Introducing ABARES historical agricultural forecast database

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Acknowledgements

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Summary

This paper provides a summary and analysis of forecast performance using ABARES newly released historical agricultural forecast database (ABARES 2021). Each quarter ABARES releases a comprehensive set of market forecasts for Australia's agricultural sector via the Agricultural Commodities and Australian Crop Report publications. These are relied on to support decisions and policy by stakeholders such as governments, agricultural industry bodies, individual businesses and other market participants. However, the accuracy of these forecasts has only been occasionally and sporadically assessed (for example Pitts 2019; Freebairn 1978). Most previous assessments have been internal, and not comprehensive.

This paper aims to improve awareness of the accuracy of ABARES forecasts over the period 2000 to 2019. It also aims to encourage debate in the user community about the accuracy, performance and value of the forecasts that ABARES and others provide. Comments on this paper, the forecasts contained in the database, and the content of the database itself are all welcome via ABARES.Commodities@agriculture.gov.au.

1.1 Analysing forecast performance

Assessments of forecast performance can be done in many ways. The accuracy of forecasts is only one dimension of forecast quality, which encompasses a broader range of attributes and considerations. Forecast quality considerations can include*:

- Usefulness
- Salience
- Legitimacy
- Credibility
- Sustainability

*Adapted from Cash et al 2002; Longmire and Watts 1981.

Accuracy is just one of many quality criteria for forecasts, falling under the broader "credibility" dimension of forecast quality.

The accuracy of forecasts is usually assessed by comparing the predicted outcome to the actual outcome. A deeper assessment (beyond the scope of this paper) would compare how the outcome was arrived at, relative to how it was predicted to happen (was a forecast correct for the right reasons or the wrong reasons?). Such an assessment would indicate if the forecasting process was robust and repeatable.

Comparisons can also be made between forecasts generated by alternative approaches or models, with comparisons vs "naïve" forecasting methods being a common approach (see for example Pitts 2019 or Freebairn 1975). Comparisons between forecasts made by different forecasters are also illustrative and can highlight how different approaches to forecasting and resourcing can affect accuracy. Diminishing returns to forecast accuracy seem likely at higher resource levels, creating a choice of appropriate levels of accuracy for different forecast uses.

It is relatively rare for forecasters to provide performance measures alongside published forecasts, particularly for agricultural forecasts (Allen 1994). The United States Department of Agriculture is notable for providing historical accuracy statistics as part of each monthly World Agricultural Supply and Demand Estimates (WASDE) release. The International Monetary Fund (IMF) provides a database of their historical macroeconomic forecasts (IMF 2020). Other forecasters, such as the OECD and the Food and Agriculture Organisation of the United Nations (OECD-FAO), do not currently provide public assessments of their historical accuracy.

This paper has a narrow focus on the accuracy of point forecasts made between 2000 and 2019. Symmetric mean absolute error has been chosen as the standard measure of accuracy for forecasts reported in this analysis (Hyndman and Koehler 2006) (see Box 1).

Box 1 Symmetric mean absolute error

Unless otherwise noted, forecast error in this paper is defined as symmetric mean absolute error. This measure is preferred as it does not penalise positive forecast errors more than negative forecast errors. Please see Hyndman and Koehler (2006) for a technical explanation.

Symmetric mean absolute forecast error is calculated using the formula

$$\frac{Absolute\ value\ of: (Forecast - Actual)}{(Forecast + Actual) \times 0.5}$$

and expressed as a percentage. A simple average of the errors for an entire time series is used as the main summary statistic for each series in this paper.

An example is shown in Table 1.

Table 1 Wheat export volume forecasts, issued September quarter

Year issued	Forecast value (kt)	Actual value (kt)	Forecast error (%)
2000–01	17,280	16,621	4%
2001–02	16,240	16,465	1%
2002–03	12,800	10,845	17%
2003–04	13,658	15,074	10%
2004–05	17,999	15,780	13%
2005–06	15,557	15,168	3%
2006–07	16,554	11,196	39%
2007–08	12,156	7,408	49%
2008–09	13,610	13,410	1%
2009–10	14,557	13,725	6%
2010–11	18,168	18,431	1%
2011–12	20,455	23,026	12%
2012–13	22,500	21,265	6%
2013–14	19,179	18,336	4%
2014–15	18,102	16,571	9%
2015–16	17,529	15,777	11%
2016–17	18,403	22,057	18%
2017–18	18,153	15,492	16%

2018–19	12,954	9,805	28%
2019–20	10,871	10,115	7%
	Forecast error for 2000–01 to 2019–20:		**13%**

