

Can seasonal forecasting improve grower profitability?

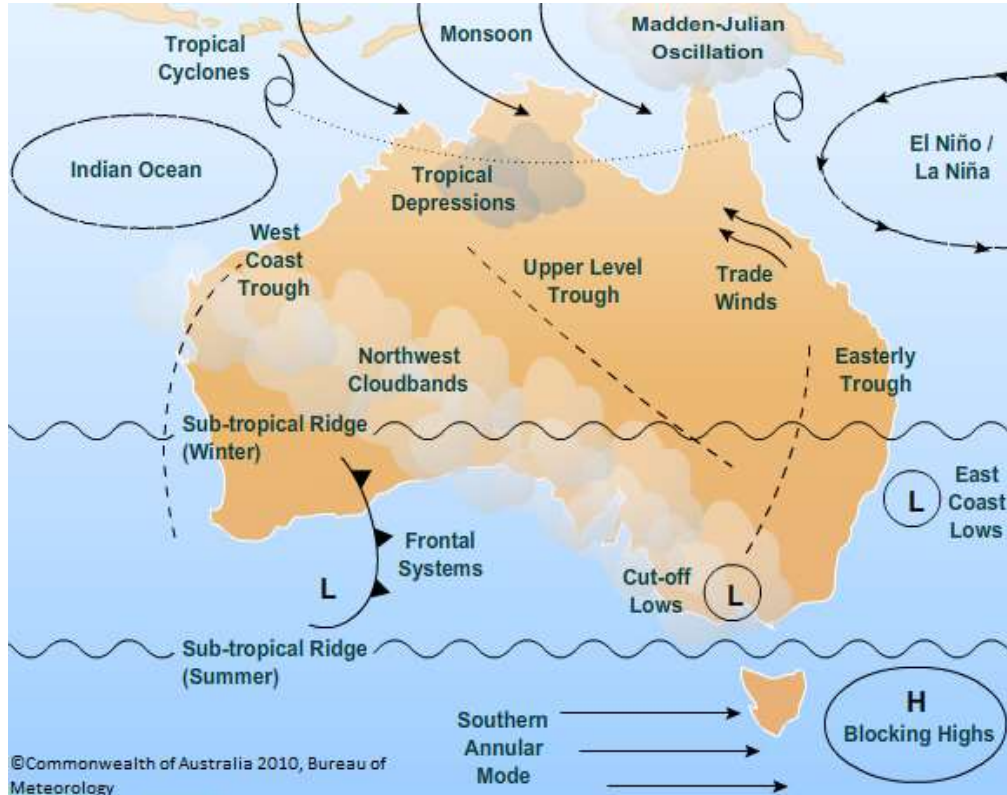
Meredith Guthrie, DPIRD and Fiona Evans, Murdoch University



Aims

- Determine where and when three month seasonal outlooks have had success in the grainbelt
- Determine if the Statistical Seasonal Forecast growing season outlooks are successful
- Determine if July-September outlooks can give guidance in making in-season N decisions

Seasonal Outlooks



Based on climate drivers

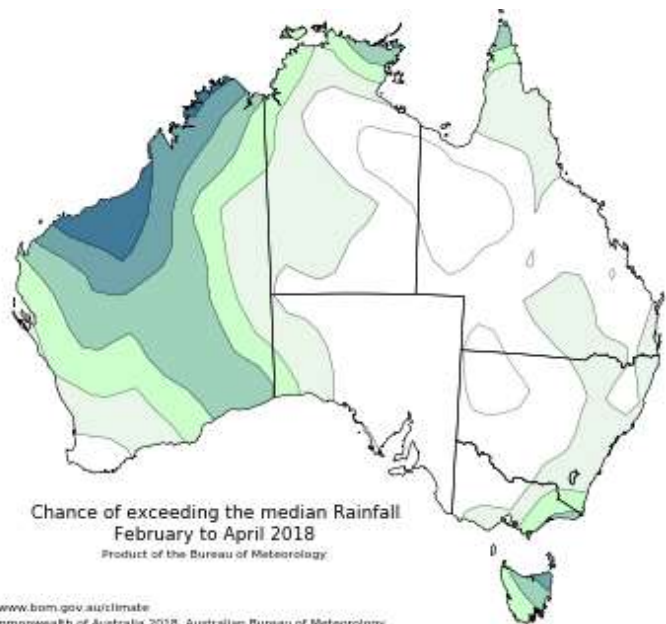
Probabilistic

Are either:
Dynamical
Statistical

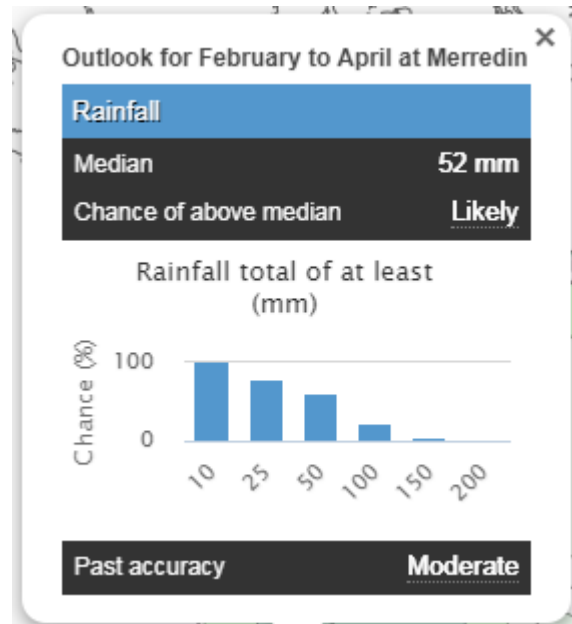
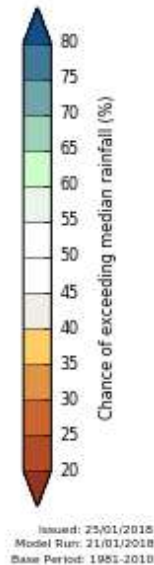
Bureau of Meteorology POAMA

- Dynamical
- Long-range forecast system up to nine months ahead.
- POAMA forecasts are run twice every week, and consist of 33 scenarios for the coming 9 months.
- Seasonal outlooks are based on the last three weeks of forecasts, i.e. five separate model runs combining to make a 165-member ensemble
- Gives the chance of exceeding the median rainfall
- Uses base period of 1981 to 2010

