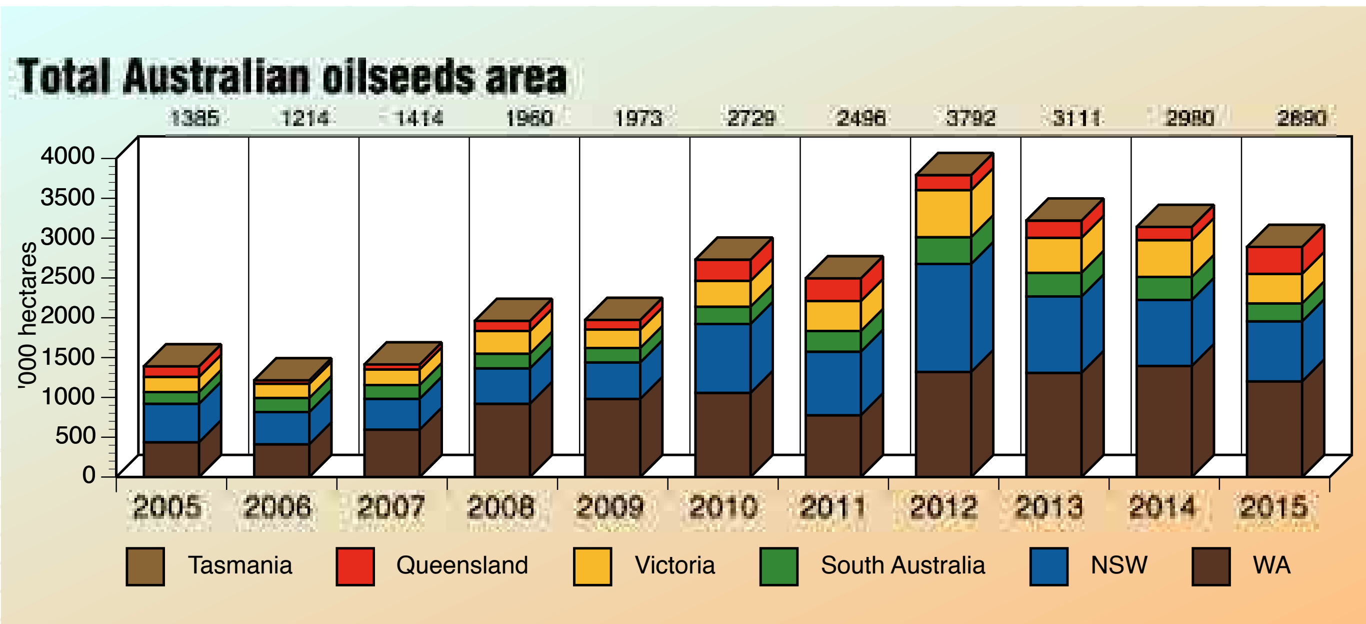
Australian lentils production

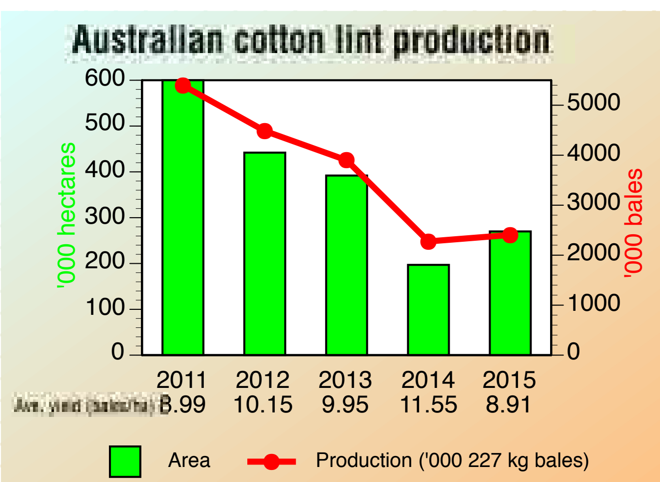


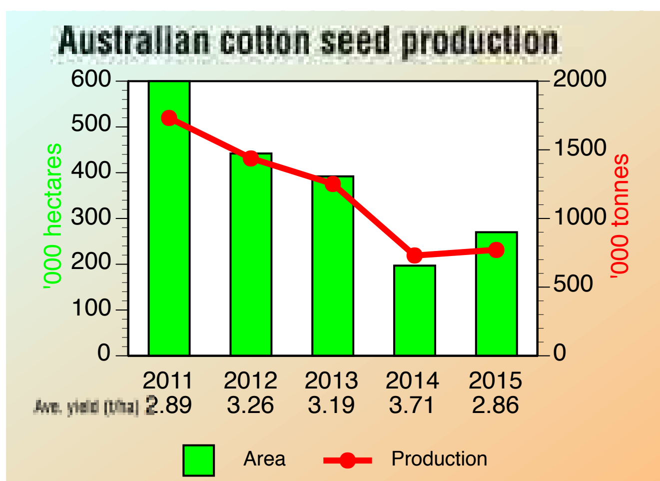
Australian canola production

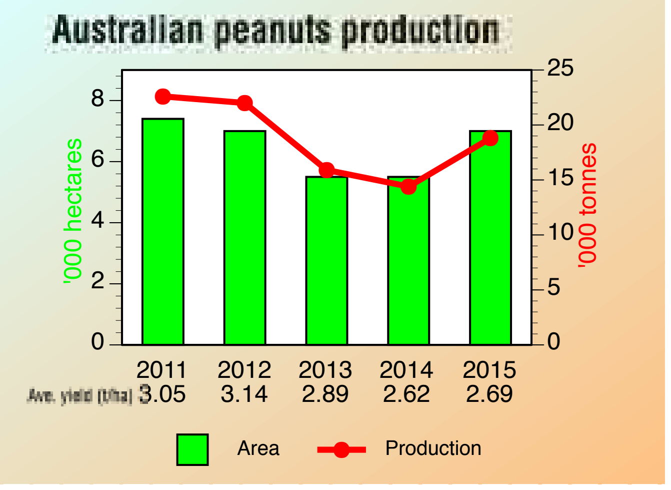


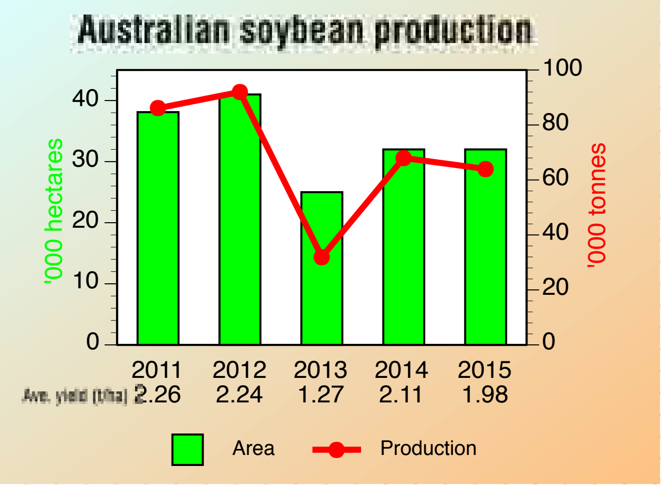

Total Australian oilseeds production
2345 977 1534 2464 2582 3719 5328 5739 5149 4300 3845
'000 tonnes
6000
5000
4000
3000
2000
1000
0
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Tasmania
Queensland
Victoria
South Australia
NSW
WA

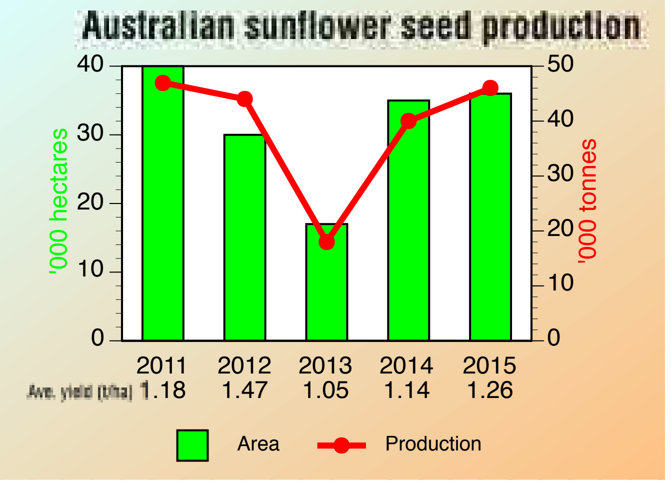

Total Australian oilseeds area
1385 1214 1414 1960 1973 2729 2496 3792 3111 2980 2890
'000 hectares
4000
3500
3000
2500
2000
1500
1000
500
0
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Tasmania
Queensland
Victoria
South Australia
NSW
WA


Australian cotton lint production
'000 hectares
600
500
400
300
200
100
0
'000 bales
5000
4000
3000
2000
1000
0
2011 2012 2013 2014 2015
Ave. yield (bales/ha) 8.99 10.15 9.95 11.55 8.91
Area
Production ('000 227 kg bales)


Australian cotton seed production
'000 hectares
600
500
400
300
200
100
0
'000 tonnes
2000
1500
1000
500
0
2011 2012 2013 2014 2015
Ave. yield (t/ha) 2.89 3.26 3.19 3.71 2.86
Area
Production







Australian canola production, domestic use, seed and oil exports (Kt)

	2011	2012	2013	2014	2015
Seed production	3427	4142	3832	3447	2945
DOMESTIC USE	871	631	969	821	na
Crushers	*558*	*596*	*557*	*560*	*na*
EXPORTS					
Seed	2323	3488	3194	2445	2146
Oil	117	116	152	159	na
Meal	22	41	42	37	na

Australian exports of oilseeds, vegetable oils and meals, by type (Kt)

		2010	2011	2012	2013	2014	2015
OILSEEDS	**Canola**	1471.0	2323.0	3488.0	3194.0	2445.0	2146.0
	Cottonseed	267.9	653.6	753.6	463.7	166.7	112.0
	Linseed	0.02	0.01	0.05	0.02	0.01	na
	Peanuts	3.5	2.9	2.8	3.2	3.0	na
	Safflowerseed	0.1	1.2	3.1	0.9	0.4	na
	Soybeans	2.1	1.1	3.1	9.0	2.2	na
	Sunflowerseed	0.94	0.61	0.95	0.51	0.17	na
	TOTAL (Kt)	**1745.3**	**2982.3**	**4251.4**	**3671.6**	**2617.4**	**>2300**
OILS	**Canola**	104.2	117.3	116.2	151.7	159.5	na
	Cottonseed	18.2	2.1	3.7	3.0	4.3	na
	Peanut	0.08	0.07	0.38	0.70	1.19	na
	Safflower & Sunflowerseed	0.20	0.40	1.5	0.22	0.04	na
	Soybeans	0.97	0.18	1.4	2.1	5.0	na
	Olive	6.1	5.2	3.0	4.9	4.4	na
	TOTAL (Kt)	**146.7**	**140.4**	**146.0**	**181.3**	**193.4**	**na**
OILSEED MEALS	**Cottonseed**	31.7	42.1	42.6	35.8	22.5	na
	Soybeans	3.5	6.4	2.9	2.0	1.4	na
	Canola	31.5	21.6	41.2	42.2	36.9	na
	Sunflowerseed	1.8	2.0	1.7	0.0	0.0	na
	Other	35.4	21.7	43.1	43.9	37.8	na
	TOTAL (Kt)	**103.9**	**93.8**	**131.5**	**123.9**	**98.6**	**na**

Australian gross grain prices ($A/tonne delivered to principal market/port, averaged across all grades)

	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16f
Wheat (APW 10 net pool return)	341	256	368	275	326	334	326	316
Barley (feed)	263	221	238	208	284	233	252	247
Oats	266	216	194	197	237	247	261	240
Triticale	311	228	234	216	297	294	289	290
Maize	361	314	337	304	332	391	380	375
Sorghum	247	226	257	219	284	327	321	280
Rice (average return to growers)	566	457	240	270	260	340	412	426
Lupins	280	269	268	232	340	345	292	290
Field peas	345	241	266	295	406	419	413	441
Chickpeas	450	443	404	457	394	352	567	697
Sunflowerseed (at crusher)	696	696	567	551	570	660	627	650
Soybeans	551	551	501	510	468	538	538	559
Canola	548	440	544	513	560	529	482	547

Gross value of Australian grain production ($A million)

	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16f
Wheat	6021	4765	7052	6775	7154	7998	6914	7211
Barley	1850	1356	1729	1723	2063	2453	2286	2346
Oats	251	186	221	255	265	268	296	315
Triticale	93	120	65	50	43	32	57	45
Maize	106	88	92	113	120	116	112	117
Sorghum	553	296	412	423	562	384	655	587
Rice	34	90	174	248	302	279	298	130
Lupins	198	222	216	228	156	216	160	176
Field peas	82	86	105	101	130	143	120	90
Chickpeas	199	216	207	308	320	222	315	706
Canola	1011	840	1283	1759	2270	2129	1737	1639
Sunflowerseed	38	29	24	16	22	12	25	30
Soybeans	44	33	15	27	33	17	37	36
Peanuts, linseed, safflower seed	28	37	30	44	33	22	15	19
TOTAL	**10508**	**8364**	**11625**	**12471**	**13919**	**14791**	**13568**	**14142**

Value of major Australian grain exports ($A million, fob)

	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16f
Wheat (incl. flour)	5028	3692	5516	6378	6776	6103	5547	5604
Barley (incl. malt)	1321	1093	1295	1875	1626	2199	2137	1871
Oats	64	53	37	47	65	85	101	138
Sorghum	405	116	146	299	364	253	424	329
Rice	143	43	165	427	459	490	506	398
Lupins	61	115	89	86	143	116	119	118
Field peas + Cow peas	62	60	85	93	89	67	91	73
Chickpeas	275	255	213	384	533	297	414	878
Cottonseed	19	46	85	195	219	168	75	57
Canola	595	583	866	1344	2094	1929	1349	1252
Other oilseeds	27	24	14	10	13	18	14	24
TOTAL	**8000**	**6080**	**8511**	**11598**	**12850**	**12300**	**11348**	**11072**

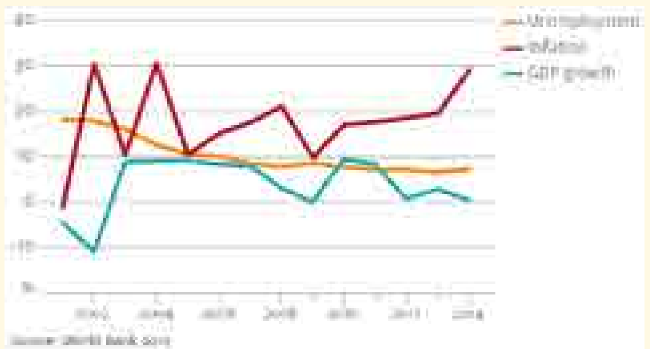
Recent developments in Argentina's agricultural export policies

By Lex Williamson, ABARES

Argentina is the second-largest agricultural exporter in Latin America. But until recently export restrictions and currency controls constrained the growth of Argentine agricultural production and exports. Following the presidential election in late 2015, these restrictions were either removed or reduced. With Argentina being a significant competitor for Australia on the international grain stage, these developments may well impact on returns to Australian growers.

In 2001 and 2002 Argentina faced a financial crisis triggered by a range of factors, including high foreign debt and currency overvaluation. The economy contracted, with gross domestic product (GDP) falling by 4.4 per cent in 2001 and by 10.9 per cent in 2002. In late 2001, the crisis resulted in Argentina's sovereign default on foreign debt and a significant government budget deficit. To increase revenue, one measure taken by the Argentine Government was to impose export taxes on major agricultural commodities.

Economic indicators, Argentina, 2000 to 2014



In 2003 the government embarked on high government spending and interventionist policies. Key institutions were nationalised and export taxes were raised for many agricultural commodities. Increased public spending encouraged higher workforce participation and led to a period of strong economic growth. But the high public spending fuelled inflation, which rose by an average of around 17 per cent a year over the period 2003 to 2011.

Despite relatively high economic growth, the interaction of high inflation with currency controls hindered the Argentine economy. From 2002 the Central Bank of Argentina set the exchange rate of the Argentine peso against the US dollar, resulting in its overvaluation. Overvaluation of the peso lowered the comparative returns of businesses converting currency through the official channels. This and other factors contributed to the stagnation of foreign investment in Argentina.

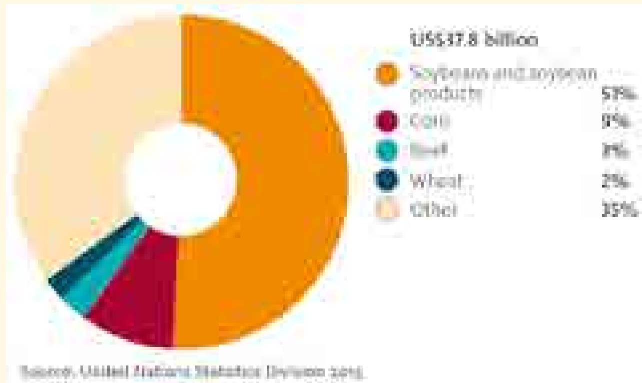
Between 2012 and 2014, GDP growth slowed significantly to an average of 1.4 per cent a year, reflecting the economic costs of high inflation and rising public sector debt coupled with falling foreign reserves.

Argentina's agricultural sector

Agriculture accounted for around 10 per cent of Argentina's GDP in 2014, with agricultural exports of US$37.8 billion or 55 per cent of total Argentine exports.

Argentina's major agricultural exports are soybeans and soybean products, corn, beef and wheat. In 2014 Argentina was the world's largest exporter of soybean meal and soybean oil, the third-largest exporter of soybeans and the fourth-largest exporter of corn.

Argentine agricultural exports, 2014



Argentina's largest agricultural export markets in 2014 were mainly in Asia (35 per cent), with China accounting for almost 11 per cent. Other significant markets included the European Union (18 per cent) and other South American countries (20 per cent), particularly Brazil (7 per cent).

Agricultural export policy

Export taxes on major Argentine agricultural exports were first introduced in 2002 in response to decreased government revenue resulting from the financial crisis. As well as boosting revenue, this policy allowed the Argentine Government to address other domestic concerns such as maintaining low food prices for consumers by constraining exports and increasing domestic supply. Export taxes slowed export growth. But the real value of grain and oilseed exports (in 2014 US dollars) continued to grow by an average of 25 per cent a year and beef exports by an average of 36 per cent a year between 2002 and 2007.

In 2007 the Argentine Government raised export taxes on major agricultural products. The government increased rates by between 10 and 15 percentage points, with the new rates ranging from 15 per cent for beef to 35 per cent for soybeans. Export growth remained positive in 2007, but another increase to the export tax rates in 2008 contributed to a 6 per cent decrease in the volume of grain and oilseed exports in that year. In 2009 the cropping sector contracted significantly, with total grain

and oilseed production falling by 32 per cent and exports by 30 per cent. Beef production was not affected by the change to export taxes because around 90 per cent of production is consumed domestically.

In May 2008 an export permit system known as the Register of Export Operations (ROE) was introduced and coexisted with the export tax system. The ROE functioned as a quantitative restriction on agricultural exports, requiring exporters to obtain government approval before exports could take place. The aim of the ROE was to ensure a sufficient domestic supply of agricultural products and keep domestic prices below world prices. Commodities considered staples in the Argentine diet, including wheat and beef, were subject to more stringent restrictions.

High export taxes and the increasingly tight restrictions imposed by the ROE resulted in agricultural production stagnating between 2010 and 2014. As a result, the total volume of grain and oilseed exports declined by 17 per cent between 2010 and 2014 and the volume of beef exports fell by 8 per cent, to roughly half of what it had been in 2007.

Table 1: Argentine agricultural export taxes

Commodity	Pre-election rate (November 2015) %	Post-election rate (January 2016) %
Soybeans	35	30a
Soybean oil	32	27a
Soybean meal	32	27a
Sunflower seeds	32	0
Peanuts	23.5	0
Wheat	23	0
Corn	20	0
Barley	20	0
Beef	15	0

a To be reduced by 5 percentage points a year until eliminated in 2021.
Source: USDA–FAS 2015a

Presidential elections of 2015

In November 2015 President Macri was elected on a platform of economic liberalisation. His government removed or reduced most export taxes, export permits and currency controls affecting agricultural products. ROE export permits for grains and oilseeds were removed and replaced with a new reporting system of Affidavits of Foreign Sale that requires exporters to report only what they export rather than seeking approval to export. At time of publication, changes had not been made to the export permit requirements for beef.

Unlike other agricultural products, export taxes on soybeans and soybean products are subject to a phased removal, with planned annual reductions of 5 percentage points starting in 2015 and ending in 2021. In 2014 soybeans and soybean products accounted for almost 51 per cent of the value of Argentina's total agricultural exports and 28 per cent of total exports.

In December 2015 the new Argentine government also introduced a floating exchange rate scheme. This allows both domestic and foreign firms to freely convert pesos to foreign currency. Following this change the peso depreciated by around 25 per cent by 1 January 2016, from 9.8 pesos to US$1 to around 13 pesos to US$1. A lower value of the peso against major world currencies is expected to increase farm sector incomes and improve the competitiveness of Argentine agricultural exports on the world market.

Implications

The removal or reduction of export restrictions and currency controls by the Argentine government is expected to lead to both short-term and long-term changes to Argentina's agricultural sector. In the short term, exports of grains and oilseeds are expected to increase because large stockpiles of soybeans, corn and wheat are likely to be made available for export. At the end of September 2015 the United States Department of Agriculture estimated that a total of 36 million tonnes of soybeans, wheat and corn were held by producers in stocks, with the majority being soybeans. This was 44 per cent higher than average closing stock volumes between 2010 and 2014.

The continued use of export taxes on soybeans and related products is likely to discourage a significant increase in soybean production in the short term as corn and wheat become relatively more profitable and the areas planted to those crops increase at a greater rate. But as the tax rates on soybeans decline in the longer term, Argentine grain production is expected to adjust. Production of major exported crops is expected to rise as farmers respond to the policy changes in future planting seasons.

Beef and livestock exports are also expected to gradually increase over the longer term as producers adjust to the removal of export taxes. But the extent of any increase will depend on whether and when quantitative export restrictions are lifted. Because beef is an important staple food in Argentina, the government may be less likely to remove the quantitative restrictions quickly to prevent any significant domestic price increase for beef.

Domestic producers are expected to benefit significantly from the more liberal trading environment because they will be able to freely sell their stockpiled grains and any chosen volume of production on the world market for a greater return than previously. Export returns will also be supported by the devaluation of the peso. ■

World supply and demand for wheat and total coarse grains, million tonnes (Mt)

Supply and demand for wheat (by major producer)	Opening stocks	Production	Imports	Total supply	Total use	Exports	Closing stocks
Argentina							
2013	0.2	9.2	0	9.4	5.2	2.5	1.7
2014	1.7	13.9	0	15.6	5.7	5.4	4.5
2015	4.5	11.3	0	15.8	6.3	7.2	2.3
Australia							
2013	5.8	25.3	0	31.1	6.6	18.3	6.1
2014	6.1	23.1	0	29.2	6.9	16.6	5.7
2015	5.7	24.2	0	29.9	7.2	16.9	5.8
Canada							
2013	5.1	37.5	0.1	42.6	8.8	23.5	10.4
2014	10.4	29.4	0.1	39.8	8.9	23.9	7.1
2015	7.1	27.6	0.1	34.7	8.7	22	4
China							
2013	53.7	121.9	6.7	182.4	123.3	0.3	58.7
2014	58.7	126.2	2.1	187.1	123.4	0.2	63.4
2015	63.4	130.2	2.5	196.1	119.5	0.3	76.3
EU-27							
2013	8.8	143.2	4.1	156.1	113.8	32.8	9.5
2014	9.5	156.1	6.2	171.8	123.6	36.2	12
2015	12	159.3	5.7	176.9	126.8	32.8	17.3
India							
2013	24.2	93.5	0.1	117.7	93.9	6	17.8
2014	17.8	95.9	0.3	113.9	93.3	3.4	17.2
2015	17.2	86.5	0.6	104.3	89.8	0.5	14
Russia							
2013	7.3	52.1	1.0	60.4	35.8	18.5	6.1
2014	6.1	59.1	0.4	65.6	36.6	22.2	6.9
2015	6.9	61	0.7	68.5	37.6	23.4	7.5
Ukraine							
2013	3.0	22.3	0	25.3	11.9	9.5	3.9
2014	3.9	24.7	0	28.6	12	11.2	5.5
2015	5.5	27.3	0	32.7	12.9	15.1	4.8
United States							
2013	19.5	58.1	4.6	82.3	34.2	32.1	16.1
2014	16.1	55.1	4.1	75.3	31.6	23.2	20.25
2015	20.5	55.8	3.4	79.7	32.2	20.5	27.1
Total world supply and demand for wheat (Mt)							
2013	169.8	717.4	156.5	887.2	698.9	156.5	188.4
2014	188.4	728.7	153.4	917.1	716.4	153.4	200.6
2015	200.6	733.8	153.9	934.4	720.2	153.9	214.2
Total world supply and demand for coarse grains (ie. total of corn, barley, sorghum, oats & rye) (Mt)							
2013	163.5	1281.0	156.2	1600.7	1233.4	164.4	211.2
2014	211.2	1298.5	168.5	1678.2	1268.5	185.2	241.1
2015	241.1	1263.6	166.9	1671.6	1261.6	160.7	243.1
Total world supply and demand for wheat and coarse grains (Mt)							
2013	333.3	1998.4	312.7	2487.9	1932.3	320.9	399.6
2014	399.6	2027.2	321.9	2595.3	1984.9	338.6	441.7
2015	441.7	1997.4	320.8	2606.0	1981.8	314.6	457.3

Summary of world statistics for wheat

	Area (million ha)	Production (Mt)	Use (Mt)	CLOSING STOCKS World (Mt)	CLOSING STOCKS Major exporters (Mt)	Stocks to use ratio (%)	Trade (imports) (Mt)	Price US$ (Hard Red Winter, Gulf)
2007	215	607	602	132	48	22	110	362
2008	223	685	645	172	69	27	137	271
2009	222	678	652	199	77	31	128	209
2010	218	652	659	194	74	29	126	317
2011	221	697	698	192	68	28	145	299
2012	215	655	677	169	50	25	141	348
2013	219	717	699	188	54	27	157	317
2014	223	729	716	201	63	28	153	266
2015	223	734	720	214	70	30	154	215

World wheat production by region (Mt)

	Argen.	Aust.	Canada	China	EU 27	India	Iran	Kazak.	North Africa	Other FSU 12	Pakis.	Russia	Turk.	Ukraine	US	TOTAL WORLD
2008	11.0	21.4	28.6	112.5	150.7	78.6	10.0	12.5	13.0	13.3	20.1	63.8	17.0	25.9	68.0	685
2009	11.0	21.8	26.8	115.1	138.3	80.7	12.0	17.1	17.0	14.2	24.0	61.8	18.5	20.9	60.4	678
2010	15.9	27.4	23.3	115.2	136.8	80.8	13.5	9.6	16.5	13.1	23.9	41.5	17.0	16.8	60.1	652
2011	14.5	29.9	25.3	117.4	137.4	86.9	12.4	22.7	18.4	13.8	25.0	56.2	18.8	22.3	54.4	697
2012	8.0	22.9	27.2	120.8	131.6	94.9	13.8	9.8	17.2	14.5	23.3	37.7	16.0	15.8	61.8	655
2013	9.2	25.3	37.5	121.9	143.2	93.5	14.5	13.9	19.7	15.6	24.2	52.1	18.8	22.3	58.1	717
2014	13.9	23.1	29.4	126.2	156.1	95.9	13.0	13.0	16.9	15.9	25.0	59.1	15.3	24.7	55.1	729
2015	11.3	24.2	27.6	130.2	159.3	86.5	13.8	13.7	20.0	15.5	25.5	61.0	18.0	27.3	55.8	734

TABLE NOTES...

European Union 27 (EU 27) consists of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany (originally West Germany), Great Britain, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

Former Soviet Union 12 (FSU 12) consists of Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

Near East Asia refers to Iran, Saudi Arabia, Syria and Turkey.

Far East Asia refers to China, Afghanistan, India and Pakistan.

Southeast Asia refers to Indonesia, Malaysia, Philippines, Thailand and Vietnam.

