

Climate prediction and applications in New Zealand

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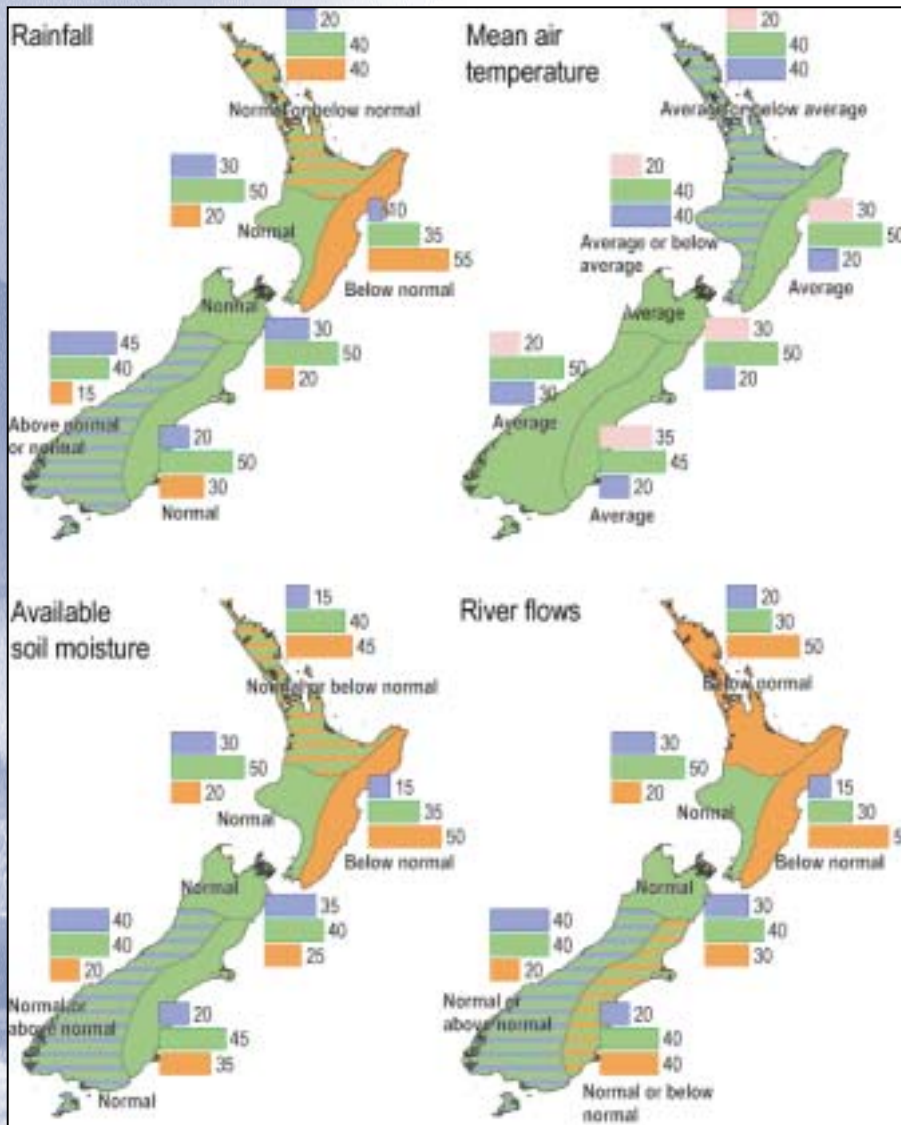
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Outline