Source: Author analysis using ABARES historical forecast database

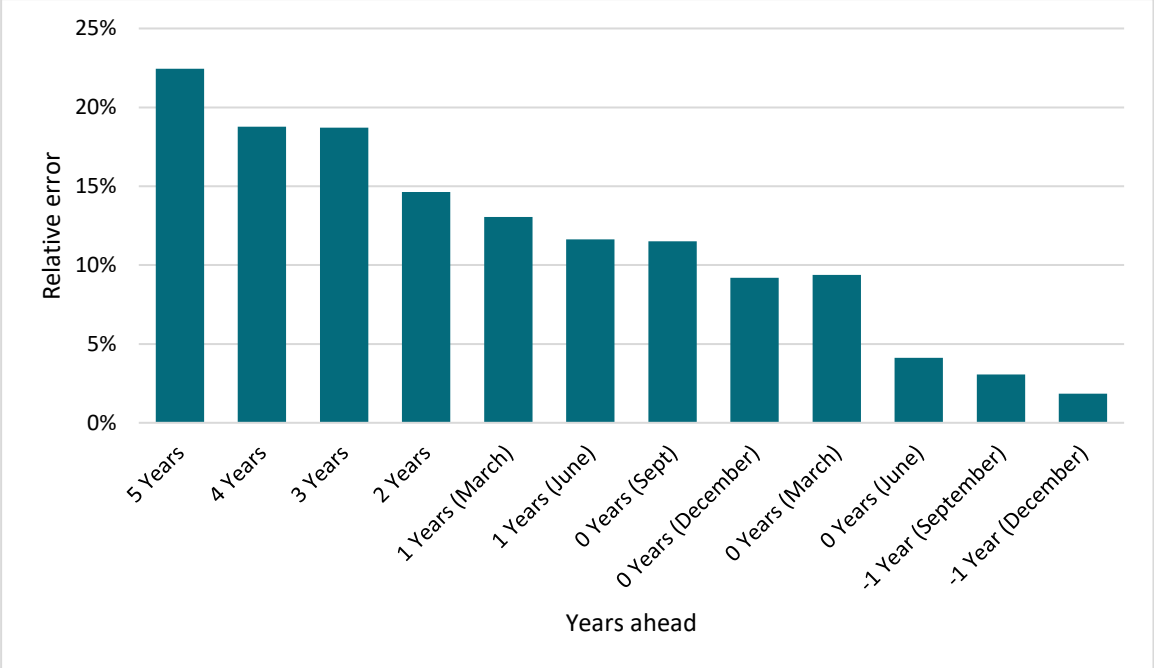
1.2 Accuracy over time

The accuracy of individual forecasts generally improves as the lead time between forecast and outcome reduces. This is because more information becomes available to the forecaster and the degree of uncertainty about important contributing factors is reduced. Most time series included in this database exhibit the pattern shown in Figure 1, with the relative error falling over time.

Relative errors for ABARES price forecasts issued in March for the coming financial year averaged 16% across the included series. This falls to 11% by September (issued in the first quarter of the financial year in question) and to 7% by December. Relative errors for production volumes average 12% in March and fall to 7% by December. Relative errors for export volumes average 19% in March and fall to 11% by December.

Appendix A: Summary forecast performance statistics contains summary statistics of forecasts made over the course of a calendar year, for all prices, volumes, values, areas and animal numbers contained in the database. The summary tables provided with the database also contain additional metrics of forecast performance such as counts of over and under-prediction, and the average error of predictions for each series.

Figure 1 Example of forecast accuracy over time - Skim milk powder production



Note: Australian dairy production volume data is released with a lag and is subject to revisions following release. This is partially responsible for the relative error shown for the backcast (-1 year) periods.
Source: Author analysis using ABARES historical agricultural forecast database

The longest time horizon for ABARES forecasts contained in this database is 5 years, with the shortest time horizon being for forecasts issued late in-year (forecasts issued in June for the

financial year that ends on 30 June that year). The database also contains "backcasts" for some series. Backcasts in this paper are defined as estimates made after the end of the period, but before the outcome is known. For instance, official crop production estimates for Australia are often not released by the Australian Bureau of Statistics until 12-18 months after harvest is completed. Back-casts are required for most agricultural time series. The only exception is market prices which are generally available in a timely manner. It is important to note that official estimates are just that – estimates – and so are themselves subject to sampling error and changes in coverage and accuracy over time (ABS 2015).