Major world wheat trading regions/countries (Mt)

	2011	2012	2013	2014	2015
IMPORTS					
Brazil	7.3	7.4	7.1	5.4	6.5
EU 27	7.4	5.3	4.1	6.0	6.3
FSU 12	8.0	7.2	7.4	7.7	7.7
Japan	6.4	6.6	6.1	5.9	5.8
Mexico	5.0	3.8	4.6	4.5	4.4
Middle East	20.9	20.9	20.7	21.3	19.8
Northern Africa	24.9	22.1	25.2	25.2	24.1
Southeast Asia	17.4	15.8	16.4	19.9	20.1
EXPORTS					
Argentina	12.9	3.7	2.3	5.3	7.0
Australia	23.0	21.3	18.3	16.6	16.9
Canada	17.3	19.6	23.3	24.1	22.0
EU 27	16.7	23.5	32.0	35.4	32.5
US	28.6	27.4	32.0	23.2	21.1
Russia	21.6	11.2	18.6	22.8	23.0
Ukraine	5.4	7.1	9.8	11.3	15.5
Others	19.3	26.8	20.5	14.4	16.2
TOTAL WHEAT TRADE (Mt)	**144.8**	**140.6**	**156.8**	**153.1**	**154.2**

World durum wheat production and trade

	2011	2012	2013	2014	2015
PRODUCTION (Mt)					
Algeria	2.5	3.0	2.5	1.3	2.5
Australia	0.6	0.5	0.5	0.5	0.5
Canada	4.2	4.6	6.5	5.2	5.4
EU 27	8.2	8.2	8.1	7.6	8.5
India	1.1	1.2	1.2	1.3	1.2
Kazakhstan	3.0	1.4	2.0	2.0	2.1
Mexico	2.2	2.1	2.3	2.3	2.3
Syria	1.7	1.5	1.5	0.8	1.4
Turkey	3.0	3.3	4.1	3.3	4.1
United States	1.4	2.2	1.6	1.5	2.2
Other	8.8	7.7	8.6	8.7	9.6
WORLD TOTAL PROD'N (Mt)	**36.7**	**35.7**	**38.9**	**34.5**	**39.8**
MAJOR IMPORTERS (Kt)					
Algeria	1821	1613	1529	1748	1740
EU 27	1860	1453	1902	2828	2170
Japan	273	197	212	205	220
Morocco	661	765	734	633	640
United States	614	667	819	908	640
Venezuela	403	424	440	407	430
Other	1788	2285	2514	2531	2405
MAJOR EXPORTERS (Kt)					
Australia	348	237	245	102	50
Canada	3859	4289	4740	5680	4740
EU 27	1379	1390	1089	1207	1210
Mexico	918	841	1275	1039	1050
Turkey	2	1	4	101	100
United States	554	581	689	773	790
WORLD TOTAL TRADE (Kt)	**7420**	**7404**	**8150**	**9260**	**8245**
Semolina component (Kt)	*360*	*376*	*369*	*390*	*400*

Summary of world statistics for coarse grains

	2011	2012	2013	2014	2015
Area (million ha)	312	316	323	321	321
Production (Mt)	1155	1135	1281	1298	1264
Total use (Mt)	1159	1138	1233	1268	1262
Closing stocks: World (Mt)	169	166	211	241	243
Closing stocks: US (Mt)	22.9	23.5	34.3	47.0	51.3
S.T.U.R. (%)	14.6	14.6	17.1	19.0	19.2
Trade (Mt)	147	120	164	185	161

World coarse grains production by region and country (Mt)

	2011	2012	2013	2014	2015
Argentina	30.1	37.2	35.7	34.0	35.1
Australia	12.5	11.5	12.2	12.2	12.6
Brazil	75.9	84.2	82.6	87.6	86.6
Canada	22.9	24.4	28.7	22.0	25.7
China	199.3	212.2	225.4	222.8	231.6
EU 27	149.9	145.9	158.9	170.6	151.0
India	42.1	40.0	43.2	43.1	38.8
Mexico	25.7	28.9	32.0	32.4	30.8
Nth Africa & Mideast	26.0	26.5	31.1	26.9	33.2
Russia	33.1	28.7	35.7	40.4	37.3
Southeast Asia	25.1	25.3	26.8	26.9	27.7
Sub-Saharan Africa	80.1	81.2	80.5	82.0	80.1
Turkey	10.6	11.1	13.1	9.5	14.1
Ukraine	33.5	29.5	40.0	39.4	33.2
United States	323.7	285.3	367.1	377.2	366.9
Other	64.5	63.1	68.2	71.1	59.3
WORLD TOTAL (Mt)	**1155**	**1135**	**1281**	**1298**	**1264**
Corn Total	889.0	873.2	991.4	1009.7	969.6
Barley Total	134.0	130.8	145.0	143.1	147.8
Sorghum Total	57.0	57.2	58.8	64.3	66.6
Oats Total	22.3	21.1	23.8	23.0	22.4

Major world barley and sorghum producers (Mt)

	2011	2012	2013	2014	2015
BARLEY					
Argentina	4.5	5.0	4.7	2.9	3.6
Australia	8.2	7.5	9.2	8.2	8.5
Canada	7.9	8.0	10.2	7.1	8.2
China	1.7	1.6	1.7	1.8	1.7
EU 27	51.8	54.9	59.7	60.5	61.0
Russia	16.9	13.9	15.4	20.0	17.1
Turkey	7.0	5.5	7.3	4.0	7.4
Ukraine	9.1	6.9	7.6	9.4	8.7
United States	3.4	4.8	4.7	3.9	4.7
TOTAL WORLD PROD'N (Mt)	133	129	144	141	146
SORGHUM					
Argentina	4.2	4.7	4.4	3.5	3.9
Australia	2.2	2.2	1.3	2.2	2.2
India	6.0	5.3	5.5	5.4	5.5
Mexico	6.4	6.2	8.5	6.3	6.6
Sub-Saharan Africa	23.3	23.4	22.8	24.1	22.3
United States	5.4	6.3	9.9	11.0	15.2
TOTAL WORLD PROD'N (Mt)	57	58	61	64	68

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World coarse grains trade by region and country (Mt)

	2011	2012	2013	2014	2015
IMPORTS					
China	7.9	5.6	12.4	25.7	17.2
EU 27	6.9	11.8	16.3	9.3	16.2
Japan	17.7	17.7	17.5	16.7	17.0
Mexico	12.8	7.7	11.3	11.6	12.2
Middle East & Northern Africa	25.0	23.5	30.7	34.1	29.9
Saudi Arabia	10.5	12.4	11.3	11.1	11.5
South Korea	7.7	8.3	10.5	10.3	10.1
Southeast Asia	6.7	8.0	10.7	11.4	11.0
United States	3.1	6.5	3.3	3.3	3.6
EXPORTS					
Argentina	22.3	29.5	16.6	21.0	22.8
Australia	7.9	6.8	8.1	7.7	7.3
Brazil	12.7	26.1	22.1	21.9	37.5
Canada	3.8	4.7	5.5	3.6	4.1
EU 27	7.2	8.9	7.8	15.1	10.5
Russia	6.0	4.4	7.1	9.1	6.9
Ukraine	17.5	15.5	24.1	24.2	19.3
United States	40.1	20.6	56.8	56.3	49.9
TOTAL WORLD TRADE (Mt)	**133**	**132**	**164**	**185**	**161**

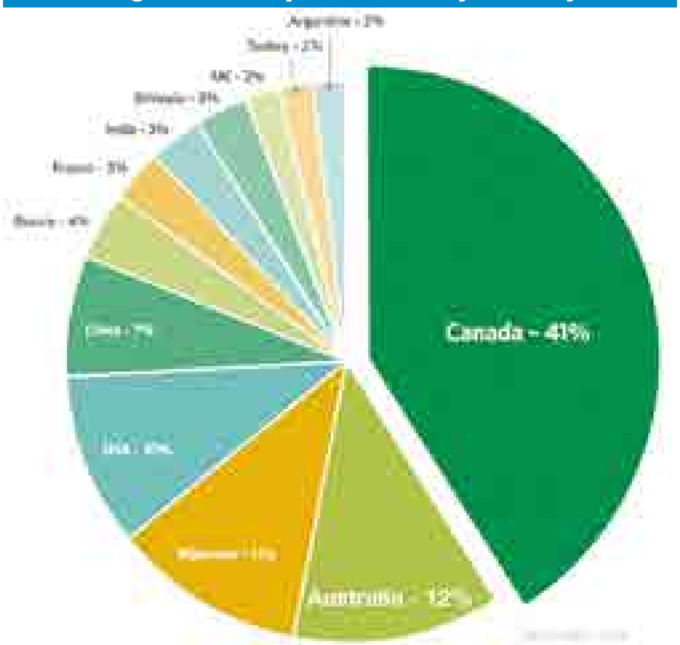
World barley trade by region (Kt)

	2011	2012	2013	2014	2015
MAJOR IMPORTERS					
Algeria	501	364	778	723	600
Brazil	274	369	338	489	400
China	2541	2184	4891	9859	7500
Iran	1700	1100	1100	1900	1500
Japan	1257	1356	1294	1097	1300
Libya	183	573	681	1001	900
Saudi Arabia	8600	10200	8500	8200	8000
Tunisia	218	764	456	483	400
United Arab Emirates	524	541	468	400	400
Uruguay	77	252	126	189	175
Others	5521	4427	5196	5720	5160
MAJOR EXPORTERS (feed and malting)					
Argentina	3631	3647	2829	1598	2200
Australia	6568	5165	7124	6208	5863
Canada	1437	1316	1714	1384	1350
EU 27	3646	6473	4926	10642	9000
Kazakhstan	659	151	501	476	600
Russia	3668	2366	2791	5803	3000
Ukraine	2166	2659	3827	4332	3600
United States	179	163	336	292	300
TOTAL EXPORTS (Kt)	**21396**	**22130**	**23828**	**30061**	**26335**

World sorghum trade by country (Kt)

	2011	2012	2013	2014	2015
IMPORTS					
Chile	487	485	206	152	150
Colombia	453	707	194	40	50
EU27	78	254	208	125	125
Israel	3	50	85	11	10
Japan	1343	1934	1034	876	825
Mexico	1392	2090	501	11	450
New Zealand	72	92	29	5	10
Sudan	187	114	194	144	150
Others	614	1238	3883	6423	6423
MAJOR EXPORTERS					
Argentina	1595	3216	1114	1223	1050
Australia	1112	1291	701	1205	966
China	52	32	11	9	8
India	104	236	82	111	90
United States	1772	2064	4093	8951	7950
TOTAL EXPORTS (Kt)	**6500**	**7102**	**6467**	**11785**	**10510**

Percentage of world pulse trade by country



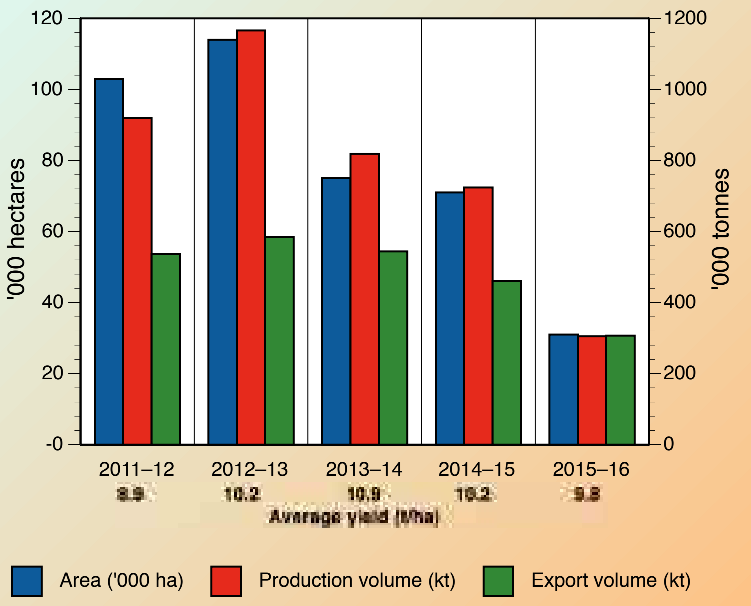
Major world pulse trade and production (Kt)

	2009	2010	2011	2012	2013	2014	2015
IMPORTS: Asia	4840	3761	5000	na	na	na	na
India	*3750*	*2304*	*3222*	*3816*	*3845*	*4500*	*5370*
Africa	718	1088	928	**814**	na	na	na
Americas	1154	1125	1138	**1394**	na	na	na
Europe	1130	1204	1108	**1242**	na	na	na
Middle East	380	314	368	**338**	na	na	na
EXPORTS: Americas	5842	6083	5889	**5333**	na	na	na
Canada	*4193*	*4307*	*4308*	*3367*	*5237*	*5982*	*6225*
Asia	2743	2644	1797	**2473**	na	na	na
Europe	1168	1065	1109	**1015**	na	na	na
Turkey	239	254	267	**248**	na	na	na
Australia	1312	1437	1992	2167	1786	**1720**	**1994**
TOTAL WORLD PULSE TRADE (Kt)	**11811**	**11199**	**12128**	**12556**	**13500**	**13000**	**12500**
PRODUCTION: Africa	7106	9292	7575	11821	**8234**	na	na
Americas	12321	12543	9605	11975	**12900**	na	na
Canada	*5189*	*5347*	*3883*	*5313*	*6105*	*6584*	*6257*
Asia	24266	26470	28335	26993	**29021**	na	na
India	*14072*	*17236*	*17647*	*16704*	*18311*	*18430*	*na*
Europe	3963	4330	4695	3982	**3756**	na	na
Turkey	1237	1345	1234	1290	**1257**	na	na
Australia	2083	2491	2633	2195	2267	1966	2506
TOTAL WORLD PULSE PRODUCTION (Kt)	**63964**	**69627**	**68218**	**70419**	**73000**	**71000**	**70000**

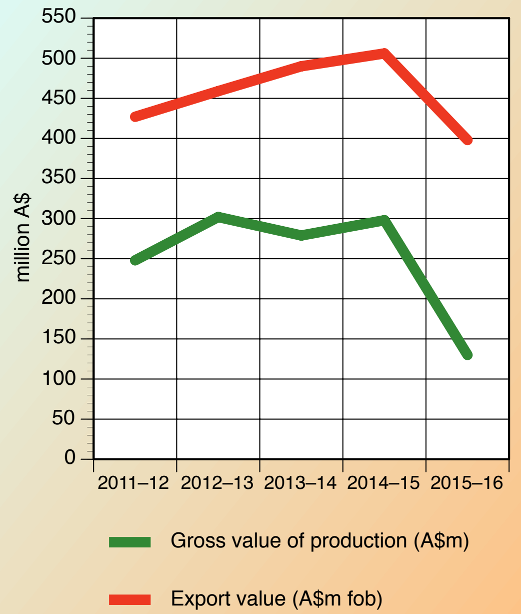
Major world oilseeds trade and production (Mt)

	2009	2010	2011	2012	2013	2014	2015
IMPORTS: Canola	11.11	10.49	13.10	13.00	16.30	14.10	13.60
Japan	*2.31*	*2.32*	*2.40*	*2.50*	*2.40*	*2.40*	*2.40*
Soybeans	93.10	88.76	93.45	95.90	113.50	126.60	129.30
China	*53.90*	*52.34*	*59.24*	*59.86*	*70.80*	*79.00*	*82.00*
EXPORTS: Canola	11.11	10.49	13.10	13.00	16.30	14.10	13.60
Australia	*1.19*	*1.55*	*2.562*	*3.51*	*3.19*	*2.45*	*2.15*
Canada	*7.35*	*7.21*	*8.69*	*6.71*	*9.20*	*9.10*	*9.60*
Soybeans	93.10	91.70	92.16	100.53	113.50	126.60	129.30
Brazil	*28.58*	*29.95*	*36.26*	*41.90*	*45.70*	*54.60*	*56.90*
United States	*41.70*	*40.96*	*37.15*	*35.85*	*44.60*	*50.50*	*46.00*
Sunflowerseed	1.61	1.78	1.92	1.54	1.95	1.77	1.53
TOTAL WORLD OILSEEDS TRADE (Mt)	**111.42**	**108.36**	**111.03**	**118.11**	**133.50**	**146.50**	**149.33**
PRODUCTION: Canola	60.81	60.56	61.57	63.76	71.60	71.00	67.70
Australia	*1.91*	*2.36*	*3.43*	*4.14*	*3.83*	*3.45*	*2.95*
Canada	*12.94*	*12.79*	*14.61*	*13.87*	*18.60*	*16.40*	*17.20*
Soybean	260.85	264.25	240.49	270.70	284.60	320.30	322.70
Brazil	*69.12*	*75.30*	*66.50*	*81.50*	*86.10*	*96.20*	*100.00*
United States	*91.42*	*90.66*	*84.29*	*82.79*	*91.39*	*106.90*	*106.95*
Sunflowerseed	32.17	33.07	39.68	35.75	43.34	40.73	41.45
TOTAL WORLD OILSEEDS PRODUCTION (Mt)	**442.32**	**460.97**	**447.70**	**475.82**	**504.18**	**535.65**	**526.88**

Summary of Australian rice statistics (paddy) by area and volume



Australian rice export value and gross value of production



Summary of world statistics for rice

	Area (million ha)	Production (Mt, milled)	Use (Mt)	Closing stocks (Mt)	Stocks to use ratio (%)	Trade (Mt)	Av. price US$/t (Thai 100%)
2010–11	160	450	443	100	22.6	35	518
2011–12	160	467	456	107	23.5	40	590
2012–13	158	472	466	110	23.6	39	565
2013–14	161	478	479	112	23.4	43	429
2014–15	160	479	483	109	22.6	42	419
2015–16	159	473	485	97	20.0	42	366

World rice production, by country (Mt, milled equivalent)

	Aust.	B-desh	Brazil	China	EU-27	India	Indon.	Japan	Myan.	Pakis.	Philip.	Thail.	US	Viet.	TOTAL
2010–11	0.72	31.7	9.3	137.0	2.1	96.0	35.5	7.6	11.1	5.0	10.5	20.3	7.6	26.4	**450**
2011–12	0.92	33.7	7.9	140.7	2.1	105.3	36.5	7.8	11.4	6.2	10.7	20.4	5.9	27.1	**467**
2012–13	1.16	33.8	8.0	143.0	1.9	105.2	36.8	7.9	11.7	6.0	11.4	20.3	6.3	27.5	**472**
2013–14	0.57	34.4	8.2	142.5	1.8	106.7	36.3	7.9	11.9	6.8	11.9	20.3	6.1	28.0	**478**
2014–15	0.51	34.5	8.5	144.6	1.6	105.5	36.3	7.8	12.5	6.9	11.9	18.7	7.1	28.8	**479**
2015–16	0.21	34.6	7.6	145.7	1.8	103.6	36.3	7.6	12.2	6.8	11.3	16.6	6.1	28.8	**473**

In this section the rice crop is the year of planting.
(The 2015–16 figure is therefore a forecast of the Australian rice harvest in March–April 2016.)

Section 3

Trends in the global grain market

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Social, demographic and economic change and global grain markets

By Chris Coore, Advantage Program Manager for Agfarm

The growing world population is not a new phenomenon – nor should it be surprising that this growth has increased the global demand for grain. Despite the annual population growth rate decreasing from 5 to 3 per cent over the past few years, it is expected that global population will climb from the current 7.4 billion people to 9.4 billion in 2050 – a rise of 27 per cent. And faster growth forecasts are expected for second and third world countries. Asia accounts for about 30 per cent of the world's land mass while being home to 60 per cent of the global population.

Figure 1: Asia is home to 60 per cent of the global population

Fortunately, most parts of Asia are financially and economically stable enough to handle population growth largely through the importation of goods and services from other countries.

Our geographic location, and wealth of primary products, puts Australia in good stead to capitalise on this Asian population growth projection in terms of the export of food, fibre and other resources.

The building of closer relationships through free trade and other inter-government agreements will also help to increase the export of grains from Australia into Asia.

Social, economic and demographic changes

Global economic output and personal wealth has increased every decade between 1930 and 2016. Global Gross Domestic Product (GDP) per capita is a measurement of the value of all goods and services produced throughout the world divided by the world population.

AT A GLANCE…

- There are numerous factors contributing to the continual increase in global demand for grains. This article delves into the very significant areas of:
- Global population growth; and,
- Social, demographic and economic change.
- It is important to have a holistic perception of these factors to help understand what has led to global grain demand being at an all-time high.

The value of this per capita measurement has more than trebled in real value since 1930.

This incredible increase in wealth throughout the world has changed how people live and eat, in turn increasing the global demand for grain. The world is now consuming less carbohydrates while consuming more protein, dairy and edible oils. In marketing terms, in recent seasons this has been reflected in protein–wheat spreads.

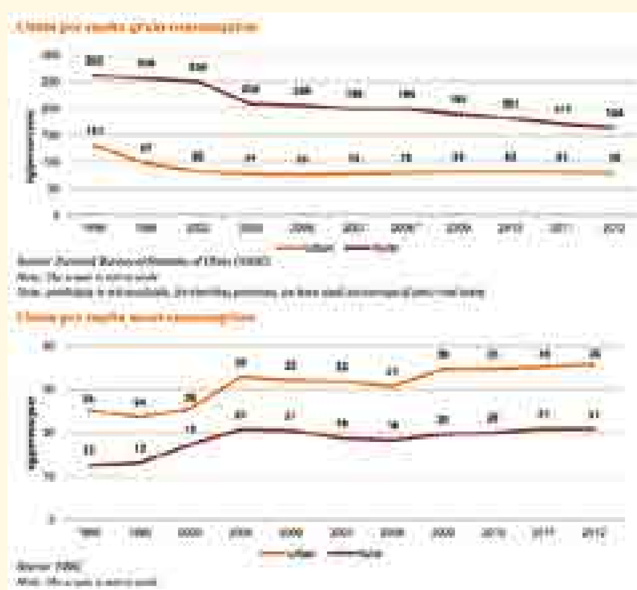
This increased demand for protein has also seen an increased demand for water. Ultimately, food production is dependent on the availability of water and with the current diet trends, the world needs more litres of water to match food demand.

Take beef as an example. Research indicates that around 14,500 litres of water produces one kilogram of beef. But bread only requires around 1500 litres of water per kilogram of production.

In other words: One kilogram of animal protein uses about 10 times more water than one kilogram of grain.

The correlation between wealth and eating patterns in China is

Figure 2: China grain and meat consumption



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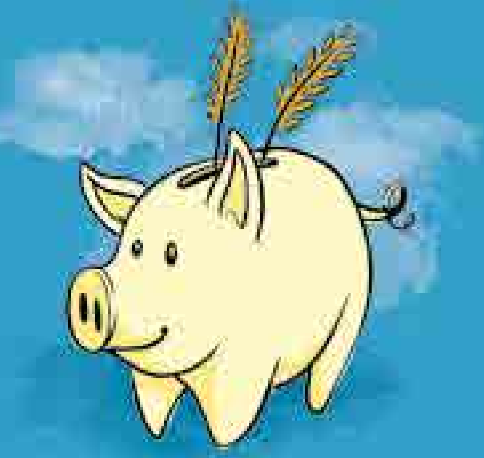

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outlined in a recent Price Waterhouse Coopers article. Presented in that article was data showing that the overall direct consumption of grains in China up until 2012 decreased while the overall direct consumption of meats increased (Figure 2). Close inspection of the charts shows that rural consumption of grains is higher than urban, while the urban consumption of meats is higher than rural.

This means that although direct grain consumption is on the decline in China, indirect grain consumption – in the form of animal feed to produce beef, pork and poultry – creates an overall increase in total grain consumption.

And this higher demand for protein does not equate to higher demand for milling wheat varieties. The wheat price spreads for H2 and H1 varieties over APW and ASW – along with the wheat–barley spread tightening, supports this.

Figure 3 depicts Chicago wheat vs corn over the past 10 years. Interestingly, the 10-year average difference between wheat and corn is 145 cents per bushel – and it has recently been trading at 100 cents – wheat being the premium.

While there are other influences creating the tightening of the wheat vs corn spread, the underlying driver has been the sharp and dramatic rise in intense livestock production, in turn adding to the increase in demand for feed grains.

If the past decade has taught us anything in the agricultural industry, it is that global demand for wheat and feed grains is on a continual incline.

For corn, 2006 global consumption was 725 million tonnes. For 2016, corn consumption is projected to be 970 mt – an increase of 33 per cent over a decade.

Wheat has the same growth trend. In 2006 global demand was 598 mt and for 2016 its projected consumption will be 725 mt – an increase of more than 20 per cent.

As a general marketing rule, demand does not fluctuate at the same rate, or in parallel, with supply. This underlines the need for global wheat production to remain at record levels to feed a continual increase in demand.

The current 2016–17 season is starting to show signs that global wheat production is likely to decline year on year for the first time in four years. If this occurs there will be pressure on ending stocks and the global wheat balance sheet will consequently tighten.

The fundamental concern is that supply is volatile and demand is not. Global production over the past four years has been outperforming the past decade averages. But this is mainly due to generally favourable weather conditions.

The law of averages would suggest that we are due for adverse weather conditions in some growing regions around the world.

So what does it mean?

With an increasing global population – combined with changing human diets and more water intensive agricultural requirements – we need to be ever more innovative to meet the increased demand for food, water and fibre.

The consistency in demand over the past decade makes predicting future demand relatively easy. The greatest fear is the one we cannot see – will supply continue to match demand?

Despite global grain supply being at record levels over the past four years, this is not sustainable. Weather, water and governments are the biggest unknowns in future production.

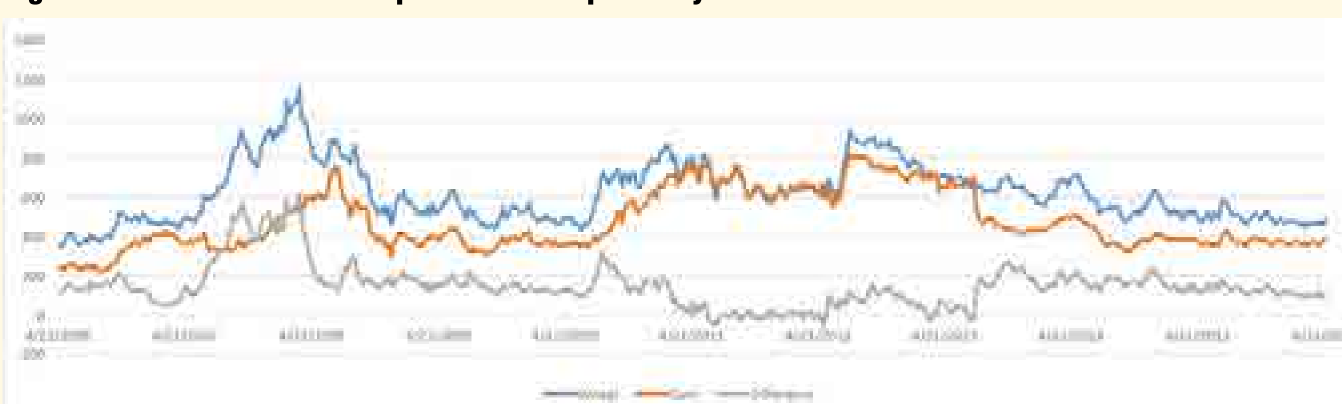
And it is the unknown that brings volatility and price fluctuations to grain markets.

As a result of recent record grain crops, we often hear the phrase “the world is awash with grain”. But if a production shock does occur it will not take the world long to consume the current stockpile.

In the meantime, grain demand will continue to rise, prices will ebb and flow and the market’s function will be to incentivise growers to produce the best crops they can. ■

Figure 4: CBOT wheat price since 1973 vs the average of 410 US cents per bushel

Figure 3: CBOT wheat vs corn price over the past 10 years



Australian feed grain and the China factor

By Chris Coore, Advantage Program Manager for Agfarm

Over the past three years, sorghum production in Australia has been well supported by demand from China. This buying spree resulted in 1.6 million tonnes of exports in the 2014-2015 season and a premium being paid to Australian sorghum growers. Unfortunately, what goes up, must come down, which we have started to see this summer season.

In late March 2016, the Chinese government went to extreme measures to curb their ballooning domestic corn stockpile with the announcement they will move closer to a 'free market' system. Since 2009 the government has supported domestic production by implementing a price floor on corn resulting in a huge increase in corn production.

The price floors were designed to keep local producers farming by matching incomes they could receive in the city, ensuring the continuation of local corn production.

But the price support system worked too well. China is now in a situation where they have a domestic glut of corn within a global balance sheet that is well supplied with feed grains.

This means Australian sorghum exports to China are set to decline. The current market – along with the Australian shipping line-up – is showing exports for the 2015-16 sorghum season being only 37.5 per cent of last year, at around 600,000 tonnes.

Feed grains in China

Corn stockpile figures for China are difficult to ascertain but most estimates have the stockpile sitting at about 180 million tonnes of corn. This is an enormous amount – but it needs to be put into perspective.

Throughout China, around 800,000 tonnes of feed grain is consumed each day. In other words, a 180 million tonne stockpile is just 225 days' worth of corn consumption.

The growth in the feed grain stockpiles in China have caused concern for several reasons.

- Corn storage space is sparse; and,
- Due to the length of time corn has been stored, there are some quality concerns.

In addition, Chinese consumers are paying inflated values for their feed grains compared to global prices. Over the past few seasons Australian feed grains have found a ready market in China because the Australian product has been far cheaper than domestic corn prices.

In fact until very recently, it was cheaper to load grain from Australia, ocean freight to China, discharge the vessel and then deliver the grain to up-country destinations, than it was to buy Chinese corn 50 km down the road from the feed mill.

This is yet another example of government intervention leading to gross inefficiencies in the marketplace.

Chinese authorities have put restrictions on international feed grain traders. The government wants to limit grain entering China by way of stricter control of import permits and tighter regulation of phytosanitary requirements for grain imports.

This has helped increase the consumption of local corn in China – and this increased consumption has been 'offset' by another record Chinese corn harvest in 2015.

China faced this exact predicament in 1999–2000 when feed grain reserves rose uncontrollably and the government was caught holding huge intervention stocks. But the years following quickly turned the situation around.

Figure 1: China (orange line) versus US (purple line) corn futures over the past 10 years

Low prices were followed by a severe drought which plagued China in 2001 and 2002 eating up corn stocks and creating a bullish market.

With the long term weather forecast suggesting it is unlikely that this scenario will be repeated, Australian suppliers will have to look to other factors for the return of a bullish market.