POAMA



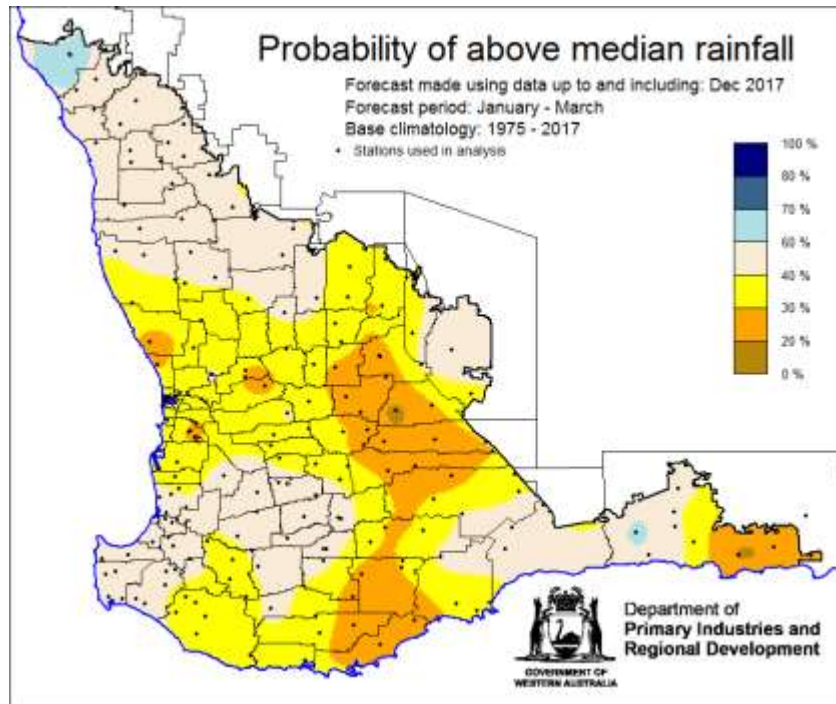
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DPIRD SSF

- Statistical, developed in 2012 because there was a gap in seasonal forecasting for the WA grainbelt
- Uses historical relationships from 1950 between global sea surface temperature and sea level pressure with rainfall in south-west Australia to produce forecasts of rainfall for future months
- Statistical forecasts are not for exact amounts.
- Probability of above median rainfall
- Chance of above median can select years 1975-2017 or 2000-2017

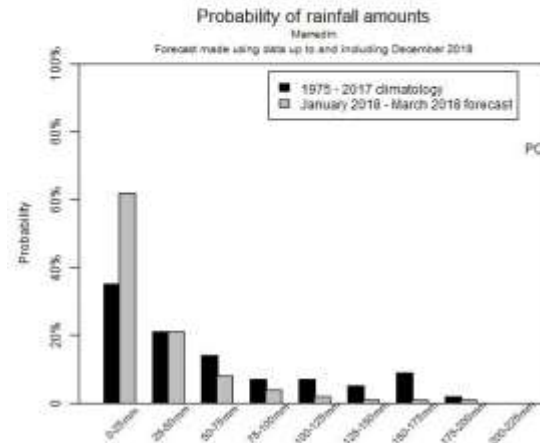
SSF



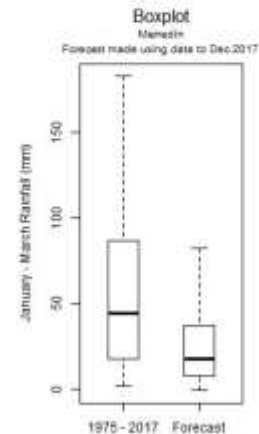
The **Statistical Seasonal Forecast (SSF)** system uses historical relationships between global sea surface temperature and sea level pressure with rainfall in south-west Australia to produce forecasts of rainfall for future months.

Rainfall forecasts

Station	Maneelin (DAFWA)
Forecast start month	January 2018
Forecast end month	March 2018
Base climatology	1975-2017
Cumulative map	Growing season



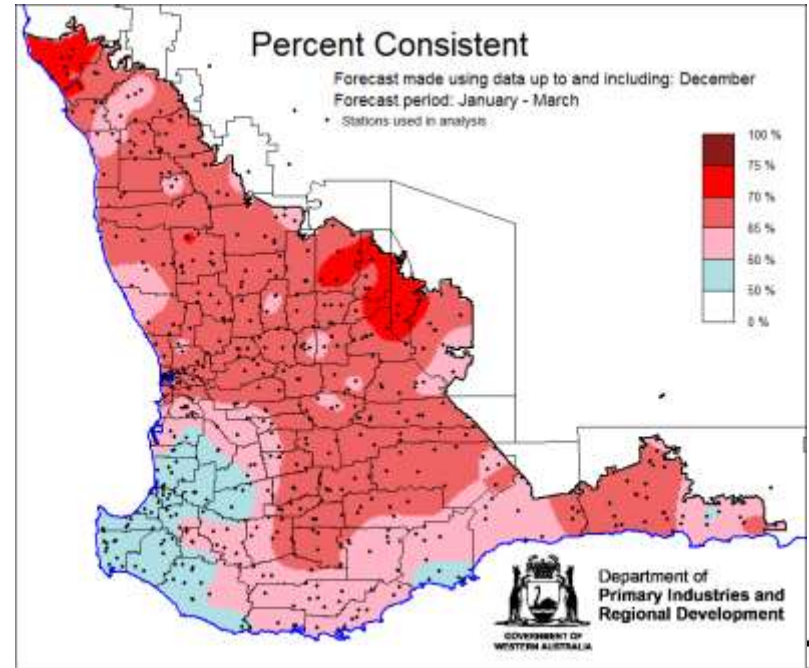
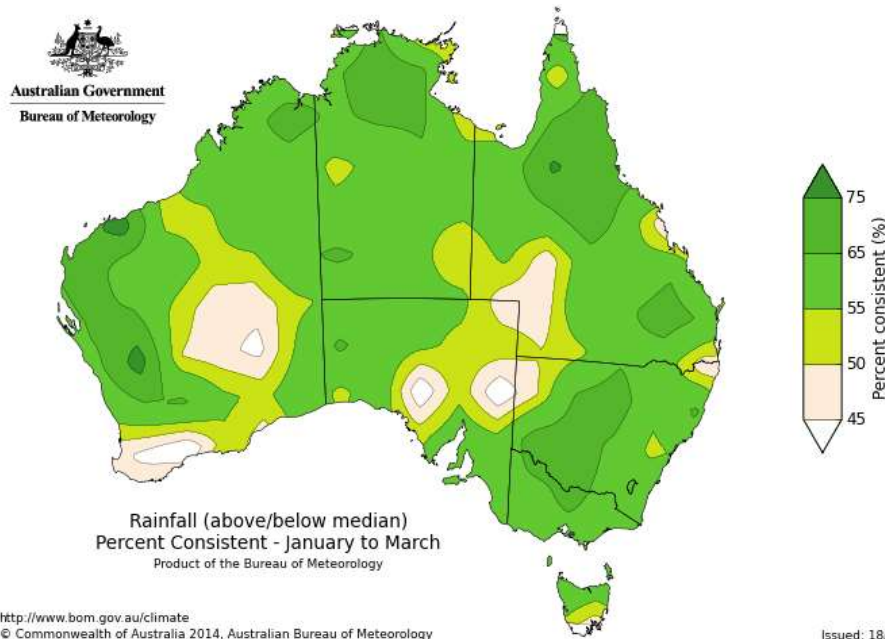
Produced by the Department of Agriculture and Food, WA



