Forewarned is Forearmed:

Equipping farmers and agricultural value chains to proactively manage the impacts of extreme climate events

This project is supported by funding from the Australian Government Department of Agriculture and Water Resources as part of its Rural R&D for Profit programme

Australian Government

Department of Agriculture and Water Resources

Russell Pattinson, National Coordinator

Background

1. The importance of climate change, climate variability extreme events is clear
2. Key driver of production and income fluctuations ….. And of social well-being!
3. Improve the forecast of extremes (e.g. extreme high or low rainfall, heat, cold and frost)
4. Aim - decrease impacts on farm and industry profit.

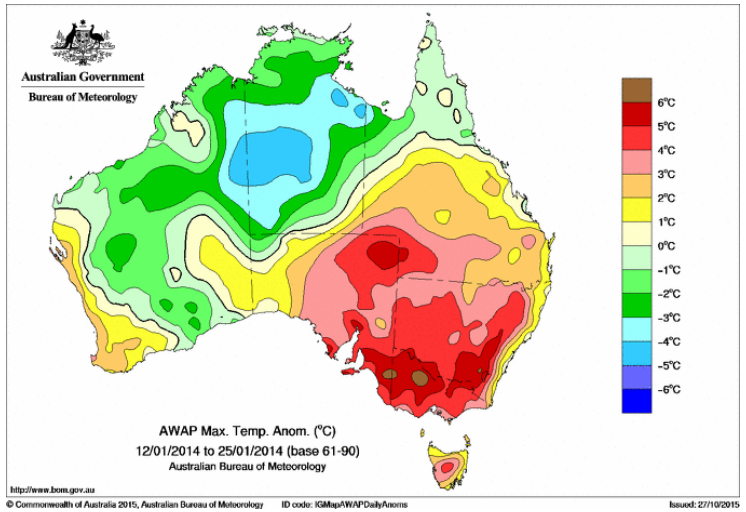
ForeWarned if ForeArmed

Take home messages

- There is a major project underway
- Multi-facetted approach of the project
- What are we talking about – experimental products and processes?

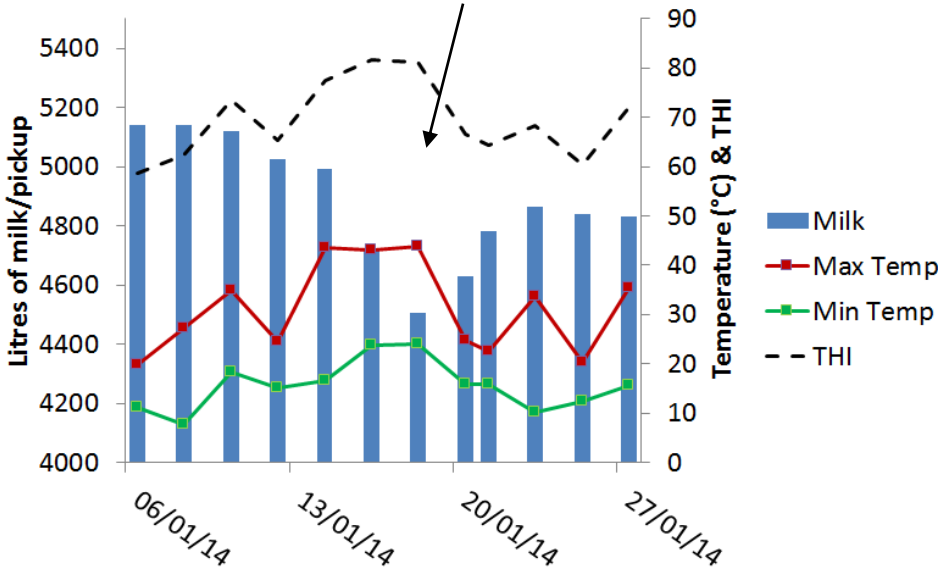
So what?
Heatwaves and milk production – factory data

January 2014 - Heatwave



11% state-wide drop in milk production

$6.6M loss to Victorian farmers over 3 days



Estimated cost of $1,500 per farm

Eckard & Cullen (2017)

Overall Project – 4 Components

1. **Research**
   - Improve predictions - for rainfall (wet, dry), temperatures (hot, cold), frost.
   - User needs'

2. **Development** - develop new forecast products - weeks to season out

3. **Industry review** - assess new products. Understand timing, timeframes, layout. Risk management products

4. **Communication & training** to industry – bolt onto existing processes

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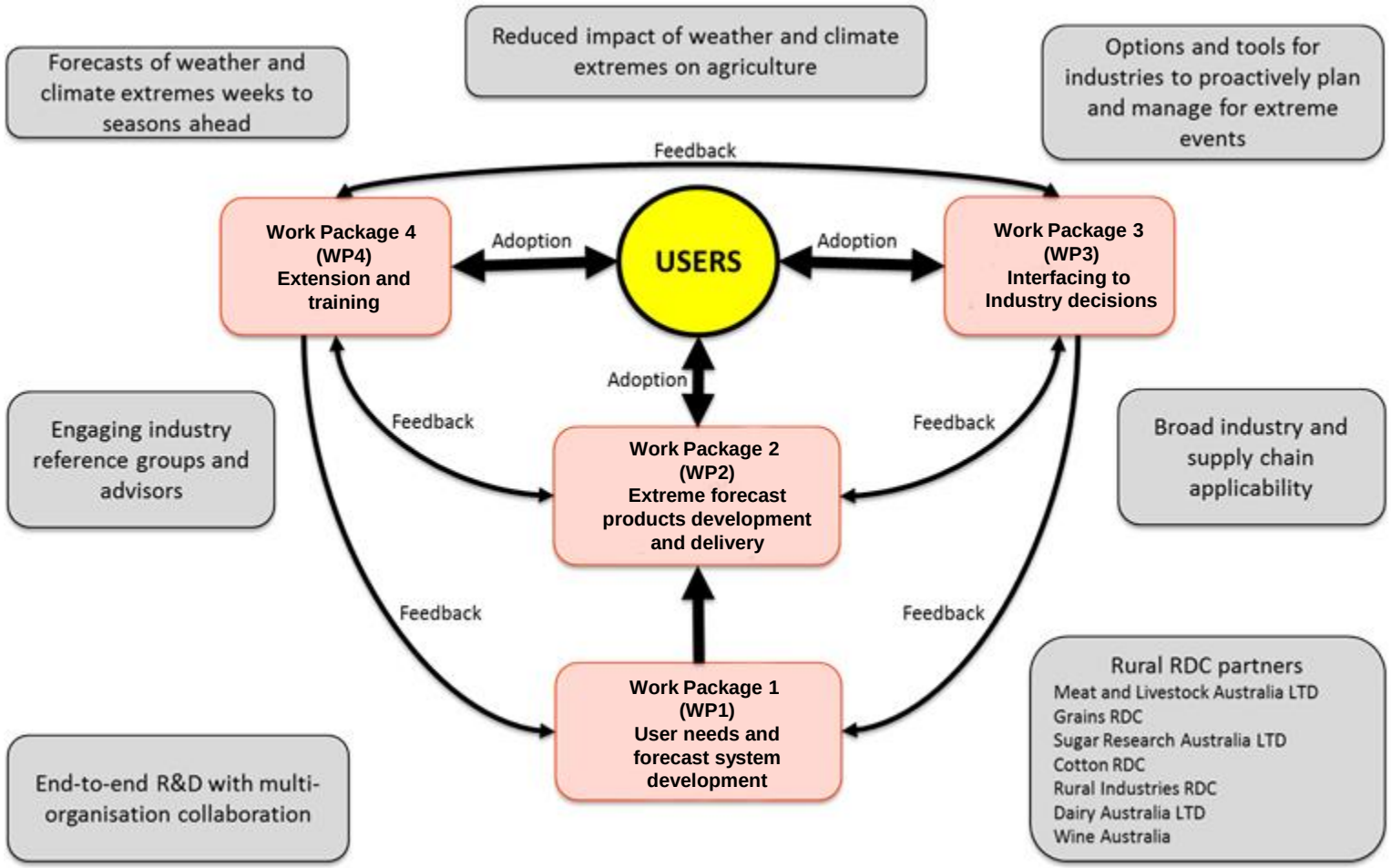
Integrated approach