Australian sorghum and domestic consumption

In recent years there has been a slight reduction in the size of the Australian cattle herd. But with strong beef export demand – and while cattle remain available – most analysts anticipate the number of cattle on feed will remain at near record highs of about 950,000 head.

Strong export demand for our beef will be supported by an AUD–USD exchange rate in the $0.70 to $0.78 range.

Domestic grain consumers will typically incorporate sorghum into the feed ration at a $35 to $40 discount to ASW/feed wheat prices.

SECTION 3 TRENDS IN THE GLOBAL MARKET

In line with the 10-year average, 2015-16 sorghum production for Australia is estimated at around two million tonnes.

Victoria had a dry 2015-16 season which is dragging more grain than usual over the South Australian and NSW borders. With wheat and barley prices remaining firm throughout Australia's southern region, a lot of sorghum could be hauled south during 2016 to assist the feed grain deficit. This will bolster the demand for sorghum.

So what does it all mean?

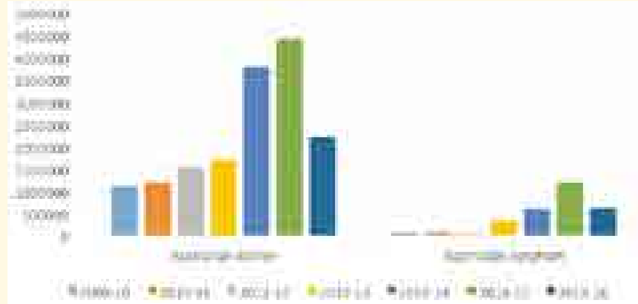
As shown in Figure 1, in the past few years Chinese corn futures (orange line) have been much higher than the US corn futures market (purple line) – but Chinese futures are now starting to come more into line with the global marketplace.

With the lower price of corn in China, more of the domestic corn stock will be consumed.

As they say: "Low prices cure low prices." So we can expect that for the upcoming plant, the area sown to corn in China will decrease with more land going into soybeans.

Australian barley and sorghum exports to China for the 2015-16 season are projected at about 50 per cent behind the pace from this time (April) last year. Figure 2 gives an overview of the barley and sorghum exports leaving Australia for China since 2009.

Figure 2: Australian barley and sorghum exports (metric tonnes) to China, 2009 – 2016



Exports are likely to remain below pace for the next 12 months while China goes through this clearance process.

But the longer term outlook is positive. The China-Australia Free Trade Agreement has recently been enacted and will reduce import tariffs and open up what were previous barriers to trade.

Agfarm anticipates that the Chinese government will move closer to a free market for feed grains once the corn clearance process has been completed.

This will make way for increased Australian sorghum and barley trade in line with global values as well as a more consumer-oriented China of the future.

Australian sorghum is also gaining interest from new export homes in Asia as a substitute feed grain – this only adds to the bullish outlook. ■

Grain production at risk with continuing drought in the Indo-Pacific

By Somya Rajawat, Global Food & Water Crisis Research Program

The 2015–16 El Niño period has had a significant impact on agriculture within the Indo-Pacific, bringing about a drought that has particularly affected rice growth in Asia; which collectively produces 90 per cent of the world's supply.

While the worst parts of the El Niño had passed by May 2016, the rainy season had yet to arrive for a number of countries and many fear more drought. The International Rice Research Institute (IRRI) has gone as far as to predict the onset of a food crisis similar to the 2007–08 food crisis, which saw prices increase by 300 per cent at its peak.

But predicting whether 2016 will see a food shortage is difficult.

The cause of the 2007–08 food shortage was a complex situation that cannot be attributed to a simple issue of demand surpassing supply.

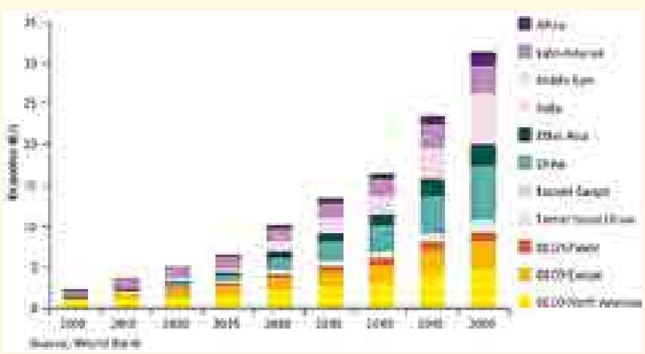
Although oil prices are relatively low at the moment, the World Bank projections indicated in Figure 1 and Table 1 show that middle class expansion and biofuel consumption will continue to increase – and do so at a rapid pace.

In conjunction with the almost identical to 2007–08 movements in the international trade market, this makes it clear that there is a very distinct possibility that a food shortage will occur in the coming months.

International and regional responses

Approximately 70 per cent of the price increases in 2007–08 were caused by export restrictions – curtailing this behaviour on the international trade market will make a large difference. If "rice diplomacy" can take place, countries can assist each other in absorbing price shocks and, in the long-term, help to strengthen domestic food security, through the sharing of sustainable farming techniques.

Figure 1: Biofuel demand by region



Drought in the Indo-Pacific is raising fears of a food shortage, similar to 2007–08.

Less than 10 per cent of grain consumed in the United States is directly consumed through breads, pastas and breakfast cereals. But in countries like the Philippines and India, the overwhelming majority of grain is directly consumed.

People in wealthier countries consume most of their grain indirectly, through the consumption of meat. In this way, it is particularly important – even vital – that developed countries head such operations and efforts to curtail food shortages. The IRRI has endorsed this, calling for another 'Green Revolution', through which richer non-grain producing countries support the development of drought-resistant crops that are mutually beneficial to themselves and grain producing countries.

Another long-term solution could lie in the reduction of biofuel use. While the fuel has been marketed as an environmentally friendly alternative to fossil fuel, its use can be linked to increased global poverty, hunger and environmental degradation through the expansion of agricultural land.

But there are some short-term actions that will immediately halt the onset of a food shortage. If the Asia-Pacific – while engaging in long-term solutions – can co-ordinate a cohesive response to the shortage, there is a good chance the shortage can be quickly corrected, assuming climate conditions improve, or at the very least, do not worsen.

Any opinions or views expressed in this article are those of the individual author, unless stated to be those of Future Directions International.

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Table 1: Size of the world middle class 2009 to 2030 (millions of people and global share)

	2009		2020		2030	
North America	338	18%	333	10%	322	7%
Europe	664	36%	703	22%	680	14%
Central and South America	181	10%	251	8%	313	6%
Asia Pacific	525	28%	1740	54%	3228	66%
Sub-Saharan Africa	32	2%	57	2%	107	2%
Middle East and North Africa	105	6%	165	5%	234	5%
World	**1845**	**100%**	**3249**	**100%**	**4884**	**100%**

Source: World Bank.

Section 4

District Reports

Reviews of the 2015–16 season and plans for 2016–17

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Western Australia

State overview

The 2015 winter cropping season started early with extensive rains across virtually the entire Western Australian grainbelt in late March and early April. Not only did the stored soil moisture provide a buffer against a dry winter, it provided an early sowing opportunity for canola and lupins, particularly in the Geraldton and Esperance port zones.

Winter was then characterised by long dry spells between rainfall events, finishing finally with one of the driest springs on record. Crops in districts along the west coast, and in the Kwinana and Albany zones, suffered a large loss of yield potential and grain quality. But for below average September rain, the WA grain crop could have rivalled the record harvests of 2011 and 2013.

Harvest was a 'stop start' affair with numerous thunderstorms causing rain delays and lightning strikes causing fires, including a large and tragic event in the Esperance zone.

The Esperance zone was the pick of the zones in 2015 with record receivals and grain yields across the entire region, from Ravensthorpe to Salmon Gums to Esperance. Spring rainfall was adequate to achieve good grain quality along with the high yields. The disastrous fire in November caused an estimated 100,000 tonnes in lost grain and a further 200,000 tonnes to the extreme winds that accompanied it. A further large quantity of grain was smoke damaged, rendering it unsuitable for human food markets.

Grain quality across the state was generally mixed. Canola crops produced very good oil content of 46 to 48 per cent with over 50 per cent of the state's canola crops with above average yields. Cereal grain quality was below average. Wheat had slightly above average protein and screenings. Protein levels were however lower than would normally be expected in the dry finish to the season. Barley grain quality was mostly poor with high screenings and higher protein levels than normal which saw the majority of production being relegated to feed grade. Malt grade receivals were low. Oats grain quality suffered in the exceptionally dry winter in the Williams to Kojonup districts. Groat content was low and the quantity qualifying for No1 grade was very low.

Despite the low grain quality, grain crops in most regions were profitable. The notable exceptions were the sandy soils of the west coast and the Great Southern districts of the Albany zone where yields and quality were very much below average.

The 2015 year, as in previous seasons, showed the ability of WA grain growers to be able achieve profitable grain yields in the face of uncertain and dry seasonal conditions. Early sowing, fast crop sowing and soil amelioration – allowing roots to penetrate to access deep soil moisture – are the key ingredients were seen as the key ingredients to this success.

The Midlands

The highlight of 2015 was the rewards to growers who have worked hard on their soil management with amelioration programs paying dividends in a difficult season. A lot of grain was grown on deep moisture in a very dry season. Returns were far better than for growers with little change in soil management. Additionally, timely weed control strategies paid off handsomely.

The disappointing part was the dry spring where a small amount of rain in mid-September would have increased yields and grain quality enormously. Ultimately yields were around average but grain quality suffered.

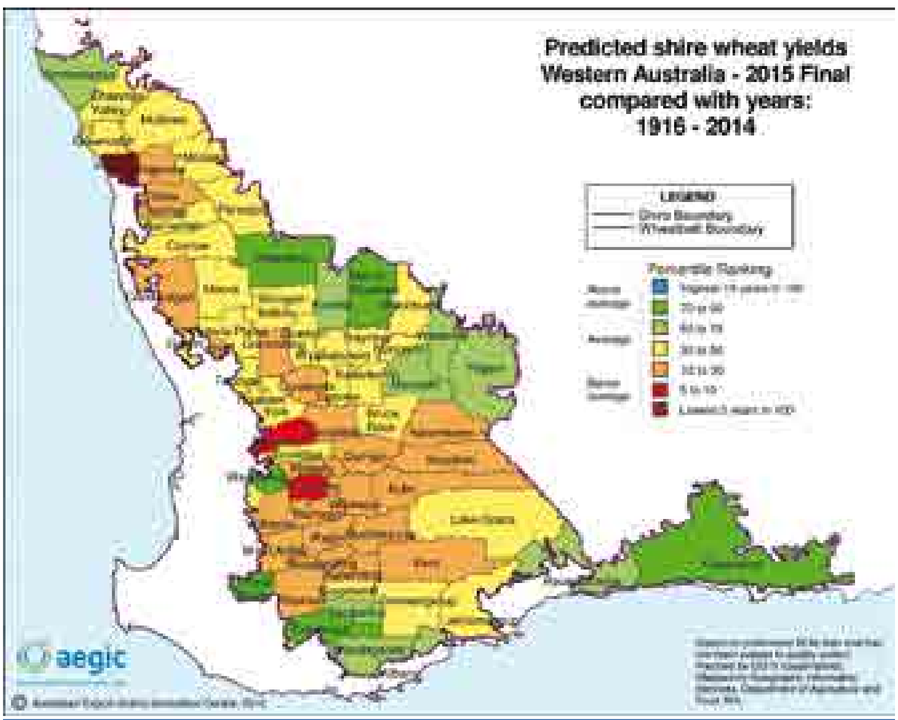
Frost damage in terms of yield and quality was significant but heat shock, particularly in eastern districts, caused more damage. Despite this, the Dalwallinu, and the further out eastern, districts had a good season.

In terms of wheat varieties, the dominant Mace performed well with acceptable quality. But Corack suffered in quality terms due to the dry spring.

Bass was the best of the barley varieties, but still had high screenings and most went to feed grades. But overall, barley crop profitability was still acceptable.

Roundup Ready and TT hybrid canola varieties performed best, although all canola crops performed well, especially where they were sown early. It is very likely that any early sowing opportunity for canola in April will be taken up enthusiastically.

The area of crop sown to oats in the Midlands is expected to rise in 2016 on the back of strong pricing. Hay buyers are also offering higher prices to try and attract supply. The expected area cut



It was a mixed bag of average shire wheat yields for the Western Australian 2015 winter crop. When compared to historic shire wheat yields, the southern and eastern areas generally had an above average harvest.

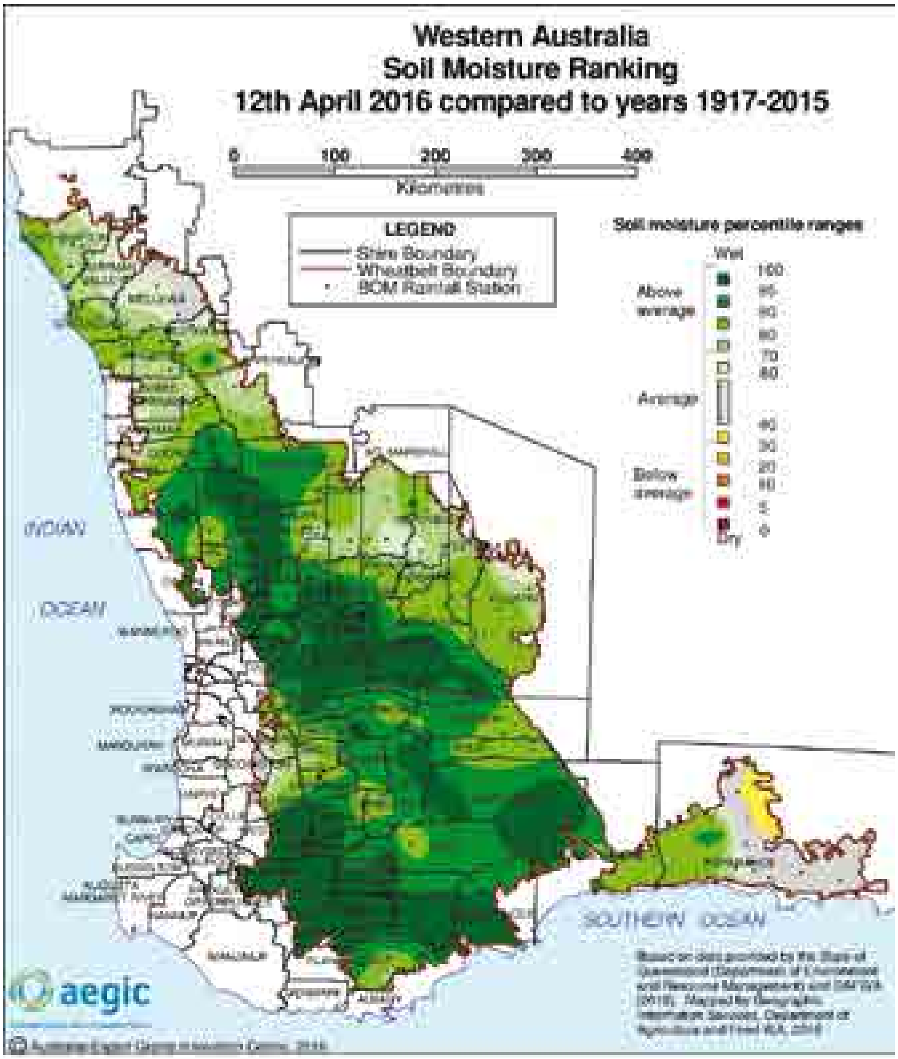
for hay will remain steady with any increased planned sowings of oats for grain production.

The poor performance of crops sown after May 22 last year, especially wheat, will see the seeding program conducted faster in future with the aim of finishing a week or so earlier to avoid the spring drought risk.

Grower optimism for the 2016 season in the Midlands is high.

Kwinana east

The 2015 season saw most growers in the Kwinana east zone having to contend with difficult seasonal conditions. Budget management was important along with good summer weed control. Use of deep seeding tillage bars showed value to allow plants to establish deep root systems and access deeper water.



Thanks to some unseasonal summer rainfall, by mid-April 2016 the Western Australian cropping belt had above average soil moisture. With widespread planting rain during April, the WA 2016 winter crop was away to a 'flyer'.

Wheat generally yielded around average with just acceptable quality. Corack wheat had poor rust tolerance and its grain quality was also a concern.

For growers with financial constraints, the lack of adequate summer weed control and subsequent lack of moisture conservation contributed to a poor result.

There will likely be a few more pulse paddocks (mainly chickpea) in 2016, and more oats on wodgil soil types, with the current strong market for both being the major factor.

Kwinana west

Good summer weed control and low winter weed burdens delivered benefits for early sown crops in 2015 in the Kwinana west zone.

Canola was the standout performer, benefiting from the early sowing in April and escaping the worst of the spring drought. Yields were above average and oil content was in the range of 46 to 50 per cent. Canola sown after a fallow in low rainfall districts is delivering strong yields and providing two years of good weed control in paddocks that have had high weed burdens.

Grain quality in cereals was disappointing with high screenings in wheat and barley. Yields were average to below average, due to the dry spring.

There is likely to be more canola crops planted in 2016 if there is a very early sowing opportunity.

Barley is producing better gross margins than wheat in many districts, and more barley is expected to be sown in 2016 at the expense of wheat.

The area sown to oats will rise, especially in eastern districts with Bannister and Williams popular varieties, replacing some canola and lupins crops.

Albany zone

The 2015 season showed the value of early

TABLE 1: 2015 WA production estimates ('000 tonnes) – GIWA

Port zone	Wheat	Barley	Canola	Oats	Lupins	Field pea	State total
Kwinana	4084	967	488	252	140	7	5938
Albany	1626	1127	400	232	52	6	3443
Esperance	1475	893	437	17	20	21	2863
Geraldton	2015	86	218	12	240	1	2572
Totals	**9200**	**3073**	**1543**	**513**	**452**	**35**	**14,816**

Note: The grain totals reported are for whole farm production. This includes on-farm seed and feed requirements as well as grain traded outside of the CBH delivery system.

sowing when the opportunity arises, especially in the southern districts of the Albany zone. All crops are likely to be sown earlier in 2016 than has been the usual practice.

While frost risk is important the yield loss to heat shock/dry spring was far more significant. Sowing early will lessen that risk. Interestingly, long season varieties, sown early were reportedly hit more by frost than mid-season maturity varieties.

For 2016, there will be more oats planted in the Albany zone with forward pricing very attractive and the advantage of earlier sowing and some frost resistance.

The area sown to wheat is expected to decline in favour of increased plantings of oats.

There will be less canola planted with the input costs getting high and the sclerotinia risk rising.

Lupin yields were disappointing but the area grown in 2016 should remain similar.

Barley cropped area will likely be similar as gross margin potential remains good. La Trobe, with higher disease tolerance, will become the dominant variety grown accounting for as much as 70 per cent of the barley crops sown.

With lots of frosted grain last year, seed quality is a concern and good conditions at sowing in 2016 are required to minimise the risk of reduced crop establishment.

Esperance zone

Very strong winds accompanying the tragic fires in November soured a very good season for Esperance. Approximately 300,000 tonnes of grain was lost in the bad weather with 200,000 tonnes lost to wind damage rather than fire.

Despite that, the Esperance port zone delivered a record grain harvest of around 3,000,000 tonnes with 2,600,000 tonnes delivered to CBH.

Soil moisture levels are generally high after 100 mm of rain in January across the zone. With a reasonable germinating rain in early April, there is likely to be another early start to cropping programs in 2016.

Geraldton zone

The wet summer combined with good summer weed control in eastern districts was the key ingredient to an above average result in 2015 for the northern and eastern districts of the Geraldton zone. Ameliorated soils allowing deep root depth were critical to accessing deep moisture and good early crop growth.

High yields were achieved in spite of a generally dry growing season. Some growers had yields to rival 2011 and 2013, with 2015 being in the top 10 per cent of financial results.

Frost had a larger impact on grain quality and yield than first anticipated. Lots of frost-affected and distorted grain was delivered. Screenings in wheat averaged around 7 per cent. But heat shock combined with dry soil caused more yield loss than frost, particularly in coastal and near coastal districts.

Across the zone, canola was the standout performer. Planted early, it was mature enough to withstand the dry spring, and avoid the worst of the frost.

All crops on poor sands were very poor, especially coastal districts with very low rainfall and no summer rain.

Fallow paddocks in 2014, sown to wheat and canola performed best.

Lupins continue to impress with generally better gross margin returns than for the other crops. Additionally the weed control strategy for lupins is now working well and growers have confidence in growing them. As a result the area sown to lupins is expected to rise again in 2016, mainly at the expense of areas sown to barley and to a lesser extent canola.

The canola area will decline slightly, mainly from paddocks with lower yield potential being sown to other crops.

Mace wheat performed well in the dry spring but Corack did not and this variety is likely to be replaced in 2016. Sceptre is being bulked up to replace Mace in the coming years. Bremer looks to have strong potential in longer season and high yield potential districts.

Optimism is high for 2016. Lime spreading, weed spraying and deep ripping have been done.

Compiled from Grain Industry Association of WA crop reports

Northern agricultural region

The 2015 winter crop in review

The 2015 winter crop endured a patchy season in the WA northern grain region. The year started dry but the northern ag area had very good March and April 2015 rain in most areas. Warm conditions in May really pushed crop development in the early sown crops. The warm conditions made good crop establishment difficult across much of the region with rapidly drying soil and poor crop emergence.

There was a severe damaging wind event on June 17 with winds in excess of 90 km per hour and some crops required resowing in the Irwin and west Mingenew areas.

The district received very good rainfall from late July through August, 2015. And wet conditions at that time of year in our part of the world mean exceptional plant growth rates and the crops took off. The turnaround by the crops after a dry June and early July was fantastic. Light crops bulked up and the crops that were doing well at the start of the wet conditions were looking pretty awesome.

But unfortunately, late August and September were very dry across the region with Decile 1 or 2 rainfall in most areas. This saw many crops ‘droughting’ as they tried to fill grain.

The hot dry spring conditions favoured crop growth on the higher water holding capacity soils. This translated to higher yields on these better soil types. Yield suffered on the sand soils.

Anything that improves plant root growth contributed to a significantly increased grain yield. Long-term lime applications and deep tillage gave good yield responses in 2015.

Harvest started in September for some growers, due to early sowing, and the fast crop development from warm conditions.

There was some frost damage last season, and for a number of farmers, it turned out worse than expected. High in the landscape sand areas with deep valleys were the worst affected.

Severe frost damage occurred from Balla to Mingenew with a few other areas damaged as well.

How the crops performed in 2015

Wheat crops generally performed as expected. Frost reduced crop yield and quality on some farms. Quality was generally good but there were screenings problems in some areas where the soil moisture ran out.

Canola crops had a huge yield range. Some crops in the north and east yielded in the high 'ones' with some over two tonnes per hectare. But others were severely damaged by insects and yielded very poorly. Green peach aphid and diamondback moth were the main insect problems. Crops again performed well in the wetter parts of the landscape and on the better soil types.

Lupins generally performed well and most growers were happy with their crops. The exception was the very dry Irwin area where crops performed poorly due to lack of moisture plus a severe wind event that cut many crops off.

Barley crops were good where rainfall had been 350 mm or above for the year but struggled where the season was dry and finished quickly. Almost all barley crops went on the feed stack due to high grain screenings.

Generally, crops performed as expected given the tough 2015 spring. Frost damage added to the disappointment for some growers. The north and east of the region would take another 2015 but some growers in the south west of the region had their worst season on record.

Prospects and trends in 2016

The major trends in our area for 2016 will be a major swing back to deep tillage. Older rippers are being pushed to get down to around 450 mm while some new machines are aiming to get to 600 mm deep. The ripping is also being done with inclusion plates that drop some of the top soil down the back of the ripping tine. This gave large yield increases in 2015 and could give greater life of the ripping effect.

RR canola area is increasing with the crop giving very good weed control and yield performance. Some of the increase will come from a reduction in lupin planting on some farms.

Peter Norris, WA Northern Agricultural consultant
Agronomy For Profit and Synergy Consulting

South Coast

Overview of the 2015 season

Early and mid season 2015 winter crop conditions on the South Coast of WA were generally very favourable. Rainfall during August and the first half of September had been very good – in some places too good causing waterlogging. In mid-September CBH was forecasting a record crop for the Esperance port zone.

But the ensuing spring rainfall was very minimal – fortunately most areas had very good reserves of stored soil moisture to adequately finish crops.

Harvest was underway by early October with canola and barley being the first crops to come off. These early crop yields were very good with canola ranging from 1.2 to 2.5 tonnes per hectare with oil as high as 50 per cent.

Barley yields were from 3.0 to 5.5 tonnes but quality was mixed with some higher screenings and low protein.

Harvest conditions were frustrating with some grower wags describing it as a FIFO harvest – two days on, three days off – due to continual showery weather.

But on the good harvest days, grain was being taken off at an incredible rate. This is testament to modern harvest management, capacity and grain handling logistics. The 2015 season was set to deliver so much for the region but for many farmers, these expectations were not met while for others, it will be a season to forget for many unfortunate reasons.

On November 17 a catastrophic fire ripped through over 130,000 hectares from North Cascade through to South East Scaddan. The fire was started in crown land several days earlier by lightning strike and was fuelled by plus 40 degree temperatures and winds gusting over 80 km per hour.

Tragically four lives were lost in the fire-storm – three European farm workers and Scaddan farmer, Kym Curnow. The loss of human life has been very sobering for the entire South Coast farming community – in addition to the loss of crops, livestock and farm infrastructure.

For those not effected directly by the fire, the strong gusting hot winds resulted in significant yield loss due to pod shatter in canola and head loss in both wheat and barley. It was not uncommon to see barley head loss in the order of 1.5 to over 2 tonnes per hectare.

Standing canola crops lost half of their yield potential, whilst wheat not as badly affected by the wind, still lost 0.3 to 0.5 tonnes per hectare.

The 2015 grain production loss for the region due to fire and wind was estimated to be in the order of 500,000 tonnes.

Harvest on the South Coast was very lengthy stretching out for over eight weeks. Towards the end of harvest most growers were jumping between the header and boomspray to control summer weeds that had germinated throughout harvest.

For those in the fire zone, one of the major priorities post harvest had been to try and prevent wind erosion of the fragile topsoil. Some farmers planted cover crops of barley, wheat or millet – others just waited for a decent rain to stabilise the soil or make a start to seed some form of cover crop.

The positive of the 2015 season is that many growers produced some of their best crops ever, showing the potential of the region and the robust farming systems they have in place.

Quenten Knight, Agronomist
Precision Agronomics Australia

South Australia

SA state summary

Winter crops in 2015

The South Australian 2015–16 winter crop harvest was completed in all districts by mid-January, 2016. Despite the hot, dry finish to the season and frost damage in some areas, cereal yields were average to above average in most districts.

Pulse yields were severely affected by the hot dry conditions and yields were well below average.

There was a high proportion of lower quality cereal grain with high levels of screenings and low test weights, increasing the amount of grain classified into lower grades or stored on-farm.

Most farmers on Eyre Peninsula and the Mid North delivered some lower quality grain into the bulk handling system at lower grades. Where possible some was either blended or cleaned to improve quality.

In the Mallee and Upper South East more of the poorer quality grain was stored on-farm and this is now being sold into domestic markets.

Mixed farmers have stored additional poorer quality grain to supplementary feed or finish lambs and other livestock to target weights.

Spraying of summer weeds that had germinated following rains in November continued into January.

Hot weather in January enabled control of snails in some districts.

Prospects for 2016

Further rain in January and February 2016 resulted in a second germination of weeds and many farmers have sprayed twice and some three times to conserve soil moisture and nitrogen.

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Stored soil moisture levels are generally only low to moderate across the agricultural districts, despite heavy summer rainfall.

Farmers have been cleaning seed in preparation for the coming season.

Indications are that the area sown to cereals will remain relatively stable in 2016 but there could be significant changes to the area of other crops. The area sown to canola will increase on Lower Eyre Peninsula but fall in most other districts.

The area sown to lentils will likely increase in the Mid North and Yorke Peninsula, while the area of peas is likely to fall.

Heavy rains in February caused some damage to lucerne seed crops in the Upper South East, with early crops the worst affected. Record high seed prices will help off-set seed damage.

Statewide pastures summary

Summer rains reduced feed quality in stubble paddocks but summer weeds and volunteer cereals that germinated after January and February 2016 rains provided some useful stockfeed.

Stubble paddocks were heavily grazed in most areas of the state and by mid March, very little valuable feed remained where weeds had been controlled.

SOUTH AUSTRALIA 2015–16 WINTER CROP PRODUCTION (tonnes) AND AREA (hectares) AGAINST THE 5 YEAR AVERAGE

		5 year average	2015–16
Wheat	Area	2,234,300	2,200,000
	Prod'n	4,693,600	4,307,000
Durum	Area	68,200	49,500
	Prod'n	191,800	82,750
Barley	Area	903,800	839,300
	Prod'n	2,159,900	1,939,200
Oats	Area	79,000	70,300
	Prod'n	135,800	104,000
Rye	Area	8,900	7,500
	Prod'n	8,500	6,200
Triticale	Area	62,300	21,800
	Prod'n	102,300	32,700
Peas	Area	108,800	102,600
	Prod'n	151,400	105,600
Lupins	Area	65,400	76,700
	Prod'n	90,400	63,850
Beans	Area	69,500	68,600
	Prod'n	125,700	75,300
Chickpeas	Area	16,600	20,500
	Prod'n	21,400	18,240
Lentils	Area	98,700	123,700
	Prod'n	153,900	138.580
Vetch	Area	15,800	29,600
	Prod'n	11,700	11,900
Canola	Area	278,200	210,500
	Prod'n	392,900	295,300
Total SA crop	**Area**	**4,009,600**	**3,820,600**
Total SA crop	**Prod'n**	**8,239,000**	**7,180,600**

Western Eyre Peninsula

- Harvest was completed in Western Eyre by the middle of December with most grain delivered to receival points by the end of the month.
- Some cereal crops produced high screening levels, particularly on heavier soil types.
- Some farmers cleaned this grain to improve quality specifications prior to delivery.
- Although most farmers have not yet completed planning their rotations for 2016, early indications are that there will not be a significant change in crop type or area.