Produced by DAFWA

Percent Consistent skill maps

- Shows the accuracy of forecasts using historical data.

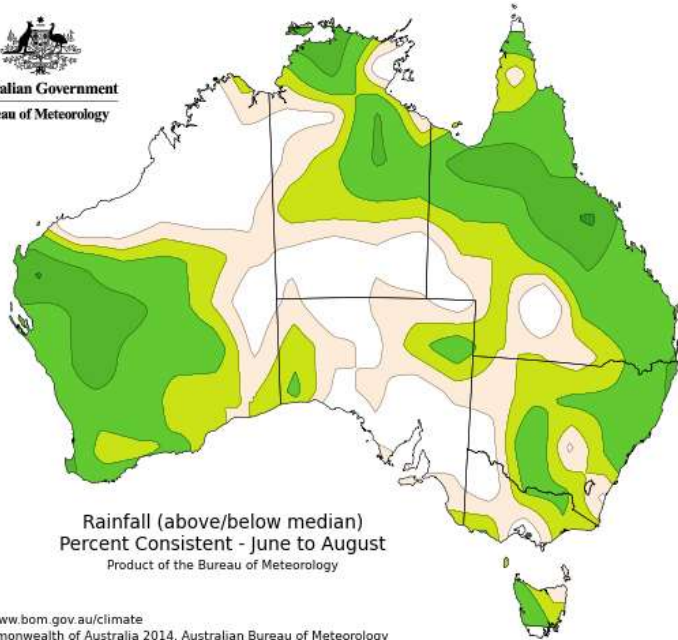


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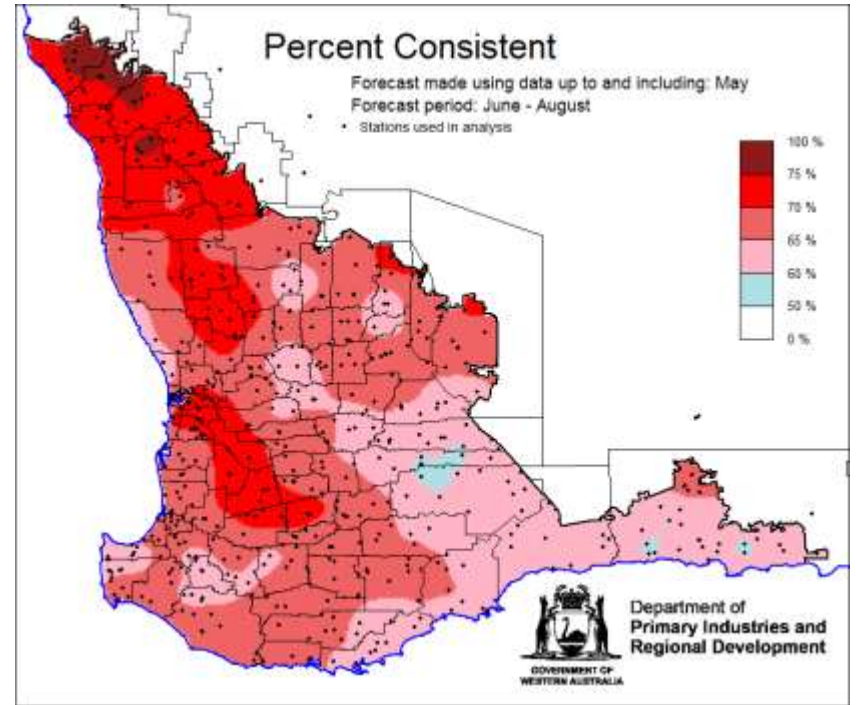
Skill maps winter