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Objective: Equip Australian agricultural value chains to foresee & proactively manage the impacts of extreme climate events

Improve extreme events forecast (rainfall, temp) weeks to seasons ahead → develop new end-user tools → communicate outputs

1. Understand industry needs and improve forecasts	2. Develop extreme event forecast products	3. Industry engagement	4. Extension & communication
Aims & activities • Increase understanding of drivers of extreme events • Reduce systematic biases in forecasts to improve accuracy • Understand what industry needs (and when) in relation to forecasts of extreme events on multi-week to seasonal timescale • Feed above into activities 2, 3 and 4 **KPI** • Improved seasonal forecasts and ability to predict extreme events **Lead Partners:** Bureau of Meteorology, Monash University,	**Aims & activities** • Evaluate key historical extreme events (hindcasting) • Develop new extreme weather/climate forecast products • Test & refine new forecast products, such as heatwave predictions • Increase uptake of forecast products **KPI** • Deliver at least 5 new extreme event forecast products that are valued by producers **Lead Partners:** Bureau of Meteorology	**Aims & activities** • Establish reference groups for key agricultural industries • Identify key historical extreme events • Develop industry-specific risk management plans • Trial experimental products • Record producer responses to extreme event forecasts **KPI** • New products trialled and reviewed by producers • Industry-specific risk management plans developed **Lead Partners:** University of Melbourne, University of Southern Queensland, SARDI, QDAF	**Aims & activities** • Operate Community of Practice (researchers, advisors, producers) to improve understanding of new forecast products • Communicate the value of new products through existing networks • Increase awareness of new risk management tools **KPI** • Increased awareness / use of extreme events products • Improvement in industry (ex-ante Cost Benefit Analysis (CBA)) **Lead Partners:** Agriculture Victoria, BCG, third party for CBA
Budget: $6.832 M (cash & in-kind)		**Budget $6.232 M (cash & in-kind)**	