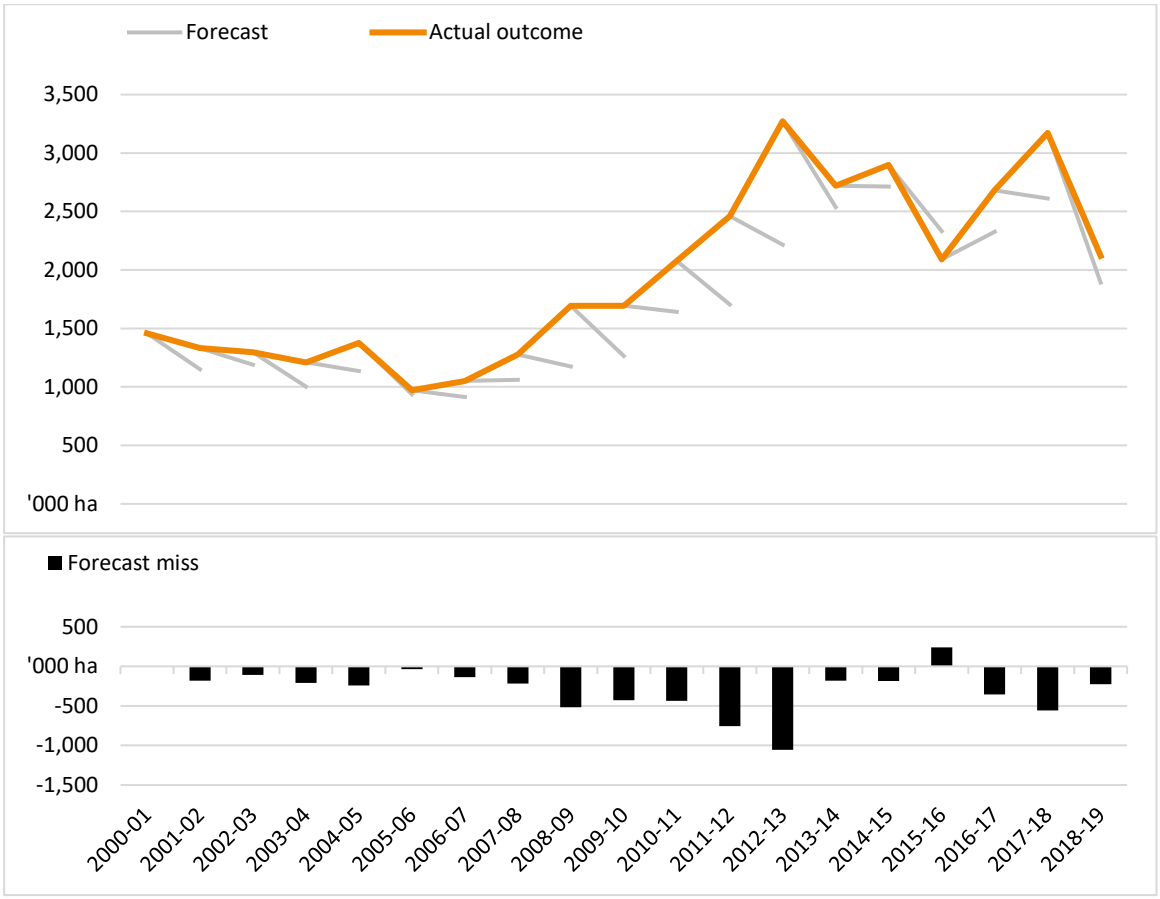
1.3 Forecast bias

Across all observations contained in the dataset, ABARES forecasts exhibited a slight negative bias between 2000 to 2019. Of 14,508 observations in the first release that are forecasts, 54% were lower than observed outcomes (negative bias), and 46% were higher (positive bias). This result should be caveated with the fact that the database does not contain every forecast made by ABARES over the period and is also not a random sample of those forecasts.

Examples of unbiased, positively biased and negatively biased forecasts can be found in many individual time series within the database. Examples are shown in Figure 2, Figure 3 and Figure 4. The summary tables included with the database include counts of under and over-prediction for every series in the historical forecast database.

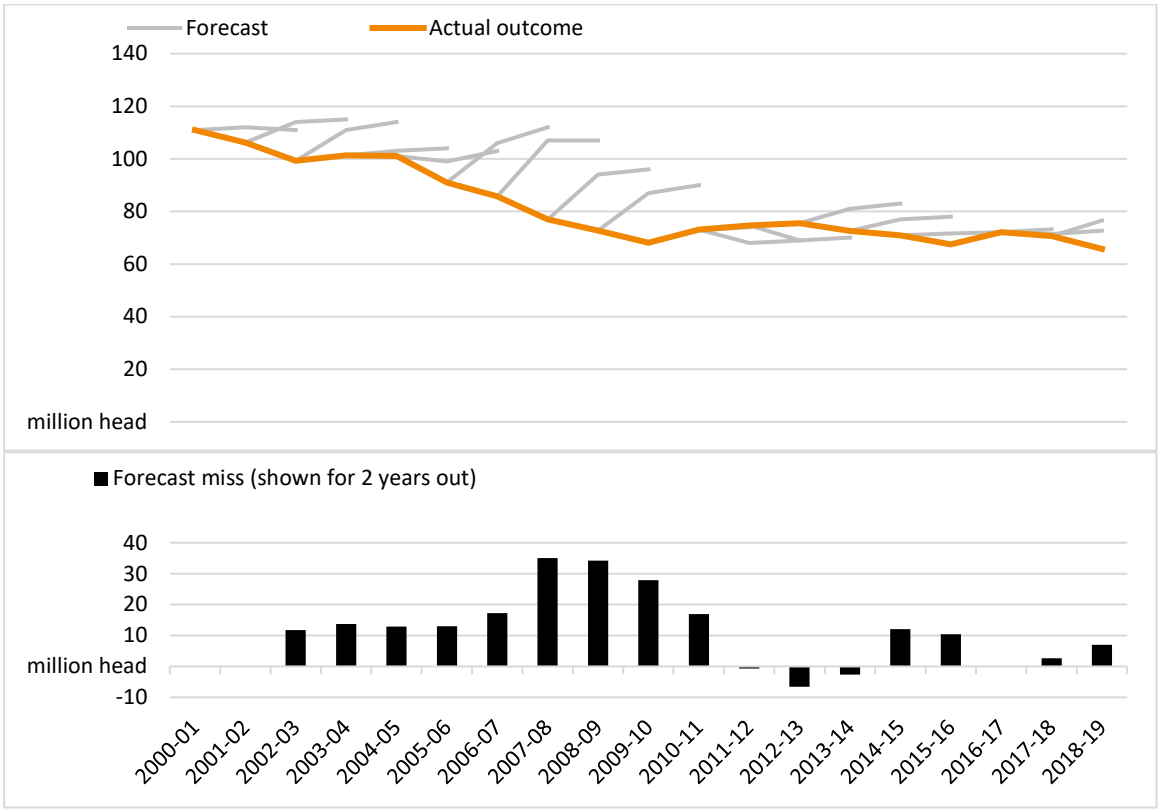
There can be many reasons for forecast bias and so care should be taken in interpretation. Bias may arise from systematic factors or by chance (depending on the rigour of the indicator of bias chosen). Bias apparent in a single series may be the result of a poor specification or forecasting procedure, by systematic adoption of optimistic or pessimistic predictions (Armor and Sackett 2006), or introduced by reliance on a biased exogenous input over which the forecaster has limited or no control (Abarbanell and Lehavy 2003). Biases in a single forecast series (such as crop area) can contribute to biases in other dependent series (such as the area devoted to competing land uses). Historical series can also be revised, and so a forecast that would once have been accurate can become less accurate in hindsight when compared to a revised benchmark.