Australian Government
Bureau of Meteorology



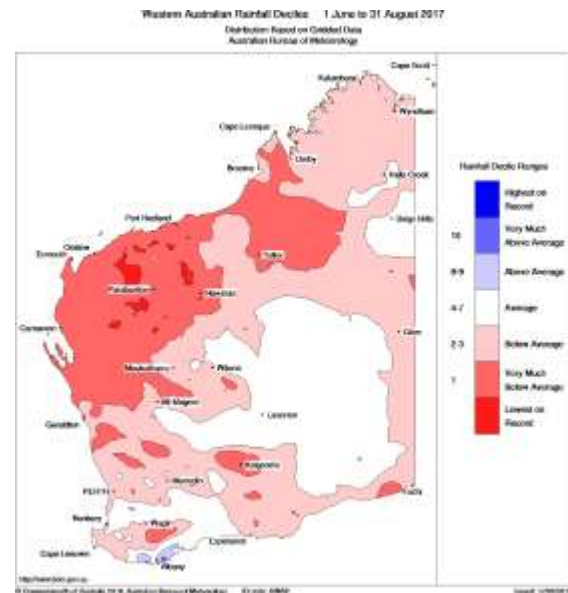
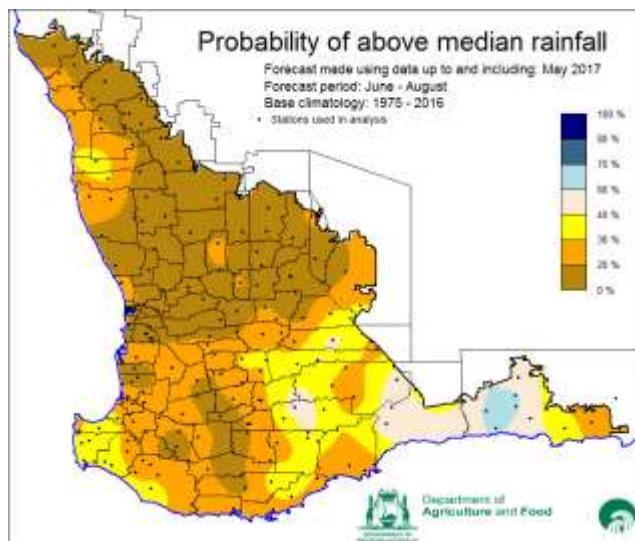
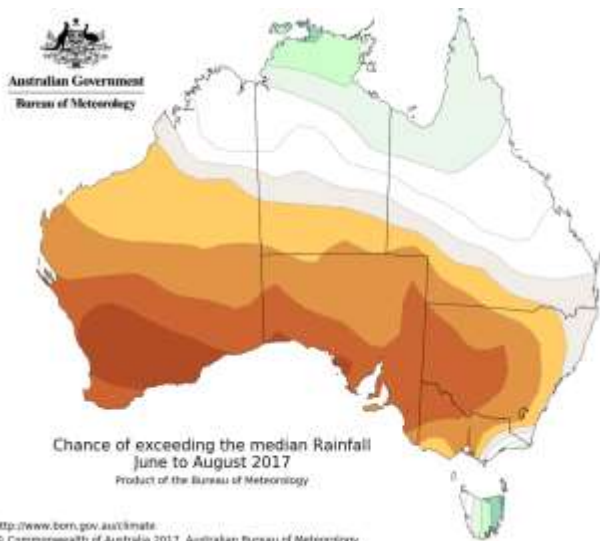
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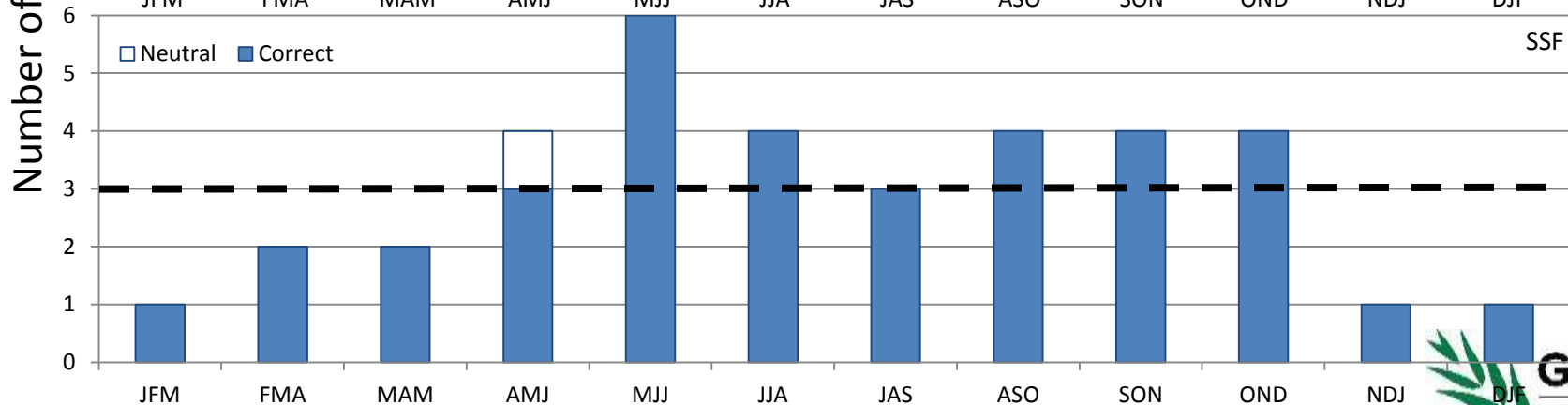
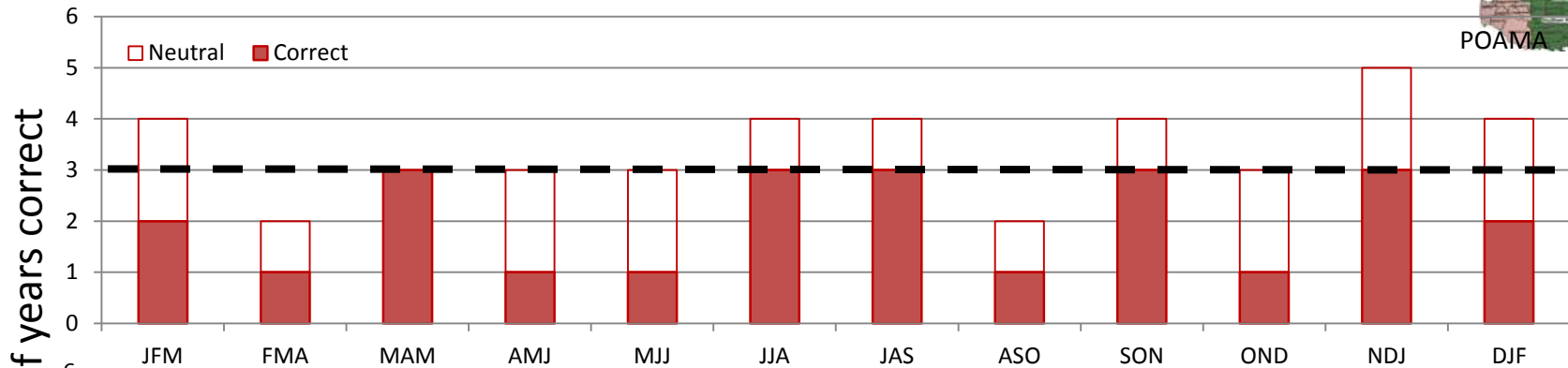
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Success rates 2012-2017

Visually rate success: did the outlook match rainfall in four regions of the grainbelt? For each three month outlook over 6 years



