Farmers’ use of weather and forecast information in the Western Australian wheatbelt

Marit Kragt & Myrtille Lacoste

Work commissioned by the WA Bureau of Meteorology
Project “Benefits of Doppler investments in the WA wheatbelt”
Thank you

- Thank you to Diana Greenslade and Leon Majewski for organising this remote presentation

- The planet is thanking you for the GHG savings

Your flight:
From: Perth (AU), PER to: Melbourne (AU), MEL, Roundtrip, Economy Class, ca. 5,400 km, 1 traveller

---

CO₂ amount: 0.954 t
Project background

- Work commissioned by the WA Bureau of Meteorology (December 2016)
- Investigate the benefits of new weather radars in the WA Wheatbelt (total investment commitment $23m)
- Radars were installed between Oct 2016 and June 2017, at estimated cost of $15m
Research Questions

1. The use of weather and forecast information
   - How is weather information used by farmers?
   - Which decisions are impacted by weather and forecasting services?

2. Potential financial benefits to farmers
   - What benefits are experienced by farmers thanks to new weather info?
   - Where measurable, what is the financial value of these benefits?

3. Cost-benefit analysis
   - What are the installation and maintenance costs?
   - Do the new radar investments yield a positive net present value?
Data from semi-structured interviews in Wheatbelt:
  - Two study areas that did not previously had radar
  - Total 51 respondents, 37 farms (100% response rate)
Results: Use of weather information

- Farmers use multiple weather and forecast products, across multiple platforms
- Over 20 different products cited across the sample
- On average, respondents use 5 products
Results: Use of weather information

Farmers use multiple weather and forecast products, across multiple platforms

- Over 20 different products cited across the sample
- On average, respondents use 5 products

16% 11% 11% 8% 5% 7% 6% 5% 7%< 5% each

Primarily accessed via apps on mobile phones rather than websites on computers

1 Daily and 7-day forecasts, town and district based
2 OCF (Operational Consensus Forecasts) provided by BoM but accessed via AWN (AustralianWeatherNews.com)
3 BoM “Water and the Land - For Agriculture and Natural Resources Management”, mainly 4-day forecast maps
4 BoM “Weather maps”: forecasts, synoptic and barometric charts, poles, oceans
5 GFS (Global Forecast System) mainly accessed via noaa.org and wxmaps.org
6 AWS (Automatic Weather Stations): past observations

a) “Market share”
Number of times a product is named in total
(1-11 per respondent, n = 231)

b) “Population share”
Number of respondents using the product
(n = 47)

Overall:

- 49% Bureau of Meteorology (BoM)
- 40% Third-parties, national
- 9% Intl. Dpt.

At least 1 product:
- BoM / Dpt. Agric. others, national
- others, internatl.
‘Avidity’ index defined as (# access x # products)

No impact of
- Age
- Farm size
- Cropped area / farm type
- Technological level

The hypothesis that farmers who access more weather & forecast info are younger, more ‘technologically-oriented’, or have larger farms was not confirmed.
Why those products/platforms?

- Format in which information is delivered is crucial
- Awareness raising may increase uptake
What information do you use?

- Tailor products to most relevant information to farmers

![Bar chart showing the percentage of respondents using different indicators.](chart.png)

- Cropping specialists: n=8
- Mixed crop/livestock: n=21
- n=31
Impact on farming practices

However, the **very-long-term horizon** (outlook) is not much relied on (because considered unreliable).

For planning decisions, **all the information** is important (weather + short & long-term forecast horizons).

<table>
<thead>
<tr>
<th>Planning</th>
<th>Crucial</th>
<th>Important</th>
<th>May matter</th>
<th>Minor</th>
<th>Negligible</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEAR REAL-TIME</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FORECASTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hours (&lt;24h)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days (36h, 4d, 7d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weeks (14d, 28d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OUTLOOKS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### a) NEAR REAL-TIME
- Current conditions

### b) # Most important horizons for decisions
Impact on farming practices

- Planning:
  - Crucial
  - Important
  - May matter
  - Minor
  - Negligible
  - None

- Spraying:
  - Monitoring current conditions and short-term forecasts matters most

- Sheep:

For spraying and sheep management:
NEAR REAL-TIME FORECASTS
Current conditions Overall Hours (<24h) Days (36h, 4d, 7d) Weeks (14d, 28d) Months

- Most important horizons for decisions

- Number of respondents (overall forecast / all others):
  - 35 / 35
  - 36 / 31
  - 33 / 30
  - 33 / 29
  - 36 / 34
  - 29 / 29
Impact on farming practices

For seeding, fertilising, harvest:
Longer-term forecast matters most
BUT are NOT much relied upon

There exist potential benefits of medium-term forecasting for seeding, fertilising and harvesting decisions, where forecasts are important but not yet relied upon.
Radar benefits of real-time observations?

- Doppler radar was considered most useful for real-time weather observations.
- ‘General farm planning’ and ‘Spraying decisions’ were most influenced by near real-time weather.
- Not all benefits are quantifiable.

Farmers’ assessment of importance of Doppler radar technology on farm management decisions.
Impact on practices

- Scope for impact varies:
  - e.g. Current info is already very good for spraying
  - e.g. Not that much room for fertiliser changes (logistics constraints)

- Impacts of improved weather information may be small because other factors over-ride weather-related issues
Opinion of BoM?

b) Opinion of BoM’s overall performance and competence

n=43

Very poor: 0
Not good: 1
Not very good: 2
Good: 3
Very good: 4
Excellent: 5

Grumpy farmers: <5% (often loud…)
Very happy farmers: >80% ! (often silent…)

c) Perceived overall improvement in forecast skills

n=41
Opinion of BoM?

- Success!
- Would like improved longer range forecasts, which may develop over time
Conclusion

- We interviewed farmers to estimate the impacts of improved weather observations and forecasting on farm decisions.
- From further work → radars generate positive benefits to farmers in WA wheatbelt, and positive NPV from investment.
- Note: estimates do not include ‘convenience’ benefits and benefits to other rural stakeholders (e.g. emergency services).
Farmers’ use of weather & forecast information in the Western Australian wheatbelt

Wheatbelt Radars Project:
Estimating the economic benefits from weather radar investments in the Western Australian wheatbelt

Report to the Bureau of Meteorology

Myrtile Lacoste
Marit Kragt

2018

Report to the WA Bureau of Meteorology

Thayse Nery
Marit Kragt

Release: Version 2
Date: 18 September 2018

marit.kragt@uwa.edu.au