Key Stakeholders

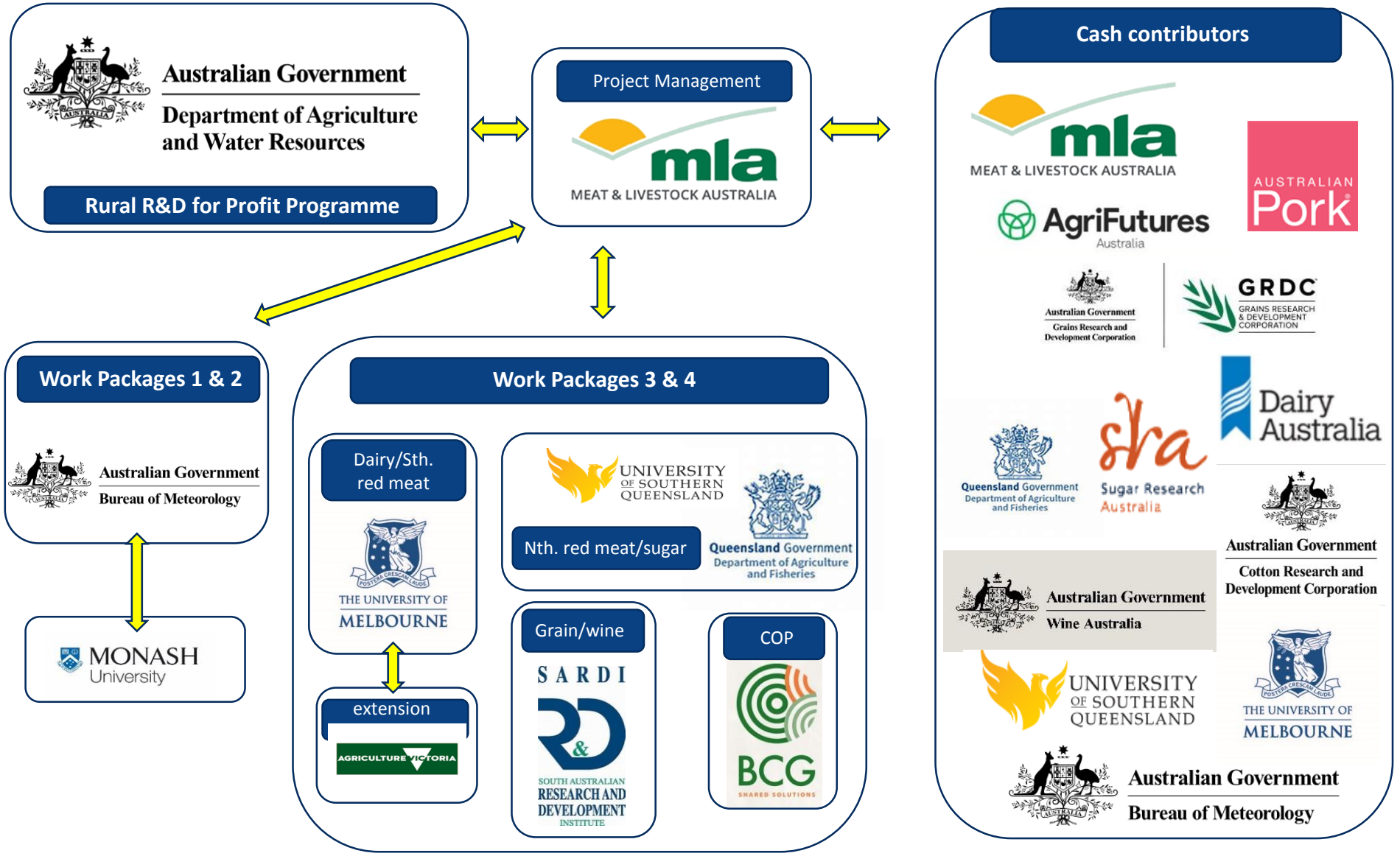
RDCs

Meat and Livestock Australia, Grains RDC, Sugar Research Australia, Cotton RDC, AgriFutures Australia, Dairy Australia, Wine Australia, Australian Pork

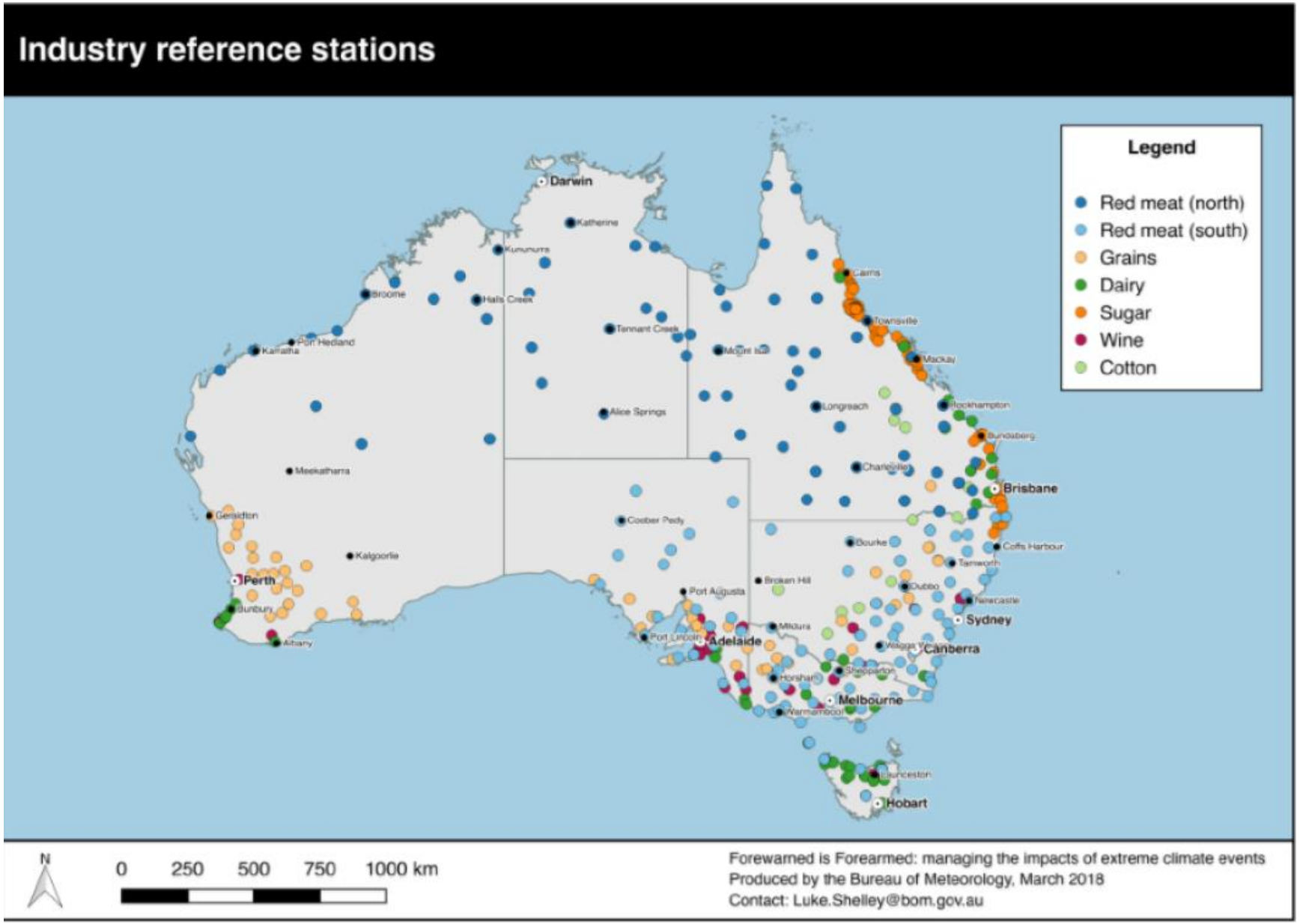
Other partners

Commonwealth Department of Agriculture and Water Resources, SARDI, University of Melbourne, University of Southern Queensland, Bureau of Meteorology, BCG, Agriculture Victoria, Monash University, QDAF

Who is involved - partners and investors



Forewarned is Forearmed - scope



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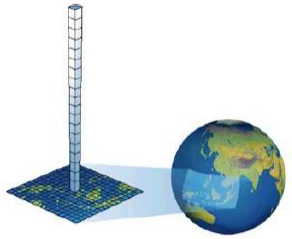
Integrated with other projects – RR&D4P Rd1, MCV, ISFS, NACP

Improving the forecast system



Work package 1 (R):

