Vegetation Health Index: Integration into Australia wheat yield forecasting

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U.S. Department of Agriculture
World Agricultural Outlook Board
Washington D.C., U.S.A.
Australia: Wheat

Wheat crop calendar for most of Australia

- Major areas combined account for approximately 75% of total national production.
- Major and minor areas combined account for approximately 99% of total national production.
- Major and minor areas derived from 2015/16 Agricultural Census data*.

**XX** = percent each state contributed, on average, to national production from 2011/12 to 2015/16*. States not numbered contributed less than 1%.

* Data obtained from the Australian Bureau of Statistics.
Australia: Barley

- Major areas combined account for approximately 75% of total national production.
- Major and minor areas combined account for approximately 99% of total national production.
- Major and minor areas derived from 2015/16 Agricultural Census data*.

XXX = percent each state contributed, on average, to national production from 2011/12 to 2015/16*. States not numbered contributed less than 1%.

* Data obtained from the Australian Bureau of Statistics.
Australia: Canola

- Major areas combined account for approximately 75% of total national production.
- Major and minor areas combined account for approximately 99% of total national production.
- Major and minor areas derived from 2015/16 Agricultural Census data*.

* Data obtained from the Australian Bureau of Statistics.
Australia: Cotton

- Major areas combined account for approximately 75% of total national production.
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- Major and minor areas derived from 2015/16 Agricultural Census data*

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* Data obtained from the Australian Bureau of Statistics.
Australia: Sorghum

- Major areas combined account for approximately 75% of total national production.
- Major and minor areas combined account for approximately 99% of total national production.
- Major and minor areas derived from 2015/16 Agricultural Census data*.

* Data obtained from the Australian Bureau of Statistics.

XXX = percent each state contributed, on average, to national production from 2011/12 to 2015/16*. States not numbered contributed less than 1%. 
Abundant rainfall in the south and east led to record wheat production.
Temperature Anomaly
January 2019

Persistent heat greatly reduced dryland crop prospects in the east.
The heavy rains have caused local flooding, but maintained overall good to excellent yield prospects for crops not impacted by flooding.
The recent decline in reservoir levels could potentially impact planting intentions for the 2019/20 growing season.
New South Wales - Southern
Cumulative Precipitation

Oct lockup

Precipitation (mm)

Date

May 1
May 9
May 17
May 25
May 30
Jun 4
Jun 12
Jun 20
Jun 27
Jul 4
Jul 12
Jul 18
Jul 25
Jul 30
Aug 5
Aug 12
Aug 19
Aug 26
Sep 3
Sep 10
Sep 17
Sep 24
Sep 30
Oct 8
Oct 15
Oct 22
Oct 29
Nov 5
Nov 12
Nov 19
Nov 26
Nov 29

Average
y2018

USDA
Agricultural Weather Assessments
World Agricultural Outlook Board
New South Wales - Southern
Cumulative Precipitation

Wheat
Diff from trend
2002 = -1.06 t/ha

Oct lockup

Precipitation (mm)

Date

USDA Agricultural Weather Assessments
World Agricultural Outlook Board
South Australia - Central
Cumulative Precipitation

Oct lockup

USDA Agricultural Weather Assessments
World Agricultural Outlook Board
Diff from trend
2017 = -0.02 t/ha
2015 = 0.03 t/ha
Avg = 0.00 t/ha

South Australia - Central
Cumulative Precipitation

Wheat

Oct lockup
Victoria - North Central
Cumulative Precipitation

Wheat
Diff from trend
2015 = -0.59 t/ha
2008 = -0.78 t/ha
2002 = -1.19 t/ha
Avg = -0.85 t/ha

Oct lockup

Precipitation (mm)

Date

USDA Agricultural Weather Assessments
World Agricultural Outlook Board
# Wheat Yield Estimate

## Analog year analyses

<table>
<thead>
<tr>
<th>State</th>
<th>Yield estimate (t/ha)</th>
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<tbody>
<tr>
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<td>1.99</td>
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<td>2.13</td>
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**National Estimate**
# Wheat Yield Estimate

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## Wheat Yield Estimate

### Analog year analyses

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**National Estimate**

- Area estimate: 11.0 Mha
- Yield estimate: 18.6 t/ha
# Wheat Yield Estimate

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Vegetation Health Index

October 2010

Poor to very poor crop conditions.