Figure 2 Example of negative bias—Canola planted area



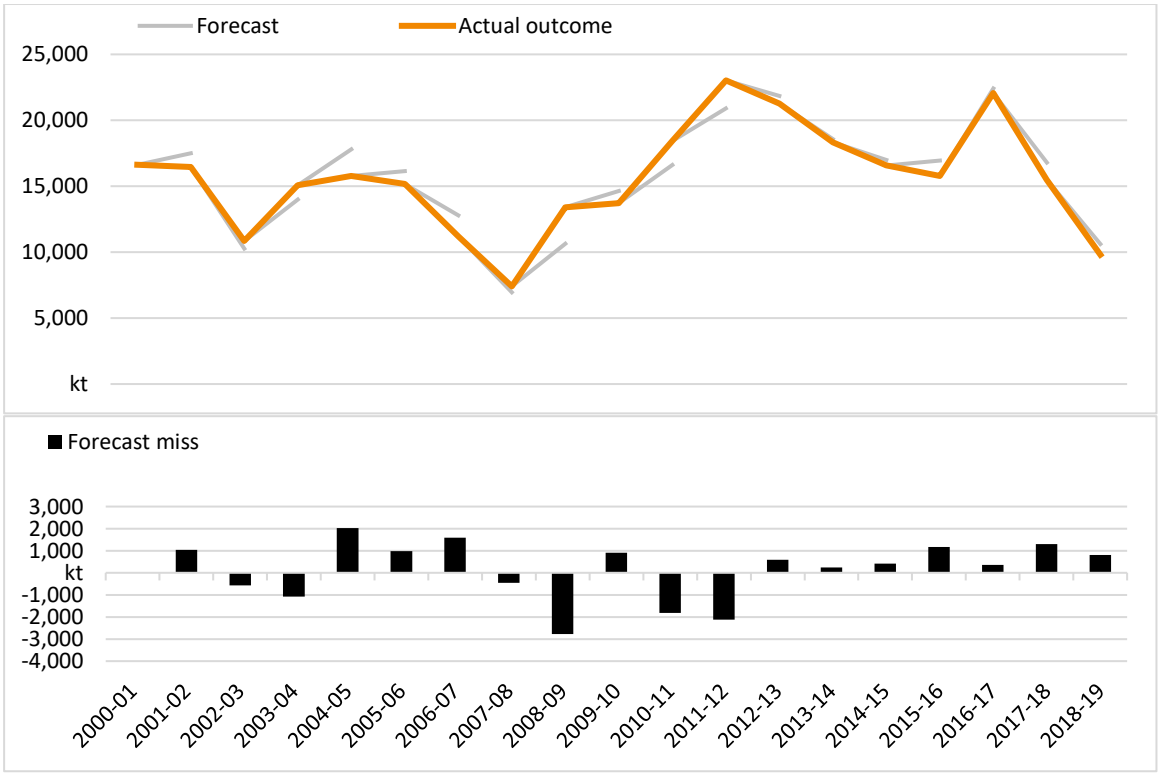
Note: Forecast issued in December quarter for current financial year. For example, issued in December 2010 for the 2010–11 financial year.
Source: Author analysis using ABARES historical agricultural forecast database

Figure 3 Example of positive bias—Sheep numbers



Note: Forecast issued in March quarter for the 2 financial years ahead. For example, issued in March 2010 for the 2011-12 and 2012–13 financial years.
Source: Author analysis using ABARES historical agricultural forecast database

Figure 4 Example of no apparent bias—Wheat export volume forecast



Note: Forecast issued in December quarter for current financial year. For example, issued in December 2010 for the 2010–11 financial year.
Source: Author analysis using ABARES historical agricultural forecast database

1.4 International comparisons

Several organisations issue forecasts for major Australian agricultural series. This allows comparisons of forecast accuracy between different forecasting agencies for the same time series. An illustrative example is shown in Box 2, comparing the accuracy of different forecasts of Australian wheat production and exports. In interpreting this comparison, readers should bear in mind the differing focuses of forecasting institutions, the amount of resources committed to forecasting, and the relative importance of Australian agriculture.