Lower Eyre Peninsula

- Harvest delays caused by cool, damp mornings in December meant that harvest carried into the first week of January for some producers.
- High screening levels resulted in many growers cleaning and blending grain to meet delivery standards.
- Immediately after harvest, most producers began spraying weeds that germinated after widespread rain in November. Significant rainfall events in both January and February resulted in further herbicide applications for weed control.
- Early indications from farmers are of some increase in the area to be sown to canola due to good returns in 2015, with an expected drop in the area sown to pulses. The area of cereals is not likely to change significantly.

Eastern Eyre Peninsula

- Harvest was finished in late December. Some farmers on heavier soil types around Buckleboo cleaned grain to improve quality prior to delivery.
- Farmers sprayed summer weeds that germinated after rain in November. Generally dry conditions through mid to late February stalled the growth of many weeds that germinated in January and early February.
- Some farmers in the Eastern Cleve Hills and Franklin Harbour districts used cultivation in early February to control weeds.
- Early indications are that the crop type and area will not change significantly this year.

Upper North

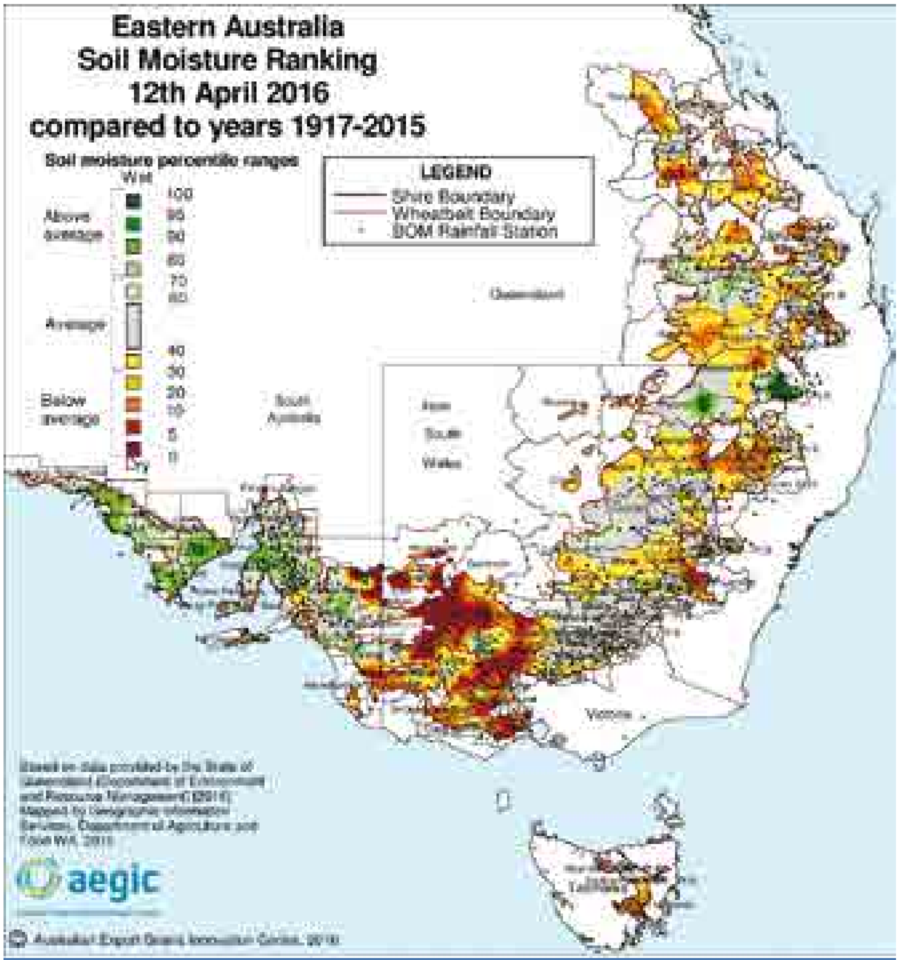
- Most poor quality grain from the 2015 harvest was delivered directly into the bulk handling system at lower prices. But some farmers were able to achieve reasonable prices selling directly to livestock producers or feed suppliers.
- Many farmers stored poor quality grain on-farm to finish lambs and other livestock.
- Some farmers have cleaned seed in preparation for the coming season.
- Farmers have been developing cropping plans for 2016 in consultation with their advisers.

Mid North

- Most poor quality grain was delivered to bulk storage facilities at lower prices.
- Some farmers were able to sell to feedlotters or feed millers at reasonable prices.
- Most grain now still on properties is for on-farm use.
- Early indications are that there will be an increase in the area sown to lentils and oaten hay in 2016, with a reduction in the area of canola and peas.
- Currently there is not likely to be a significant change in the area sown to wheat and barley although if the price of wheat continues to fall there may be less wheat sown back onto wheat stubble.

Lower North

- Outside of the Pinery fire scar area there was a germination of volunteer crops and summer weeds and most areas have been sprayed to conserve soil moisture and nitrogen.
- A few farmers sowed cereals following the rain in January 2016 in an effort to stabilise wind erosion prone areas but the lack of follow up rain has resulted in very poor emergence.
- New cereal varieties are being enthusiastically adopted by farmers.
- In the fire area there will be a larger area sown to cereals in 2016 as they will stabilise the soil quicker and there is a reduced threat of stubble borne diseases.
- The area sown to lentils and to a lesser degree chickpeas is likely to increase with a decrease in the area sown to canola.



Thanks to some good summer rainfall, many of the cropping regions of South Australia had above average soil moisture in mid-April 2016. But as the chart shows, the majority of the eastern Australian grainbelt had below average soil moisture at that time. A widespread autumn break was needed and this came with rain in late April and early May giving a much needed boost to 2016 winter crop prospects.

Yorke Peninsula

- Yields in 2015 were generally below average but still better than expected due to the below average growing season rainfall. Most farmers achieved very good crop water use efficiencies.
- Cereal grain quality was variable with high screenings due to the hot, dry finish or excess nitrogen. Australian Hard 2 wheat quality segregations were made available at grain storage facilities.
- Wheat yields and quality were very high in some areas, mostly on paddocks where lentils were grown in 2014 or on lighter soils where summer weeds were controlled.
- Many farmers are currently storing cereal grain on-farm while prices remain low.
- Canola yielded better than pulses in 2015.
- Soil moisture levels have improved following summer rains and soil residual chemical levels have been lowered, allowing more crop options in 2016.
- Farmers in the northern parts sprayed most of their paddocks for summer weeds, whilst weed control in southern area only started in mid to late February.
- Baiting for snails following January rains provided excellent levels of control. Minimal chaining and rolling occurred during hot weather in January.
- Stubble burning commenced in March and April in a number of paddocks across the district to help manage high weed and snail numbers.
- Preliminary seeding plans for 2016 indicate a slight drop in barley and an increase in lentils. Wheat area will be similar to last year while canola and other pulses will continue to be below average.

Adelaide Hills, Fleurieu Peninsula & Kangaroo Island

Central Hills/Fleurieu

- Early sown crop yields in 2015 were average with later sown crops well below average. Quality was below average for most grains due to poor late winter and spring rainfall.
- Farmers have been developing 2016 crop plans with indications that the area sown to cereals will remain stable and that there will be a likely increase in the area of hay crops to replenish on-farm fodder supplies.
- The area sown to canola and pulse crops may be reduced as they have not performed well during recent dry finishes to the season.

Kangaroo Island

- Harvest was completed ahead of schedule with 2015–16 season canola and cereal yields being average to above average but broad bean yields below average.
- Summer rains in early and late February have increased soil moisture stores but this could cause waterlogging during winter.

- There has been a significant germination of summer weeds after widespread February 2016 rains.

Lower Murray

- Harvest was completed by the end of December, 2015.
- Grain growers sprayed paddocks during January to control weeds that germinated from rainfall during and after harvest.
- Where summer weeds have been controlled, soil moisture should be good for the 2016 season, particularly lower down in the soil profile.
- Farmers have been progressively delivering grain from farm storages and silo bags to local end-users.

Northern Murray Mallee

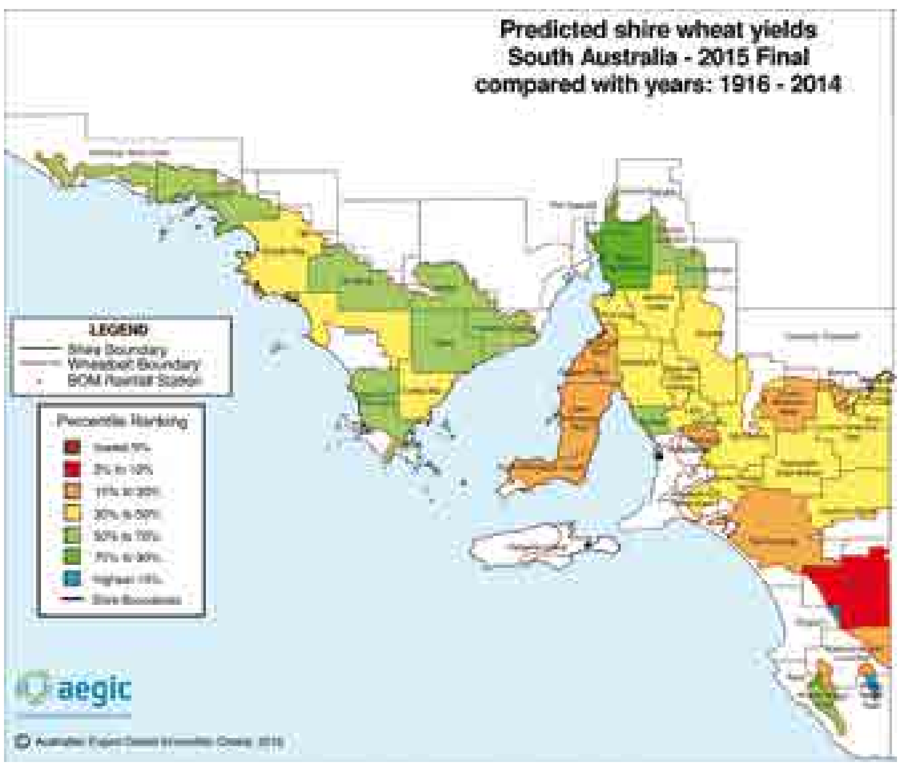
- The 2015 harvest results varied across the region with the Moorook, Waikerie and Wunkar areas not receiving sufficient rain at critical times, resulting in a below average yields, while some areas closer to the Victorian border near Paruna had their best season for many years.
- Severe frost damage to crops reduced yields from slightly above average back closer to average yields with varying grain quality.
- It is expected that there will be an increase in the area of chickpeas and other pulse crops in the region in the 2016 season, particularly if there is good early rains. More farmers are becoming confident in growing these crops through the success of other farmers and pulse trials in the area.

Southern Murray Mallee

- Harvest was completed by the end of December with higher than normal levels of grain stored on-farm in silos and silo bags – particularly barley – due to lower prices for poor quality grain.
- Farmers have been progressively delivering grain to feedlots and feed millers but there is still likely to be a considerable amount of grain stored on-farm.
- Farmers began spraying soon after harvest to control weeds that germinated after rains during harvest. A second herbicide application has been necessary in many paddocks to control further germination following rain in January and February.
- Paddocks with high levels of snails were chained during the hot heather in January and February to reduce numbers.
- Some farmers burned stubble windrows to control snails and weed seeds during February.

Upper South East

- Cereal seed quality for 2016 is poor as a result of lack of moisture in the 2015 season and high temperatures during spring and frost damage.
- Germination tests have been reasonable (90 per cent) however seedling vigour is likely to be low. Some producers are planning to increase seeding rates in 2016 to compensate for poor vigour, whilst others are reducing seeding rates where germination is adequate as the number of seeds per kg is higher.
- There are very little cash reserves to purchase more seed or change varieties.
- Significant summer rainfall has led to a germination of summer weeds, particularly in paddocks where legumes were grown in 2015. Summer weeds have also germinated in cereal stubbles but at lower levels. About half of producers are opting to spray summer weeds.
- The isolated heavy rains have mainly affected early lucerne seed crops with isolated yield losses of up to 80 per cent. On average, losses have been 10–30 per cent due to a combination of pod splitting, brown seed and sprouting.
- Record prices are being offered for lucerne seed and many producers are relying on this crop to help offset losses experienced in other enterprises as a result of the drought.
- Despite summer rainfall, chemical residues are still a concern and some producers will wait until another 40–50 mm is received before planting some 2016 crops.
- Others have adjusted their rotations and 2016 crop plans to avoid potential problems. Good record keeping of rainfall and chemical applications has been critical to manage this.
- Shorter-season varieties of cereals and clovers are being incorporated in plans where possible.
- Soil wetting polymers are being trialed by many farmers on non-wetting soils in the coming season.
- Less canola will be planted in 2016 due to poor performance and low profit margins with only about 25 per cent of normal areas likely to be sown.



When compared to historic shire wheat yields, the traditionally more reliable areas of South Australia – such as the Yorke Peninsula and the Lower South East – had a very tough 2015 season.

Lower South East

- Overall, crop yields in 2015 were average across crop types and quality was good despite a dry spring. The dry winter was beneficial particularly for areas that are usually prone to waterlogging during winter.
- No rain was received during harvest so the quality was good.
- There was significant yield variation, particularly in the northern part of the Lower South East, due to a combination of frost and lack of moisture. Yields on cereals were down 25 to 40 per cent and legumes were down 35 to 50 per cent compared to the long term average.
- Screenings were higher than normal, beans were smaller in size and canola was down 5 to 10 per cent in oil content.
- Very few 2015 crops were cut for hay and nearly all crops were harvested and returned a profit.
- Broad beans returned record prices due to strong price competition and a shortage in supply. Prices of $1300 per tonne have been reported. Consequently, many producers are planning to increase the area planted to broad beans in 2016.
- Sub clover has germinated following recent rains and producers are hoping enough rain will continue to keep it going until the 2016 season breaks properly
- Canola is being grown less in crop rotations due to reduced margins and is been replaced by broad beans. Overall there is very little change in crop plans for 2016 from 2015.

PIRSA Crop and Pasture Report, April 2016

Victoria

State overview

Conditions in Victoria were poor during the 2015 winter crop growing season with many regions receiving less than 60 per cent of average seasonal rainfall. Reflecting this, a higher than normal proportion of crops was grazed or cut for hay.

Total winter crop production in Victoria is estimated to have decreased by 16 per cent (to 4.1 million tonnes) in 2015–16 from a below average season in the previous year. This is estimated to have been almost 40 per cent below the five-year average to 2014–15 and the lowest since 2008–09.

Wheat production is estimated to have declined by 15 per cent to around 2.1 million tonnes. Wheat quality was generally good with high protein levels and relatively few screenings.

Barley production in 2015 is estimated to have fallen by 2 per cent to 1.3 million tonnes, with an increase in area planted partially offsetting the impact of lower yields. In contrast with wheat, the overall quality of barley was poor. This was largely a result of differences in timing of crop development. Only a small proportion of barley production met malting barley standards and high screenings resulted in downgrades among the feed grades.

Canola production is estimated to have declined by around a third to 350,000 tonnes. Area planted to canola fell by 20 per cent and harvested area was further reduced by a significant proportion of crops being grazed or cut for hay. A fall in the average yield also contributed to the decline in production.

Oil content was lower than average, with many crops recording oil content of between 35 and 40 per cent.

Prospects for 2016

Very dry conditions persisted across the state's cropping regions through summer and early autumn 2016. By late-April many growers were dry-planting. Some much needed showers developed in the last week of April giving Victorian grain farmers hope that the 'break' had finally arrived.

Victorian Mallee

The 2015 winter crop in review

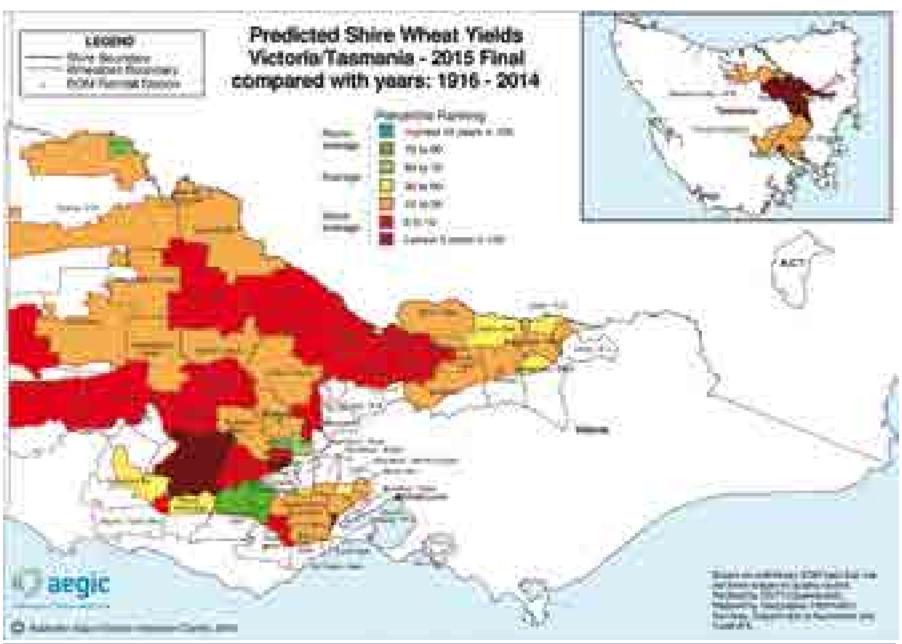
By mid September 2015 the winter crop potential in the area had been set with the ongoing drought resulting in very much below average yield prospects. Low rainfall and increasing temperatures after the previous dry season were taking a toll.

This poor yield outlook was exacerbated where there was limited soil water, sub-soil constraints (boron), heavier clay based soils, cereal on cereal or later sown crops.

For much of the Mallee region, it was a Decile 1 growing season.

Consequently, the harvest was early – underway for many by the third week of October. Some crops had also suffered heat stress with temperatures hovering between the mid to high 30s for almost a week during October. As a result, crops ripened too quickly – and given the limited soil moisture – it had a negative impact on grain size. Crops that were already filling grain at the time of the heatwave, seemed to be less affected.

A number of poor cereal crops were cut for hay with growers keen to recoup some of their costs. This decision was easier for those who were already set up for hay production and who had enough planting seed for the 2016 season. Headers stopped rolling in mid to late November.



This chart graphically illustrates the severe 2015 season encountered by Victorian and Tasmanian grain growers. Compared to shire yields going back 100 years, 2015 wheat yields were some of the lowest on record.

Yields averaged around 0.4 to 0.8 tonnes per hectare for lentils, 0.4 tonnes for field peas and 0.5 to 1.5 tonnes per hectare for cereals. Most of the barley made feed quality (F3) and lentil grains were small.

On a positive note, growers were amazed at the amount of crop that was produced despite the very dry seasonal conditions.

Prospects and trends in 2016

In general, most growers are trying to keep input costs down in 2016 given the previous poor season – and in many cases – the previous two years. The focus is on minimising costs while maintaining yield potential.

Fertiliser rates will most likely be kept to a minimum at sowing, with many growers opting to top-dress later in the year when they have a better idea of how the season is shaping up.

As far as rotations go – and owing to the past two seasons having below average rainfall for many parts of the Mallee – we can expect to see a higher percentage of paddocks go into cereals. Without a good and timely break in April, we are not likely to see too much canola around.

The high prices on offer will motivate growers to plant more area to lentils this year. By mid April there was minimal stored soil water.

Rick management options such as multi-peril crop insurance are being researched heavily. But most would be hoping that predictions of a La Niña (and an average or wetter than average season) come to fruition.

Claire Browne
Birchip Cropping Group

New South Wales

State overview

Total 2015–16 winter crop production in New South Wales is estimated to have increased on the previous season by around 12 per cent. This reflected a 5 per cent increase in planted area and an estimated 7 per cent improvement in average yield.

Wheat production is estimated to have increased by 16 per cent to 7.5 million tonnes. Area planted to wheat increased by 10 per cent to around 3.4 million hectares and average yield is estimated to have risen by around 5 per cent to 2.2 tonnes a hectare.

Barley production is estimated to have risen by 5 per cent to 1.9 million tonnes on the back of an increase in planted area.

But canola production is estimated to have fallen by about 15 per cent to 833,000 tonnes, largely reflecting a 17 per cent reduction in planted area to around 560,000 hectares. Canola yields averaged around 1.5 tonnes a hectare.

Summer crops 2015–16

Seasonal conditions in NSW towards the end of October and during November 2015 were favourable for summer crop planting. Heavy rainfall during this period improved levels of upper layer soil moisture and summer croppers increased the planted area as a response. Further heavy rainfall in January 2016 was also beneficial and yields were generally above average.

Area planted to summer crops in New South Wales is forecast to have increased by 7 per cent in 2015–16 to 468,000 hectares, driven by an estimated increase in area planted to grain sorghum and cotton.

But summer crop production is forecast to fall by 13 per cent to 1.7 million tonnes, largely because of a significant fall in rice production.

Area planted to grain sorghum is forecast to have expanded by about 8 per cent to 197,000 hectares, reflecting relatively high prices at the start of the planting window. Yields are expected to have increased by 11 per cent to around 3.6 tonnes a hectare because of favourable planting conditions and above average rainfall in January.

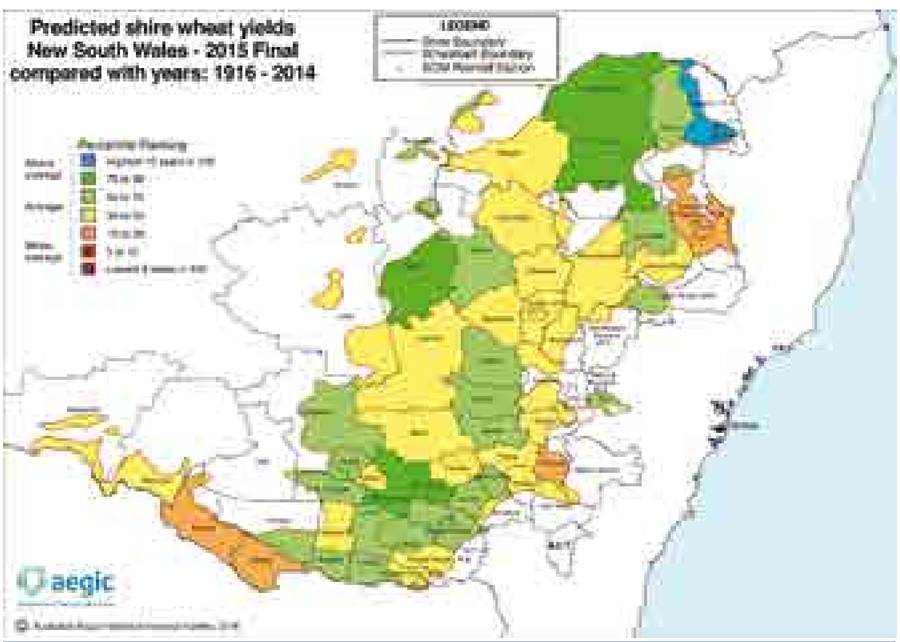
Grain sorghum production is forecast to increase by 20 per cent to 700,000 tonnes.

Area planted to cotton is estimated to have increased by 31 per cent to 163,000 hectares. This reflects an estimated 6 per cent rise in area planted to irrigated cotton to 132,000 hectares, and 31,000 hectares planted to dryland cotton, up from a negligible area last year. But average yield is assumed to have fallen by around 22 per cent, which reflects the increase in area planted to lower yielding dryland cotton.

Overall, cotton production is forecast to rise by 3 per cent in 2015–16, to 337,000 tonnes of cotton lint and around 477,000 tonnes of cottonseed.

The area planted to rice is estimated to have fallen by 57 per cent in 2015–16 to around 30,000 hectares, which reflects relatively low allocations of irrigation water and a significant increase in the price of supplementary water. Rice production is forecast to decline by 58 per cent to around 300,000 tonnes, assuming average yields.

ABARES Australian Crop Report, February 2016



New South Wales winter croppers generally enjoyed an average to slightly above season in 2015. Compared to historic shire averages, wheat yields were generally good despite a very tough spring.

Liverpool Plains

In mid-September 2015, winter crops were looking good across the Liverpool Plains. Very welcome rain was received in late August kicking winter crops along nicely until the region encountered some of the highest October temperatures on record. But fortunately, the month ended well with good storm rainfall.

This was a blessing for many growers who had started sowing summer crops – mainly sorghum – and a relief for those growers who had cotton in the ground.

The 2015 winter crop season brought with it one of the biggest armyworm infestations seen in years on the Liverpool Plains – wheat (mainly durum) and barley were the main crops affected.

Summer crops

Near zero rainfall in January and February of 2016 challenged the region's dryland summer crops. Early sown sorghum crops were harvested with surprisingly impressive yields, but the later sorghum crops showed signs of moisture stress.

The area sown to dryland cotton is growing slowly in the district, particularly with the low price of sorghum. And I'm guessing there will be even more interest in cotton this coming season with the release of Bollgard 3 – which will lend itself favourably to the dryland areas of the plains.

Prospects for 2016

With the talk of a wet winter there are optimistic prospects the coming winter crop on the Liverpool Plains. There could well be a surge in the chickpea area following a strong rally in price and a change in rotation from summer crop to winter crop.

There should be no real surprises in the balance of the winter crop mix with notable inclusions being durum and some canola.

Lauren McGavin,
Precision Seeding Solutions, Premer

Queensland

Darling Downs

Overview

Twelve months ago growers had just harvested successful summer crops and then received good April rain, which set up a good planting for the 2015 winter crop. Good follow up rain fell through spring and early summer, but at last the El Niño conditions asserted themselves with a dry late summer, and this has hurt the later planted summer crops.

For the Downs, farmers have performed very well managing their available moisture to produce good yields, despite a very strong El Niño, and have made some reasonable returns.

Winter 2015

Around 90–140 mm rain in April 2015 set up a good winter crop as it filled moisture profiles. There was a tripling of the usual chickpea area, due to the almost doubling in price, with most of the crop double cropped after sorghum.

Establishment was good and the full winter crop area went in, with

very quick emergence thanks to the good conditions. These conditions did bring on some early disease in the barley with spot form of net blotch, and early aphid infestations.

Late August rain allowed winter crops to fill grain and resulted in good yields. Barley produced 3–5 tonnes per hectare with Compass the best yielding variety. Wheat was 2.5–5.5 tonnes per hectare with October rain lifting yields but dropping protein, whilst the massive chickpea plant ranged from 1.0–3.5 tonnes per hectare, with most around 2 tonnes per hectare. The main yield reducer for chickpeas was frost damage, especially post flowering.

Overall, there were some excellent winter yields for what was a strong El Niño season.

Summer 2015–16

The summer plant was early due to August rain allowing September planting, especially with rapidly warming soil temperatures. By the end of October, 70 per cent of the summer area was planted, with the major increase being in dryland cotton as growers took advantage of the wider planting window and favourable prices.

