

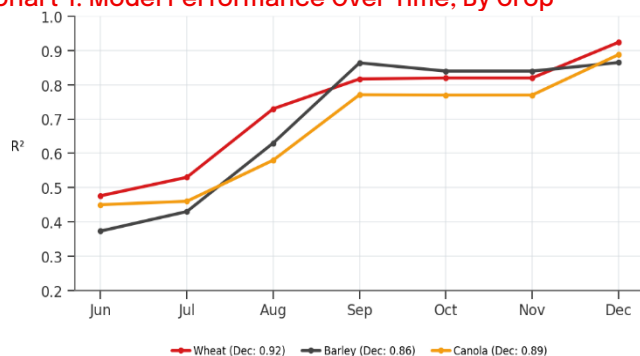
Using Satellite Data to Assess Australian Crop Conditions

Key Points

- We use satellite data to create a model for Australian crop production. The model explains a majority of the variation in wheat, barley and canola production in mainland Australia, with national R^2 above 0.85 for all three crops.
- Explanatory power builds through the season: national production R^2 is modest in June (0.37–0.48 across the three crops), rises materially by September (0.77–0.86) as the model observes most of the winter growing period, and peaks in December.
- The model updates monthly through the cropping season, providing a timely complement to ABARES's quarterly releases in June, September and December, when conditions can shift materially between official updates.
- For 2026–27, the model points to production of 33.5 Mt for wheat, 18.0 Mt for barley and 7.9 Mt for canola. This is above ABARES's September estimates for all three crops on the back of unusually strong vegetation conditions, though wheat is still down on last season.

This note introduces a new satellite-based framework for monitoring Australia's winter crops. While the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) already uses satellite data to help estimate the area planted to different crops, our framework uses satellite measures of vegetation conditions to improve estimates of yield. Our model combines a 27-year satellite record with the official estimates available at each forecast date to produce monthly production forecasts for wheat, barley and canola across the major mainland growing states.

Chart 1: Model Performance Over Time, By Crop



The model shows strong performance in 'walk-forward' testing, which uses only the information that would have

been available at each forecast date. Its performance increases as the season progresses, as satellite observations provide relatively limited information early in the season but materially improve yield and production forecasts from August to November. The framework therefore provides a timely complement to ABARES's quarterly releases, allowing crop conditions and production expectations to be updated monthly as new satellite observations become available.

How the Model Works

Our model estimates production by taking ABARES figures for area (which are based on their own in-season estimates), and multiplying them with our estimates for expected yield per hectare. We model wheat, barley and canola in New South Wales, Queensland, South Australia, Victoria and Western Australia. National production is the sum of the state estimates

We use a satellite measure of vegetation health known as the Normalized Difference Vegetation Index (NDVI) to estimate yield. **NDVI measures how green and dense vegetation is, and is closely related to crop growth.** Satellite observations are aggregated across 16 cropping zones and then combined into state-level measures. The framework summarises crop conditions over different parts of the growing season and uses only the observations available at each forecast date.

(For a visual summary of how NDVI tracks crop growth, see the example for the WA 2015 cropping season, in Appendix A)

Rather than using a single seasonal average, we summarise NDVI over a series of windows through the growing season. This is, broadly, April–May (establishment), June–July (early winter development), August–September (stem elongation and early spring growth) and October–November (grain fill). Only the windows that have been observed by a given forecast date are used. This is what drives the model's improving accuracy through the season: the June forecast draws only on the April–May window, while the December forecast has the full set available. Each window is expressed relative to its own 27-year historical distribution, so **the model is reading how green a state is for that point in the season compared with its own history**, rather than comparing raw NDVI levels across windows that aren't directly comparable.

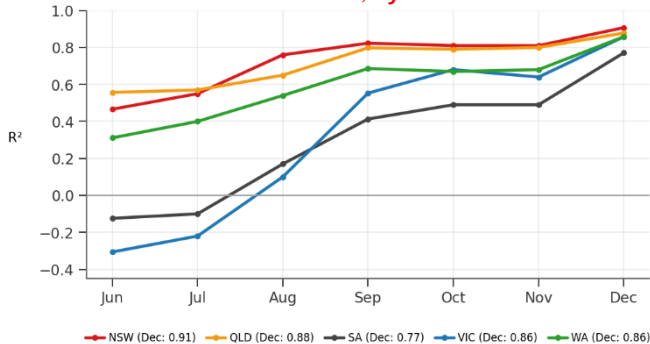
Both components of the production forecast account for historical biases in ABARES estimates. For area, pre-2022 September estimates are adjusted for their historical pattern of revision. The yield models use satellite conditions to estimate whether final yields are likely to finish above or

below the corresponding in-season ABARES estimate, taking account of historical forecast errors for each crop and state.