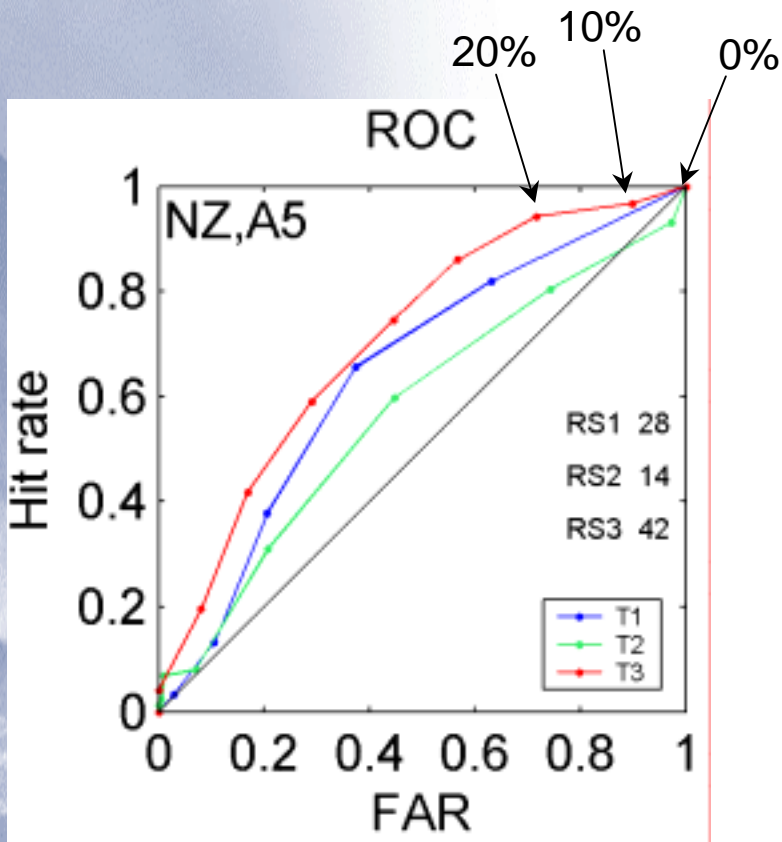
- Seasonal prediction and forecast skill
 - Update from last year
- Application of climate information
 - Dairying and economic impacts
- Future work

Seasonal forecasts



- Temperature, rainfall, soil moisture, river flow
 - Tercile probabilities
 - Forcings: ENSO, Indian Ocean, AAO, local SST
- Objective guidance, subjective synthesis
 - Global model guidance and local statistical models
 - Subjective consensus process

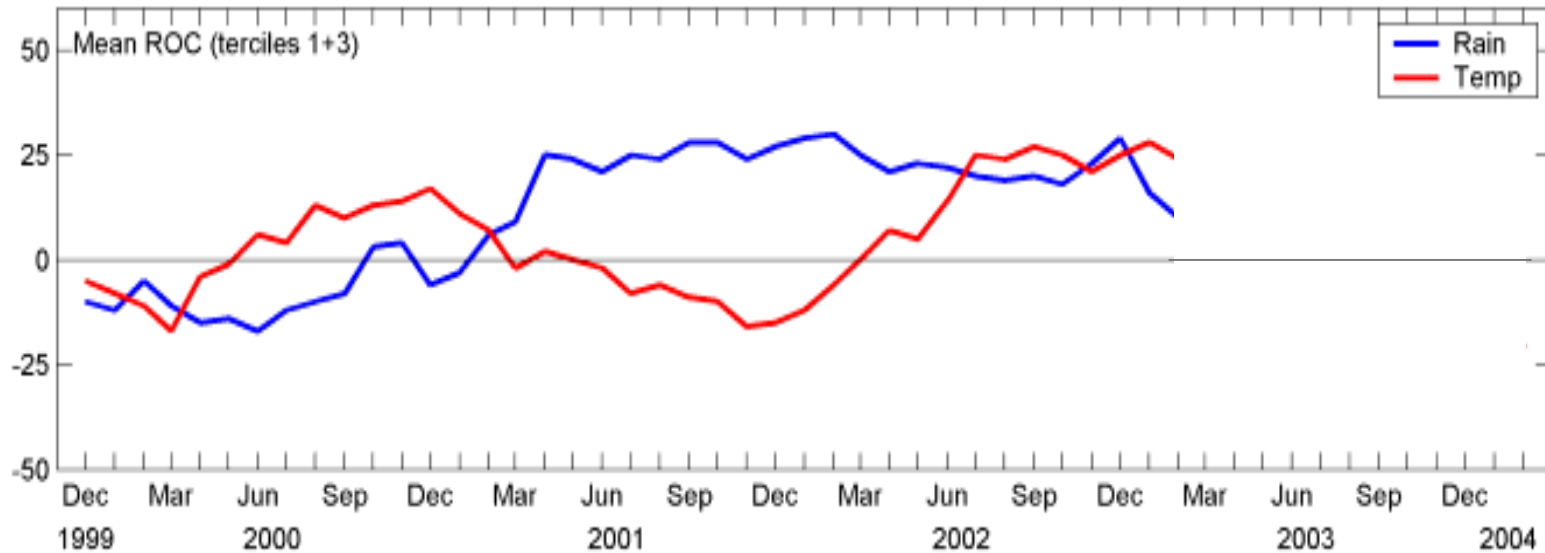
Forecast skill



- Relative Operating Characteristics (ROC)
 - Ability to discriminate events
 - Points represent thresholds for calling an event, from 0 to 100% chance
 - ROC is area between curve and diagonal
- Left: 5-year average, 1999 to 2004
 - Seasonal temperature
 - Statistical (analogue) model
 - Tercile 2 (“near average”) poorest