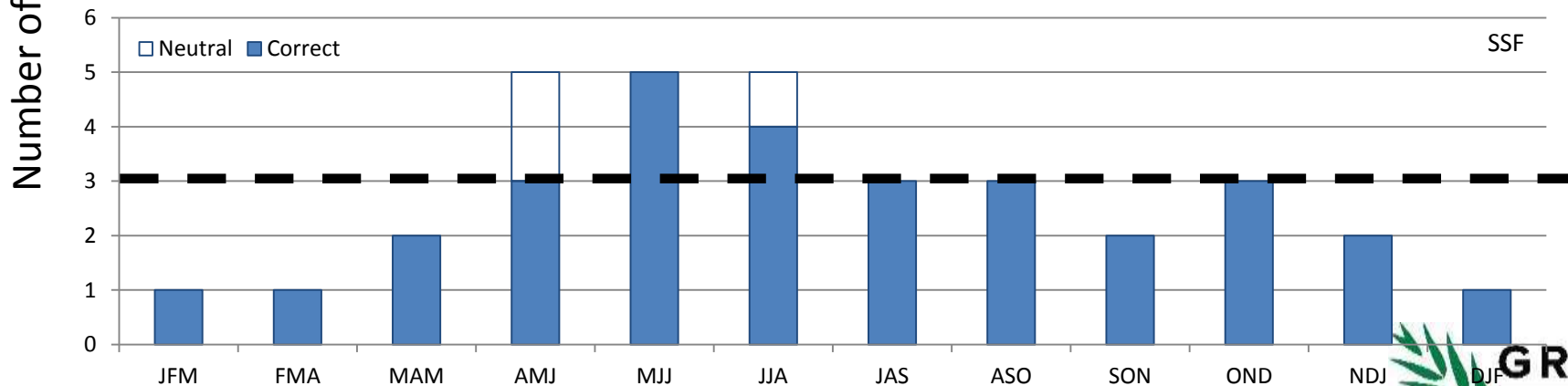
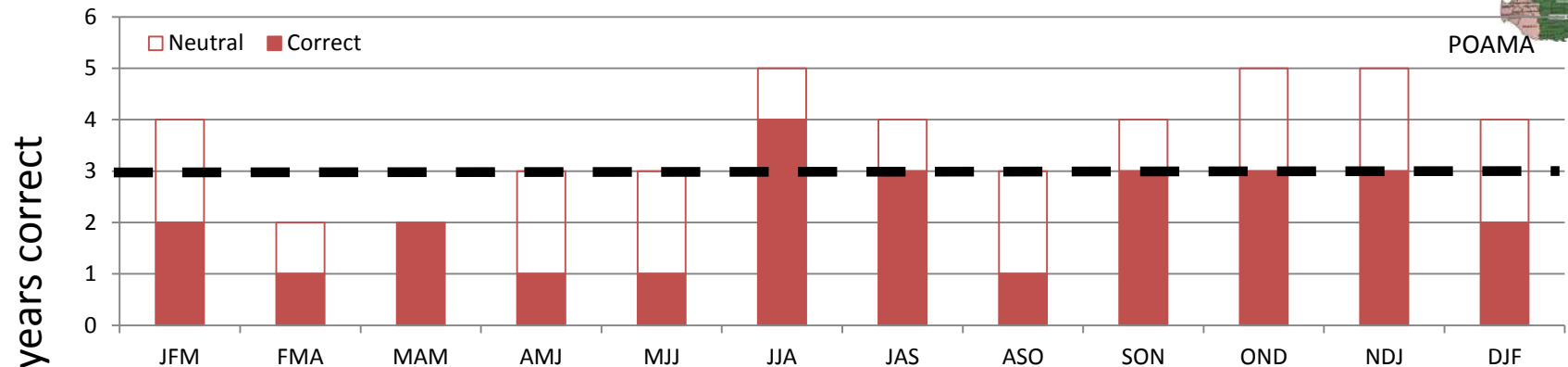
Three month outlooks in the Northern region



Three month outlooks in the Central region

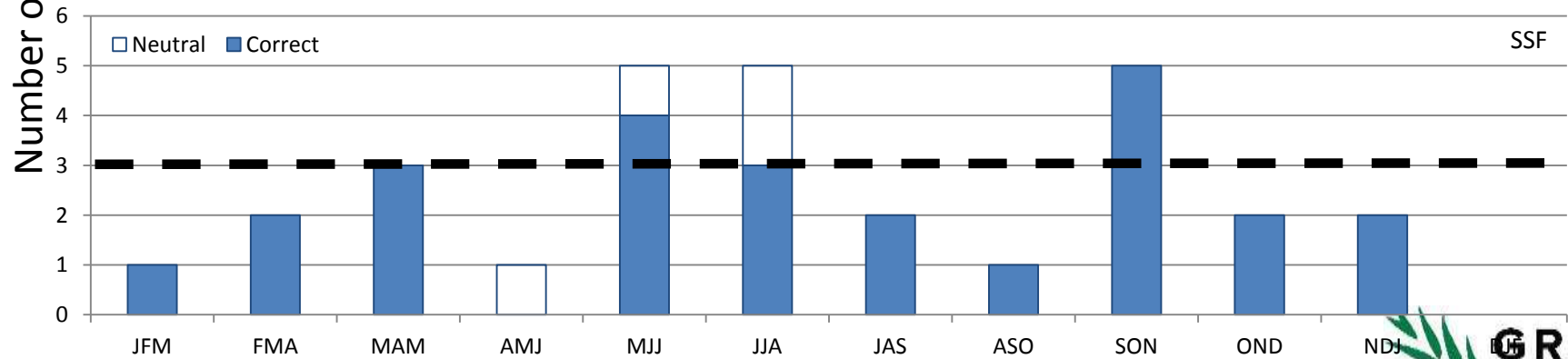
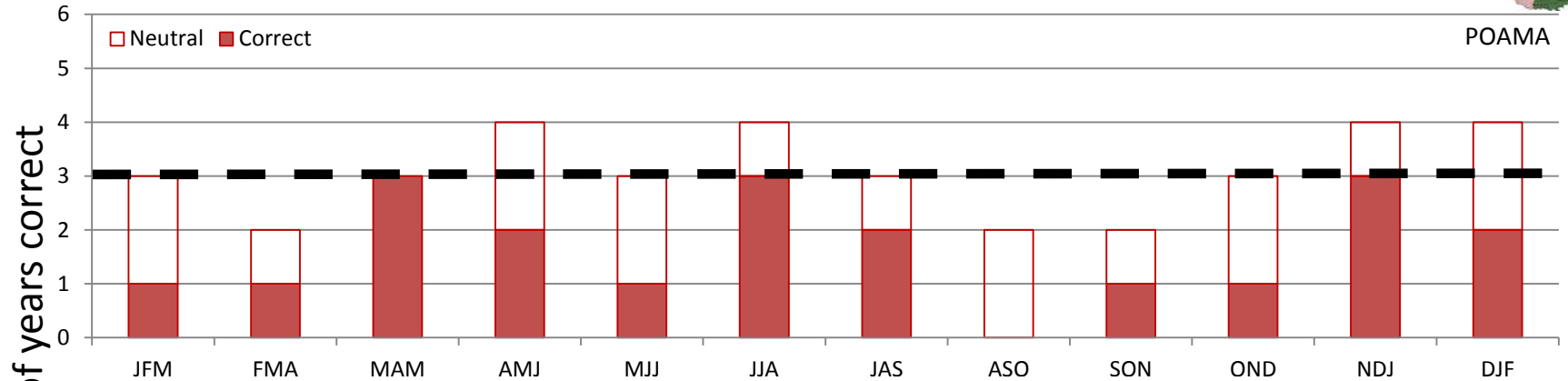