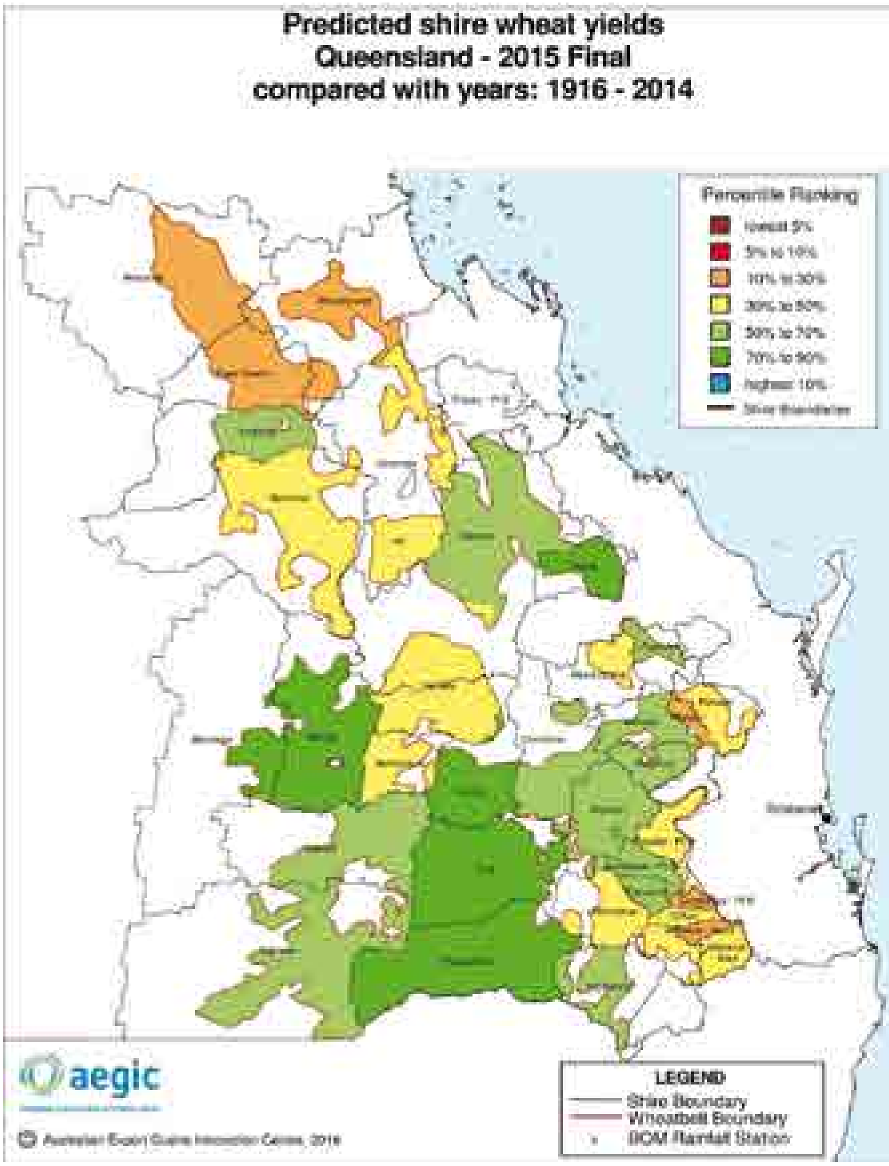
Rainfall was good through early summer, but there was a mini cyclone in late December that cut a swathe from Cecil Plains to north of Bowenville and decimated every crop in its way, damaged buildings and silos and brought down over 80 powerpoles. Around 5000 hectares of cotton was lost along with sorghum and corn, but some growers were able to replant.

The good conditions also allowed a massive area of mungbeans to be planted – tripling the usual area – as many growers double cropped into their chickpea country. But this has allowed volunteer chickpeas to survive through the summer with the risk of carrying over disease.

But since early January 2016 rainfall dropped right off and heat set in, which has affected all the December/January planted crops. This weather brought about an early harvest for the spring planted crops and some excellent yields, with sorghum between 2.5 and 10.5 tonnes per hectare dryland and up to 12 tonnes per hectare irrigated, albeit with some screenings from the hard finish.

One of the stand-out performers is dryland cotton, which is averaging 6 to 8 bales per hectare with some crops over 10 bales per hectare.

The mungbeans though suffered from the lack of rain and tan spot pressure, with many crops only yielding 1 tonne per hectare, but the $1100–$1300 per tonne prices have still allowed a good return.



Compared to historic shire averages, 2015 wheat yields were generally good in southern Queensland but Central Queensland wheat growers had a disappointing season.

Outlook for winter 2016

The main issue now is the dry conditions and the dry outlook for the first half of winter. Growers are very keen to grow another large area of chickpeas with prices even higher than last season at this stage, but planting rain is not in sight. There will be some deep planting in ground that is wet enough, but we could see a late start to the main winter plant.

Cropping trends

The main trend is growers moving to the value crops, and so both chickpeas and mungbeans have seen a surge in area this past year. Issues arising from this are the potential for rotations to be shortened and disease pressure to build.

Land values

Recent sales of some blocks south of Pittsworth saw some very high values achieved, with an average price of $7400 per hectare for good dryland country.

Hugh Reardon-Smith, Agronomist
Landmark, Pittsworth


HASTEN†

Western Downs

The 2015 winter crop in review

The end of August 2015 brought some good rainfall across the region with most areas receiving two to three inches (50–75 mm). This timely rain was extremely beneficial for most winter crops.

Chickpeas had a tremendous boost from the rain allowing crops to extend their flowering period and increase their potential yield.

By mid-season there were few disease issues with mouse damage being the bigger problem in western areas. A fair portion of winter crops in the western areas were baited for mouse control. The mice had bred up in grass and fallow paddocks over the drier months.

Helicoverpa spraying thresholds in chickpeas were lower in 2015 due to the high price (around $800 per tonne delivered Brisbane). Most growers got away with one spray by using new chemistry with good residual efficacy and spraying at the correct threshold.

Minor frost damage occurred in most cereals with the odd paddock worse off due to only a couple of days difference in planting date.

The good August rain also prompted growers to plant some early summer crops (grain sorghum and dryland cotton) from mid September. But hail caused some of these crops to be replanted.

The 2015 winter crop generally ended up very well, although a few crops were hailed out before harvest. Chickpea yields were extremely good ranging from 2 to 3.5 tonnes per hectare.

Wheat and barley also benefited from the late August 2015 rain with some crops producing 5 tonnes per hectare.

A massive mungbean planting occurred over the Christmas period encouraged by high prices – this reduced the area planted to sorghum. There had been some early insect pressure but rain at the beginning of January had these summer crops off to a good start. Insect pressure remained high throughout the flowering and podding periods with the sucking pest mirids causing the most problems.

The earlier part of the planting window lead to the best yields which ranged from 1.5–1.8 tonnes per hectare on fallow country and one tonne when double cropped.

The mungbean crops planted later in the window were down in yield due to the hot dry finish.

Sorghum crops had some good yields around 5 tonnes per hectare – but the planting date had a big effect on yields due to the timing of rainfall.

Prospects and trends in 2016

The 2016 winter crop will have another large area planted to chickpeas due to the continuing high prices. With the weather forecasts suggesting a wet winter, disease may become an issue, particularly if it's

wet later in the crop cycle. This will put heavy pressure on fungicide supplies which are already tight.

Winter cereals will also be down in area due to this but will still be grown in growers' rotations.

Nikolaus Fritz, Account Manager
Agronomy – Landmark, Miles

Central Queensland

Winter crops 2015

Wheat: Lack of planting rain resulted in a small area of wheat in CQ during the 2015 winter, perhaps as little as 15,000 hectares (down from an average of 200,000 hectares). Most of that was in the Dawson/Callide Valleys. While the yields on the Central Highlands were generally very low (less than 1 tonne per hectare), excellent yields of 4 tonnes per hectare were achieved in the better crops in the Dawson.

Chickpea: About 45,000 hectares of chickpea were planted across CQ in 2015, most of this on the Central Highlands and almost all of it deep planted to chase soil moisture. Low soil moisture resulted in fewer plants and patchy establishment. This caused problems at harvest and beyond with late maturing plants still holding green pods.

Yields of 0.75 to 1.0 tonne per hectare were average. Cooler weather during the Central Highlands' chickpea harvest resulted in very few header fires.

A couple of weeks later in the Dawson/Callide region, hotter, drier weather and bigger crops resulted in many header fires during their harvest. The better chickpea crops in the Dawson/Callide yielded more than 2.5 tonnes per hectare.


Central Qld district reporter Maurie Conway in a sorghum crop "grown for the experience" due to poor prices.

Summer crops 2015–16

The 2015–16 summer in CQ was hot and dry with only scattered and isolated storms across all districts. Scattered, isolated 'spring' storms were the norm right throughout summer. What was missing was a good

drenching from a widespread rain influence. Only the paddocks under the storms finished wet enough to plant. Even many long-fallowed paddocks were too dry to plant.

The Dawson was wetter in spring 2015 so this region generally fared better throughout summer. The Callide was wet in spring but missed out on rain at Christmas and remained dry until February. The patchiness of the rain is typified by the Callide region where the northern end around Wowan is still dry while the southern end around Thangool is wetter.

Currently on the Central Highlands, parts of Mt McLaren district are the wettest, with Capella to Rolleston dry except for paddocks where successive storms have fallen. Dysart is good.

Sorghum: Given the current low price someone suggested if you grew sorghum this summer you were doing it for the experience – not for the money. My guess is that there was less than 80,000 hectares of sorghum planted across CQ with only a small area in the Callide, a few paddocks in the Dawson and some paddocks scattered across the Central Highlands. Most of the Central Highlands crop was planted very late, with much of the crop planted in February. A wide spread at planting will mean an even wider spread at harvest.

The crop currently ranges from ready for harvest to just finished flowering. Low rainfall during summer will result in low to modest yields (2 tonnes per hectare) although given the season thus far some crop look surprisingly good (3–5 tonnes per hectare).

Mungbeans: Low sorghum prices and high mungbeans prices were enough enticement for many new growers to plant mungbeans. This was a steep learning curve with both the spring and the summer crops encountering tough growing conditions in most districts.

The large area of spring mungbeans planted in the Callide had a wet start but a dry finish. Generally, the earlier summer crops fared better than later planted summer crops. My guess is about 15,000 hectares of spring and 40,000 to 50,000 hectares of summer mungbeans were planted. Yields vary enormously from fail to better than 2 tonnes per hectare.

Cotton: The 2015–16 summer saw about 18,000 hectares of cotton planted on the Emerald Irrigation Area and 3000 hectares on the Dawson. A hot, dry, summer set up high yields for cotton in CQ but a week's wet weather at defoliation resulted in yields up and quality down.

2016 winter crop prospects

Currently there are large areas of fallow across CQ especially on the Central Highlands. A large rainfall event of 200–400 mm of steady rain would result in a huge winter crop planting but only a very brave person would bet on that happening in the next month or two.

Winter crop planting has started in CQ. Wheat planting started mid-April and chickpea planting started during the last week of April.

High chickpea prices and a dry soil surface will result in a huge area planted to chickpeas rather than wheat. My guess is if it stays dry the area planted to chickpeas will be about 40,000 hectares south of Emerald (Gindie, Rolleston, Dawson and Callide) and up to 80,000 hectares north of Emerald.

If it rains, seed and herbicide will be the limiting factor – not paddocks to plant – and the area planted will increase by 30–60 per cent

A bigger chickpea planting will result in a reduction in the area planted to wheat, although some paddocks not planted to sorghum this summer may be planted to wheat to provide groundcover.

More on-farm storage is being built in CQ. This is driven by both a discontent with the local grain depot and more grain buyers in the market. More than a dozen companies currently seek to buy grain from CQ. When the eastern seaboard has a big crop much of the CQ crop is exported through either Gladstone or Mackay.

When southern Queensland and northern NSW has low production then more grain buyers move into CQ.

Many paddocks across CQ are bare of stubble either because they have missed crops due to drought or they have been cultivated to control mature weeds.

Feather Top Rhodes grass (*Chloris virgata*) continues to be a major weed problem in CQ and a common reason for ploughing.

More cases of hard to kill (potentially resistant to glyphosate) sweet summer grass (*Brachiaria eruciformis*) are being reported. Common hard to kill broadleaf weeds include milk thistle or sowthistle, tridax daisy and fleabane.

While summer rainfall has been underdone for cropping, it has been moderate to good for grass growth. Most paddocks grew good quantities of grass during summer but lack of follow up rain has meant that many paddocks, especially where stock numbers are high, are now 'well mown'. Generally cattle are in good to excellent condition. Oats for finishing cattle is a minor crop in CQ but lack of planting rain caused a reduced area planted this year.

The Fairbairn dam had some inflow during February. By mid-April 2016 the dam level was 41 per cent capacity or 540,000 megalitres.

Maurie Conway,
Department of Agriculture, Fisheries and Forestry. Emerald.

Section 5

Managing Resistance

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America – big weeds, big resistance, big problem

By The Australian Herbicide Resistance Initiative

Everything is bigger in America. Cars, food, supermarkets, houses (McMansions), Presidential hopeful hairdos .... and weeds. American weeds are huge. Weeds such as tall waterhemp and Palmer pigweed grow 2 to 3 metres and can have seed set of around 1 million seeds per plant.

And these aren't even the big ones!

Tall waterhemp and pigweed represent the world's biggest herbicide resistance problem. These weeds infest millions of hectares in the US and are resistant to multiple herbicides (with glyphosate resistance the biggest problem).

Herbicide bills for some US farmers went from $75 per hectare pre-resistance to over $250 per hectare once glyphosate resistance set in.

The good news is that Dr Jason Norsworthy and others from the University of Arkansas have looked at the biology of pigweed and found its Achilles heel – seed retention.

Harvest weed seed control

Sure, these weeds set a lot of seed, but they retain 99.5 per cent of them at harvest. Bingo!

Harvest weed seed control (HWSC) has a lot to offer and our little country Down Under has the answers. Australian farmers and researchers are world leaders in harvest weed seed control. We've invented seven different techniques, including the most recent innovation, the integrated Harrington Seed Destructor (iHSD).

A prototype narrow windrow burning chute gave excellent results in US soybean trials.

As Albert Einstein wrote:

"We can't solve problems by using the same kind of thinking we used when we created them."

In other words, herbicides are not the answer to herbicide resistance. Herbicides will definitely play a major part, but alone they aren't the answer.

In 2012, Michael Walsh from the University of Sydney (then AHRI) travelled to the US to work with Jason Norsworthy from the University of Arkansas. During this trip they started to measure seed retention of Palmer pigweed. Things were looking good for HWSC after this initial research so they built (what we believe is) America's first narrow windrow burning chute and put it to the test in a soybean crop.

When Jason Norsworthy visited Western Australia in 2013 to attend the Global Herbicide Resistance Challenge conference he returned to the

Based on photographs of a Western Australian designed chaff cart which used an elevator system, University of Nebraska researcher Jason Norsworthy had a similar cart built in the US.


Vortex®
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more flexible control.
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US with photos of Lance Turner's chaff cart that uses an elevator system to transfer weed seeds into the cart. He had a chaff cart built from these photos and put it to the test.

Jason knew that weed seed retention of pigweed looked good for HWSC and further research began to evaluate seed retention of tall waterhemp.

Pigweed and waterhemp

Generally speaking, Palmer pigweed (*Amaranthus palmeri*) has been a problem for farmers in the American south in the cotton growing region and tall waterhemp (*Amaranthus tuberculatus*) has been a problem further north in the major corn–soybean production areas. But more recently, pigweed has moved in on waterhemp's turf and is now a problem further north.

These photos illustrate how quickly the pigweed in this US field has been spread by the harvester over three seasons. No harvest weed seed control practices have been used.

It's true that these weeds can set up to 1 million seeds per plant but that's in ideal situations where there's no crop competition. This study looked at weeds growing in soybean crops.

Weeds were sampled at crop maturity, around the first opportunity to harvest.

On average, Palmer pigweed set around 34,000 seeds per plant and tall waterhemp set 40,000 seeds per plant. Not one million, but still very impressive seed set.

For Australian farmers, these weeds are like wild radish on steroids!

The pigweed result was significantly affected by one sample that was taken one to two weeks late. If this outlier is removed, the average seed retention of pigweed was 99.8 per cent.

The seed retention results were outstanding (Table 1).

Table 1: Seed retention results using HWSC practices

	Pigweed	Waterhemp
Average seed set per plant	33,888	40,372
Average seed retention % at first harvest opportunity	99.32%	99.70%
Average seed set per plant	230	121

The choice

American grain growers have a choice.

- They can choose to spread the weed seeds out at harvest so they have something to spray next year; or,
- They can remove 99 per cent or so of the weed seeds at harvest so they are faced with perhaps 200 seeds rather than 40,000 seeds to spray with herbicides.

The accompanying photos demonstrate just how quickly these weeds can spread around the field with the harvester. How different would these pictures look with HWSC in the mix?

Australian success story

Australian grain growers are experiencing excellent results with HWSC and the seed retention of our main weeds is nowhere near as good as that of American weeds.

Research by Michael Walsh found that wild radish retained 99 per cent of its seed at wheat maturity but annual ryegrass retained only 86 per cent.

HWSC, in combination with other weed control tools (herbicides, crop competition etc), has been extremely successful for ryegrass despite this lower level of seed retention.

New herbicides and new herbicide traits will be of enormous benefit to American grain growers when these technologies become available.

If they are to be successful for the medium to long term, these new technologies must be combined with HWSC.

As Einstein pointed out we need to use new thinking to solve our problems. Harvest weed seed control is new thinking.

The Australian Herbicide Resistance Initiative (AHRI) team is a world leader in herbicide resistance research and its management in cropping systems. For more information see: www.ahri.uwa.edu.au ■

Comprehensive study reveals cost of weeds to Australian growers

Australia's most comprehensive analysis of the cost of weeds in cropping systems has shown that despite increasing levels of herbicide resistance, in-crop weed populations are being kept low and yield loss due to weed competition ($708 million) is much lower than total weed management costs ($2,573 million).

The Grains Research and Development Corporation (GRDC) commissioned report – *Impact of Weeds on Australian Grain Production* – was released in April, 2016. GRDC General Manager Crop Protection Ken Young said the industry study into the cost of weeds – including yield losses and the costs of weed management practices – had input from 600 growers, as well as agronomists, consultants, agribusiness data experts and researchers.

"Weeds present one of the largest costs to grain growers and are one of the biggest influences on the management of cropping systems," Ken said. "This study is the most comprehensive review to date on the cost of weeds to Australian grain growers and the adoption of weed management and tillage practices, and will help guide future decisions on cropping systems research, development and extension."

CSIRO Senior Research Scientist (Farming Systems) Rick Llewellyn, the lead author of the report, said key results at a national level included:

- The overall cost of weeds to Australian grain growers is $3.3 billion annually.
- Weeds are costing Australian grain growers on average $146 per hectare in expenditure and yield losses.
- Average expenditure on weed control, including herbicide and non-herbicide practices, is $113 per hectare.
- Yield losses due to weeds amounts to 2.76 million tonnes of grain.
- The most expensive weeds in terms of total yield losses are annual ryegrass, wild radish and wild oats, with brome grass being a notable major weed that is increasingly costly.

The study has identified important differences between regions and agro-ecological zones.

Cost of weeds across the agro-ecological zones

Northern

- Central Queensland – total cost of weeds is $85 million per annum or $213 per hectare.
- North-eastern NSW and south-eastern Queensland – total cost $249m per annum or $174 per hectare.
- North-western NSW and south-western Queensland – total cost $249m per annum or $174 per hectare.
- Central NSW – total cost $272m per annum or $163 per hectare.

Southern

The cost of controlling weeds in southern agro-ecological zones ranges from $105 per hectare in the low rainfall zone – including the SA and Victorian Mallee and Upper Eyre Peninsula – up to $184 per hectare in the higher rainfall zones including SA's Mid North, Yorke Peninsula and Lower Eyre Peninsula:

- SA's Mid North, Yorke Peninsula and Lower Eyre Peninsula – total cost of weeds is $319 million per annum or $184 per hectare.
- South-East of SA and Victoria's Wimmera – total cost $311m per annum or $168 per hectare.
- SA and Victorian Mallee – total cost $317m per annum or $105 per hectare.

Looking over the *Impact of Weeds on Australian Grain Production* report are GRDC General Manager Crop Protection Ken Young (left) with principal report author Rick Llewellyn. (PHOTO: Nicole Baxter, Coretext)

- Victorian high rainfall and Tasmanian grain production zone – total cost $52m per annum or $162 per hectare.
- Victorian and NSW Slopes – total cost $357m per annum or $165 per hectare.

Western

- Overall annual cost to Western Australian grain growers is $927 million per annum or $117 per hectare.

Rick said that as weed control through cultivation had declined, adoption by growers of a range of other weed management practices had increased.

"Crop-topping, double knockdown and narrow windrow burning have increased, with the latter showing rapid recent increases in some areas, particularly WA," he said.

Rick said WA growers were leaders in the adoption of harvest weed seed control (HWSC) practices which, when combined with other control measures, played a crucial role in reducing weed populations and weed seed banks, and minimised the impact of herbicide resistance.

"The total national cost of using HWSC practices – such as narrow windrow burning, chaff carts, the Harrington Seed Destructor and chaff tramlining – is estimated at $17 million annually, with $13 million of this in WA," he said.

"WA has more than three times the per hectare expenditure on HWSC compared with the other regions, but other regions are now following the WA lead and practices such as narrow windrow burning are increasing rapidly."

Reducing costs

Rick said the costs of yield losses due to weed competition ($708 million nationally) were much lower than total weed management costs ($2.6 billion). "Reducing the cost of weed management is one of the grains industry's largest challenges," he said.

Rick said that as weed control through cultivation had declined, adoption by growers of a range of other weed management practices had increased. "Harvest weed seed control practices are increasing rapidly in many areas, but in the more northern areas it is double knockdown use that has seen a surge in adoption over recent years," he said.

Analysis shows that GRDC investment into the area of herbicide resistance alone over the past 25 years has returned a benefit-to-cost ratio of $3.50 for every dollar invested.

For a free copy of the GRDC report see: www.grdc.com.au/ImpactOfWeeds. ■

How stuff works: 2,4-D, free radicals and monkeys

By The Australian Herbicide Resistance Initiative

It's pretty amazing that 2,4-D is our oldest herbicide, yet scientists have only just worked out how it actually kills weeds. This has taken years of research by many researchers to understand. So, like the monkey Curious George (the analogy becomes clearer later), AHRI researchers set out to understand how 2,4-D works.

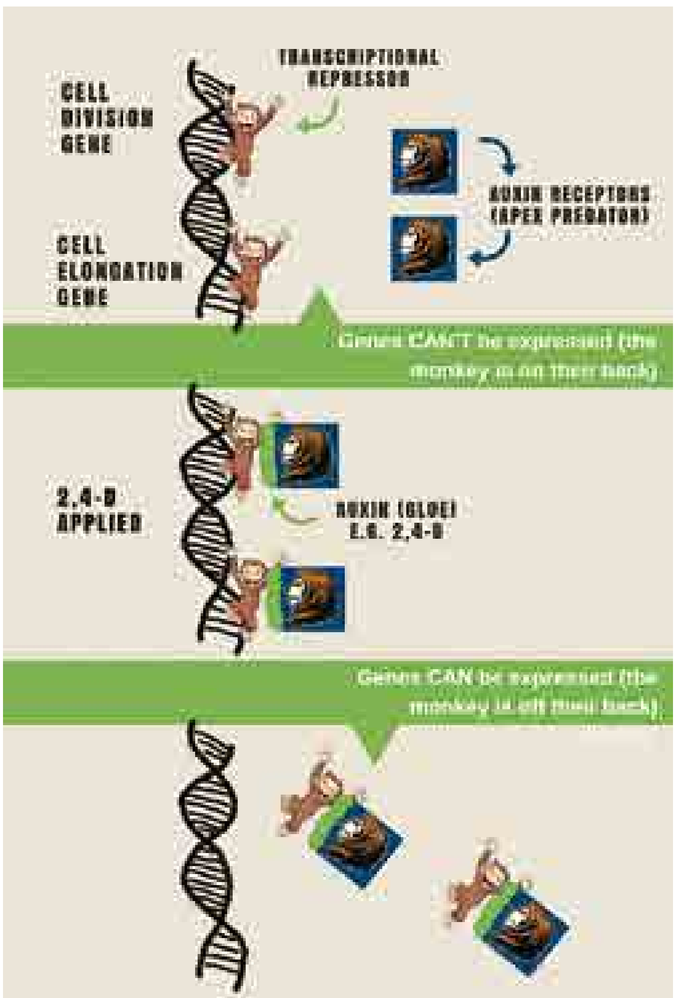
The 2,4-D herbicide works in three stages:

- First, it over-stimulates plant growth;
- Second, it closes the stomata and shuts down photosynthesis; and,
- Finally, the plant eventually starves to death as it works hard to detoxify the free radicals.

In a nutshell: 2,4-D kills the plant by excessive free radicals (and all symptoms link back to this). But there's a whole lot more to it than that.

Understanding auxins

Auxins are hormones that have many jobs, one of which is to regulate cell growth by controlling cell division and cell elongation. Plant cells need auxins to be at just the right level. Too little and plant growth is not stimulated at all. Too much auxin, and plant growth is over-stimulated.



Sports fans will be familiar with the term, the player or team has a 'monkey on their back'. With the monkey on their back, they can't win the game.

Genes often have monkeys on their back (called transcriptional repressors) which stop the gene from being expressed. Auxins stimulate plant growth by allowing an apex predator (in this case, the SCF protein complex) to eat the monkey and free the gene. Gene expression leads to the production of proteins (enzymes) that regulate plant growth. In short, auxins can stimulate plant growth by making cell division and cell elongation happen.

How do phenoxy herbicides such as 2,4-D work?

2,4-D is a synthetic auxin. When 2,4-D is taken up by the plant, the auxin levels in the cells go through the roof. So instead of auxin being at just the right level, the auxin levels are way too high. With very high auxin levels all of the monkeys are removed from the genes (back) and all of the genes for cell elongation, cell division and hormone production are expressed all at once. At first, the plant is completely over-stimulated to grow.

This over-expression of genes does three things:

- **Free radicals are produced in very high levels.** What's a free radical, we hear you ask? A free radical is a molecule with unpaired electrons. They're unstable little beggars that cause chain reactions where the unpaired electron is passed from one molecule to the next to the next. These free radicals travel around the plant wreaking havoc wherever they go.
- **Excessive ethylene is produced.** Ethylene is a hormone that's involved in fruit ripening and it causes the cells to swell up. Ethylene is also linked to extra free radical production.
- **The plant closes its stomata because of the over-production of ABA** (abscisic acid – a stress hormone). With the stomata closed, the plant can't breathe in the CO2 it needs for photosynthesis. Photosynthesis stops, cutting off the food supply of the plant. Part of the process of photosynthesis involves sunlight exciting electrons. With no CO2 in the system, these electrons have got nowhere to go, so what's produced? You guessed it – even more free radicals.

Now we have a total free radical festival going on in the plant, causing destruction at a number of levels.

Antioxidants

In humans, excessive free radicals can cause cancer. For example, UV light from the sun creates free radicals that mess with the DNA of the cell and cause skin cancer.

The twisting and curling of weeds after a phenoxy has been sprayed is due to the free radicals interfering with actin – a protein which helps cells to maintain shape.

We've probably all heard the benefits of antioxidants such as vitamin C found in citrus or polyphenols found in green tea. These are health foods because the antioxidants they contain help to clean up free radicals that can cause cancer.

Plant and animal cells have built in antioxidant defence systems. These systems detoxify free radicals. This defence system is capable of cleaning up normal levels of free radicals that's caused by normal cell growth.

But this defence system is totally overwhelmed when 2,4-D is sprayed onto a plant and free radical levels go through the roof. In this situation, the plant ramps up the defence system (in vain) which takes a lot of energy. Unfortunately for the plant, photosynthesis has ground to a halt so it's not getting any food and the plant starves to death.

Starving to death takes time, which is why phenoxy herbicides take a long time to kill weeds.

Why do phenoxy herbicides cause twisting and curling of weeds?

The twisting and curling of leaves and stems that happens when phenoxy herbicides are sprayed onto weeds is called epinasty. This happens because free radicals interfere with a protein called actin.

Actin helps the cell maintain its shape and keeps all of the organelles in the right place.

How does wheat tolerate 2,4-D and other phenoxy herbicides?

Wheat and other monocots can detoxify phenoxy herbicides. A P450 enzyme binds an oxygen molecule onto the aromatic ring structure of the herbicide. This allows a glucose molecule to bind to the herbicide, changing it so it no longer acts like a herbicide.

This is a possible resistance mechanism in weeds such as wild radish but this is yet to be confirmed.

Wild radish resists phenoxy herbicides through reduced translocation of the herbicide.

To sum up

2,4-D kills the plant by excessive free radicals (and all the symptoms link back to this).

It took a lot of scientists many years of research to work out how 2,4-D works. There is, of course, more to it than we have reported here, but this is a good summary that should satisfy the curiosity of those of us who love to know how stuff works!

The Australian Herbicide Resistance Initiative (AHRI) team is a world leader in herbicide resistance research and its management in cropping systems. For more information see: www.ahri.uwa.edu.au

Fungicide portfolio receives a boost

By Jock Leys, Senior Product Manager, Adama

Adama's Radial fungicide recently had the final pieces to the disease control puzzle added to its label. Whilst we have been extremely pleased with the positive uptake of Adama's new fungicide Radial, we have been working hard to have two more key diseases added to its label.

Radial has now received registration for control of septoria tritici blotch (STB) in wheat and spot form of net blotch (SFNB) in barley.

We knew Radial performed well on these diseases, but it was difficult to have the diseases turn up consistently enough in the fungicide's development phase to gain initial registration.

The key to Radial's strength across such a broad range of diseases – now including STB and SFNB – is that it includes the industry's two leading active ingredients for cereal diseases, azoxystrobin and epoxiconazole.

SFNB is one of the more difficult to control barley diseases and is ranked number one by many researchers as the most economically damaging disease to Australian barley crops.

New release fungicide for 2016

Also set to make a significant impact in the broadacre disease control market this year is the brand new fungicide from Adama, Veritas. Due for registration and launch in May 2016, Veritas is a new benchmark for affordable high level disease protection in winter cereals and pulses.

Veritas will be registered for control of all key cereal diseases.

Through a special APVMA permit (PER81533 expires September 30, 2017), Veritas will also be registered for use in chickpeas and lentils for the 2016 and 2017 seasons.

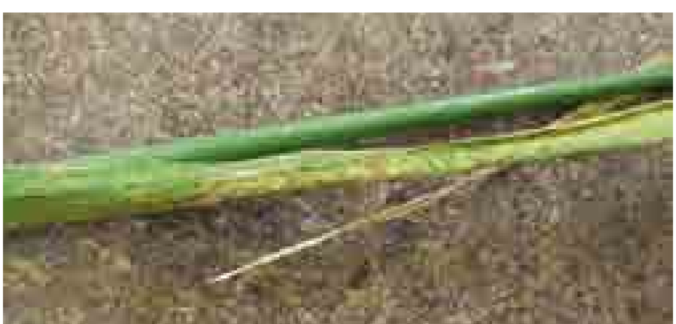
Veritas has a very similar product concept to Radial but is based on the active ingredients azoxystrobin and tebuconazole.