Forecast skill

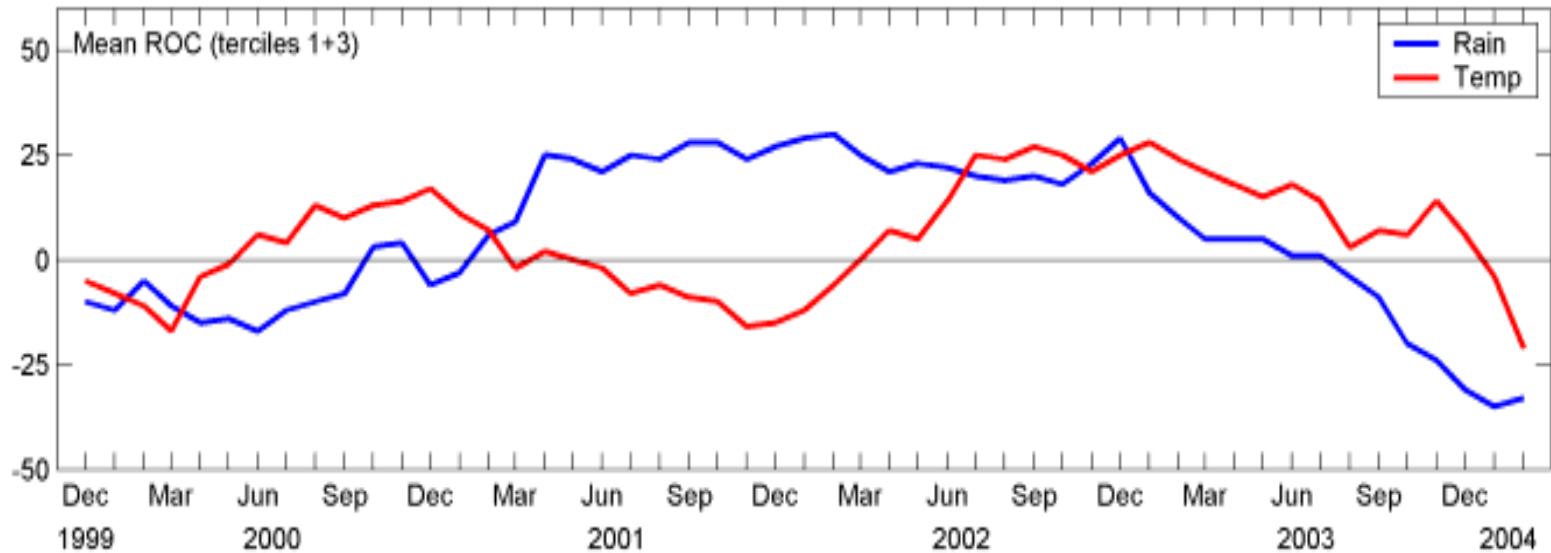
NZ Consensus seasonal, 13 month window



- Where we were at this time last year
 - Improving rainfall skill
 - Variable temperature skill