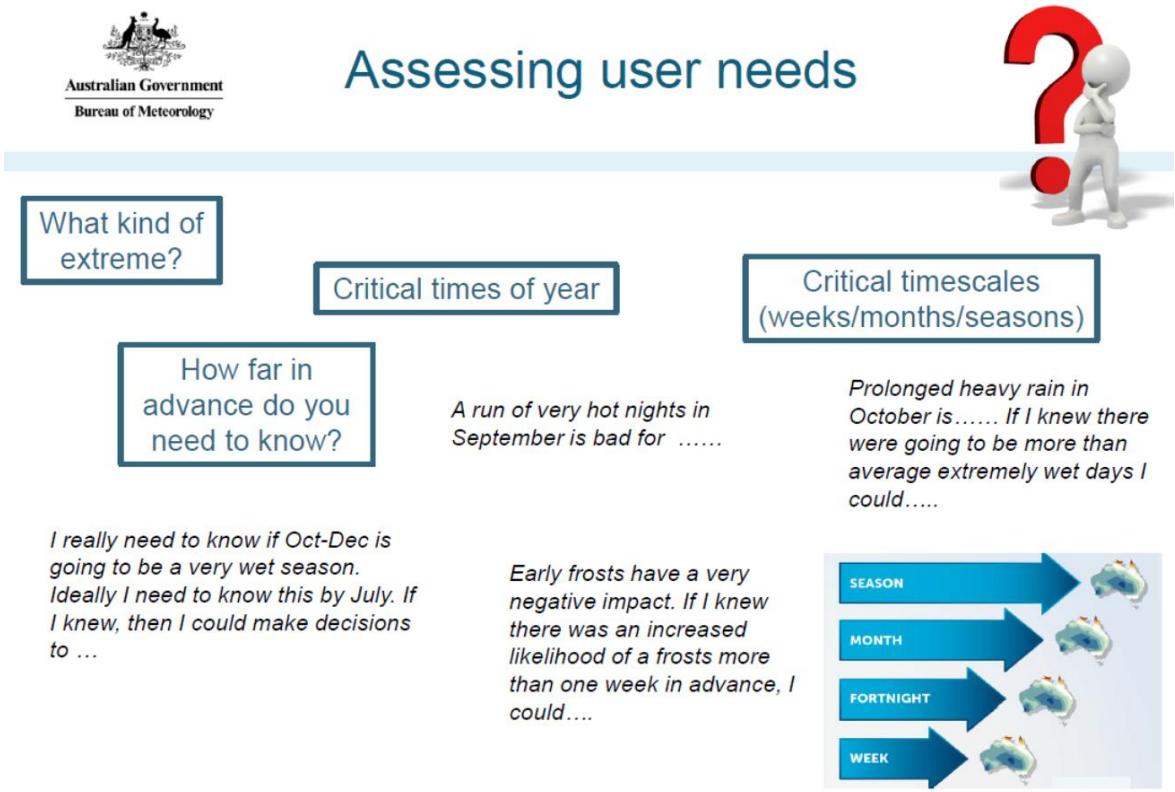
- Understand user needs
- Improved seasonal forecast system

Work package 2 (R&D)

- New extreme weather/climate forecasts
- Enhanced BoM service to agriculture

Outlooks for multi-week and seasonal timescales

Week 2
Week 3
Weeks 1 and 2
Weeks 2 and 3
Weeks 3 and 4
Month 1
Month 2
Month 3
Season 1
Season 2



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Work package 3 (D&E):

- Establish industry reference groups
- Identify key extreme events of consequence
- Develop industry-specific risk management
- Collect and evaluate feedback on forecast products

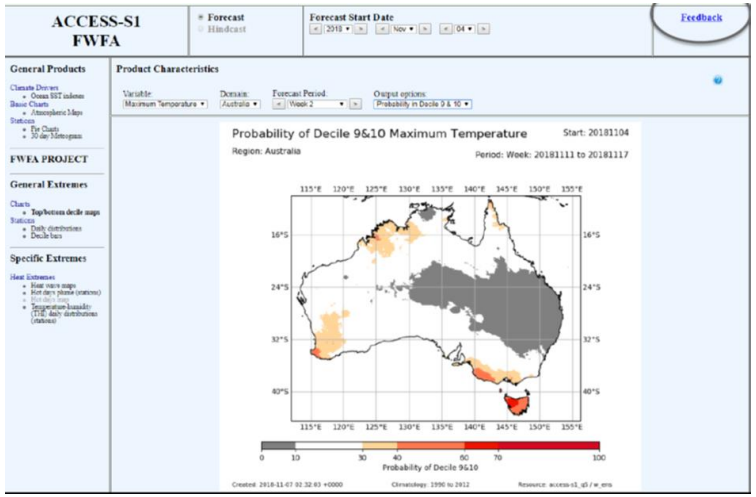
Work package 4(E)

- Existing channels - Community of Practice / The Break
- Increased awareness of new products & risk management tools
- Increased uptake of extreme event products by agricultural industries

BCG
SHARED SOLUTIONS

Forewarned is Forearmed:

- Products
  - Likelihood of extreme weather events (e.g. frost, heatwaves)
  - Extremes averaged over longer periods (e.g., an extremely hot month, an extremely wet season)
- Website with experimental products (password protected)
  - Not official products
  - Not to be publicised
  - For research purposes only
  - Feedback needed
  - Will improve over time
  - Not all will be used / operationalised
- Out-of-scope for this project: wind extremes, tropical cyclones, hail, thunderstorms, tornados, fire weather



Website:

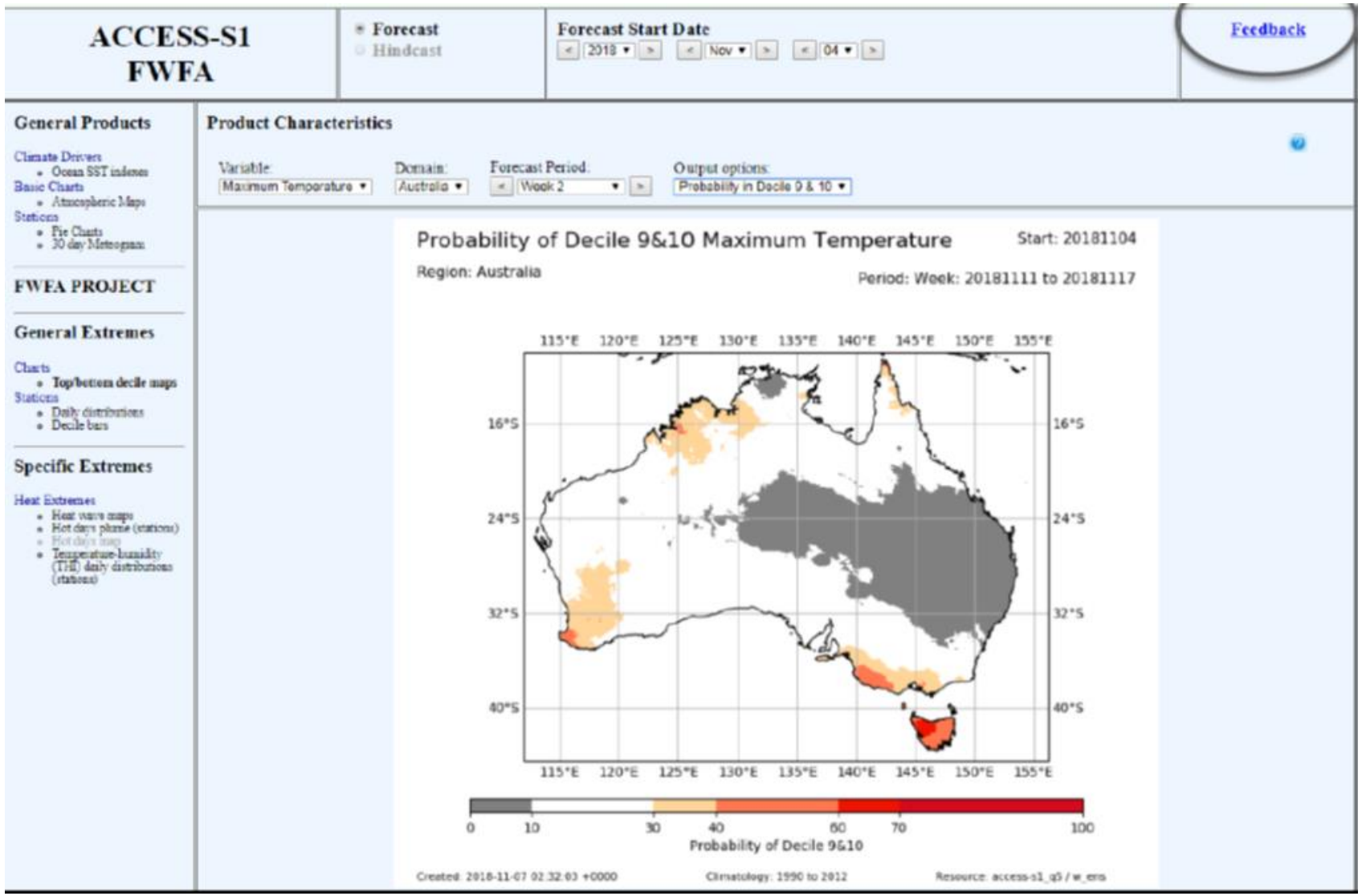
*Forecast date

*Variable (temp)

*Where

*Timeframe

*Product (map, plume)



- Probability of decile 9 & 10 heat week after next across Australia

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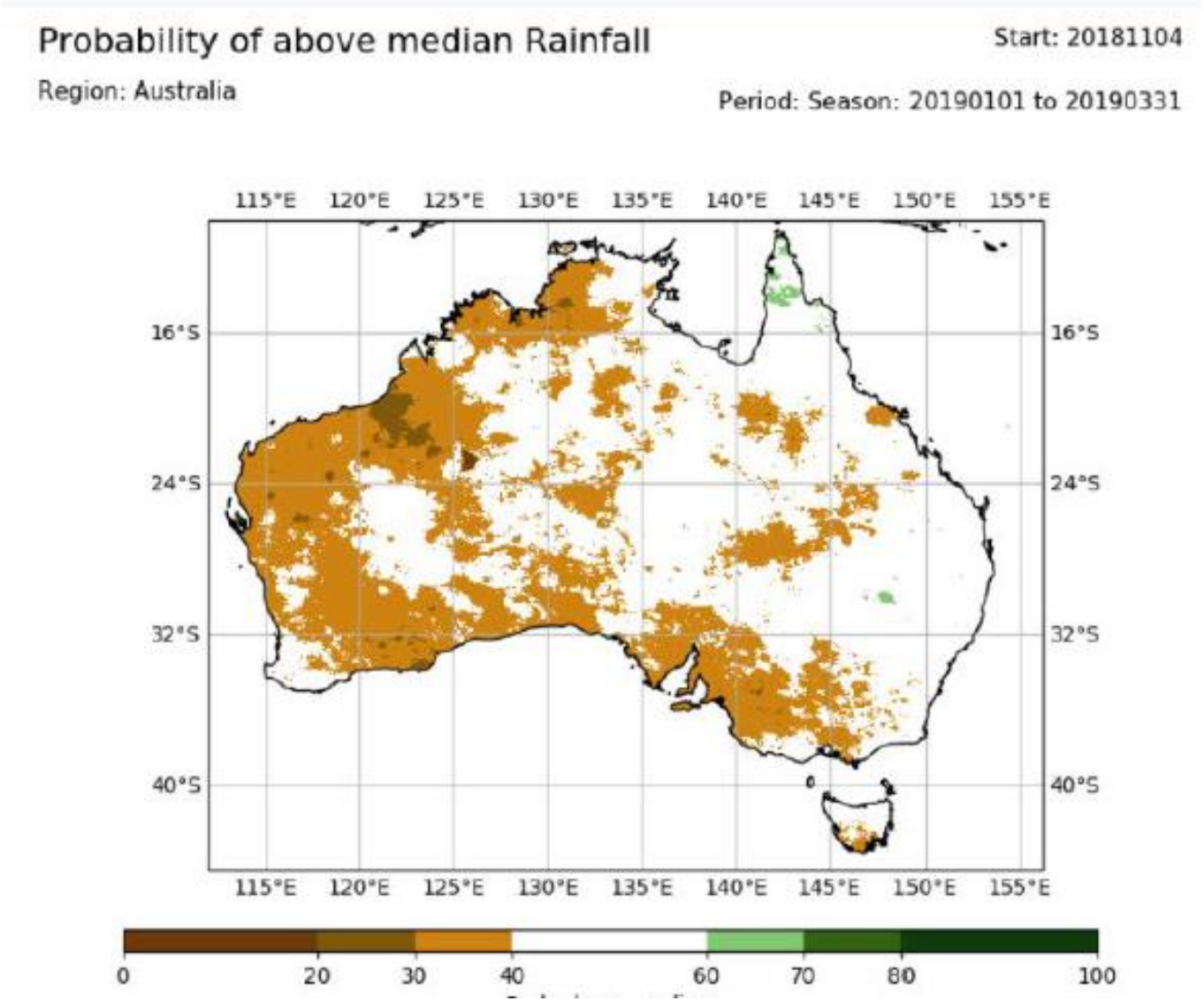
More info:

Currently



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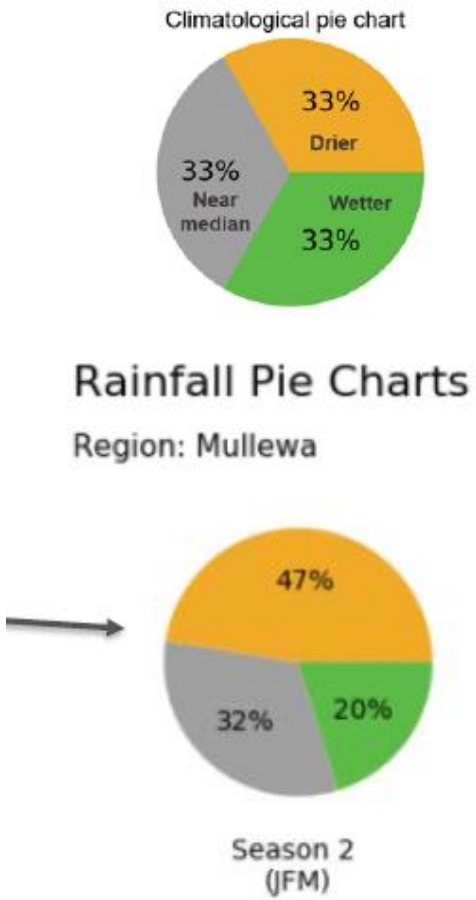
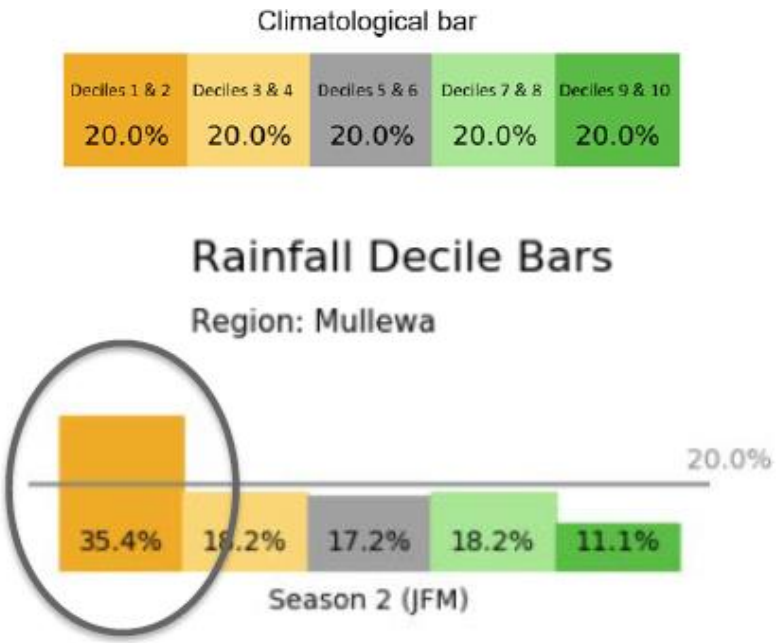
More information:





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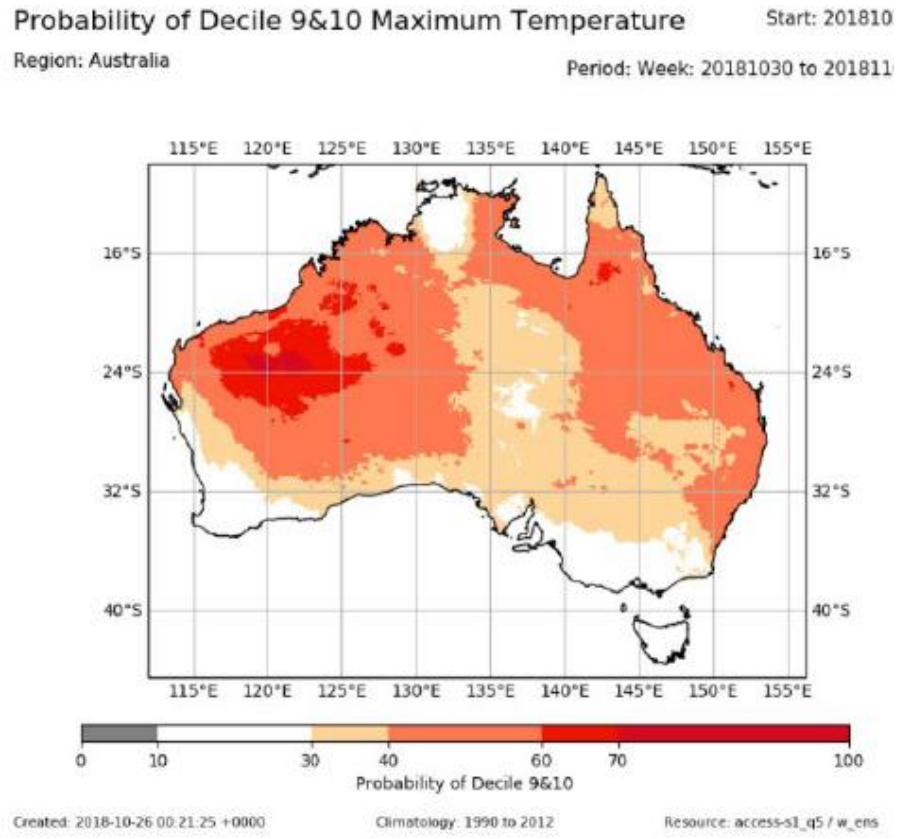
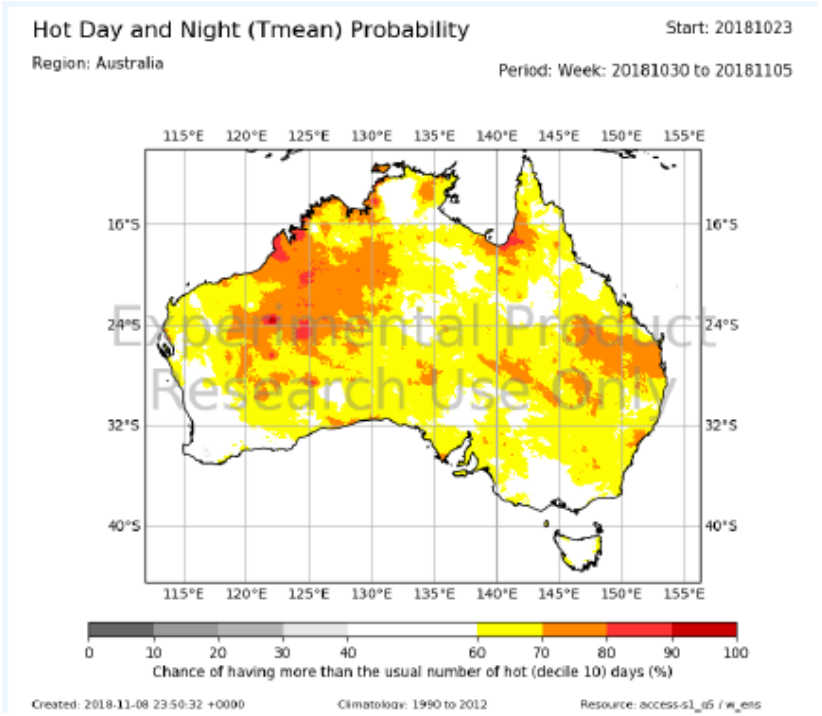
New products – heat wave