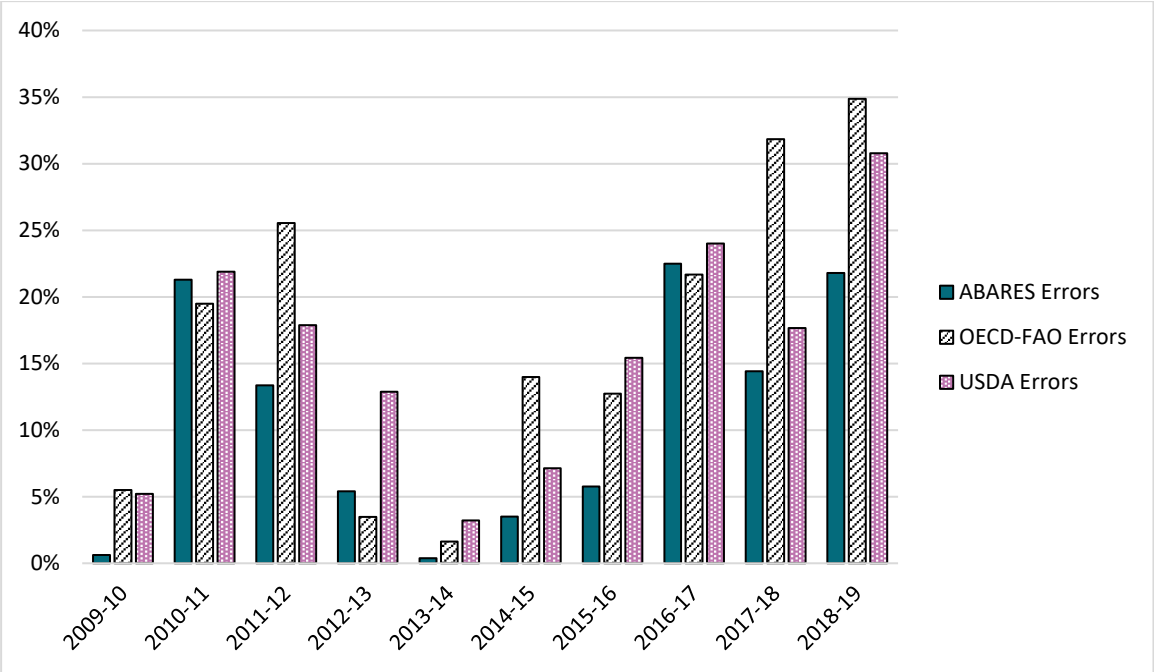
Box 2 Comparison of wheat production and export forecasts issued by ABARES, OECD-FAO and USDA

Both the United States Department of Agriculture (USDA) and the OECD Food and Agriculture Organisation (OECD-FAO) produce forecasts of Australian crop production and exports (USDA 2021, OECD 2020). Both organisations also provide accessible archives of their historical forecasts. For illustrative purposes, these agencies' forecasts of Australian wheat production and exports are compared to ABARES' forecasts below, for the period of 2009–10 to 2018–19. This comparison period was chosen as the OECD-FAO historical database is only available from 2009. For consistency, the official Australian figures are used as the actual outcomes.

The OECD-FAO releases forecasts on an annual basis in mid-July. The USDA releases forecasts each month in the World Agricultural Supply and Demand Estimates (WASDE) publication. This analysis compares ABARES and USDA forecasts issued in June with the OECD forecast issued July, for the financial year ahead.

For the 10 observations available for production, ABARES average forecast error was 11%, OECD-FAO 17%, and USDA 16%. ABARES forecasts had lower relative errors than the OECD-FAO forecasts in 7 out of 10 years, and lower relative errors than the USDA forecasts in every year of the analysis period.

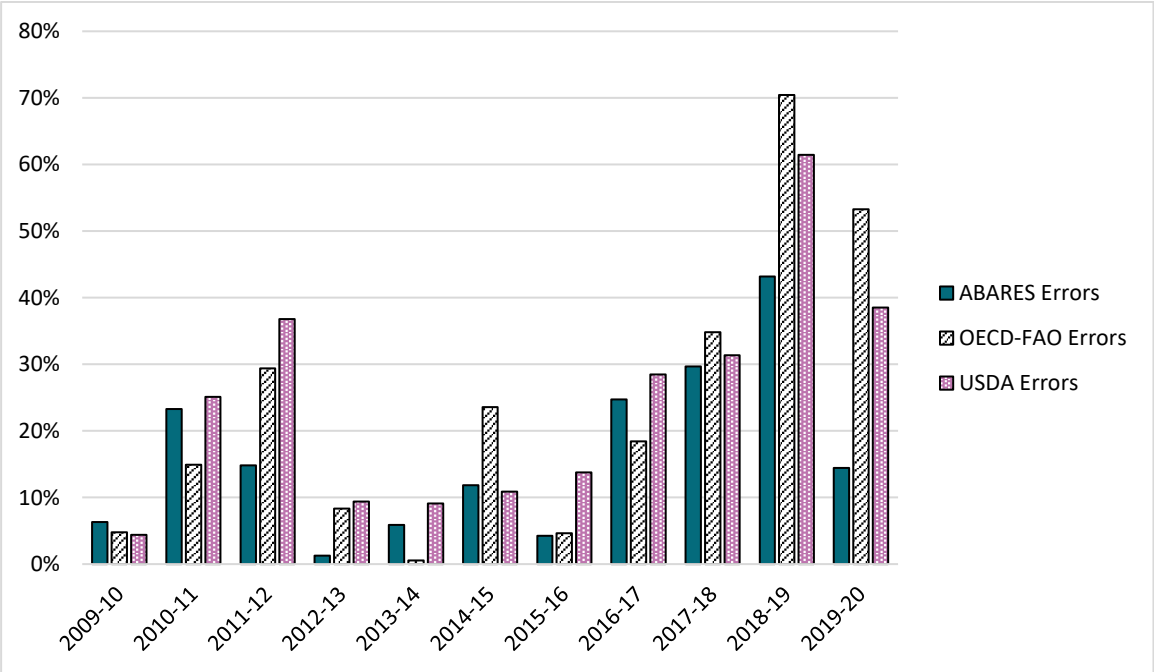
Relative forecast errors in Australian wheat production estimates issued June/July between 2009–10 and 2018–19