POAMA



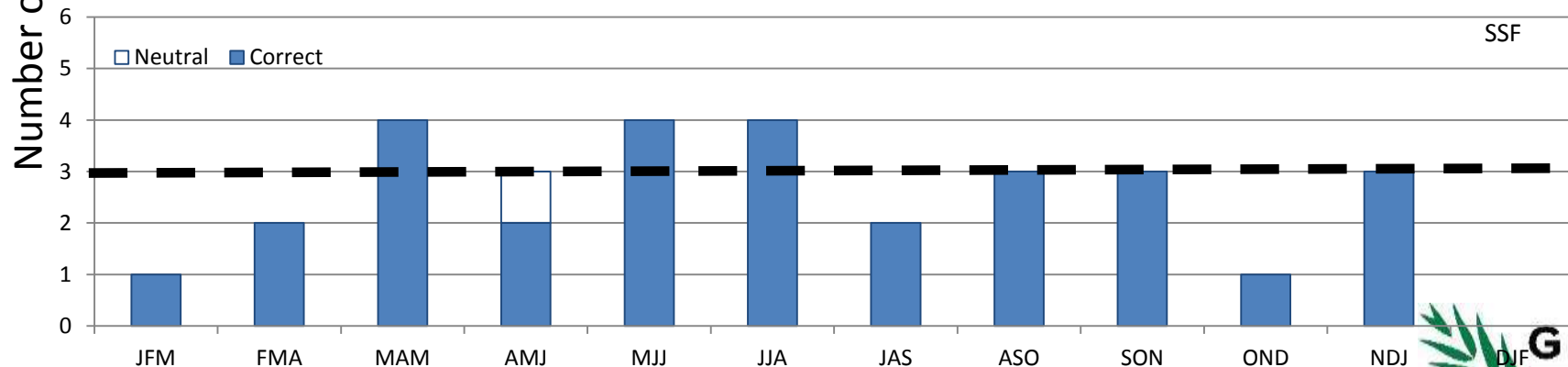
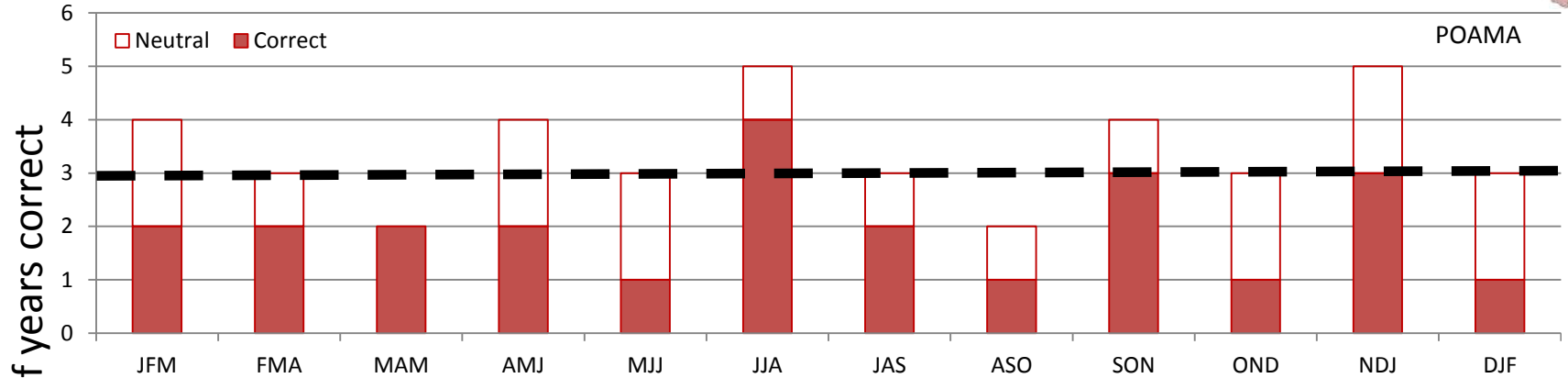