This unique combination of active ingredients allows for the optimum balance between protectant and systemic disease control.

This means that with Veritas, Adama is able to offer a high level strobilurin-based fungicide to the cereal market at a sub $10 per hectare price point. Growers are generally willing to adopt highly effective fungicides – but at the right price.

With Veritas coming in at a very affordable level, we expect many more cereal growers to take the opportunity to upgrade from straight triazole-based fungicides.

And with excellent prices encouraging growers to plant a very large area to pulses this season, the (2016–2017) permit to use Veritas in chickpeas and lentils for ascochyta and grey mould control, is also a big positive for the industry.



When compared with older single active products, superior control of diseases such as barley leaf rust can be achieved with new dual mode of action fungicides like Radial and Veritas.

With excellent chickpea prices on offer this year, growers and agronomists need to make every post a winner by keeping their crops free of diseases such as ascochyta (pictured). The new fungicide Veritas is registered for ascochyta and grey mould control in 2016 and 2017 chickpea and lentil crops. With a unique combination of active ingredients, Veritas can play an important role in disease control as well as fungicide resistance management.

There are currently no other fungicides registered in pulses with these modes of action. So the permit allows growers to take disease control to a higher level while gaining the fungicide resistance management benefits of using new MOAs.

Adama is currently seeking a full registration of Veritas in both winter and summer pulses.

Improved propiconazole formulation

Also available from Adama in 2016 is the new improved formulation of Bumper fungicide. Bumper 625 is a highly loaded propiconazole formulation requiring 2.5 times less product per hectare than the original Bumper.

Bumper 625 had a limited release in the 2015 season and feedback from growers and agronomists was extremely positive. Excellent compatibility and the easy to use low use rate formulation were two key features reported.

With propiconazole already a popular choice for disease control in barley and for yellow leaf spot in wheat, the improved Bumper 625 formulation is set for a strong following in 2016. ■

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Section 6

Precision Agriculture

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THIS SECTION BROUGHT TO YOU IN ASSOCIATION WITH:

Trimble

Precision agriculture pays its way

By Emma Leonard, SPAA

AT A GLANCE…

- Changing to PA, CTF and no-till has helped this SA cropping enterprise increase returns by $57 per hectare;
- Input savings have a substantial impact on gross margin and were achieved without a yield penalty; and,
- Nitrogen models under-estimate mineralisation and assessing crop need is a more reliable indicator.

After 10 years of precision agriculture and controlled traffic farming, Stockport (South Australia) farmer Mark Branson crunched the numbers to calculate the financial influence these systems have on his family farm's bottom-line.

Early adoption of new technology is nothing new to the Branson family. When Mark's ancestors established the farm in 1898, they became some of the first to adopt the superphosphate research results from the local Roseworthy Agricultural Institute.

The 2014 season not only marked 116 years of productive farming by the Bransons, it was also 10 years since they had converted to RTK guidance (ie Real Time Kinematic satellite navigation), controlled traffic farming and full no-till. These changes also kick-started the use of yield data, which had been collected by the Bransons since 1997.

So, Mark decided it was time to crunch the numbers to see what impact PA technologies were having on their farm's bottom line and what changes were providing the greatest financial gains.

Input savings are critical to the bottom line

"Most people look to yield as the benchmark for justifying system changes but yield is too influenced by seasonal factors," says Mark. "Input savings can represent greater benefits – as I found out."

Mark did need to include yield gain in his calculations but based this information on gains in water use efficiency (WUE) from data he had collected since 1988. WUE is used because it takes into account the largest outside influence on yield – growing season rainfall (GSR).

Mark used the change in five year rolling averages of WUE over time to indicate the improvement in yield with the adoption of new technology. The calculation of WUE uses actual yield divided by potential yield.

Mark Branson uses a handheld biomass sensor to compare crop reflectance of the N-rich strip against the adjacent crop. This establishes the various nitrogen application rates required. (PHOTO: Emma Leonard)

Potential wheat yield (based on the French Schultz model) is GSR minus 110 mm for evaporation losses multiplied by 20.

So, for 350 mm GSR, the potential yield is 4800 kg per hectare – but if only 4000 kg is harvested, then 83 per cent of potential has been achieved.

"Between 1988 and 2014 we moved from achieving 63 per cent to nearly 100 per cent of potential yield, which suggests changing systems is having a positive impact on production," Mark said.

The box below outlines the key changes over time to the Branson's cropping systems. These include adopting full no-till in 2002.

Financial impact from the new technologies

As Mark really wanted to see the impact of the adoption of PA technology and CTF systems, he dissected the figures into WUE gain pre-2002 and post-2002.

Based on this dissection he established that the pre-2002 annual average WUE gain for wheat was 1.1 per cent improved yield, while from 2002 to 2014 it was 2.2 per cent.

Mark attributed the additional annual 1.1 per cent WUE gain post 2002 to the adoption of no-till, PA technology and CTF systems.

FARMING SYSTEM CHANGES INFLUENCING YIELD AND PROFIT

1988 to 2001

- Introduction of grain legumes and oilseed crops.
- Introduced new wheat varieties.
- Nitrogen based fertilisers introduced.
- Stubble retention enforced.
- No-till introduced.

2002 to 2014

- No-till enforced.
- Variable rate technology introduced in 2006.
- Controlled traffic introduced in 2004.
- Introduction of animal manures as an additional carbon source.
- Growing as many high carbon crops as possible.
- Inter-row sowing introduced.

The same calculations were done for other crops. Smaller yield gains were recorded for barley and faba beans but no yield gains were recorded for canola nor field peas.

Mark calculated that yield gains in the 10 years up to 2014 across his 900 hectare cropping program, contributed to a total increase in income of almost $8 per hectare. This was based on:

- Wheat, 380 ha – $16.20 per ha income gain from yield increases;
- Barley, 260 ha – $3.79 per ha gain; and,
- Faba beans, 88 ha – $1.21 per ha gain.

Total $ gain from yield increases across 900 hectares – $7.87 per ha

The CTF system has evolved and is now based on a 1 to 4 system with the seeder 9.8 m wide and the boomspray and fertiliser spreader 39.2 m. All vehicles are on 3 m axles and all implements fit the system except the harvester.

The combination of RTK guidance and CTF has helped reduce overlap by up to 4 per cent and correspondingly less inputs of seed, fertiliser and sprays. Savings in the latter have also been boosted by the addition of auto-section control on the boomspray and auto-width and auto cut-off on the fertiliser spreader.

Mark has not included any saving for time or fuel due to reduced area driven and increased work rate as these are difficult to calculate.

So purely on reduced inputs due to less overlap, Mark estimates a saving of $7.24 per hectare with fertiliser representing the biggest saving.

- Seed, $1.69 per hectare saved from reduced overlap;
- Sowing fertiliser, $3.64 per ha;
- Chemical, $1.33 per ha; and,
- Post fertiliser, $0.58 per ha.

Total savings from less overlap across 900 hectares – $7.24 per ha

Savings in fertiliser, lime and gypsum and herbicides have also been achieved from targeting inputs to need. The Bransons have the ability to vary input rates on the seeder, sprayer and fertiliser spreader.

Varying herbicides has been used on a trial basis and is currently too hard to calculate its economic benefits. But the use of replacement phosphorus and nitrogen – based on budgeting and crop scanning – have generated substantial savings without any yield penalties.

Inputs of gypsum and lime are varied based on soil colour and yield data. Locations are ground-truthed to confirm the rate and type of amendment.

Variable rate nutrients

Phosphorus (P), if adequate, is applied in the soil during the seeding pass at replacement rates derived from the previous year's yield maps. The lower the yield the less nutrient removed, so less is applied. Rates are calculated from the P lost in grain from the previous crop plus a buffer P rate for nutrients lost to the soil.

The Bransons make their own rate maps using the SMS Advanced software.

Nutrient adequacy is assessed by checking soil samples over time to see if P is changing – but this is difficult as P levels change slowly.

As producers of durum and bread wheat, and malting barley, achieving the correct protein percentage is a high priority for the Bransons. They have experimented with a harvester mounted protein meter but nitrogen (N) management remains their main method of managing protein content.

Achieving an even spread of the input across the complete width is vital in variable rate and CTF systems.
(PHOTO: Mark Branson)

Many different methods are used to calculate the rate of N to be applied to the crop. The main method is using N-rich strips which are assessed using a handheld GreenSeeker®. This technique uses the crop itself as the indicator of its N needs.

Deep soil nitrogen is measured to assess available N and this information is used with a forecast yield at the time of application, to see if top-up N is required.

"In some crops no nitrogen has been applied until flag leaf emergence," Mark says. "The N-rich strips give us the confidence not to apply N rather than adding an 'insurance' dose."

The N-rich strips are located on various soil types in a paddock and these provide a reference that is unlimited by nitrogen. The scanned readings from the crop and N-rich strips are compared. This identifies if additional nitrogen is required and maximum and minimum application rates are determined.

Tractor-mounted CropSpec sensors are used to vary the N rate on-the-go according to the site specific canopy requirements.

"I have not been able to make nitrogen models work for my farm for years. We are finding more mineral nitrogen is available than the models

BRANSON FARM DETAILS…

- **Location:** Stockport, 75 km north of Adelaide, South Australia
- **Farm size:** 1200 ha in two blocks, 12 km apart (80% cropped)
- **Annual rainfall:** 425 to 525 mm
- **Soil:** Red brown earth and self- mulching dark brown cracking clay, pH ranging from acid to alkaline, undulating land, creeks.
- **Enterprises:** Durum and bread wheat, malting barley, canola, faba beans, field peas, self-replacing merino flock and prime lambs
- **Personnel:** Mark and Nola Branson and son Sam, parents Deane and Jennifer Branson and a full time workman
- **Average wheat yield:** 4.2 t/ha

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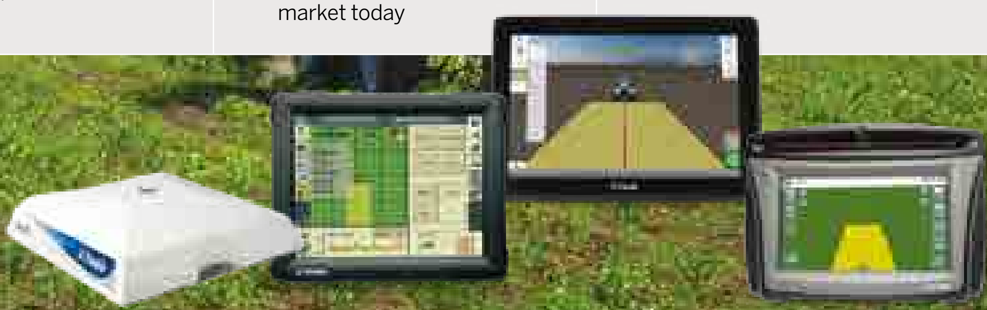

* All horizontal accuracy specifications are based on repeatable in-field performance 95% of the time.Dependent on receiver capabilities and user's geographic location.

Correction Services

PREVIOUS CONTENTS NEXT

THE PA TIMELINE

- 2003 – Lightbar guidance & Grain yield monitoring
- 2005 – Grid soil sampling; Electromagnetic soil maps; and, On-farm research
- 2005 – VR seeding tests began
- 2008 – Vehicle steering
- 2010 – RTK & Spray application mapping
- 2013 – Variable rate phosphorus & nitrogen

predict – sensors enable me to confidently respond to the crops' needs.

"Deciding not to apply nitrogen is often a harder decision than deciding to apply – this is where the sensors really give me confidence," Mark says.

N-rich strips are put in all crops including barley and canola, but the Bransons have the most confidence using them in wheat crops where more research has been done. According to Mark, additional research needs to be done on barley and canola nutrition to improve the agronomy in those crops.

The ability to save on fertiliser and soil amendments – while maintaining a yield gain – have created the greatest savings for the Bransons, representing around $54 per hectare.

"Savings in fertiliser inputs due to the adoption of PA technologies – yield mapping, targeted soil sampling and crop sensing – represent nearly 80 per cent of the financial benefits we have recorded from systems changes," Mark says.

- Phosphorus $16.00 per ha saving from reduced rates;
- Nitrogen $33.78 per ha saving; and,
- Gypsum/Lime $4.36 per ha saving.

Total nutrition savings across 900 hectares – $54.14 per ha

Total savings and gains from systems changes in the 10 years up to 2014 were estimated at $69.25 per hectare. But these gains do not happen without taking on some additional capital costs.

PA capital costs

Mark used 2014 prices for machinery and software and averaged these costs for his 900 hectare cropping program over 10 years.

Table 1: A summary of the increased income, savings and costs attributed to adopting PA technology, CTF and no-till, 2004 to 2014

	$/ha	$/ha
Yield gains/ha	$7.87	
Input overlap savings	$7.24	
Nutrient savings	$54.14	
Subtotal of savings		$69.25
Total PA capital expenses		–$12.28
Increase in annual income		**$56.97**

Based on 900 hectares of cropping each year

The final PA capital cost, amortised over 10 years, came to around $11.00 per hectare.

- RTK GPS/console unlocks – $44,000;
- Tramline renovator – $18,000;
- Modifications to airseeder – $15,000;
- Software – $3000; and,
- Biomass sensors – $20,000.

Total PA capital cost for 900 ha – $100,000

In addition, the Bransons estimate a cost of $1 per hectare for time managing data and $0.67 per hectare for the RTK GPS signal – which they now receive from a dealer-owned network – bringing the total annual PA capital cost per hectare to just over $12.

To sum up

PA-inspired changes to the Branson's farming system have increased the cropping profit by around $57 per hectare each year (Table 1).

This is more than $50,000 annually across the 900 hectares of crop.

"Yield gains have yet to plateau," Mark says "and it could take another 10 years to fully realise the benefit of all these changes as the soil is still improving and more nutrients are cycling each year."

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mark@bransonfarms.com.au

This article was originally published in the Society of Precision Agriculture Australia (SPAA) magazine *Precision Ag News*. SPAA is a non-profit membership based group promoting the adoption of precision agriculture. Join SPAA and reap the benefits of PA support. To join SPAA and subscribe to *Precision Ag News* visit www.spaa.com.au

UAVs to 'look for' nutrients and insects

Imagery obtained from cameras mounted on unmanned aerial vehicles (UAVs) could help growers and consultants to identify crop areas deficient in nutrients and at increased risk of attack from insects.

A UAV, with multispectral camera attached, over canola. The colour-coded map depicts crop variability.

These images could enable growers to inspect these areas at ground level to confirm nutrient deficiencies and detect insects, resulting in early, targeted and cost-effective treatment of crops.

This is the finding from research funded by the Grains Research and Development Corporation (GRDC), the University of Western Australia's (UWA) Institute of Agriculture and the Department of Agriculture and Food (DAFWA).

The research was conducted at a CSBP trial site at Williams, WA where canola was sown on gravelly, sandy loam soils, with various potassium (K) fertiliser treatments, and was led by DAFWA researcher Dusty Severtson as part of a PhD project undertaken at UWA.

Dusty found that areas of K-deficient canola could be accurately classified using reflectance data from a multispectral camera mounted on an eight-rotor remote controlled UAV.

"The highest accuracy (99.9 per cent) was at 120 metres above ground level and at flowering about four months after seeding," he said.

"But very high accuracies were found at this height at the four-to-eight leaf growth stage (92 per cent) and stem elongation/pre-flowering growth stage (99 per cent) as well.

"Furthermore, the research showed that leaf area indices (LAI) – or overall leaf cover – were considerably reduced in four-to-eight leaf canola, meaning that mapped regions displaying reduced LAI could be targeted for on-ground inspection early in the season."

K-deficiency made plants more susceptible

Dusty said the research also confirmed that green peach aphid numbers were substantially higher on K-deficient plants than on K-sufficient plants, confirming that plants lacking in K were more susceptible to pests and diseases.

"Grain yields from K-deficient canola in the trials were up to 47 per cent lower than canola with adequate levels of this nutrient, due to the effect on plant growth and damage from insects," he said.

"The use of UAVs and multispectral cameras could help growers to move further away from blanket applications of fertilisers, herbicides and insecticides and further towards detecting and specifically targeting specific areas of paddocks," Dusty said.

Andreas Neuhaus, of CSBP, who assisted with the trials, said the emphasis in the use of this technology was on crop monitoring and early identification of variability in crop performance across paddocks.

"Plant tissue tests or inspections can then provide further insights which, depending on the season and crop stage, can be acted on either in the current year or be used for planning for the next season," he said.

Dusty Severtson: E: dustin.severtson@agric.wa.gov.au GRDC UWA000158 ■

Customising your precision farming display

Farmers who want to customise their precision farming display now have that capability with Trimble's TMX-2050™. The display includes the Ag App Central marketplace where farmers can access Trimble Connected Farm™ apps as well as Trimble-approved third-party apps. By accessing the apps that are most useful to their farm operations, language and regional compliance requirements, farmers can customise their experience and benefit from improved productivity, streamlined workflows, and better data management.

The Ag App Central marketplace provides farmers with one convenient location to download and install apps, view descriptions and images, report issues, connect with developer partners, and stay current with on-demand updates. In addition, the data connectivity of the display provides growers with access to the entire Connected Farm solution where they can view field activities and other key farm information all in one central location enabling better decision making with real-time data.

The Trimble TMX-2050.

Connected Farm Apps

Trimble created several apps – available in the Ag App Central marketplace as well as through the Google Play™ Store or the Apple App Store – that allow farmers to use their smartphone or tablet to better manage their farm operations remotely.

- Connected Farm Field – enter detailed field records and install to multiple devices so records can be collected instantly and sent to Connected Farm where profit and loss information can be viewed for the entire operation;
- Connected Farm Scout – map field boundaries, mark flags, and enter scouting information;
- Connected Farm Fleet – monitor an entire fleet from any location to increase field efficiency and productivity; and,
- Connected Farm Irrigate – monitor and control centre pivot systems in real time from any location resulting in reduced trips to the field and ensuring the right amount of fluid is applied in the right place.

To view the apps available in App Central marketplace, visit:
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Section 7

A big year for pulses

2016 INTERNATIONAL YEAR OF PULSES

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THIS SECTION BROUGHT TO YOU IN ASSOCIATION WITH:

AGT FOODS AUSTRALIA

Trends in worldwide production, consumption and trade of pulses

2016 INTERNATIONAL YEAR OF PULSES

The cultivation of pulses can be traced back thousands of years. Ancient civilizations in Mesopotamia grew peas, beans and lentils as far back as 8000 BC, and researchers recently discovered evidence of faba beans cultivated in northern Israel over 10,000 years ago. These staple crops have been an integral part of human diets for millennia, and today are an important crop not only for food security, but also for combatting malnutrition, alleviating poverty, improving human health and enhancing agricultural sustainability.

Yet pulses have not experienced anywhere near the same production increase as that of corn, wheat, rice and soybean in the past 50 years.

Between 1961 and 2012, the advances of the Green Revolution led to massive gains in both yield and production of many basic foodstuffs through the industrialisation of farming. During this period corn, wheat, rice and soybean all saw cumulative production gains somewhere between 200 and 800 per cent, while pulses expanded by only 59 per cent over the same timeframe.

Consumption of pulses has seen a slow but steady decline in both developed and developing countries.

By contrast, consumption of dairy products and meat has increased, and is predicted to continue to rise considerably.

No major changes are forecast in per capita consumption of pulses, with the world average remaining at around 7 kg per person per year.

Why aren't pulses keeping up?

So why aren't pulses faring as well as other crops? The answer lies partially in changing patterns of diet and consumer preferences.

As countries become richer, populations are shifting from vegetable proteins to more expensive protein sources like dairy and meat. But this is not to suggest that there will be a surplus of pulses or a drop in demand – in many countries, the population is growing at a rate that exceeds farming output.

In other words, farmers cannot grow enough pulses to keep up with increased demand. In these cases, countries are forced to import pulses, which explains why international trade in pulses has grown much more rapidly than production.

This trend is expected to continue as production of pulses lags behind trade.

In India and China, the consequences of this imbalance are already manifesting. China recently transitioned from net-exporter to net-importer of pulses, and India – the world's largest producer and importer of pulses – is experiencing massive price hikes in pulses after a poor harvest this year.

The International Year of Pulses is more important than ever. Raising awareness about these important crops can help increase production, encourage new research and development, and ultimately ensure that pulses are widely available for consumption throughout the world. ■

With human diets tending away from vegetable proteins, per capita demand for pulses is lower – but overall production and trade needs to continually increase to meet the demands of an ever larger global population.

Australian chickpea production and exports to remain high

By David Mobsby and Kyann Zhang, ABARES*

*Forecasts and comments based on information available in late February, 2016

Since 2012–13 chickpeas have been Australia's single largest pulse crop. Australian chickpea production is estimated to have reached a record 1 million tonnes in 2015–16. This was the result of above average yields and a doubling in planted area as producers responded to rising world chickpea prices in early 2015.

During 2015 world chickpea prices rose from already elevated levels because of an anticipated fall in Indian pulse production resulting from below average rainfall. In response to forecast relatively high chickpea prices, Australian chickpea plantings are expected to increase in 2016–17, but production is forecast to be marginally lower – assuming a return to average yields.

Over recent months, Australian chickpea exports have reached record monthly levels, reflecting the large 2015–16 crop and strong import demand from India. Exports in the December quarter 2015 reached around 781,000 tonnes, compared with around 179,000 tonnes for the same quarter in 2014. Around 80 per cent of these exports were shipped to India, with the remainder largely exported to neighbouring Bangladesh and Pakistan. For 2015–16 as a whole, chickpea exports are forecast to be around 1 million tonnes ($878 million).

In 2016–17 export volumes are expected to remain relatively high, but export prices are forecast to fall, resulting in a forecast lower export value of $544 million.

Australian chickpea export prices are expected to average $872 a tonne in 2015–16 and then decline in 2016–17.

Chickpea exports, Australia

Indian pulse production expected to be below average in 2015–16

India is the world's largest chickpea producer, accounting for around 68 per cent of world production. But to meet domestic demand, India supplements its production with a large volume of chickpea imports.

Indian chickpea production was adversely affected by unfavourable seasonal conditions in 2014–15 and again in 2015–16. Early in the 2014–15 season, below average rainfall reduced area planted and untimely rainfall later in the season reduced crop yield.

In 2015–16 the Indian Government announced support policies aimed at encouraging higher production of chickpeas and other pulses.

But chickpea plantings in 2015–16 have been below average because of unseasonably dry conditions. By late January 2016, an estimated 8.5 million hectares of chickpeas had been planted – 6 per cent below the average planted area of 9.1 million hectares in the five years to 2014–15.

Given the size of the Indian domestic chickpea market and its dominant position in world trade (around 23 per cent of world imports), a significant rise in Indian import demand can markedly affect world prices. Indian chickpea imports in the first six months of 2015–16 (April to September) reached 339,350 tonnes, compared with total imports in 2014–15 of 418,870 tonnes.

Indian production to recover, price to fall

A substantial supply response is expected for Indian pulse production in 2016–17, assuming an average monsoon season. More favourable planting and growing conditions are expected to result in higher average yields and planted area, compared with the current season.

Total Indian pulse production in 2016–17 is expected to rise significantly. This forecast higher production would reduce import demand in 2016–17.

Australian chickpea export prices are expected to average $872 a tonne in 2015–16 but are forecast to decline over 2016–17 to an average of $574 a tonne. ■

Understanding global pulse markets

By Pulse Australia

There are a number of buyers, markets and contract options available to Australian pulse growers. It is strongly recommended that growers develop relationships with more than one buyer/marketer and remain in contact with them throughout the season.

This can be beneficial to both parties as growers can provide regular updates on the potential volume and quality of the pulse grain they will be marketing and marketers can provide the most accurate information concerning the global market trends. Pulse Australia members provide a range of marketing solutions for growers.

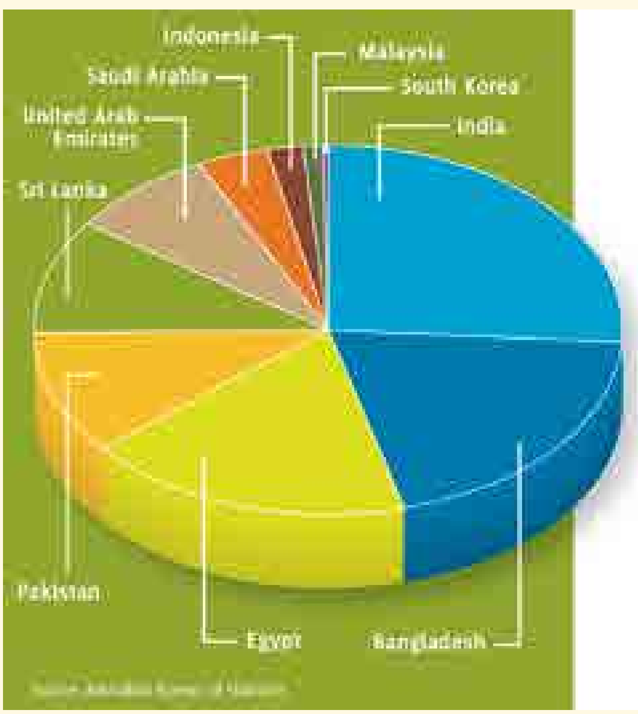
World markets

The global pulse markets are all driven by supply and demand. Australia has a large exportable surplus of pulses, harvested mainly in October to December each year. Export destinations for Australian pulses include Asia, North Africa, Middle East and the Indian sub-continent. Pulse markets are volatile and can be subject to price changes very quickly. Although Australia is renowned for high quality grain, and can attract a premium for its pulses, it is still at the mercy of the global supply and demand situation and the consequential price moves.

World pulse production is not increasing to any significant degree, but the population that depends on pulse protein in developing countries continues to rise. The higher values for wheat and oilseeds – and a changing diet away from vegetable proteins reflecting western influences – is behind this trend of reduced pulse area.

Many growers also believe that pulse production involves a higher level of risk than some other grain crops.

Figure 1: Australia's top 10 export destinations for pulses (2010 through 2014)



AT A GLANCE…

- High pulse prices stem demand. So the more expensive products get, consumption decreases. Markets go up, but will always come down again at some point.
- Currency at origin and destination has a big impact on prices and demand – a lower Australian dollar means we can sell cheaper exports. A lower Indian rupee means less buying power for Indian importers.
- The tonnage of various pulse crop produced by Australia's major exporting competitors impacts on our competitiveness in the world market. Canada is a major competitor in lentil and field pea export markets; Europe, the UK, Canada, Poland and Lithuania for faba bean; and, Turkey, Mexico and Russia for desi and kabuli chickpea.
- Market 'shorts' can cause spikes that temporarily inflate prices.
- The quantity and quality of the pulse crops produced in Australia does affect local and international markets.
- Domestic markets can impact in years of short supply, particularly for field pea, lupin and faba bean.
- Weed seed restrictions into India necessitate cleaning of Australian pulses before exporting.
- Price varies according to time of sale, whether at harvest or after storage or warehousing.
- Prices of imported soybean meal and other vegetable proteins, along with feed cereal grain price, currently sets the feed pulse maximum prices that feed manufacturers and end-users can afford.
- Global moves to ethanol/biodiesel production will impact on total global food and feed supply and demand.

A significant factor in this perceived higher risk is the spot price market that pulses are traded within.

The futures and trading houses dealing with cereals and oilseeds provide growers with greater control over price risk, which is attractive to growers. But unlike cereal and oilseed markets, pulses are not traded in advance of the purchase, nor is there a futures market.

For pulses, the value at harvest or delivery to the market, is uncertain when planting choices are made. This makes forecasting market conditions impossible with any confidence or accuracy, making it difficult for growers to determine the best time to sell their produce.

The world's largest consumers and importers of pulses – the Indian sub-continent – purchases pulses as demand requires. Additionally, grain visual appeal is a major consideration by sub-continent buyers and is often as important as objective measurement of grain quality.

High quality the key

To maximise marketing opportunities, Australian growers must continue to reliably and efficiently produce the high quality product that pulse export markets require. We can reasonably expect that pulse prices will rise and fall over time, but the on-going shortfalls of domestic production in the Indian sub-continent are unlikely to change in the foreseeable future.

Maximising yields and keeping input costs down must remain as the driving forces for feed grains into domestic markets. Establishing an ongoing relationship with an end-user or marketer is becoming increasingly important.

Trade into some countries carries more risk to the marketer than others. In the sub-continent and Middle East markets, government controls are less stringent than those exercised in Australia and this can result in a higher degree of contract defaults and disputes over shipment quality on arrival at the destination port.

Australian marketers factor this higher risk into contracts. This situation is somewhat worse when world financial markets are highly volatile. Such situations usually result in a tightening of lines of credit, which makes marketing difficult to achieve for anything other than the spot market.

Understanding and being able to react to market influences is difficult and complex. Your preferred marketer will keep abreast of developments and advise accordingly.

Major pulse importers

The Indian sub-continent (India, Pakistan, Sri Lanka and Bangladesh) is the world's largest consumer and importer of pulses. The region is Australia's biggest and most important pulse market (Figure 1). With a growing population and a trend towards increased cereal and oilseed production and consumption, pulse production in the area regularly falls well short of domestic demand, often to the tune of 3 or 4 million tonnes annually. This can be exacerbated by unfavourable seasonal conditions.