Notes: Last revised release used for WASDE data where relevant. OECD data downloaded from OECD.Stat service on 8 January 2020.
Sources: Author analysis using ABARES historical agricultural forecast database; OCED-FAO 2020; USDA 2021

For the 11 observations available for exports, ABARES average forecast error was 16%, OECD-FAO 24%, and USDA 24%. ABARES forecasts had lower relative errors than the OECD-FAO forecasts in 7 out of 11 years, and lower relative errors than the USDA forecasts in 9 out of 11 years.

Relative forecast errors in Australian wheat export estimates issued June/July between 2009–10 and 2019–20



Notes: Last revised release used for WASDE data where relevant. OECD data downloaded from OECD.Stat service on 8 January 2020. Each agency's own historical data used to estimate errors shown in order to account for differences in marketing years. 2019–20 USDA estimate taken from January 2021 WASDE release.
Sources: Author analysis using ABARES historical agricultural forecast database; OCED-FAO 2020; USDA 2021

Differences in forecast performance for exports should be interpreted with caution. As each agency uses different 12-month aggregation periods for each year's exports, forecast errors each year may not be directly comparable. Each agency's own historical time series was used as the actual outcome measure in this analysis, in contrast to the ABS figures used for production estimates. This analysis should only be interpreted as providing a general sense of relative errors over time.

Appendix A: Summary forecast performance statistics

ABARES Forecast performance 2000–01 to 2018–19 for selected price series

Commodity	Series	Unit	Relative Error (a)				Average Error (b)			
			Mar-for next FY	Jun - for next FY	Sept - for current FY	Dec - for current FY	Mar-for next FY	Jun - for next FY	Sept - for current FY	Dec - for current FY
Wheat	APW Pool Return	$/t	15%	17%	8%	5%	45	47	23	16
Wheat	ASW Pool Return	$/t	22%	16%	12%	7%	49	36	27	17
Barley	Feed 1, delivered Geelong	$/t	24%	23%	13%	9%	57	54	31	21
Barley	France feed barley, fob Rouen	US$/t	16%	12%	7%	4%	32	26	13	8
Barley	Gairdner Malt 1, delivered Geelong	$/t	21%	23%	15%	9%	54	58	37	23
Canola	Canada, fob Vancouver	US$/t	2%	8%	2%	1%	10	41	8	7
Canola	Delivered Melbourne, (Nov-Oct MY)	$/t	19%	17%	13%	5%	93	85	68	24
Canola	Delivered Melbourne, (Oct-Sep MY)	$/t	17%	9%	6%	8%	65	37	24	36
Canola	Delivered Melbourne, FY	$/t	6%	6%	3%	2%	35	32	15	12
Cotton	Cotlook A index	USc/lb	16%	15%	11%	8%	12	12	9	7
Sugar	Nearby futures price (Oct–Sep basis), ICE no. 11 contract.	USc/lb	22%	22%	17%	12%	3	3	2	2
Sugar	Return to growers for sugarcane	$/t	16%	13%	13%	10%	5	4	5	3
Maize	US no. 2 yellow corn, fob Gulf	US$/t	15%	15%	10%	5%	27	27	17	8
Soybeans	US no.2 soybeans, fob	US$/t	15%	15%	12%	8%	58	59	48	32
Cattle	Saleyard price, weighted average	c/kg (cw)	10%	8%	5%	4%	33	29	17	12
Dairy - Butter	Butter	US$/t	24%	23%	19%	11%	719	687	531	347

Commodity	Series	Unit	Relative Error (a)				Average Error (b)			
			Mar-for next FY	Jun - for next FY	Sept - for current FY	Dec - for current FY	Mar-for next FY	Jun - for next FY	Sept - for current FY	Dec - for current FY
Dairy - Cheese	Cheese	US$/t	16%	14%	11%	6%	549	493	360	193
Dairy - Raw Milk	Farmgate Milk	c/L	11%	9%	8%	7%	4	4	3	3
Dairy - Skim Milk Powder	Price	US$/t	26%	25%	20%	10%	719	653	514	288
Lamb	Saleyard price, weighted average	c/kg (cw)	14%	13%	9%	6%	55	51	34	24
Sheep	Saleyard price, weighted average	c/kg (cw)	23%	23%	18%	16%	52	53	42	35
Wool	Eastern Market Indicator	c/kg	14%	9%	9%	6%	140	91	84	59
Australian Dollar	Ratio of Australian dollars to US dollar	A$/US$	9%	7%	5%	2%	0.07	0.06	0.04	0.02

(a) Symmetrical mean absolute percentage error. (b) Absolute terms, in original units of series.