Very good to excellent crop conditions.
Vegetation Health Index vs. Wheat Yields

South Australia

Based on 13 years of data (2002-2014)

VHI data – Week 32
(7 day period ending Aug 12)

Note – Prelim data available Aug 13
Final data available Sep 24

$R^2 = 0.10$
Vegetation Health Index vs. Wheat Yields

*South Australia*

Based on 13 years of data (2002-2014)

VHI data – **Week 33**
(7 day period ending **Aug 19**)  

Note – Prelim data available Aug 20  
Final data available Oct 1

$R^2 = 0.19$
Vegetation Health Index vs. Wheat Yields

South Australia

Based on 13 years of data (2002-2014)

VHI data – Week 34
(7 day period ending Aug 26)

Note – Prelim data available Aug 27
Final data available Oct 8

$R^2 = 0.35$
Vegetation Health Index vs. Wheat Yields

South Australia

Based on 13 years of data (2002-2014)

VHI data – Week 35
(7 day period ending Sep 2)

Note – Prelim data available Sep 3
Final data available Oct 15

$R^2 = 0.49$
Vegetation Health Index vs. Wheat Yields

South Australia

Based on 13 years of data (2002-2014)

VHI data – Week 36
(7 day period ending Sep 9)

Note – Prelim data available Sep 10
Final data available Oct 22

$R^2 = 0.61$
Vegetation Health Index vs. Wheat Yields

South Australia

Based on 13 years of data (2002-2014)

VHI data – Week 37
(7 day period ending Sep 16)

Note – Prelim data available Sep 17
Final data available Oct 29

$R^2 = 0.74$
Vegetation Health Index vs. Wheat Yields

South Australia

Based on 13 years of data (2002-2014)

VHI data – Week 38
(7 day period ending Sep 23)

Note – Prelim data available Sep 24
Final data available Nov 5

$R^2 = 0.84$
Vegetation Health Index vs. Wheat Yields

*South Australia*

Based on 13 years of data (2002-2014)

**VHI data – Week 39**
(7 day period ending Sep 30)

Note – Prelim data available Oct 1
Final data available Nov 12

\[ R^2 = 0.88 \]
Vegetation Health Index vs. Wheat Yields

*South Australia*

Based on 13 years of data (2002-2014)

VHI data – **Week 40**
(7 day period ending Oct 7)

Note – Prelim data available Oct 8
Final data available Nov 19

\[ R^2 = 0.91 \]
Vegetation Health Index vs. Wheat Yields

South Australia

Based on 13 years of data (2002-2014)

VHI data – Week 41
(7 day period ending Oct 14)

Note – Prelim data available Oct 15
Final data available Nov 25

$R^2 = 0.92$
Vegetation Health Index vs. Wheat Yields

The relationship between VHI and wheat yields is strong in these states as well...

Western Australia: $R^2 = 0.87$ (week 44)

Victoria: $R^2 = 0.92$ (week 42)

New South Wales: $R^2 = 0.91$ (week 42)

Queensland: $R^2 = 0.70$ (week 42)
## Winter Wheat Yield Estimates – Dec 2015

### Estimated area (ha) and VHI yield (t/ha) prod (Mt)

<table>
<thead>
<tr>
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<th>Estimated Area (ha)</th>
<th>VHI Yield (t/ha)</th>
<th>Prod (Mt)</th>
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<td>1.71</td>
<td>8.8</td>
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<td>2,360,000</td>
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## Yield Estimates – Dec 2015

### Winter Wheat

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Adequate to abundant rainfall throughout most of the growing season has resulted in a high yielding crop.
Similarly, combination of adequate to abundant soil moisture at the beginning of the growing season, and near-normal rainfall through mid-September...

...appeared to help wheat withstand untimely heat and dryness later in growing season.
VHI data – Week 42
(7 day period ending Oct 21)

Note – Prelim data available Oct 22
Final data available Dec 3

Western Australia
South Australia
Queensland
New South Wales
Victoria
VHI data – Week 42
(7 day period ending Oct 21)

Note – Prelim data available Oct 22
Final data available Dec 3

Note the good vegetation conditions in parts of South Australia and New South Wales...
VHI data – **Week 42**
(7 day period ending **Oct 21**)  

Note – Prelim data available Oct 22
Final data available Dec 3

...these *favorable signals* lie within major wheat producing areas.

[Map of Australia showing major wheat growing areas]
### Yield Estimates – Dec 2015

**Winter Wheat**

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Yield Estimates – Dec 2015

1.74 (ABARES)
Yield Estimates – Feb 2016 update

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1.90 (ABARES)
In contrast, extreme drought during the last growing season significantly reduced crop production.
Frequent heat compounded the impact of extreme drought, desiccating dryland crops.
Since 2010, there has been a strong relationship between spring rainfall and dryland area.
Since 2010, there has been a strong relationship between spring rainfall and dryland area.

Rainfall = 109 mm

\[ y = 1,380.55x - 29,485.11 \]

\[ R^2 = 0.94 \]
Since 2010, there has been a strong relationship between spring rainfall and dryland area.