Understanding the degree of domestic pulse production in the sub-continent will provide indicators as to the likely demand for Australian pulses. In common with Australia, India produces desi and kabuli chickpea, field pea and lentil. Faba beans are not consumed widely in India, and therefore is not a market for Australian faba bean exports.

The Indian agriculture system has two seasons, the Rabi (winter growing season) and Kharif (summer or monsoon season). Rabi planting occurs from October to January and harvest finishes in June, prior to the monsoon season. Almost all crops are irrigated. A strong monsoon season is necessary to replenish soil water and irrigation reserves for production in the rabi season.

Kharif planting occurs from June to August when the monsoon starts and harvest commences as early as October. Some irrigation is used, but most production is rain-fed.

In India, the government plays a major role in regulating domestic pulse grain supply, with the aim to have domestic pulse prices as low as possible. Most pulse purchases are made on a tender system via government agencies. This allows the government to on-sell the grain at a subsidised price onto the domestic market to offset the fluctuations in world prices, enabling the majority of the population to purchase more affordable pulse grain.

Government regulations limit how long private traders can hold pulse stocks, reducing the opportunity for speculation that may lead to increased domestic prices.

World pulse production calendar

There are significant variations in the timing of seeding and harvest of pulse crops between the northern and southern hemispheres. The northern hemisphere pulse crop is summer grown while the southern hemisphere is winter grown. The exception is chickpea, which is grown in both winter (rabi) and summer (kharif) seasons in the Indian subcontinent.

Australia's major pulse crops

Chickpeas

Chickpea is also known as ceci bean, garbanzo bean, chana, sanagalu Indian pea and Bengal gram.

Chickpea has two distinct types – desi and kabuli – with different market preferences and prices. Both command the highest prices when grain size is large with an even and light colour.

Desi chickpea is the smaller and darker of the two types and generally more suited to broadacre production across a wide range of regions. Large seed will be used as whole grain, but the principal use is as a dehulled and split grain (dhal). Despite desi chickpeas being used for dhal, a light tan seed coat is paramount to buyers.

Kabuli is the premier chickpea type and is priced on size and colour. Shape and texture are also important as it is mostly consumed as a whole grain in chickpea salads and hot meals. Bigger is usually preferred as is an even, light creamy coloured coat.

Large (9–12 mm) kabuli chickpea production is best suited to regions with reliable rainfall and/or irrigation, which is particularly important during grain fill. Small kabuli (6–8 mm) varieties are more adapted to medium rainfall regions, and are primarily used as whole grain or for milling into flour (gram or besan).

Because of the popularity of kabuli and the difficulty of achieving high quality grain, a greater number of countries import kabuli chickpea compared with those that import desi types.

The primary competitor for desi chickpea in sub-continent markets is the Canadian yellow field pea. When the differential in price between chickpea and field pea is large, buyers will look to field pea to substitute for a proportion of the chickpea flour. This then lowers the cost of production, hence price of manufactured foods. Canada is the largest producer and exporter of yellow field pea.

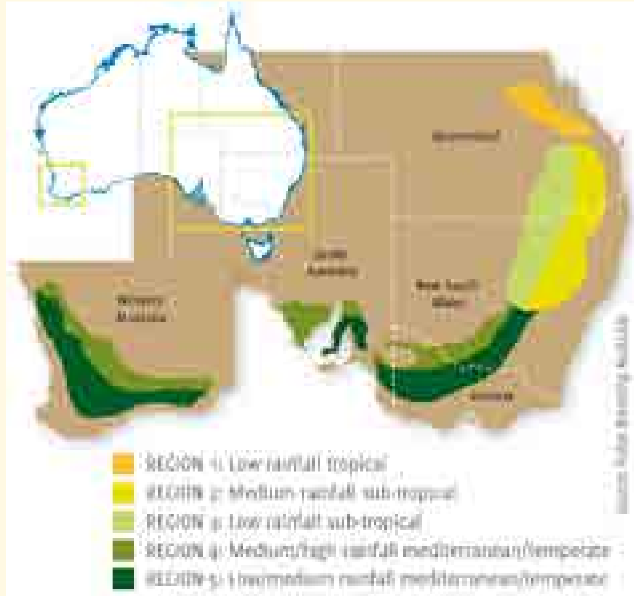
Factors that should influence Australian farmers to grow chickpea include:

- The Indian winter (Feb–April) Rabi production estimate;
- Any negative influences will increase the need for imports of either chickpea or field pea;
- Canadian planting intentions and export carryover estimates for yellow field pea; and the,
- Quantity and quality of Australian production

The outlook for Australian chickpeas is influenced by:

- The chickpea harvest in Canada, Syria and Turkey, which occurs before the Australian harvest; and,
- Prospects of harvest in the Indian sub-continent, which occurs at and after the Australian harvest.

Figure 2: Areas of pulse production



Lentils

Also known as masoor, lentil is the premier winter pulse for consumers and often attracts the highest price of all the Australian winter-grown pulses. It is always in demand on the Indian sub-continent and Australia is a significant world supplier of lentils into this market.

There are two types of lentil – red and green. Canada's lentil production is principally green lentil, while Australia's is principally red. Red lentil is more adapted to the lower rainfall regions of southern Australia.

Australia is one of the main exporters of lentil on the global market, along with Canada and the US. Smaller exporting countries such as Turkey and Myanmar also influence the world price but are less predictable with their varying exportable surplus or import needs.

Factors that should influence Australian farmers to grow lentils include:

- Local price expectations and their relativity to other pulses and grains;
- Canada's planting intentions (data available from April);
- Canadian domestic carryover stocks and the quality of those stocks;
- Myanmar's export surplus;
- Domestic production of pulses in India (finishing in May); and,
- Availability of forward price contracts in Australia.

Outlook for Australian lentils is influenced by:

- The crop harvest in Canada, Syria and Turkey (before the Australian harvest); and,
- Prospects of lentils in the Indian sub-continent (at and after the Australian harvest).

Lupin

The export and domestic trade in Australian sweet lupin (narrow-leaf) is principally for the stockfeed industry. It is sought after as a high protein ingredient for rations used in the intensive dairy, beef and pork industries. It also is highly desired for the extensive sheep industry and has desirable properties for the aquaculture market.

Interest is increasing in the human consumption of lupin.

Australian seasonal conditions and the subsequent availability of pasture feed – as well as the various feed grains – strongly influences the lupin farm gate price. In drought years, domestic demand for lupin will generally drive prices higher than that achieved in export markets.

Australian sweet lupin (narrow-leaf) is used mainly in the stockfeed industry. (PHOTO: DAFWA)

The price of imported vegetable protein, such as soybean meal, canola meal or palm kernel meal, strongly influences the lupin export price. Soybean meal is usually plentiful in supply and can be sourced all year round, enabling forward ordering and regular supply.

Export markets for Australian sweet lupin are distinctly different to those for other pulses and include Spain and South Korea for intensive animal feeds, and aquaculture markets in Scandinavia and Indonesia.

The albus lupin market is primarily in Egypt, where it is consumed as a snack food. This is a limited market with a total import requirement of around 50,000 tonnes annually. Overproduction in Australia can exceed the Egyptian market requirements and flatten demand accordingly.

Despite their similar nutritive value, albus lupins are not as readily accepted into the domestic feed markets as Australian sweet lupin (narrow-leaf). This is possibly driven by the historically higher pricing for export markets where production was often lower than export demand.

Factors that should influence Australian farmers to grow lupin include:

- Domestic stocks and previous season domestic production;

Factors that should influence marketing decisions for Australian lupin farmers include:

- Estimate of domestic production of lupin;
- Estimate of domestic availability, type and quality of protein feeds including green pasture;
- On-farm storage capacity enabling marketing throughout the year;
- The world price and availability of soybean meal; and,
- Demand for on-farm use by graziers as a fodder grain, especially in drought situations.

Faba beans

The market for faba bean – also known as horse bean – is more limited than other food pulses, and is largely restricted to the Middle East, principally Egypt.

Suppliers of faba beans to Egypt include the United Kingdom and the European Union (predominantly France), both of which have a geographical advantage over Australia in shipping.

Additionally, the harvest of European faba beans is complete by September, giving a 3 to 4 month advantage to supply this market before the Australia harvest is ready for export.

Markets prefer the green seed coat colour of new crop faba bean.

It is critical that Australia produces a high quality faba bean product with excellent colour and uniformity of size. As the seed coat oxidises, buyer acceptance declines along with the price. Storage facilities with controlled temperature can increase the time before oxidation starts to occur.

The European faba beans can be of lesser quality, often because of bruchid damage (a similar effect as pea weevil in Australian field peas).

Faba beans that have a minor seed coat blemish (wrinkling, staining or darkening with age) can be split to produce a quality product if the defect does not damage the kernel. But this is a more limited market.

Broad beans face similar market forces.

Factors which should influence Australian farmers to grow faba or broad beans include:

- Forecast planting intentions of European farmers, France and UK;
- Previous season import activities of Egypt; and,
- Export activity from Australia and potential carryover stocks.

Outlook for Australian faba beans is influenced by:

- The crop harvest in Egypt, UK and France (before the Australian harvest); and,
- Prospects for Chinese exports (before and at Australian harvest).

Field peas

Known as yellow pea in Canada (similar to white field pea in Australia), Australian production includes dun, white, blue and kaspa type field pea.

The kaspa type is now the most dominant in Australian agriculture. It's less bitter taste than dun is preferred in southern India and Sri Lanka.

Canada is by far the world's largest exporter of field peas, known as 'Canadian Yellows', which are white seeded, round peas with yellow kernels. Canada exports throughout the year to the sub-continent with India being its biggest customer.

Australian production and export totals for field peas do not influence world prices.

Canadian Yellow peas are used in the sub-continent principally by lower paying markets, but will be purchased in larger quantities when the import price of chickpea and lentil becomes too high for the domestic market.

Similarly, demand for Australian field pea will increase when the Indian market deems that the price for chickpea is too high.

Factors that should influence Australian farmers to grow field peas include:

- Canadian field pea planting intentions, data is available in March to April;
- Indian domestic rabi season (February to April) pulse production; and, Any negative influences will increase the need for imports of either chickpea or field pea.

Outlook for Australian field peas is influenced by:

- Pea and chickpea harvest in Canada and chickpea production in Syria and Turkey (before the Australian harvest); and,
- Prospects of harvest in the Indian sub-continent (at and after the Australian harvest).

Note that field pea market issues must take chickpea supplies into account, although Australian kaspa peas are now finding their own unique market in India apart from as a substitute for chickpeas.

Further information see www.pulseaustralia.com.au

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Section 8

Grain Storage & Handling

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Bulk grain bags a good option – but use them properly for best results

AT A GLANCE…

- Grain bags are best suited for short-term, high-volume grains to assist with harvest logistics.
- Site planning and preparation is the first and most important step for successful storage.
- Bulk grain bags are a higher risk form of storage compared with silos – requiring experience and best management practice.
- Inspecting grain bags weekly, or more frequently, and patching holes will reduce the chance of spoilt grain from moisture or pests.

Bulk grain bags, also known as silo bags, can be a handy harvest storage option if used properly. A planned approach with careful management is essential. They are best used for short-term storage (a few months maximum) to support harvest logistics.

Successfully storing grain for longer periods in bulk grain bags requires experience, a carefully prepared site and regular monitoring for grain quality and pest incursions.

The capacity of grain bags varies with bag size – which generally ranges from 40 to 90 metres long, and anywhere from 100 to 300 tonnes depending on the type of grain and how much the bag is stretched during filling.

The material most commonly used for grain bags is a three-layer polyethylene – two white layers to protect against the ultraviolet rays and reflect heat and a black inner layer to block light.

Which grains can be stored?

Due to their short-term storage capacity and suitability for supporting harvest pressure, growers tend to use grain bags primarily for extending existing storage of wheat, barley and sorghum during high-yielding seasons.

Patience and accuracy during filling will make emptying the bag much easier. Keep the bag filling evenly and straight.

Aeration cooling is not yet proven with grain bags. So storing canola or high-value pulses is not recommended.

Cereal grain quality is best preserved when the moisture content is below 12.5 per cent. Storing grain at higher moisture content in bags not only compromises grain quality but increases the risk of grain swelling and splitting the bag.

Being unable to aerate bags and having a large surface area exposed to heating from the sun means grain remains warm for months after harvest. This can affect seed germination rates and malt barley quality.

Storing grain at harvest temperatures of 30°C and above, favours high insect reproduction rates, so take extra care with hygiene and monitoring.

Bulk grain bags are an effective form of storage when used in the right situations and when they are managed correctly.

Buying grain bags

There are some simple – but very useful – checks to do to help you choose the right grain bag.

- Test the bag quality by pushing your thumb through an edge of the bag – you will be able to make a subjective judgement as to whether it is high or poor quality. Test different brands before you buy.
- Ensure the bag is UV stable for 12 months and complies with the ISO 9001 quality management system.
- Make sure the bag has stretch indicators for accurate filling.
- Ensure the grain bag is designed for grain not silage – different bags look similar and can be confused leading to disastrous results.

Choosing a site

Appropriate site selection is the first – and most fundamental – step in successful grain bag management.

- Placing bags in different paddocks makes filling direct from the harvester or chaser bin easier but it increases maintenance and monitoring time. This can compromise grain quality.
- Bags located across a number of paddocks can present some big challenges in wet weather.
- A central, common storage site for bags is ideal for easier site preparation, monitoring, bag maintenance, vermin control and out-loading.
- Select a hard, smooth, elevated site with a gentle slope where water can drain away.
- Allow plenty of room around the grain bags for machinery access and trucks to turn around.

Preparing the site

- Grade and roll the site, removing sticks, rocks or sharp objects.
- Clear, firm ground makes operating both the filling and emptying machines easier and with less chance of brakes skidding.

PREVIOUS CONTENTS NEXT

- A firmly-rolled site helps drainage and prevents water pooling where the grain bag might 'sink' into soft ground.
- Anything that can puncture the bag is a threat and must be removed. Set up the site away from rocks, sticks, trees (they drop branches and harbour birds) and away from sand hills or long grass where pests such as rabbits, mice and foxes can shelter.
- Anecdotal evidence suggests a thin sprinkle of urea can be spread on the ground where the bag is to be laid to deter mice from burrowing under it.

Setting up the filling machine

The most common filling machines are power take-off (PTO) driven, forcing grain into the bag, stretching it by about 10 per cent as it's laid. A more recent development is the gravity filling design, which requires no power or tractor to operate and relies purely on gravity to fill and stretch the bag.

Make sure the machine is clean before filling the bags.

Grain pests, such as weevils and other insects, can survive in small amounts of grain left in equipment from the previous season. If the machine is not clean, these pests can infest the new season's grain and will multiply and spread through the entire grain bag.

Fitting the bag onto the machine with two people saves time and reduces the chance of injury. When setting up the bag on the filling machine, ensure the stretch markers are on a side where they can be seen and measured when the bag is filling.

When filled, any holes in the bag, will allow the grain to absorb moisture from the ground. To minimise this the sealing options include:

- Sealing the ends of the grain bag with a heat sealer; or,

- Clamping the ends between two lengths of timber or steel, rolling each end around the timber then tucking the bag under itself with about a metre overlap.

The squarer the starting end of the bag, the easier it is to empty with less shovelling – a cable tie around the end is NOT a good idea.

Before filling the bag, use a string line to mark a straight path along the full length of the bag.

A straight bag is a lot easier to empty than a curved one.

Filling the bag

Patience and accuracy during filling will make emptying the bag much easier, reduce maintenance on the bag during the storage period and result in less spills and fewer stops to realign machinery.

- Keep the bag filling evenly and straight to avoid creases – mice tend to attack creases.
- Adjust the brakes and direction often, and in small increments.
- Avoid over-filling (over-stretching) the bag as extra strain makes it more prone to holes, splits and tears.
- Remember, the polyethylene bags will stretch more easily when filled with warm grain on hot days.
- Bags can be filled straight from the harvester, but operators may be tempted to rush, which leads to a poor job and increases the risk of an accident for operators or damage to machinery.
- Stop filling the bag while there is still plenty of bag to seal and re-attach to the emptying machine – about four metres is a good rule of thumb.
- As with the starting end, heat seal or clamp the bag end to keep moisture out, then tuck the excess bag under itself and cover with soil to stop it flapping in the wind.

Site security and maintenance

Site security starts with hygiene. Cleaning the site after filling will not only remove harbours for grain insects, it will remove feed that attracts mice and wildlife. After cleaning up around the site, establish mice baiting stations along the length of each bag and put up signs to warn people of the poison.

Keep the site free of grass by spraying it regularly to remove cover for

mice and wildlife. A sturdy fence – even an electric fence – around the bags can help prevent animals accessing the bags and chewing or walking on them. Even if there are no livestock in the paddock, remember there is always the potential for stray livestock or wild animals to cause a lot of damage in a short time.

Checking as often as twice daily may be required if vermin are plentiful during wet weather. During normal conditions, check at least weekly. Patch any tears or punctures with quality tape or silicone to prevent moisture entering the grain bulk.

Emptying the bag

When making the initial cut in the bag for out-loading, place a piece of tape horizontally across the bag below where it is stretched tight at the top. Make the first cut perpendicular to the bag just below the tape. Do not make the cut parallel to the bag as there is potential for it to split up the entire length of the bag, exposing the grain and making it difficult to pick up.

As for filling the bag, frequent, small adjustments to align the machine and roller speeds are better than large adjustments.

When the bag is almost empty and there's not much weight left in it, the unloading machine may drag the bag towards itself. This can cause tears from the ground or from over stretching. To prevent this, drive the tractor slowly backwards as the last bit of the bag is emptied.

Clean up

Clean grain residues from machinery used for grain handling to prevent reinfestation with insect pests next season. Structural treatments are a wise addition to a thorough clean down.

An inert dust such as diatomaceous earth (DE), can be blown into the machinery to prevent insects harbouring during the off-season.

Site clean-up is vital for success. Spilt piles of grain, and leftover small bags of grain, provide an ideal harbour for insects to live and breed.

Safety around grain bags

Filling and emptying grain bags poses a number of safety hazards, exacerbated by the fact that during harvest people are usually tired and in a hurry. Always follow machinery manufacturer instructions and consult your state occupational health and safety authority for advice.

Treat all operating machinery with respect – keep a distance from machines and always have room to take a step away if needed.

Think before you make any adjustments or movements on machinery.

Ensure anyone on-site is standing clear of the filling machine and tractor before adjusting the brakes as it can lurch forward at any time. Making small adjustments reduces the risk of the machine lurching.

Source: GRDC Grain Storage Fact Sheet – *Successful storage in grain bags*

For more information see:
The Stored Grain Information Hub: www.storedgrain.com.au
Grain Trade Australia: www.graintrade.org.au

Tips on storing your valuable pulses

AT A GLANCE…

- Pulses stored above 12 per cent moisture content require aeration cooling to maintain quality.
- Meticulous hygiene and aeration cooling are the first lines of defence against pest incursion.
- Fumigation is the only option available to control pests in stored pulses, which requires a gas-tight, sealable storage.
- Avoiding mechanical damage to pulse seeds helps maintain market quality and seed viability and makes the stored grain less attractive to insect pests.

Storing pulses successfully requires a balance between ideal harvest and storage conditions. Harvesting at 14 per cent moisture content captures grain quality and reduces mechanical damage to the seed but requires careful management to avoid deterioration during storage.

Pulse crops most commonly grown in Australia include broad beans, faba beans, chickpeas, field peas, lentils, lupins, vetch and mungbeans.

Many of the quality characteristics of the grain from these crops are in the appearance, size and physical integrity of the seed. Mechanical seed damage, discolouration, disease, insect damage, split or small seeds will downgrade quality and market value.

Buyers prefer large, consistently-sized seed free of chemical residues for easy processing and marketing to consumers.

Optimum moisture and temperature

Research has shown that harvesting pulses at higher moisture content (up to 14 per cent) reduces field mould, mechanical damage to the seed, splitting and preserves seed viability.

The challenge is to maintain this quality during storage as there is an increased risk of deterioration at these moisture levels. As a result, pulses stored above 12 per cent moisture content require aeration cooling to maintain quality.

Grain Trade Australia (GTA) sets a maximum moisture limit of 14 per cent for most pulses but bulk handlers may have receival requirements as low as 12 per cent.

As a general rule of thumb, the higher the moisture content, the lower the temperature required to maintain seed quality (Table 1).

Green pods and grains increase the risk of mould developing during storage – even at lower moisture content. Aeration cooling will help prevent mould and hot spots by creating uniform conditions throughout the grain bulk.

Weather damage hinders storage

Pulses exposed to weathering before harvest deteriorate more quickly in storage. As an example, chickpeas stored for the medium to long term (6–12 months) continue to age and lose quality (Table 2).

Growers can minimise the effects of seed darkening, declining germination and reduced seed vigour by:

Table 1: Maximum recommended pulse storage period

		Grain temperature (°C)	
		20	30
Moisture %	14	3 months	N/A
	13	9 months	3 months
	12	> 9 months	9 months

Source: CSIRO Stored Grains Research Laboratory

Table 2: Storage life of chickpeas (longevity of seeds in months) at various stored grain temperatures and moisture contents

		Grain temperature (°C)		
		20°	30°	40°
Moisture content (%)	12	66.6	16.6–21.6	3.6–4.3
	15	23–28	6–10	1–1.6

Source: Pulse Australia

- Lowering moisture content and temperature; and,
- Harvesting before weather damages the grain.

Aeration cooling

Aeration cooling is a vital tool in high quality tored grain management. Cooling helps:

- Create uniform conditions throughout the grain bulk.
- Prevent moisture migration.
- Maintain seed viability (germination and vigour).
- Reduce mould growth.
- Lengthen (and in some instances, stop) insect reproduction cycles.
- Slow seed coat darkening and quality loss.

Aeration cooling allows for longer-term storage of low-moisture grain by creating desirable conditions for the grain and undesirable conditions for mould and pests.

Unlike aeration drying, aeration cooling can be achieved with air-flow rates of as little as 2–3 litres per second per tonne of grain.

High-moisture grain can also be safely held for a short time with aeration cooling before blending or drying. The fans need to be run continuously to prevent self heating and quality damage.

And growers need to be aware that small seeds – such as lentils – will reduce the aeration fan capacity as there is less space for air to flow between the grains.

SECTION 8 GRAIN STORAGE & HANDLING
THIS SECTION BROUGHT TO YOU IN ASSOCIATION WITH
Tapex
We improve fodder productivity

Cone-based aerated silos are ideal for pulse storage.

The cowpea weevil (*Callosobruchus* spp.).

Aeration drying

Pulses stored for longer than three months at high moisture content (greater than 14 per cent) will require drying or blending to maintain seed quality. Aeration drying has a lower risk of cracking and damaging pulses, which can occur with hot-air dryers.

Unlike aeration cooling, drying requires high airflow rates of at least 15 to 25 litres per second per tonne along with careful management.

Handle with care

In addition to harvesting at high moisture content, growers can manage the pulse seeds' quality at harvest by:

- Minimising the number of times augers shift grain.
- Ensuring augers are full of grain and operated at slow speeds.
- Checking auger flight clearance – the optimum clearance between flight and tube is half the grain size to minimise grain lodging and damage.
- Operating augers as close as possible to their optimal efficiency – this is usually at an angle of 30 degrees.
- Where possible, using a belt conveyor instead of an auger.

Cone-based silos fit the bill

Silos are the ideal storage option for pulses, especially if they are cone based for easy out-loading with minimal seed damage.

For anything more than short-term storage (three months), aeration cooled and gas-tight sealable storages suitable for fumigation are essential for best quality management.

Always fill and empty silos from the centre holes.

This is especially important with pulses because most have a high bulk density. This means loading or out-loading off-centre will put uneven weight on the structure and can cause it to collapse.

Avoid storing lentils in silos with horizontally corrugated walls as the grain can run out from the bottom first and collapse the silo as the grain bulk slides down the silo walls.

The pea weevil (*Bruchids pisorum*).

Pests and control options

The most common stored pulse pests are the cowpea weevil (*Callosobruchus* spp.) and pea weevil (*Bruchids pisorum*). The cowpea weevil has a short life span of 10–12 days while the pea weevil only breeds one generation per year.

The only control options are phosphine, an alternative fumigant or controlled atmosphere. All of these options require a gas-tight, sealable storage to control the insects at all life stages.

Chemical sprays are not registered for stored pulses.

While there is a maximum residue limit (MRL) for dichlorvos on lentils, the product is only registered for use on cereal grains.

Weevil development ceases at temperatures below 20°C. This is a strong incentive for aeration cooling, especially if gas-tight storage is not available.

Keep it clean

The first line of defence against grain pests is before the pulses enter storage – and this means meticulous grain hygiene.

Because pest control options are limited, it's critical to remove pests from the storage site before harvest.

Cleaning silos and storages thoroughly and removing spilt and leftover grain removes the feed source and harbour for insect pests.

Clean the following thoroughly:

- Empty silos and grain storages;
- Augers and conveyers;
- Harvesters;
- Field and chaser bins;
- Spilt grain around grain storages; and,
- Leftover bags of grain

Chemicals used for structural treatments do not list the specific "use before storing pulses" on their labels and MRLs in pulses for those products are either extremely low or nil.

Using chemicals – even as structural treatments – risks exceeding the MRL, so is not recommended.

Using diatomaceous earth (DE) as a structural treatment is possible but wash and dry the storage and equipment before using for pulses. This will ensure the DE doesn't discolour the grain surface.

If unsure, check with the grain buyer before using any product that will come in contact with the stored grain.