Forecast skill

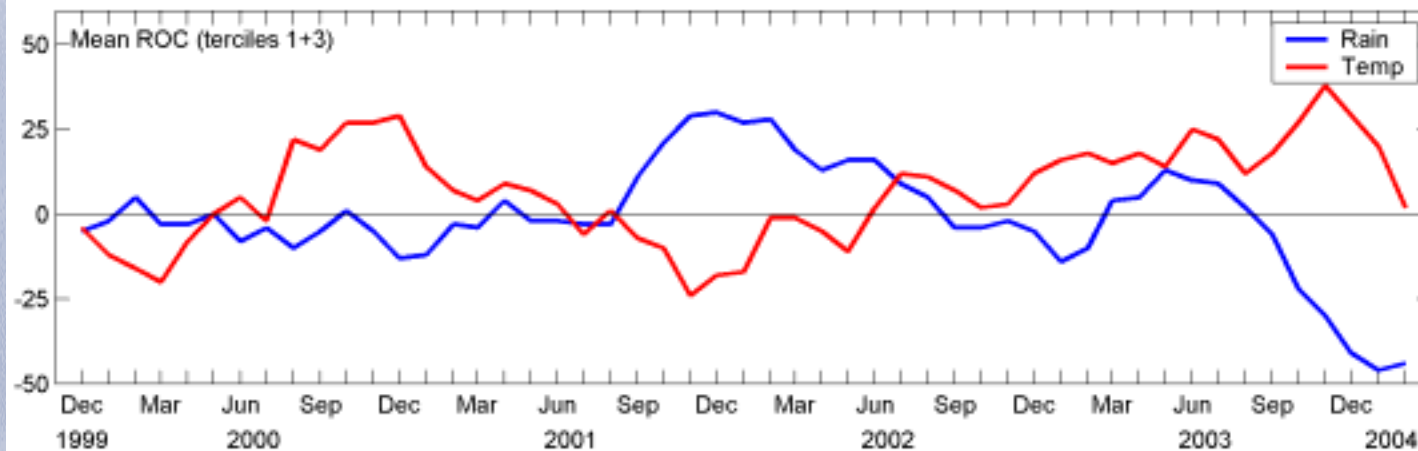
NZ Consensus seasonal, 13 month window



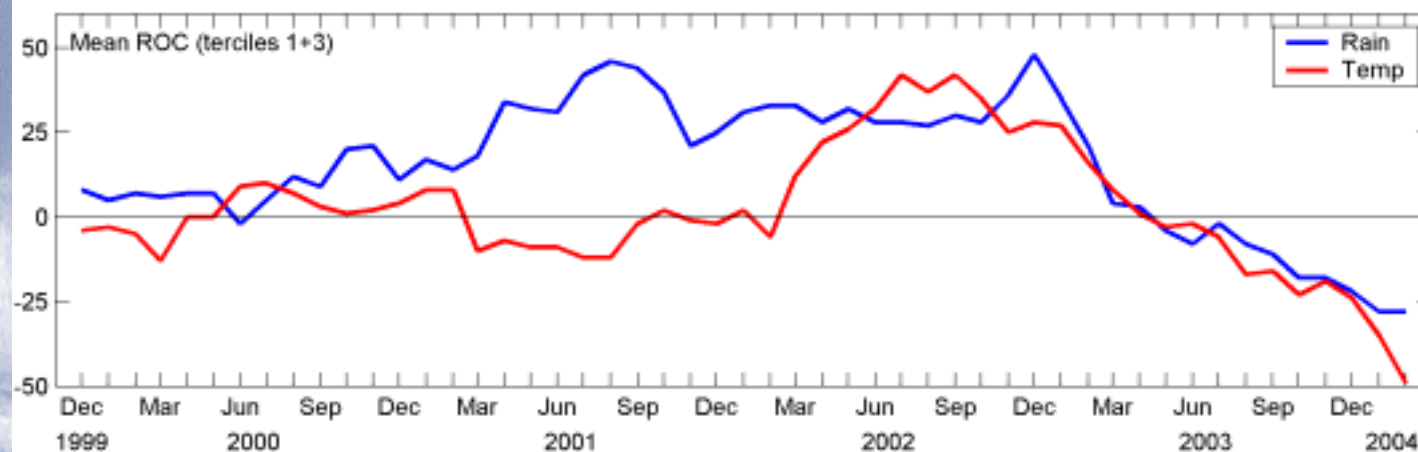
- Decline in skill since last Symposium
 - No obvious relationship to ENSO forcing
 - Predictions made every month, for all regions of New Zealand
- Not always capturing skill of statistical models
 - Need a more objective approach for final outlook?