Model Performance

We assess the framework using walk-forward testing from 2010–11 to 2025–26. For each test season, yield is estimated using only information from earlier seasons. We use multiple forecasts, which are averaged, and compared to the corresponding ABARES yield estimate. These are combined with the area estimate that would have been available at the time. The results therefore provide a realistic indication of historical forecasting performance rather than an in-sample measure of fit.

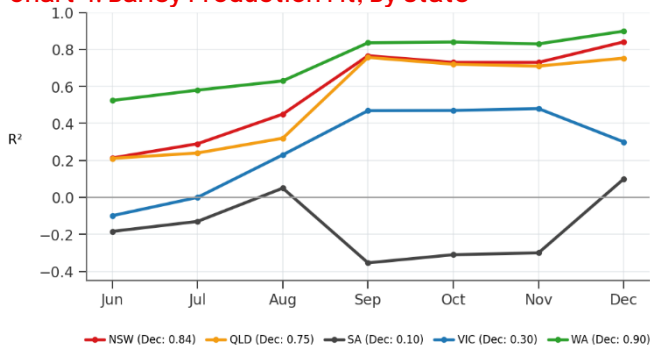
Chart 3: Wheat Production Fit, By State



At the national level, the production model explains between 37 and 48 per cent of the variation in final production in June. By September, this rises to 77 per cent for canola, 82 per cent for wheat and 86 per cent for barley. In December, the corresponding results reach 89 per cent for canola, 92 per cent for wheat and 87 per cent for barley.

Performance is more uneven at the state level. The model generally performs strongly in New South Wales, Queensland, Victoria and Western Australia, particularly once the August–September vegetation window becomes available. South Australia is a notable exception. September production performance is relatively weak there, despite the satellite-based yield models generally outperforming the corresponding ABARES yield estimates.

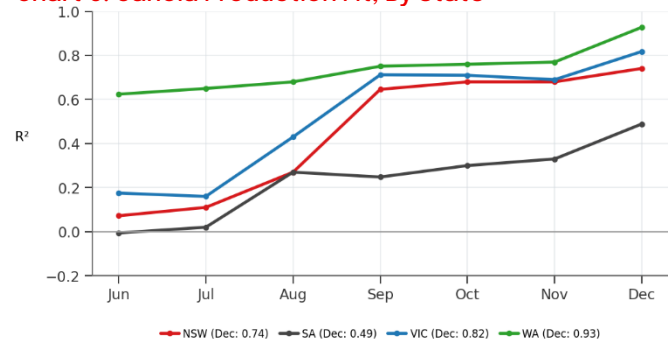
Chart 4: Barley Production Fit, By State



The state results also underline why the framework should be interpreted as a complementary forecasting signal rather than a mechanical replacement for ABARES estimates. The model adds information where satellite conditions diverge from the assumptions embedded in ABARES forecasts, but the size and reliability of that contribution vary across crops, states and stages of the season. National aggregation reduces

some of this state-level noise, producing materially more stable results than many of the individual state models.

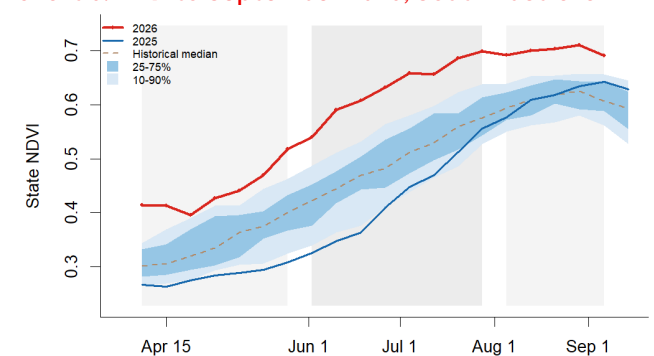
Chart 5: Canola Production Fit, By State