Source: Author analysis using ABARES historical agricultural forecast database

ABARES Forecast performance 2000–01 to 2018–19 for selected Australian production series

			Relative Error (a)				Average Error (b)			
Commodity	**Series**	**Unit**	**Mar-for next FY**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**	**Mar-for next FY**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**
Wheat	Production	kt	21%	21%	11%	5%	4,413	4,125	2,184	1,150
Barley	Production	kt	22%	20%	16%	16%	1,723	1,517	1,247	1,245
Canola	Production	kt	27%	23%	17%	19%	613	477	398	415
Cotton	Lint production	kt	33%	24%	16%	14%	169	135	84	75
Sugar	Cane cut for crushing	kt	9%	9%	7%	5%	3,042	3,029	2,375	1,446
Sugar	Sugar (tonnes actual)	kt	7%	7%	7%	3%	321	297	296	136
Dairy - Butter	Butter	kt	8%	11%	9%	7%	10	13	13	10
Dairy - Cheese	Cheese	kt	5%	6%	6%	5%	18	20	20	17
Dairy - Raw Milk	Milk produced	ML	4%	3%	3%	2%	363	350	319	195
Dairy - Skim Milk Powder	Production	kt	13%	12%	12%	9%	28	25	25	19
Lamb	Carcase weight	kt (cw)	7%	6%	5%	4%	27	25	23	16
Wool	Shorn wool	kt	7%	5%	4%	4%	29	22	15	15
Wool	Total wool, greasy equivalent	kt	7%	5%	4%	4%	31	24	17	17
Beef	Carcase weight	kt	6%	6%	4%	3%	136	122	92	72
Dairy - Whole Milk Powder	Production	kt	20%	21%	19%	15%	26	25	23	18
Mutton	Carcase weight	kt (cw)	19%	20%	16%	10%	37	41	33	21
Pigs	Pig meat	kt (cw)	4%	4%	3%	2%	15	15	12	9
Poultry	Poultry meat	kt (cw)	4%	4%	4%	4%	40	39	40	39

(a) Symmetrical mean absolute percentage error. (b) Absolute terms, in original units of series.
Source: Author analysis using ABARES historical agricultural forecast database

ABARES Forecast performance 2000–01 to 2018–19 for selected crop production series, Australian states

			Relative Error (a)				Average Error (b)			
Commodity	**Series**	**Unit**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**	**Mar-for current FY**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**	**Mar-for current FY**
Wheat - NSW	Production	kt	39%	18%	11%	10%	2,181	986	616	546
Wheat - QLD	Production	kt	29%	15%	10%	10%	323	197	118	128
Wheat - SA	Production	kt	28%	22%	7%	6%	951	750	274	227
Wheat - VIC	Production	kt	36%	29%	9%	10%	916	698	204	239
Wheat - WA	Production	kt	17%	13%	6%	4%	1,300	954	454	329

Note: State level production estimates are first issued in the June quarter so care should be taken when comparing the data shown in this table with national figures in other tables.
(a) Symmetrical mean absolute percentage error. (b) Absolute terms, in original units of series.
Source: Author analysis using ABARES historical agricultural forecast database

ABARES Forecast performance 2000–01 to 2018–19 for selected crop area series

			Relative Error (a)				Average Error (b)			
Commodity	**Series**	**Unit**	**Mar-for next FY**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**	**Mar-for next FY**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**
Wheat	Harvested area	'000ha	8%	7%	6%	6%	940	848	748	685
Barley	Harvested area	'000ha	14%	11%	11%	11%	546	443	446	439
Canola	Harvested area	'000ha	22%	19%	19%	18%	427	341	342	327
Cotton	Harvested area	'000ha	35%	25%	18%	6%	104	81	55	20
Sugar	Harvested area	'000ha	5%	6%	6%	6%	21	22	21	21

(a) Symmetrical mean absolute percentage error. (b) Absolute terms, in original units of series.
Source: Author analysis using ABARES historical agricultural forecast database

ABARES Forecast performance 2000–01 to 2018–19 for selected crop area series, Australian states

			Relative Error (a)				Average Error (b)			
Commodity	**Series**	**Unit**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**	**Mar-for current FY**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**	**Mar-for current FY**
Wheat - NSW	Harvested area	'000ha	13%	12%	11%	9%	445	425	386	336
Wheat - QLD	Harvested area	'000ha	21%	12%	11%	12%	157	89	79	90
Wheat - SA	Harvested area	'000ha	6%	6%	6%	5%	134	128	121	100
Wheat - VIC	Harvested area	'000ha	8%	6%	7%	7%	115	91	102	106
Wheat - WA	Harvested area	'000ha	6%	6%	5%	5%	295	267	244	257

Note: State level area estimates are first issued in the June quarter so care should be taken when comparing the data shown with national figures in other tables.
(a) Symmetrical mean absolute percentage error. (b) Absolute terms, in original units of series.
Source: Author analysis using ABARES historical agricultural forecast database

ABARES Forecast performance 2000–01 to 2018–19 for selected production value series

			Relative Error (a)				Average Error (b)			
Commodity	**Series**	**Unit**	**Mar-for next FY**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**	**Mar-for next FY**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**
Wheat	Gross value	$m	23%	23%	15%	10%	1,284	1,207	800	596
Barley	Gross value	$m	21%	24%	18%	20%	350	398	333	338
Canola	Gross value	$m	32%	25%	22%	23%	338	269	265	268
Cotton	Gross value	$m	36%	24%	17%	17%	418	307	202	217
Total Crops	Gross value. Includes all cereals, legumes, oilseeds, cotton, wine grapes, sugar cane, fruits, nuts, vegetables, nursery, flower and turf, pasture crops and hay.	$m	10%	11%	9%	8%	2,176	2,497	1,969	1,728
Wool	Gross value	$m	17%	14%	13%	8%	487	407	365	208
Pigs	Gross value	$m	11%	7%	6%	5%	108	72	64	55
Poultry	Gross value	$m	8%	9%	9%	7%	143	158	150	129
Total Livestock	Gross value. Includes wool, milk, eggs, honey & beeswax, all slaughtered livestock & live animal exports	$m	8%	6%	5%	4%	1,651	1,184	960	857
Total agriculture	Gross value of all agricultural commodities	$m	7%	7%	6%	6%	2,886	3,029	2,650	2,446

(a) Symmetrical mean absolute percentage error. (b) Absolute terms, in original units of series.