Forecast skill

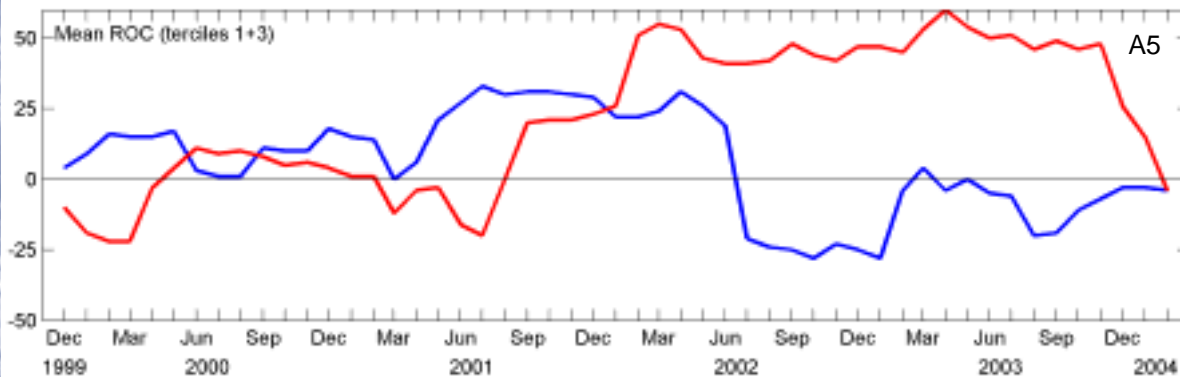
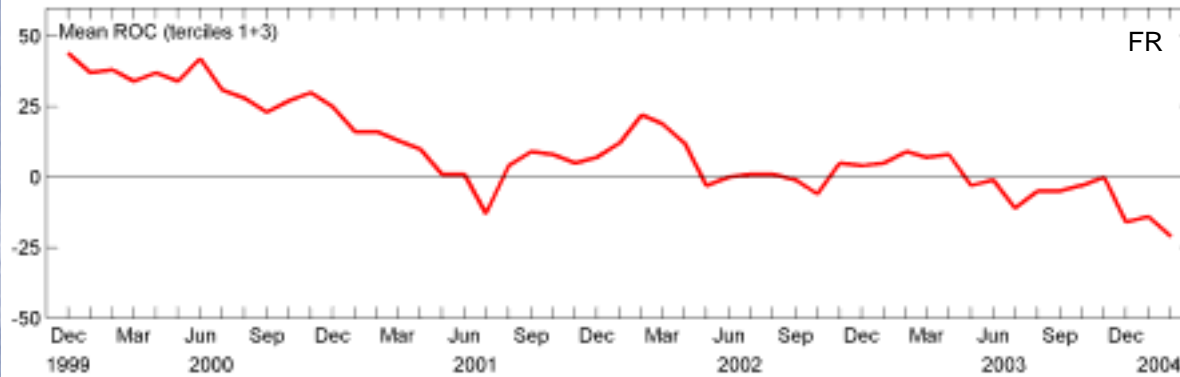
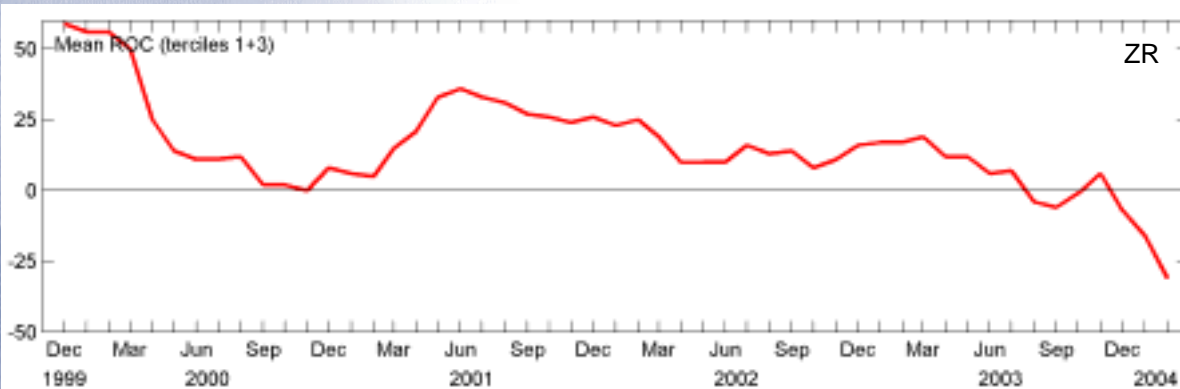
NI Consensus seasonal, 13 month window



SI Consensus seasonal, 13 month window



Forecast skill



- Guidance products show recent decline in skill
- Change in the statistical character of climate anomalies and/or teleconnections?
- More unpredictable, noisy, recently?