Source: GRDC Grain Storage Fact Sheet – *Storing Pulses*

For more information see:

Stored Grain Information Hub: www.storedgrain.com.au
Grains Research & Development Corporation: www.grdc.com.au
Grain Trade Australia: www.graintrade.org.au

Section 9

Industry Agencies

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For complimentary inclusion in the 2017 edition of the *Grain Yearbook* please contact *Australian Grain* on 07 4659 3555 or Email: grain@greenmountpress.com.au

National Bodies

National Farmers' Federation

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President: Brent Finlay
Chief Executive Officer: Tony Mahar

Grain Producers Australia

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State Bodies

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AgForce Queensland

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State President: Grant Maudsley
Chief Executive Officer: Charles Burke
Grains President: Wayne Newton
Grains Policy Director: Zachary Whale

Western Australia

Council of Grain Grower Organisations (COGGO)

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Ph: 08 9310 2636
Email: hugh.lennerts@coggo.net.au – Web: www.coggo.net.au
Independent Chairman: Chris Wilkins
Company Secretary: Hugh Lennerts

Grain Industry Association of Western Australia (GIWA)

PO Box 1081, BENTLEY DC, WA, 6983
Ph: 08 6262 2128
Email: info@giwa.org.au – Web: www.giwa.org.au
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Pastoralists' & Graziers' Association of WA (PGA)

Ground Floor, 28–42 Ventnor Ave, WEST PERTH WA 6005
Ph: 08 9212 6900 – Fax: 08 9485 0299
Email: pga@pgaofwa.org.au – Web: www.pgaofwa.org.au
PGA Western Graingrowers Chairman: Gary McGill
Policy Officer: Ian Randles

Western Australian Farmers Federation (WAFarmers)

PO Box 68, GUILDFORD WA 6935
125 James Street, GUILDFORD WA 6055
Ph: 08 9486 2100 – Fax: 08 9279 1188
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President: Tony York
Chief Executive Officer: Stephen Brown

WA Grains Group (WAGG)

C/- PO, LAKE GRACE WA 6353
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Email: wagrainsgroup1@bigpond.com – Web: wagrainsgroup.com
Chairman: Doug Clarke

South Australia

Grain Producers SA

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Email: info@grainproducerssa.com.au
Web: www.grainproducerssa.com.au
Chief Executive Officer: Darren Arney
Chairman: Garry Hansen

Victoria

Victorian Farmers Federation (VFF)

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Ph: 1300 882 833 – Fax: 03 03 9207 5500
Email: vff@vff.org.au – Web: www.vff.org.au
President: Peter Tuohey
Chief Executive Officer: Graeme Ford

Tasmania

Tasmanian Farmers & Graziers Association (TFGA)

Cnr Charles and Cimitiere Streets, LAUNCESTON TAS 7250
PO Box 193, Launceston TAS 7250
Rural Affairs Manager: Nick Steel
Ph: 03 6332 1800 – Fax: 03 6331 4344 – Web: www.tfga.com.au

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www.excelagr.com.au www.gyral.com.au

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Brian Moran 0427 722 925
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Gyral 60 YEARS

Ron Coulton 0427 293 653
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New South Wales

NSW Farmers Association

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Grains Committee: Daniel Cooper

Government Bodies

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Deputy Prime Minister
Minister for Agriculture and Water Resources

PO Box 6022 House of Representatives
Parliament House, CANBERRA ACT 2600
Ph: 02 6277 7520 – Fax: 02 6273 4120
Email: Minister@agriculture.gov.au
Web: www.aph.gov.au/B_Joyce_MP

The Hon. Greg Hunt MP
Minister for the Environment

PO Box 6022 House of Representatives
Parliament House, CANBERRA ACT 2600
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Web: www.aph.gov.au/G_Hunt_MP

The Hon. Joel Fitzgibbon MP
Shadow Minister for Agriculture

PO Box 6022 House of Representatives
Parliament House, CANBERRA ACT 2600
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Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES)

Department of Agriculture and Water Resources
18 Marcus Clarke Street, Canberra City
GPO Box 858, CANBERRA ACT 2601
Ph: 02 6272 3933 – Fax: 02 6272 2361
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Web: www.agriculture.gov.au/abares
Executive Director: Karen Schneider

business.gov.au

2 Phillip Law Street, Canberra City 2601
GPO Box 9839, CANBERRA ACT 2601
Ph: 13 28 46 – Web: www.business.gov.au

Australian Pesticides and Veterinary Medicines Authority (APVMA)

18 Wormald Street, Symonston, ACT, 2609
PO Box 6182, KINGSTON ACT 2604
Ph: 02 6210 4701 – Fax: 02 6210 4813
Email: enquiries@apvma.gov.au – Web: www.apvma.gov.au
Chief Executive Officer: Ms Kareena Arthy

Australian Government Department of Agriculture and Water Resources

GPO Box 858, CANBERRA ACT 2601
Ph: 02 6272 3933 – Freecall: 1800 900 090
Web: www.agriculture.gov.au

Australian Plague Locust Commission

Unit 7, 50 Collie St, Fyshwick ACT 2609
GPO Box 858, CANBERRA ACT 2601
Toll call (within Australia): 1800 635 962 – Fax: 02 6272 5074
Email: aplc@agriculture.gov.au – Web: www.agriculture.gov.au

Department of Foreign Affairs and Trade

R G Casey Building, John McEwen Crescent, BARTON ACT 0221
Ph: 02 6261 1111 – Fax: 02 6261 3111
Web: www.dfat.gov.au
Secretary: Peter Varghese
Deputy Secretary, Office of Trade Negotiations: Justin Brown

Department of Agriculture and Water Resources – Levies

18 Marcus Clarke Street, Canberra City
Locked Bag 4488, KINGSTON ACT 2604
Free call: 1800 020 619 – Free fax: 1800 609 150
Email: levies.management@agriculture.gov.au
Web: www.agriculture.gov.au/levies
Chief Financial Officer: Emily Canning

National Residue Survey

Department of Agriculture & Water Resources
18 Marcus Clarke Street, Canberra City
GPO Box 858, CANBERRA ACT 2601
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Office of the Gene Technology Regulator

GPO Box 9848, CANBERRA ACT 2601
Ph: 1800 181 030 – Fax: 02 6271 4202
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Gene Technology Regulator (A/g): Dr Jane Cook

Office of Rural Financial Counselling

GPO Box 858, CANBERRA ACT 2601
Ph: 1800 686 175 – Fax: 02 6272 4414
Web: www.rfcs.gov.au

Plant Breeder's Rights Office
(located within IP Australia)

Discovery House
47 Bowes Street, Phillip ACT 2606
PO Box 200, WODEN ACT 2606
Ph: 1300 651 010 – Fax: 02 6283 7999

Registrar: Fatima Beattie
Email: eservices@ipaustralia.gov.au – Web: www.ipaustralia.gov.au

Biosecurity Plant

18 Marcus Clarke Street, Canberra City
GPO Box 858, CANBERRA ACT 2601
Ph: 1800 900 090
Web: www.agriculture.gov.au
First Assistant Secretary: Marion Healy

Biosecurity Animal

18 Marcus Clarke Street, Canberra City
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Ph: 1800 900 090
Web: www.agriculture.gov.au
First Assistant Secretary: Tim Chapman

State Agriculture Departments

NSW Department of Primary industries

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Email: nsw.agriculture@dpi.nsw.gov.au – Web: www.dpi.nsw.gov.au
Director General: Scott Hansen

Department of Economic Development, Job, Transport and Resources Victoria

1 Spring Street, MELBOURNE 3001
Customer Service Centre: 136 186
Email: customer.service@ecodev.vic.gov.au
Web: www.economicdevelopment.vic.gov.au/

Department of Agriculture and Fisheries (Qld)

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GPO Box 46, BRISBANE QLD 4001
Customer Service Centre: 13 25 23
Interstate – Ph: 07 3404 6999 – Fax: 07 3404 6900
Email: callweb@daff.qld.gov.au – Web: www.daff.qld.gov.au
Follow us on Facebook and Twitter:
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Queensland Food and @QueenslandFood
Director General: Beth Woods

Primary Industries and Regions SA (PIRSA)

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Web: www.dpipwe.tas.gov.au

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Research & Development

Research and Development Corporations

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Email: grdc@grdc.com.au – Web: www.grdc.com.au

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Cotton Research & Development Corporation

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PO Box 282, NARRABRI NSW 2390
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Email: enquiries@csiro.au – Web: www.csiro.au

Grain-related CSIRO

www.csiro.au/en/Research/AF
Director CSIRO Agriculture – John Manners Ph: 02 6246 4001

Related Cooperative Research Centres

Plant Biosecurity CRC

Level 2, Building 22, Innovation Centre
University Drive, University of Canberra, BRUCE ACT 2617
LPO Box 5012, BRUCE ACT 2617
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CRC for High Integrity Australian Pork

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International agencies

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International Maize and Wheat Improvement Center (CIMMYT)

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Agrifood Awareness Australia Limited

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Australian Herbicide Resistance Initiative

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President: Tess Herbert
Chief Executive Officer: Polly Bennett

Australian Oilseeds Federation Inc

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Australian Research Council

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Chief Executive Officer: Professor Aidan Byrne

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Email: info@beangrowers.com.au
Web: www.beangrowers.com.au

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Executive Officer: John Temperley
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SA Ph: 02 6752 8210
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WA Ph: 08 9359 4118
VIC Ph: 03 9207 5511
NT Ph: 02 6752 8210
TAS Ph: 03 6398 6212

Fertilizer Australia

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Email: info@fertilizer.org.au – Web: www.fertilizer.org.au
Chairman: Adam Richardson

Grains & Legumes Nutrition Council

Level 1, 40 Mount Street, NORTH SYDNEY NSW 2060
Ph: 1300 472 467 (Australia only) or 02 9394 8661
Email: contactus@glnc.org.au – Web: www.glnc.org.au
Managing Director: Georgie Aley

Grains Research Foundation Ltd (GRFL)

PO Box 299, SOUTHTOWN QLD 4350
Mob: 0447 763 852
Email: admin@grf.org.au – Web: www.grf.org.au/
Chairman: Damien Scanlan

Nuffield Australia

PO Box 1021, NORTH SYDNEY NSW 2059
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Chief Executive Officer: Jodie Dean – **Chairman:** Andrew Johnson

Peanut Company of Australia

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PO Box 26, KINGAROY QLD 4610
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Email: peanuts@pca.com.au – Web: www.pca.com.au
Chief Executive Officer: John Howard

Plant Health Australia

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Ph: 02 6215 7700 – Fax: 02 6260 4321
Email: info@phau.com.au – Web: www.planthealthaustralia.com.au
Chairman: Darral Ashton
Executive Director and CEO: Greg Fraser
Toll Free Exotic Plant Pest Hotline 1800 084 881

Pulse Australia Ltd

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Industry Development Managers:
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Paul McIntosh, Mob: 0429 566 198 Email: paul@pulseaus.com.au
Southern region (Vic & SA)
Mary Raynes, Mob: 0408 591 193 Email: mary@pulseaus.com.au
Southern region (central & southern NSW)
Phil Bowden, Mob: 0427 201 946 Email: phil@pulseaus.com.au
Western region (WA)
Alan Meldrum, Mob: 0427 384 760 Email: alan@pulseaus.com.au

Ricegrowers' Association of Australia

NIP 37, Yanco Avenue, Leeton
PO Box 706, LEETON NSW 2705
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Email: rga@rga.org.au – Web: www.rga.org.au
President: Jeremy Morton
Executive Director: Andrew Bomm

Ricegrowers' Limited – trading as SunRice

NIP 37, Yanco Avenue, Leeton
Locked Bag 2, LEETON NSW 2705
Ph: 02 6953 0411 – Fax: 02 8916 8350
Email: mdelgigante@sunrice.com.au – Web: www.sunrice.com.au
Chairman: Laurie Arthur
Chief Executive Officer: Rob Gordon

Sustainability and Biosecurity Policy

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GPO Box 858, CANBERRA ACT 2601
Ph: 1800 900 090
Web: www.agriculture.gov.au
First Assistant Secretary: Ian Thompson

Tractor and Machinery Association of Australia

Suite 617, 434 St Kilda Road, MELBOURNE VIC 3004
Ph: 03 9867 4289 – Fax: 03 9867 4061
Email: info@tma.asn.au – Web: www.tma.asn.au
Executive Director: Richard Lewis

Grain Marketing & Handling Organisations

AWB

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Toll Free Grower Services Centre 1800 4 GRAIN (1800 447 246)
GPO Box 58, MELBOURNE VIC 3001
Email: growerservicecentre@awb.com.au – Web: www.awb.com.au

Cargill Australia

Ph: +61 3 9268 7200
GPO Box 58, MELBOURNE VIC 3001
Web: www.cargill.com.au

GrainFlow

Toll Free Grower Services Centre 1800 4 GRAIN (1800 447 246)
Web: www.grainflow.com.au

GrainCorp Operations Ltd (Sydney)

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CEO: Mark Plamquist

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Australian Grain Exporters Association (AGEA)

Australian Grain Exporters Association (AGEA)
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Email: agea@agea.com.au
President: Tim Henry

CBH Group

GPO Box L886, PERTH WA 6842
Toll Free Grower Service Centre 1800 107 759 (SA, NSW, VIC, QLD)
1800 199 083 (WA)
Web: www.cbh.com.au
Email: info@cbh.com.au\

Australian Securities Exchange (ASX) Limited

20 Bridge Street, Sydney
PO Box H224, AUSTRALIA SQUARE NSW 1215
Ph: 02 9227 0197 – Fax: 02 9227 0667
Email: grainfutures@asx.com.au – Web: www.asx.com.au/grainfutures
Enquiries: Kristen Hopkins, Manager, Commodities Sales

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Our representatives are local people from farming backgrounds with local knowledge which is invaluable in customising your machinery.

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Brian Moran 0427 722 925
Graeme Easey 0427 700 779

Gyral 60 YEARS

Ron Coulton 0427 293 653
Stewart Kings 0457 922 001

Namoi Cotton Commodities Pty Ltd

1B Kitchener Street, TOOWOOMBA QLD 4350
Ph: 07 4631 6100 – Fax: 07 4631 6184
Grain Marketing and Logistics: John Haigh
Ph: 07 4631 6118 – Mob: 0428 146 318 – Fax: 07 4631 6184
Email: jhaigh@namoicotton.com.au
Web: www.namoicotton.com.au

Grain standards/rules/contracts

Grain Trade Australia Ltd

PO Box R1829, Royal Exchange, NSW 1225
Level 7, 12–14 O'Connell Street, SYDNEY NSW 2000
Ph: 02 9235 2155 – Fax: 02 9235 0194
Email: admin@graintrade.org.au – Web: www.graintrade.org.au
Chief Executive Officer: Geoff Honey

Grower Groups

AgVance Farming Pty Ltd

172A George Street, QUIRINDI NSW 2343
Ph: 02 6746 2336
Email: office@agvance.com.au – Web: www.agvance.com.au
Contact: Jackie Crossing

Birchip Cropping Group Inc. (BCG)

PO Box 85, BIRCHIP Vic 3483
Ph: 03 5492 27873
Email: info@bcg.org.au – Web: www.bcg.org.au
Chief Executive Officer: Chris Sounness

Conservation Agriculture & No-till Farming Association (CANFA)

PO Box 276, WELLINGTON NSW 2820
Chair: Anne Williams
Ph: 02 6825 6212 – Mob: 0428 177 225
Email: magomadine2@bigpond.com
Secretary/Treasurer: John Shepherd
Mob: 0414 661 445 – Email: john@canfa.com.au
Web: www.canfa.com.au

Corrigin Farm Improvement Group Inc. (CFIG)

PO Box 2, CORRIGIN WA 6375
Group Coordinator: Veronika Crouch
Mob: 0476 046 100 – Email: cfig@cfig.asn.au – Web: www.cfig.asn.au

Central West Farming Systems

1 Fifield Road/PO Box 171, CONDOBOLIN NSW 2877
Chief Executive Officer: Di Parsons
Ph: 02 6895 1007 – Mob: 0408 655 205 – Fax: 02 6895 2688
Email: diana.parsons@dpi.nsw.gov.au

Conservation Farmers Inc (CFI)

266 Margaret Street, Toowoomba
PO Box 1666, TOOWOOMBA QLD 4350
Ph: 07 4620 0146 – Fax: 07 4641 7460
Email: office@cfi.org.au – Web: www.cfi.org.au
Executive Officer: Bernard O'Brien

Eyre Peninsula Agricultural Research Foundation (EPARF)

SARDI, Minnipa Agricultural Centre
Box 31, MINNIPA SA 5654
Project Manager: Naomi Scholz
Ph: 08 8680 6200 – Fax: 08 8680 5020
Email: naomi.scholz@sa.gov.au

Facey Group

40 Wogolin Rd, Wickepin
PO Box 129, WICKEPIN WA 6370
Ph: 08 9888 1223
Email: admin@faceygroup.org.au – Web: www.faceygroup.org.au
Executive Officer: Sarah Hyde

FarmLink Research Limited

Temora Agricultural Innovation Centre
361 Trungley Hall Road, Temora
PO Box 521, TEMORA NSW 2666
Ph: 02 6980 1333 – Fax: 02 6978 1290
Chief Executive Officer: Cindy Cassidy
Email: farmlink@farmlink.com.au – Web: www.farmlink.com.au

Grain Growers Limited

Level 19, 1 Market Street, SYDNEY NSW 2000
PO Box Q1355, Queen Victoria Building NSW 1230
Freecall 1800 620 519 – Ph: 02 9286 2000 – Fax: 02 9286 2099
Email: enquiry@graingrowers.com.au – Web: www.graingrowers.com.au
Chief Executive Officer: Alicia Garden

Grain Orana Alliance Inc (GOA)

PO Box 2880, DUBBO NSW 2830
Ph: 0400 066 201
Email: admin@grainorana.com.au – Web: www.grainorana.com.au
Chief Executive Officer: Maurie Street

Grower Group Alliance

PO Box 1081, BENTLEY DC, WA, 6983
Project Leader: Rebecca Wallis
Ph: 08 6180 5759 – Mobile: 0400 681 054
Email: rwallis@gga.org.au – Web: www.gga.org.au

Hart Field Site Group Inc.

PO Box 939, CLARE SA 5453
Ph: 0427 423 154
Email: admin@hartfieldsite.org.au – Web: www.hartfieldsite.org.au
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Email: chairperson@hartfieldsite.org.au
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Email: trials@hartfieldsite.org.au
Secretary: Sandy Kimber
Mobile: 0427 423 154
Email: admin@hartfieldsite.org.au

Kondinin Group

Head Office: 613–619 Wellington Street, Perth WA 6000
PO Box 78, LEEDERVILLE WA 6902
Free Ph: 1800 677 761 – Fax: 08 6263 9177
Web: www.farmingahead.com.au

Liebe Group

PO Box 340, DALWALLINU WA 6609
Ph: 08 9661 0570 – Fax: 08 9661 0575
Executive Officer: Clare Johnston
Email: clare@liebegroup.org.au – Web: www.liebegroup.org.au

Mallee Sustainable Farming Inc

Work Days: Mon-Thurs
1/2103 Fifteenth St, Irymple VIC 3498
PO Box 843, IRYMPLE 3498
Ph: 03 5024 5835
Web: www.msfp.org.au
Executive Manager: Stuart Putland
Mob: 0427 219 103
Email: stuart.putland@msfp.org.au

MacKillop Farm Management Group (MFMG)

Limestone Coast, South Australia
Nyroca Road, PADTHAWAY SA 5271
Executive Officer: Krysteen McElroy
Ph: 0408 655 108
Email: kmcelroy@mackillopgroup.com.au
Web: www.mackillopgroup.com.au

Mingenew Irwin Group

PO Box 6, MINGENEW WA 6522
Ph: 08 9928 1645 – Fax: 08 9928 1540
Executive Officer: Sheila Charlesworth
Mob: 0427 281 007 – Email: sheila@mig.org.au
Web: www.mig.org.au

Northern Grower Alliance

Chief Executive Officer: Richard Daniel
Ph: 07 4639 5344 – Mobile: 0428 657 782
Email: richard.daniel@nga.org.au – Web: www.nga.org.au

Partners in Grains

Executive Manager: Helen Lamont
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Email: national@partnersingrain.org.au
Web: www.partnersingrain.org.au
National Chair: Sharon Honner
Mobile: 0438 322 254
Email: sharon.honner@gmail.com

Riverine Plains Inc

PO Box 214, MULWALA NSW 2647
Ph: 03 5744 1713
Executive Officer: Fiona Hart
Email: info@riverineplains.com.au – Web: www.riverineplains.com.au

SANTFA (South Australian No-Till Farmers Association Inc)

Web: www.santfa.com.au
Chairman: Tom Robinson
Mob: 0400 291 219 – Email: president@santfa.com.au
PO Box 930, BERRI SA 5343
Admin contact: admin@santfa.com.au Fax: 08 8125 6502

South East Premium Wheat Growers Association (SEPWA)

PO Box 365, ESPERANCE WA 6450
Executive Officer: Niki Curtis
Ph: 08 9083 1125 – Fax: 08 9083 1100 – Mob: 0447 908 311
Email: eo@sepwa.org.au – Web: www.sepwa.org.au

Southern Farming Systems Ltd

23 High Street, INVERLEIGH, VIC 3321
Ph: 03 5265 1666 – Fax: 03 5265 1678
Email: office@sfs.org.au – Web: www.sfs.org.au
Chief Executive Officer: Jon Midwood
Email: jmidwood@sfs.org.au

SPAA Society of Precision Agriculture Australia Inc

PO Box 3490, MILDURA VIC 3502
Ph: 0437 422 000 – Fax: 1300 422 279
Executive Officer: Nicole Dimos
Email: info@spaa.com.au – Web: www.spaa.com.au

Victorian No-Till Farmers Association (VNTFA)

17 Darlot Street, Horsham
PO Box 1397, HORSHAM VIC 3402
Ph: 03 5382 0422 – Mob: 0429 820 429
Email: info@vicnotill.com.au – Web: www.vicnotill.com.au

Walgett Special One Grain (WSOG)

PO Box 496, WALGETT NSW 2832
Ph: 1300 28 12 28 – Fax: 02 6828 1249
Email: admin@specialonegrain.com.au
Web: www.specialonegrain.com.au
Trading Manager: Jaimee Carrigan

WANTFA

Private Bag 5, WEMBLEY WA 6014
Ph: 08 9383 7630
Email: admin@wantfa.com.au – Web: www.wantfa.com.au
Executive Director: David Minkey – Mob: 0417 999 304
Email: david.minkey@wantfa.com.au

Yorke Peninsula Alkaline Soils Group

61–63 Main Street, MINLATON SA 5575
Ph: 08 8853 2241 – Fax: 08 8853 2269
Project and Funding Coordinator: Kristin McEvoy
Mob: 0400 283 015
Email: projects@alkalinesoils.com.au – Web: www.alkalinesoils.com.au

Government Grants

For special circumstances assistance administered by DAFF go to:

Web: www.agriculture.gov.au/agriculture-food/drought

GrantsLINK (for assistance with federal grants for community projects) see:

Web: www.grantslink.gov.au
Ph: 1800 026 222
Web: www.business.gov.au

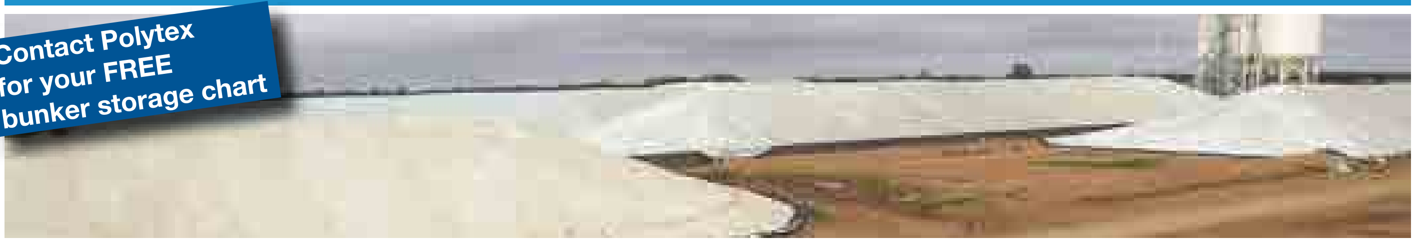
Section 10
Suppliers' Directory

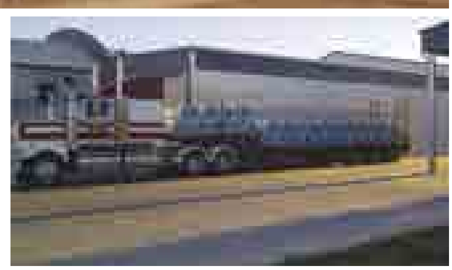
AGRICULTURAL CHEMICALS
4Farmers – www.4farmers.com.au
Achieve – Crop Care: www.cropcare.com.au
Axial – Syngenta: www.syngenta.com
Barrack 720 Fungicide – Crop Care: www.cropcare.com.au
Barrack Betterstick – Crop Care: www.cropcare.com.au
Boxer – Syngenta: www.syngenta.com
Cognito – Syngenta: www.syngenta.com
Deluge – Victorian Chemicals: www.vicchem.com
Envoy – Victorian Chemicals: www.vicchem.com
Hammer – Crop Care: www.cropcare.com.au
Hasten – Victorian Chemicals: www.vicchem.com
Hot-Up – Victorian Chemicals: www.vicchem.com
Ken-Up Dry – Kenso: www.kenso.com.au
Pentagon – Farmoz: www.farmoz.com.au
Precept – Bayer CropScience: www.bayercropscience.com.au
Rancona – Chemtura: www.chemturaagrosolutions.com.au
Roundup Ultra Max – Sinochem: www.roundupag.com.au
Roundup PowerMax – Nufarm: www.nufarm.com.au
Sakura – Bayer: www.sakuraherbicide.com.au
Sharpen – BASF: www.agro.basf.com.au
Spray Seed – Syngenta: www.syngenta.com
Speedy 250 – Kenso: www.kenso.com.au
Steward EC – DuPont: www.dupont.com
Valor – Sumitomo: www.sumitomo-chem.com.au
Velocity – Bayer CropScience: www.bayercropscience.com.au

AG MACHINERY PARTS
Alloy & Stainless Products: www.asproducts.com.au
ITC National: www.itcnational.com.au
Neil's Parts: www.neils.com.au

CONTAINER RECYCLING
drumMuster: www.drummuster.com.au

EDUCATION
C-Qual: www.c-qual.com
CSIRO: www.csiro.au
Kondinin Group: www.farmingahead.com.au
Rockhampton Grammar School: www.rgs.qld.edu.au
Toowoomba Grammar School: www.twgs.qld.edu.au





ELECTRONIC EQUIPMENT/PRECISION AG
Advanced Farming Systems – Case IH Agriculture: www.caseih.com
Agmaster: www.agmaster.com
Graintec Scientific: www.graintec.com.au
Infratec Sofia: www.foss.com.au/sofia
John Deere: www.johndeere.com.au
Outback Guidance: www.outbackguidance.com
Perten Instruments: www.perten.com
Sparex: www.sparex.com
TACS Australia: www.tacs.com.au
Trimble: www.trimble.com/agriculture

EMPLOYMENT
The Gate: www.the-gate.com.au 0408 717 459

ENERGY
Ergon: 1300 736 349
Mobile Energy: www.mobileenergyaustralia.com.au

FERTILISERS & SOIL HEALTH SERVICES
Amorsil – Nutrifert: www.nutrifert.com.au
BASF: www.basf.com.au
Bioag: www.bioag.com.au
Big N – Incitec Pivot: www.incitecpivot.com.au
Charlie Carp: www.charliecarp.com
Chemtura: www.chemtura.com.au
EasyATS – Incitec Pivot: www.incitecpivot.com.au
Easy N – Incitec Pivot: www.incitecpivot.com.au
Evergol Prime – Bayer: www.evergolprime.com.au
Granulock – Incitec Pivot: www.incitecpivot.com.au
Hibrix: www.hibrix.com.au
Nutrilab: 07 4671 5155
Omnia Nutriology: www.omnia.net.nz
Phosyn Analytical: www.yaraphosyn.com
Superior Fertilisers: www.superiorfertilisers.com.au
Ultimate Agri Products: www.ultimateagri.com.au
Verno FG – Tanuki: www.tanuki.com.au
Victorian Chemicals: www.vicchem.com
Zinc – Yarra: www.yarra.com.au
Zincstar – Impact Fertilisers: www.impactfert.com.au

FINANCE
Accelerate – AgFarm: www.agfarmaccelerate.com.au

GRAIN STORAGE & HANDLING
Agridry: www.agridry.com.au
Agrishelter: www.agrishelter.com.au/
Allied Grain Systems: www.alliedgrainsystems.com.au
AllShelter: www.allshelter.com.au
Assorted Bag Closers: 03 9399 9171
Convey-All: www.convey-all.com
CSW Chaser Bins: www.cswag.com.au
CustomVac: www.customvac.com.au
Cyclone Silos (One Steel): www.onesteelcyclone.com.au
Darling Downs Tarps: www.ddt.com.au
Ellis & Son: Freecall 1800 808 769
Geronimo: www.geronimo.com.au
Jaylon: www.jaylon.com.au
Kotzur: www.kotzur.com.au
Maersk Line: www.maerskline.com
Perry Engineering: www.perryengineering.com
Polytex: www.polytex.net.au
SCT Logistics: www.sctlogistics.com.au
Silo Ventilation Systems: www.silovent.com
Tapex: www.tapex.com.au
WRL Engineering: www.wrltoolboxes.com.au

HARVESTERS & COMBINES
Case IH Agriculture: www.caseih.com
Chesterfield: www.chesterfieldaustralia.com.au
Claas: www.landpower.com.au
John Deere: www.johndeere.com.au/combines
Neil's Parts: www.neils.com.au
New Holland Agriculture: www.newholland.com

INSECT MANAGEMENT
Bioglobal: www.bioglobal.com.au
Helicovex – Organic Crop Protectants: www.ocp.com.au
Pyrinex Super – Adama: www.adama.com

IRRIGATION
Valmont Irrigation: www.valley-au.com
Ezyflo Agricultural: www.ezyflo.net.au

LP GAS
Kleenheat Gas: 1300 135 111

MACHINERY MANUFACTURERS & DISTRIBUTORS
Case IH Agriculture: www.caseih.com
Claas: www.landpower.com.au
Dennys Engineering: www.dennyssilosandengineering.com
Flexicoil: www.flexicoil.com.au
John Deere: www.johndeere.com.au
Neil's Parts: www.neils.com.au
New Holland Agriculture: www.newholland.com

REAL ESTATE
CBRE: www.cbre.com.au/services/agribusiness
Colliers International: colliers.com.au/agribusiness

SEED SUPPLIERS & PLANT BREEDERS
Australian Grain Technologies: www.ausgraintech.com
Canola Breeders: www.canolabreeders.com.au
Nufarm: www.nufarm.com.au
Nuseed: www.nuseed.com
Nuseed Roundup Ready Canola – Nufarm: www.nufarm.com.au
Pioneer: www.pioneer.com
Roundup Ready Canola – Monsanto: www.monsanto.com.au
Seednet: www.seednet.com.au

SEED TREATMENT
CRT Seed Treatment: www.cropcare.com.au
Dividend – Syngenta: www.syngenta.com.au
Emerge – Syngenta: www.syngenta.com.au
Nodulaid – Becker Underwood: www.beckerunderwood.com.au
Nodulator – Becker Underwood: www.beckerunderwood.com.au
Seedboost – Omnia Nutriology: www.omnia.com.au

SOIL & PLANT ANALYSIS
Phosyn: www.yaravita.com
Milne Industries Dalby: www.daybreak.com.au

SPRAYERS & SPRAYER EQUIPMENT
Case IH Agriculture: www.caseih.com
Croplands: www.croplands.com.au
Goldacres: www.goldacres.com.au
Hardi: www.hardi.com.au
Integrated Transfer Solutions: www.its-aust.net
John Deere: www.johndeere.com.au

TILLAGE MANUFACTURERS & DISTRIBUTORS
Boss Engineering: www.bosseng.com.au
Bourgault: www.bourgault.com
Case IH Agriculture: www.caseih.com
Excel Agriculture: www.excelagr.com.au
Flexicoil: www.flexicoil.com.au
Gessner Industries: www.gessner.com.au
Gyral: www.gyral.com.au
John Deere: www.johndeere.com.au
K-Line: www.k-line.net.au
Manutec: www.manutec.com.au
NDF: www.ndf.com.au
Serafin: www.serafinmachinery.com.au
Tobin No-Till Seeding Technology: www.tobinnotill.com.au

TANK CLEANERS
All Clear – Agnova: www.agnova.com.au

TRAVEL & RECREATION
Barcoo Ski Lodge – Victorian Alps ski and summer resort
Dinner Plain Central Reservations: 1800 670 019
Charlton's Tackle & Bait: 07 3818 1677
Greenmount Travel: 07 4659 3555 www.greenmounttravel.com.au

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Accufire: www.accufire.com.au

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