Three month outlooks in the Southern Region

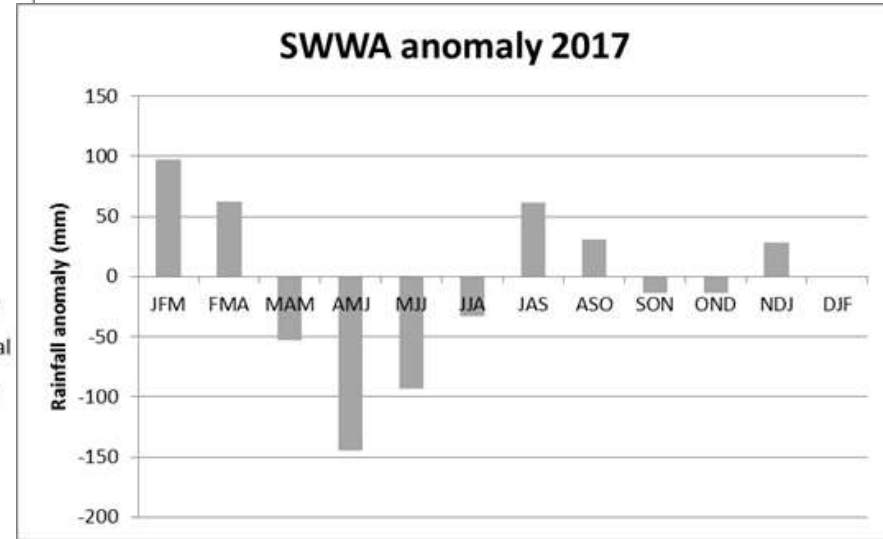
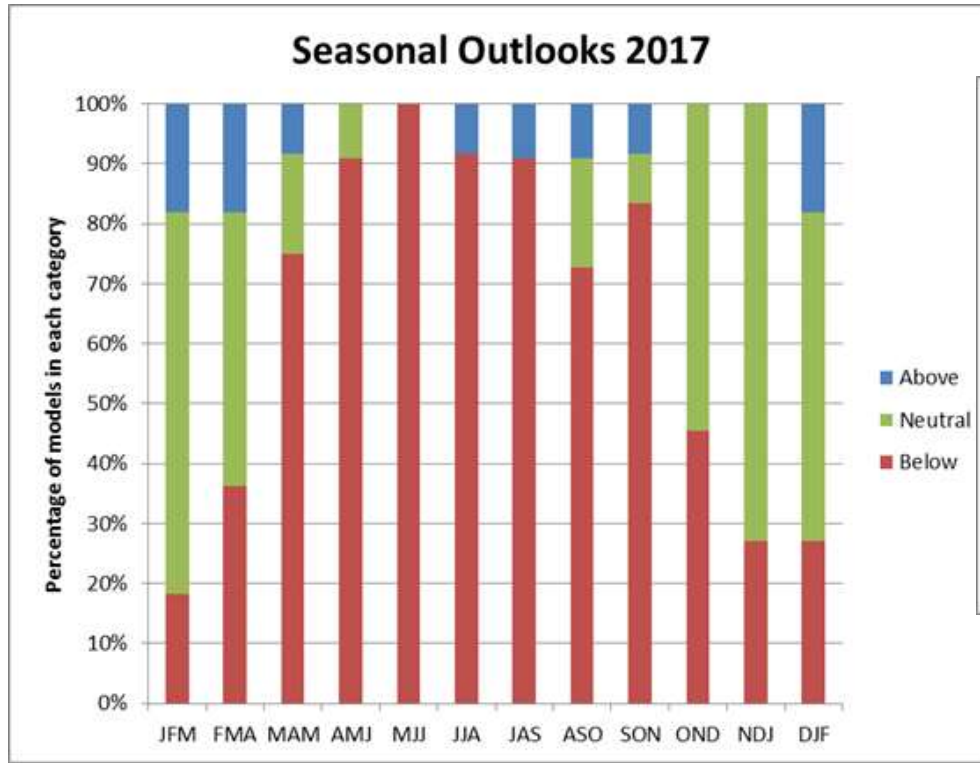




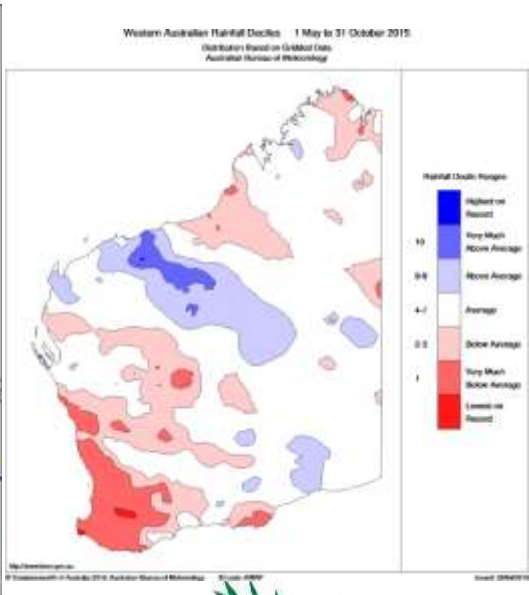
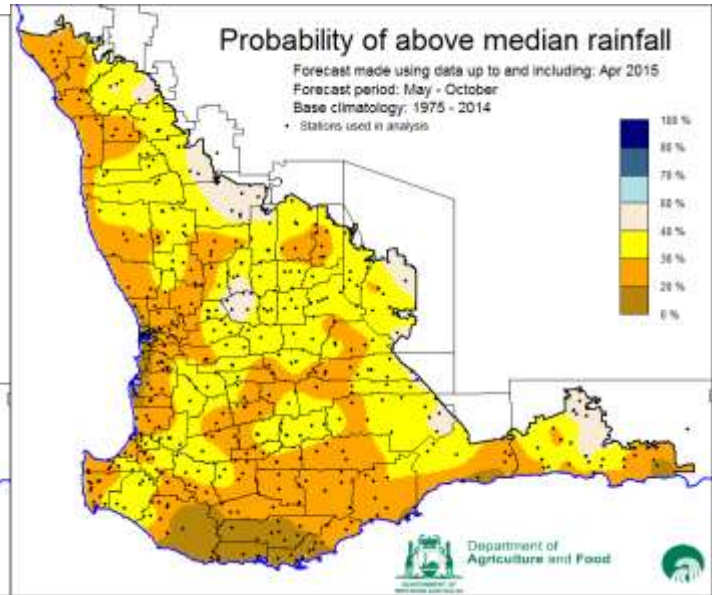
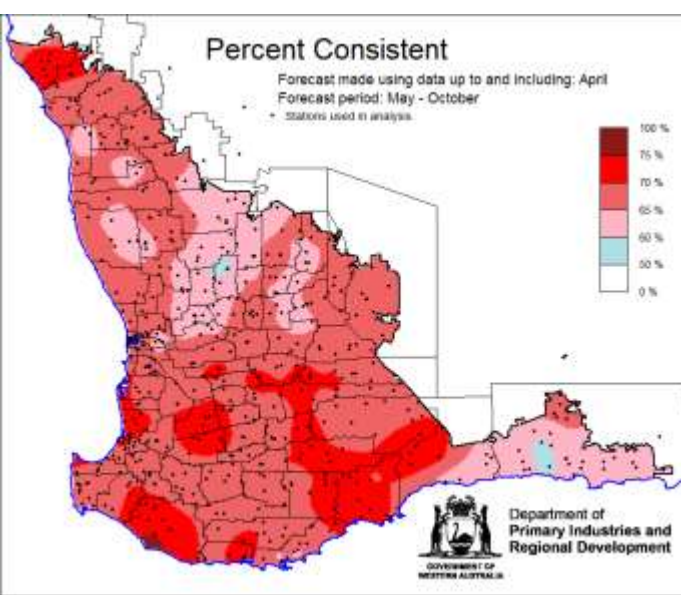
Three month outlooks in Esperance



Other models



SSF growing season outlook



SSF growing season outlooks



Growing season year	Northern region	Central region	Southern region	Esperance
2012		✓		✓
2013	✓			
2014	✓	✓		✓
2015	✓	✓	✓	✓
2016	✓	✓		
2017	✓	✓	✓	✓