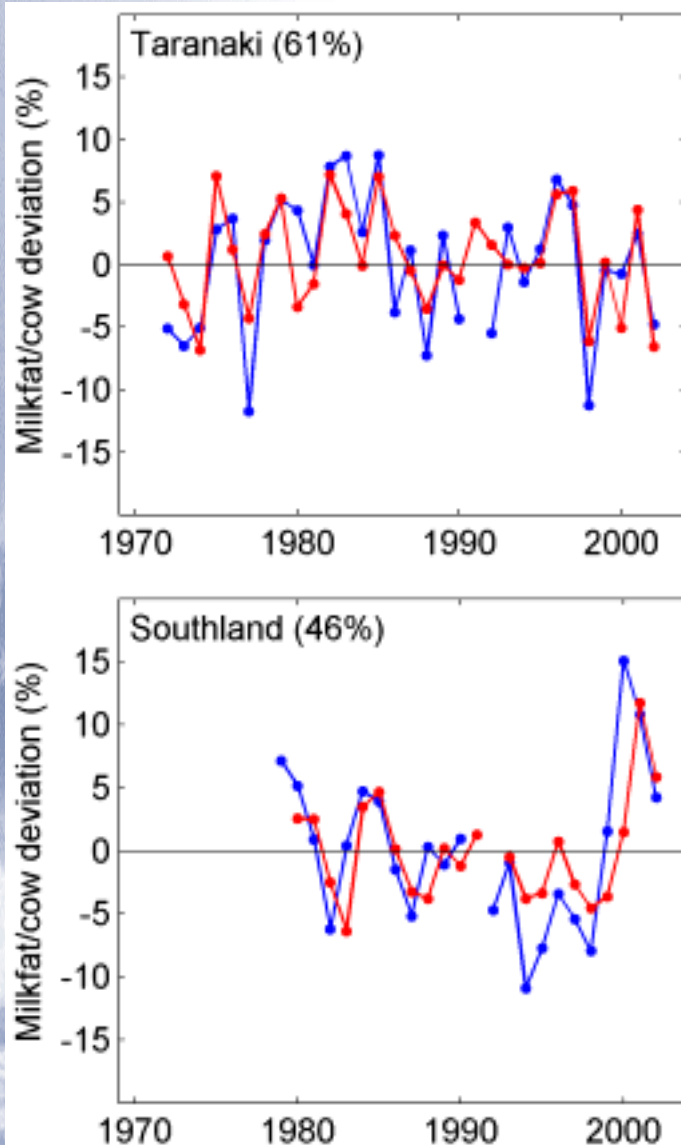
Applications of seasonal climate information

- Agricultural sector
 - Advice to agribusiness, farmers
 - Links to fisheries, catch prediction
- Energy sector
 - Risks to hydro-electricity supply
- Economic sector
 - Advice to Government, ag. Production
 - Developing economic forecasting tools

Agricultural/economic impacts

- Milk production related to climate
 - Spring conditions known to be important
- Looked at regional average milkfat per cow
 - Seventeen regions, annual data
- Related to seasonal climate
 - Soil moisture deficit, rainfall
 - Temperature, GDDs
- Good results in most regions
 - Spring/summer temperature
 - Summer soil moisture deficit
 - Absolute deviations important: cows like normal conditions
- Estimate effects on overall economy