Source: Author analysis using ABARES historical agricultural forecast database

ABARES Forecast performance 2000–01 to 2018–19 for selected animal number series

			Relative Error (a)				Average Error (b)			
Commodity	**Series**	**Unit**	**Mar-for next FY**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**	**Mar-for next FY**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**
Cattle	Beef cattle	million head	5%	4%	3%	3%	1.2	1.1	0.6	0.8
Cattle	Cows in milk and dry	million head	6%	6%	6%	5%	0.1	0.1	0.1	0.1
Cattle	Total cattle (beef and dairy)	million head	4%	5%	3%	3%	1.2	1.3	0.9	0.8
Sheep	Total sheep	million head	8%	7%	6%	5%	7.2	5.7	5.1	4.3
Wool	Sheep shorn	million head	7%	6%	5%	4%	7.3	6.0	4.8	4.2
Pigs	Total pigs	million head	7%	7%	7%	7%	0.2	0.2	0.2	0.2

(a) Symmetrical mean absolute percentage error. (b) Absolute terms, in original units of series.
Source: Author analysis using ABARES historical agricultural forecast database

ABARES Forecast performance 2000–01 to 2019–20 for selected export volume series

			Relative Error (a)				Average Error (b)			
Commodity	**Series**	**Unit**	**Mar-for next FY**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**	**Mar-for next FY**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**
Wheat	Includes grain equivalent of wheat flour	kt	23%	19%	13%	8%	3,479	2,753	1,821	1,139
Barley	Includes grain equivalent of malt	kt	31%	27%	26%	17%	1,616	1,330	1,286	883
Canola	Export volume	kt	38%	27%	22%	20%	625	386	326	320
Cotton	Excludes cotton waste and linters	kt	20%	16%	16%	13%	111	90	82	66
Sugar	Export volume	kt	12%	9%	6%	5%	415	307	221	183
Dairy - Butter	Includes butter concentrate and butter oil, dairy spreads, dry butterfat and ghee all expressed as butter	kt	19%	18%	20%	19%	10	9	11	9
Dairy - Cheese	Export volume	kt	12%	9%	8%	10%	22	17	13	19
Dairy - Skim Milk Powder	Export volume	kt	14%	15%	14%	12%	22	25	23	18
Lamb	Shipped weight	kt (sw)	13%	11%	9%	8%	24	20	17	13
Wool	Total wool, greasy equivalent	kt	9%	8%	8%	6%	48	40	41	28
Beef	Shipped weight	kt	12%	10%	10%	7%	118	102	97	69
Dairy - Whole Milk Powder	Export volume	kt	23%	21%	17%	14%	22	20	16	12
Mutton	Shipped weight	kt (sw)	23%	19%	16%	10%	32	27	23	14

(a) Symmetrical mean absolute percentage error. (b) Absolute terms, in original units of series.

Source: Author analysis using ABARES historical agricultural forecast database

ABARES Forecast performance 2000–01 to 2019–20 for selected export value series

			Relative Error (a)				Average Error (b)			
Commodity	**Series**	**Unit**	**Mar-for next FY**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**	**Mar-for next FY**	**Jun - for next FY**	**Sept - for current FY**	**Dec - for current FY**
Wheat	Free-on-board value	$m	22%	19%	12%	9%	1,016	864	520	388
Barley	Free-on-board value	$m	25%	28%	27%	22%	377	415	401	332
Canola	Free-on-board value	$m	36%	27%	24%	23%	327	233	217	229
Cotton	Free-on-board value	$m	25%	18%	16%	13%	338	231	184	155
Sugar	Free-on-board value	$m	19%	15%	12%	12%	310	230	183	170
Total Crops	Free-on-board value	$m	11%	9%	7%	5%	2,045	1,671	1,237	882
Dairy - Butter	Free-on-board value	$m	23%	17%	14%	17%	47	31	26	31
Dairy - Cheese	Free-on-board value	$m	16%	9%	7%	10%	143	75	58	82
Dairy - Skim Milk Powder	Free-on-board value	$m	17%	17%	16%	17%	79	89	85	93
Wool	Free-on-board value	$m	12%	11%	8%	7%	372	333	245	215
Beef	Free-on-board value	$m	18%	16%	15%	11%	1,083	901	884	602
Dairy - Whole Milk Powder	Free-on-board value	$m	26%	20%	21%	16%	105	78	83	64
Total Livestock	Free-on-board value	$m	10%	9%	8%	7%	1,773	1,541	1,474	1,159
Total agriculture	Free-on-board value	$m	8%	7%	6%	5%	2,596	2,595	2,371	1,885

(a) Symmetrical mean absolute percentage error. (b) Absolute terms, in original units of series.

Source: Author analysis using ABARES historical agricultural forecast database

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