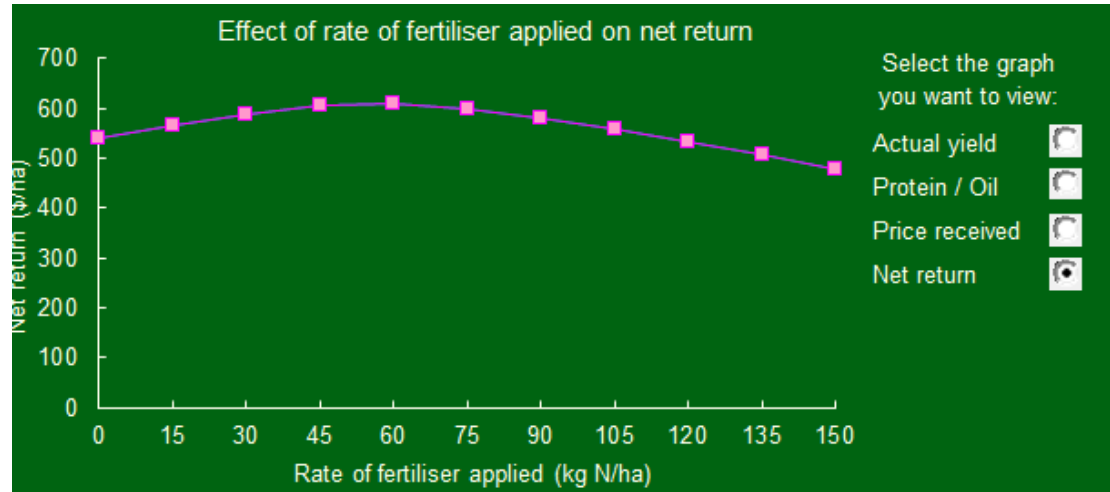
Are July-September outlooks beneficial in making in-season N decisions?

- Comparing July-September outlooks to using the median July-September rainfall
- Selected four locations in the four regions: Nabawa, Merredin, Katanning and Salmon Gums
- Hindcasting using years 1981-2017
- Calculated Potential Yield for each year
 - Hindcast yield – using actual July-September rainfall
 - POAMA yield – July-September outlook rainfall from 33 runs of each year
 - SSF yield – July-September outlook rainfall from cross-validation
 - Median yield – yield using median July-September rainfall

N calculations

- For each year and each location
- The hindcast potential yield was put into Select Your Nitrogen to determine optimal N rate and N return
- All other potential yields: outlook and median compared to this optimal potential yield
- N return is averaged over 37 years to give \$/ha/pa

SYN output



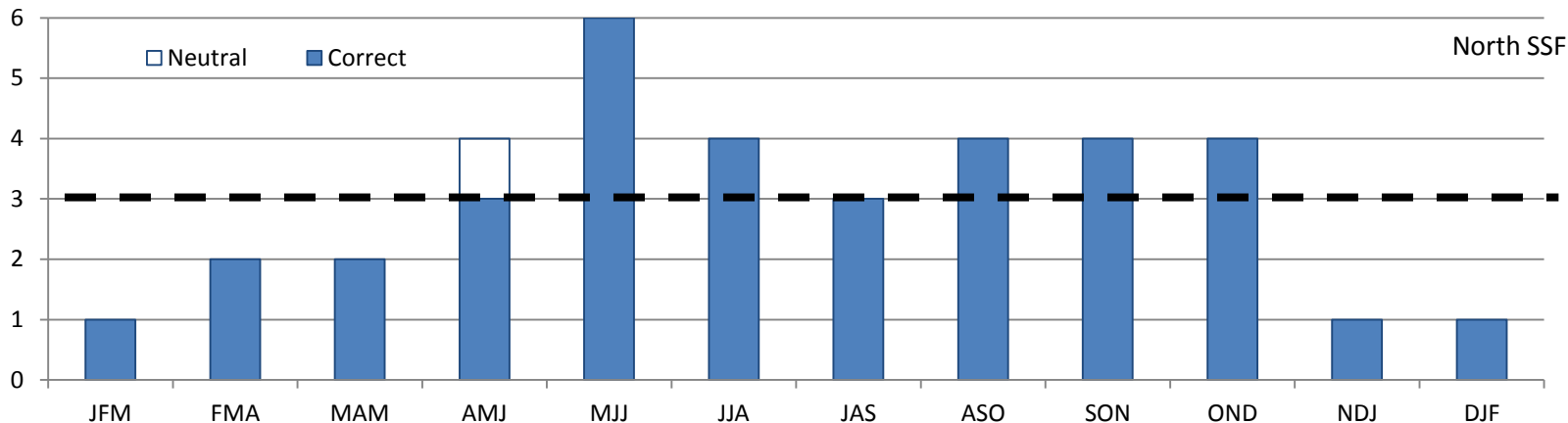
Pot Yield	1981	1982	1983	1984	1985
Observed	5.1	4.6	5.1	5.7	3.1
POAMA	5.8	4.2	4.4	7.9	3.1
Median	5.1	4.5	3.4	6.0	2.7
SSF	5.6	4.2	3.5	6.7	2.3

Average net return (\$/ha/pa) in-season N

	Nabawa	Merredin	Katanning	Salmon Gums
Hindcast	643	389	563	480
Median Rainfall	563	337	505	408
SSF	558	340	501	410
POAMA	564	329	503	409

Summary

- Three month outlooks
 - SSF most success in Northern with 5 out of 12 seasons correct (May, June, August , September and October)
 - POAMA some success in Central and Esperance region in winter (JJA)
- SSF growing season
 - Most success in northern and central region
- In-season N decisions
 - Neither model had much to offer in July for in-season N decisions
- Seasonal outlooks have potential when models have skill



Growing season year	Northern region	Central region
2012		✓
2013	✓	
2014	✓	✓
2015	✓	✓
2016	✓	✓
2017	✓	✓

Potential value

- Seasonal forecasting has the potential to assist in
 - Crop choice and area grown
 - N decisions at seeding - May
 - Preliminary results (MJJ) POAMA \$23/ha/pa greater than median at Nabawa over 20 years
 - Stocking rates
 - Buying and selling livestock – sheep and beef
 - Pasture growth calculations
 - Forward selling
 - Other industries such as cotton and sugar

Acknowledgments

AgriFutures Australia project

“Improved use of seasonal forecasting to increase farmer profitability”



www.managingclimate.gov.au



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