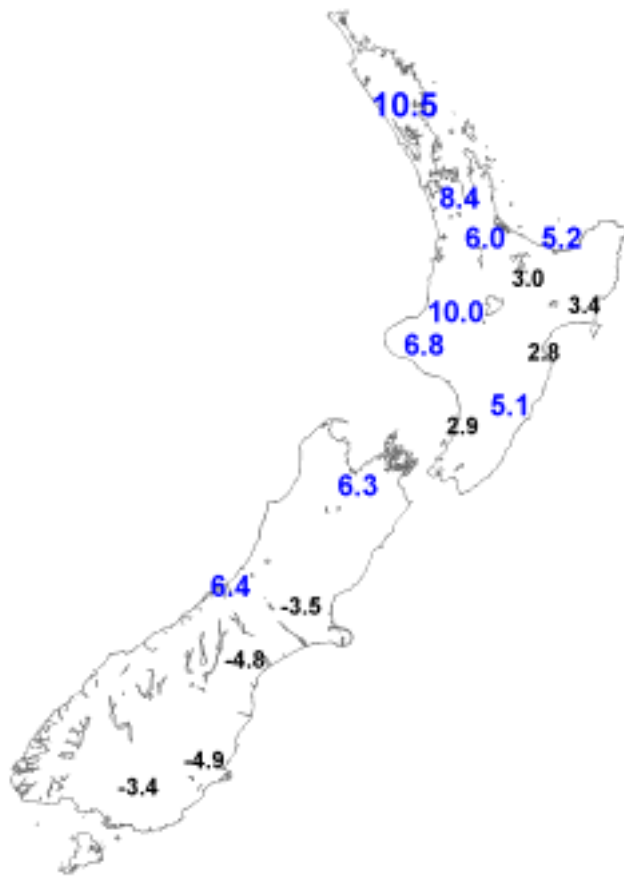
Milkfat production



- Typical fit around 60% variance accounted for
 - 20-30 years data
 - Three predictors
- Observations through end of February predict production to end of May
- ...or, observations to end of November, and forecast through February
 - 3 to 6 months lead time

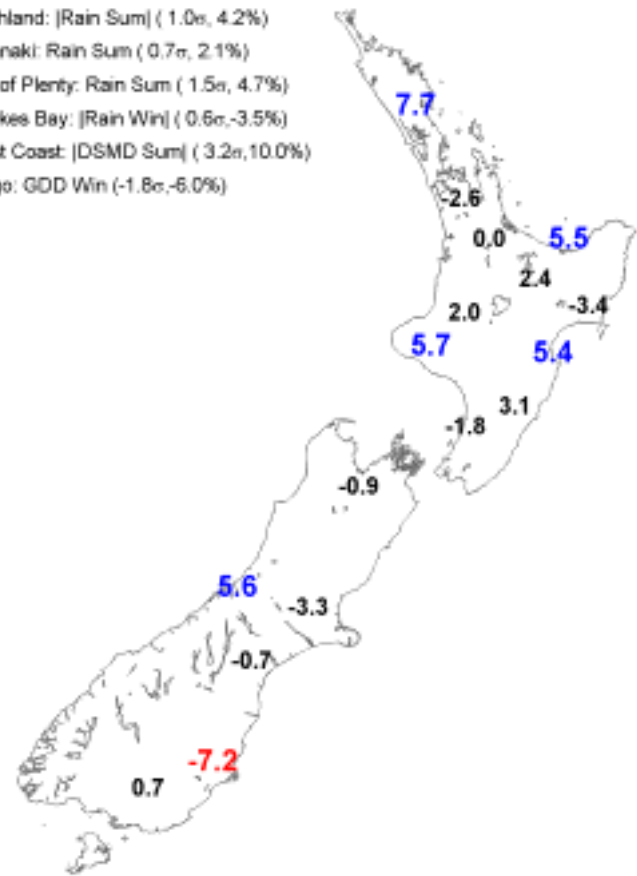
Milkfat production

1996-97 Observed (% deviation)