Outlook for the 2026/27 Cropping Season

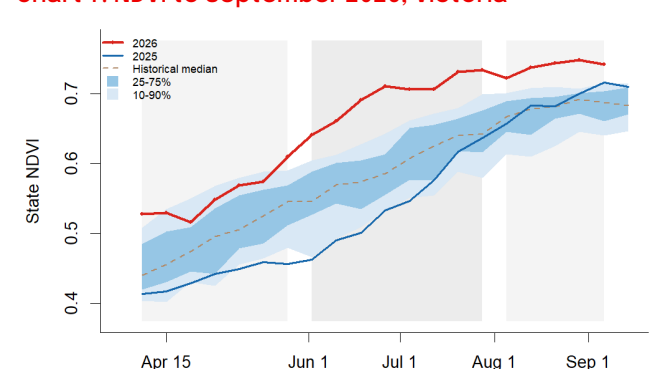
Satellite vegetation conditions point to a larger Australian winter crop than implied by ABARES's September forecasts. Our current estimates are 33.5 Mt for wheat, 18.0 Mt for barley and 7.9 Mt for canola. The difference is not uniform across the country: conditions are particularly strong in Victoria and Western Australia, while the South Australian estimates carry greater uncertainty because historical production performance there has been affected by errors in planted-area estimates.

Chart 6: NDVI to September 2026, South Australia



The current forecasts use satellite observations through September and therefore capture the important August–September growth window. Walk-forward testing suggests that the model has substantial forecasting power by this stage of the season, although further observations during October and November could still alter the yield outlook, particularly if finishing conditions diverge from the strong vegetation signal observed to date.

Chart 7: NDVI to September 2026, Victoria



Wheat: We estimate Australian wheat production at 33.5 Mt in 2026–27. This would represent another large national crop, although production would remain below last season's exceptionally strong result. The forecast primarily reflects above-average vegetation conditions across the major eastern and western cropping regions. The satellite signal is strongest in Victoria and Western Australia, while conditions in New South Wales also remain supportive. The national estimate is above ABARES's September forecast, suggesting that current crop development is stronger than incorporated in ABARES estimate.

Some caution is warranted in translating high NDVI directly into final yield. Exceptional vegetation growth does not always produce a proportionate increase in grain production, particularly when observed conditions lie outside the historical range used to estimate the model. The operational forecast therefore caps extreme satellite observations and applies only part of the raw model correction away from ABARES. This reduces the risk of extrapolating mechanically from unusually high vegetation readings.

Table 1: Outlook for Wheat Production (Mt)

Crop	2025/26	ABARES	NAB
NSW	11.20	7.70	8.50
Victoria	4.25	4.90	5.78
Queensland	2.31	1.21	1.21
South Australia	4.74	6.00	6.99
Western Australia	13.40	10.00	10.99
Mainland	35.90	29.81	33.46

Barley: We estimate barley production at 18.0 Mt, with the largest contributions to the difference from ABARES coming from Victoria, Western Australia and South Australia. The satellite data indicate strong crop development across these regions, and national barley production has historically been captured well by the framework by September.

The Victorian and Western Australian estimates are supported by relatively strong historical model performance. The South Australian forecast is less certain. Although the satellite-based yield signal has historically added useful information in South Australia, production performance has been considerably weaker because errors in estimated planted area can overwhelm the improvement in yield forecasting. The South Australian upgrade should therefore be interpreted as the least certain component of the national barley estimate.

Table 2: Outlook for Barley Production (Mt)

Crop	2025/26	ABARES	NAB
NSW	3.30	2.90	3.15
Victoria	3.10	3.40	3.90
Queensland	0.52	0.36	0.36
South Australia	2.15	2.90	3.23
Western Australia	7.50	6.80	7.38
Mainland	16.56	16.36	18.02

Canola: We estimate canola production at 7.9 Mt, led by another strong crop in Western Australia and above-average production in Victoria, New South Wales and South Australia. The model has historically improved on ABARES September national canola estimate, although the advantage varies by state. The evidence is strongest in New South Wales and Victoria, while the model and ABARES perform similarly in Western Australia. Historical performance is weaker in South Australia, where the present estimate should again be treated with more caution.

Western Australia remains the major contributor to national production and the current model estimate is only moderately above ABARES September forecast. The larger proportional differences in South Australia and Victoria matter less to the national total but reinforce the broader signal that vegetation conditions have generally been stronger than assumed in the September ABARES estimate.