Chance of having a decile 9-10 week



Chance of having more hot days+nights than usual in the forecast period



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New products – heat wave

Black line: The observed 90th percentile threshold of daily T_{mean}

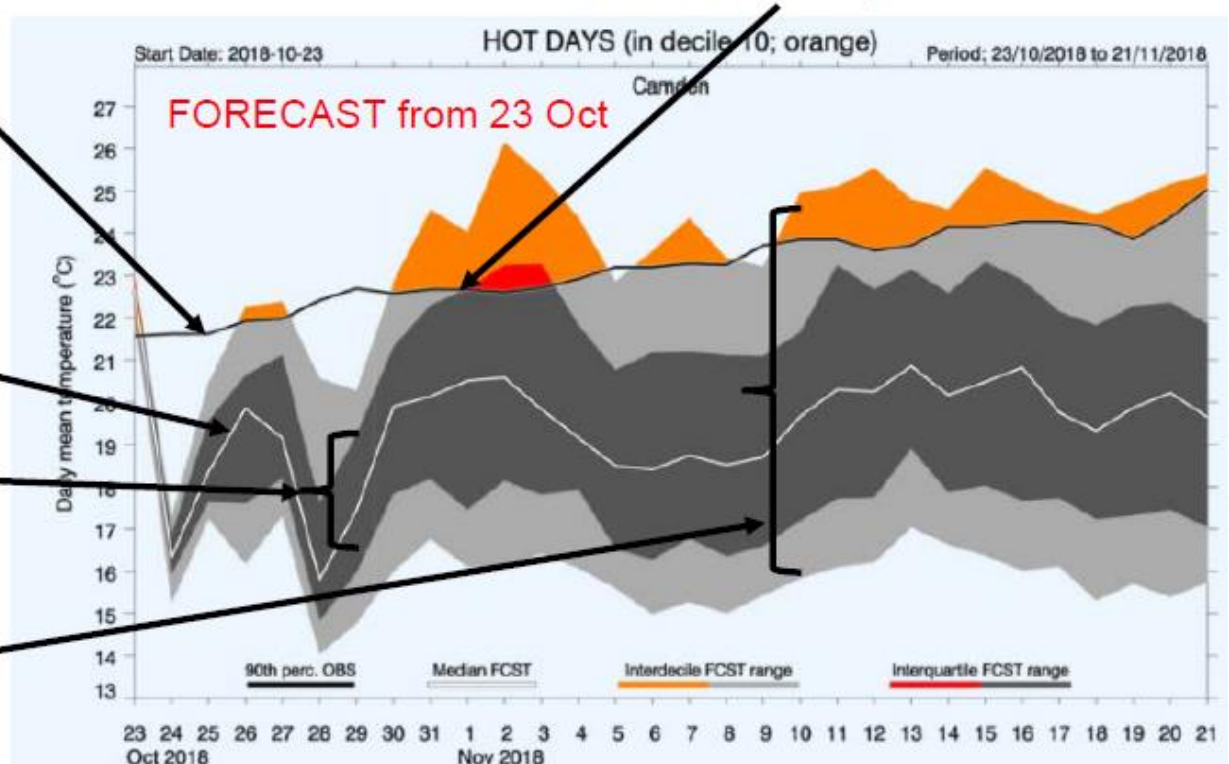
- Calculated by looking back over the historical period for the particular time of year. 10% of days are hotter than this threshold for the given time of year.

Increased hot day risk:
"Orange" if some of the forecast ensemble are forecasting temperatures exceeding the historical (climatology) 90th percentile

This is the 75th percentile i.e. more than 25% of the ensemble are forecasting temps > historical (climatology) 90th percentile. The chance of "hot days" is 25% (i.e., more than double the normal risk, which is 10%)

The "plume" is the forecast

- **White line**: middle (median) value of the forecast ensemble
- **Dark grey**: interquartile range (between the 25th and 75th percentiles of the forecast ensemble). 50% of the forecast distribution have values in this range.
- **Light grey**: interdecile range (between the 10th and 90th percentiles of the forecast ensemble). 80% of the forecast distribution have values in this range.