Table 3: Outlook for Canola Production (Mt)

Crop	2025/26	ABARES	NAB
NSW	1.60	1.20	1.29
Victoria	1.25	1.42	1.63
South Australia	0.55	0.63	0.73
Western Australia	4.25	4.00	4.29
Mainland ex-QLD	7.65	7.25	7.94

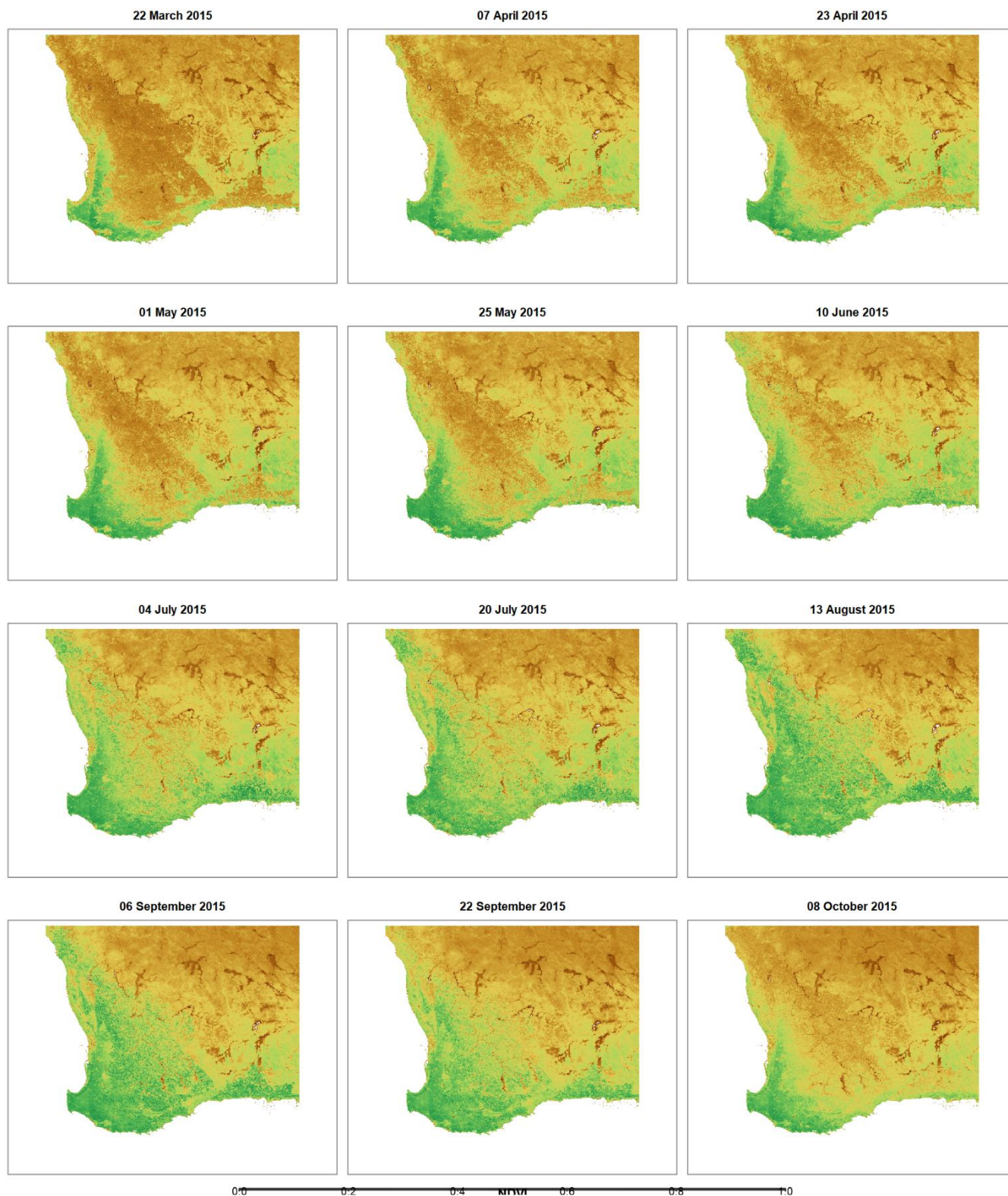
Summary

The satellite evidence points consistently towards production above ABARES September forecasts for all three crops. The national signal is most convincing for barley and wheat, while the canola result is supported by strong performance in the major producing states. Forecast risk is concentrated in South Australia, where uncertainty around planted area limits the reliability of production estimates despite useful satellite information on yield. October and November observations will provide a clearer indication of whether strong crop development translates into final yields, but the September results already support a materially stronger national production outlook than ABARES estimates.

Appendix A

Western Australia: 2015 NDVI Green-up

Twelve observations from 22 March to 08 October



Brown and yellow = low vegetation vigour | Green = high vegetation vigour

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