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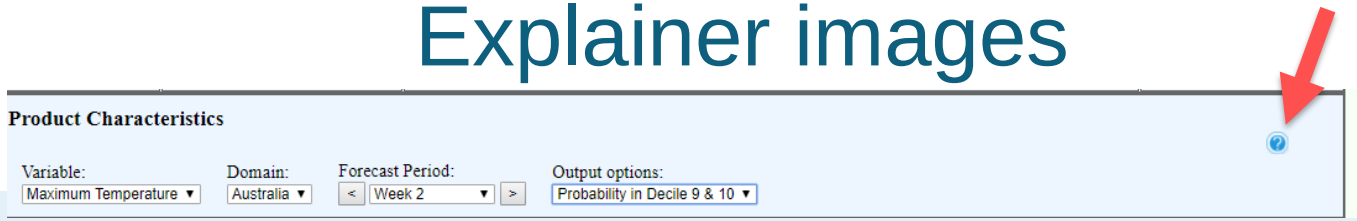
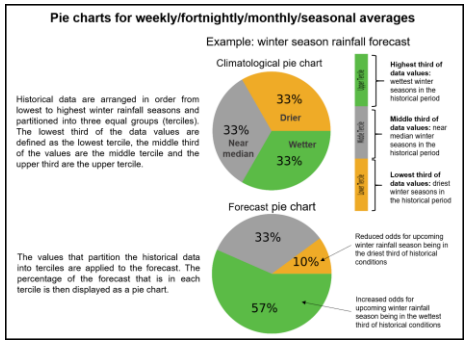
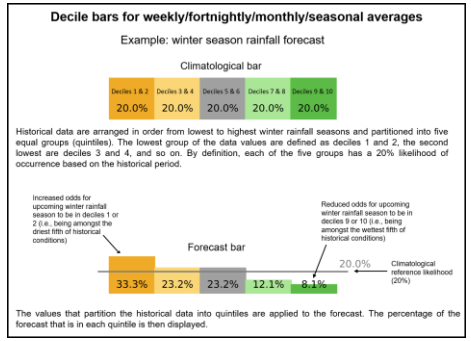
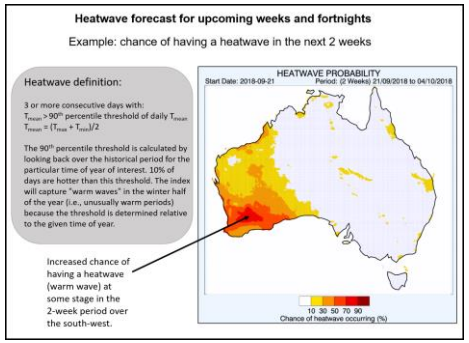
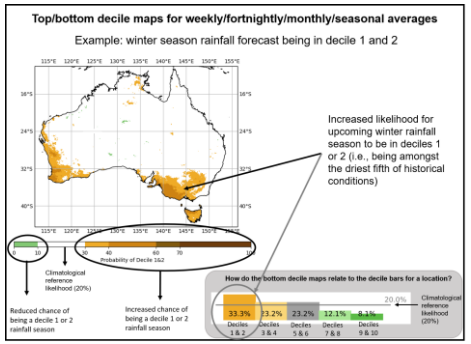
Explainer images

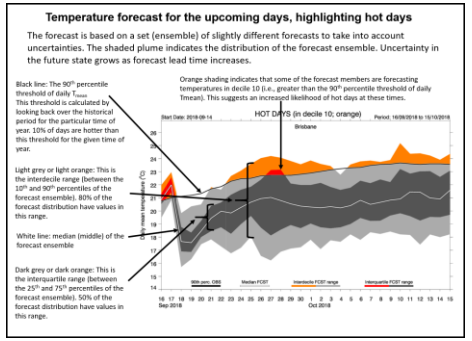


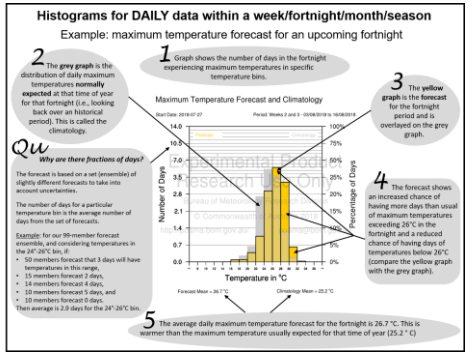


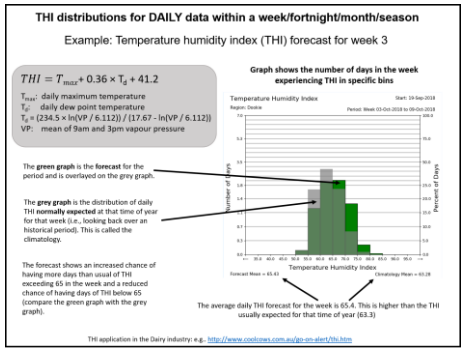












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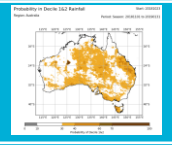
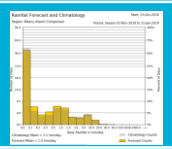
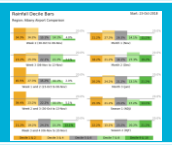
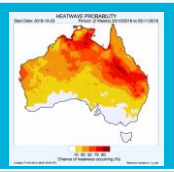
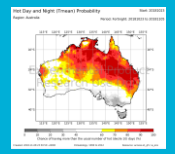
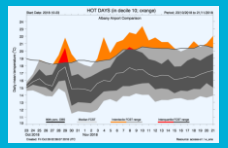
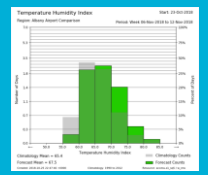
Product		Variable	
Available for Tmax, Tmin and Rainfall			
Top/bottom decile (maps)		Tmax, Tmin, Rainfall	Week 2, Week 3, Weeks 1+2, Weeks 2+3, Weeks 3+4, Month 1, Month2, Month 3, Season 1, Season 2
Daily distributions (stations)		Tmax, Tmin, Rainfall	Week 2, Week 3, Weeks 1+2, Weeks 2+3, Weeks 3+4, Month 1, Month2, Month 3, Season 1, Season 2
Decile bars (stations)		Tmax, Tmin, Rainfall	Week 2, Week 3, Weeks 1+2, Weeks 2+3, Weeks 3+4, Month 1, Month2, Month 3, Season 1, Season 2
Heat			
Heatwave maps		3 or more consecutive days > 90th percentile clim	Week 2, Week 3, Weeks 1+2, Weeks 2+3, Weeks 3+4
Hot days maps		Daily Tmean > 90th percentile clim Coming soon: Hot days: Tmax > 90th percentile Hot nights: Tmin > 90th percentile	Week 2, Week 3, Weeks 1+2, Weeks 2+3, Weeks 3+4, Month 1, Month2, Month 3, Season 1, Season 2
Hot days plume (stations)		Daily Tmean Coming soon: Daily Tmax Daily Tmin	Out to 30-days
THI (Temperature-humidity index) daily distributions (stations)		THI = T_max + 0.36 * T_dew + 41.2	Week 2, Week 3, Weeks 1+2, Weeks 2+3, Weeks 3+4, Month 1, Month2, Month 3, Season 1, Season 2

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Governance

- MLA / DAWR contract
- Research provider and funding contributor contracts with MLA
- Industry Advisory Group (IAG)
- Project Leaders group (PLG)
- Plans in place – Project, Communication, M&E, Risk management
- Three sets of milestone reports completed – 4th on its way
- Linkages to other projects
- Newsletter

Forewarned is Forearmed:

- Thanks!
- Questions?