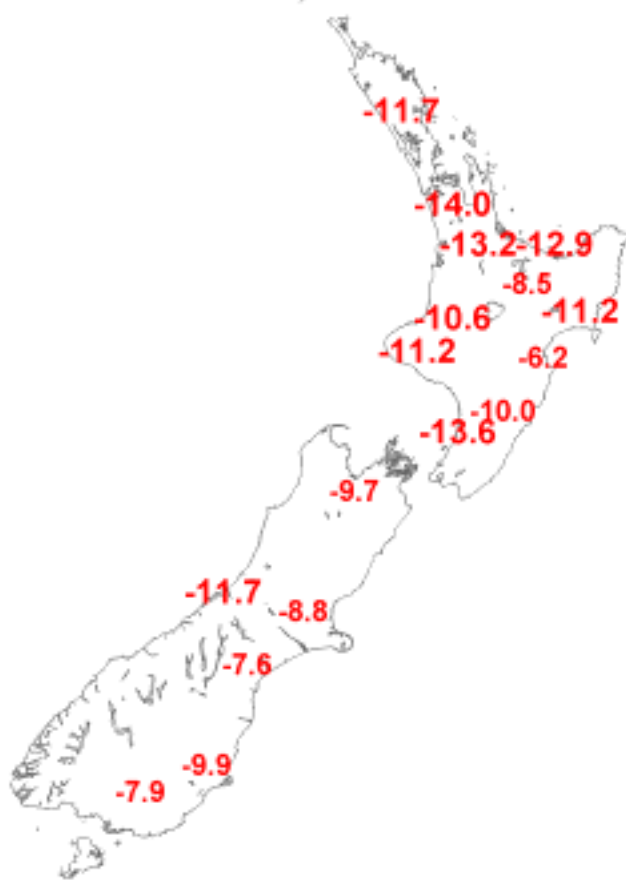
1996-97 Estimated

Northland: (Rain Sum) (1.0σ, 4.2%)
 Taranaki: Rain Sum (0.7σ, 2.1%)
 Bay of Plenty: Rain Sum (1.5σ, 4.7%)
 Hawkes Bay: (Rain Win) (0.6σ, -3.5%)
 West Coast: (DSMD Sum) (3.2σ, 10.0%)
 Otago: GOD Win (-1.8σ, -6.0%)

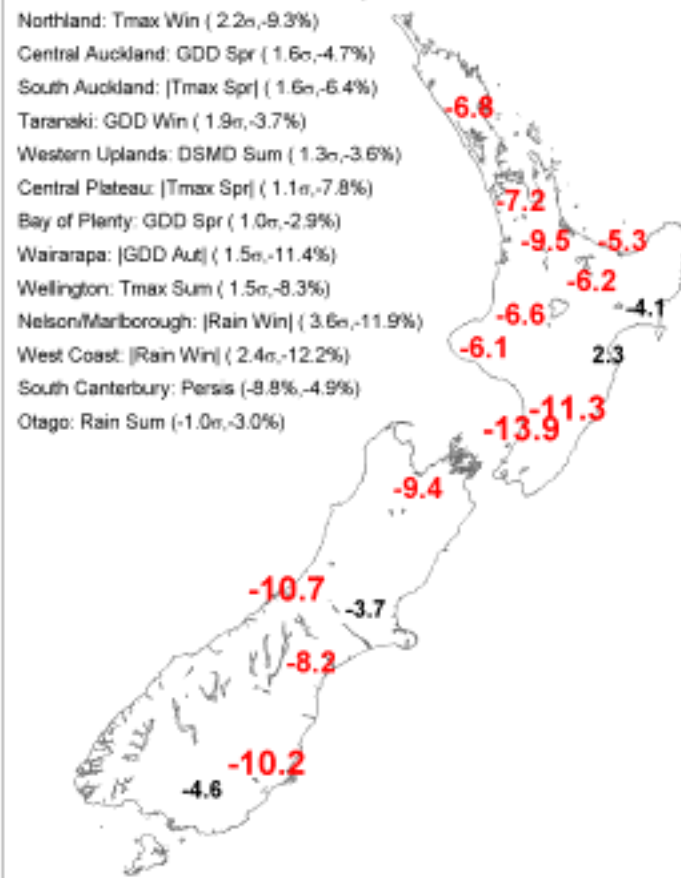


Milkfat production

1998-99 Observed (% deviation)



1998-99 Estimated



Dairy and the full economy

- Estimate a dry year reduces production by 10%
- Estimated impact on GDP about 0.4%
 - General equilibrium model
- Estimated loss of \$100 in household income
 - Two dry years have triple the effect
 - Longer recovery times, less resilience etc

Extension to other sectors

- Energy: N.Z. is 60% hydro-generation
 - Security of supply a big issue
 - ENSO, IPO/PDO very important
- Go from cows to sheep: wool & meat
 - Expecting analogous results to dairy
- Tourism sector?
 - Too strongly influenced by non-climatic effects?
- Estimate “total” cost/benefit of climate variability to the economy

Summary

- Overall forecast skill acceptable
 - Low skill over last 6-12 months?
 - Need for better use of guidance products
 - Restrict forecasts in time/space?
- Strong links between climate and dairy production
 - Extend to wool, meat, energy...
 - Start to quantify climate-economy links

Future

- Testing RCM for S/I prediction
 - Links to Met Office Hadley Centre
 - Need to weight effort/benefit
- Improved statistical guidance
 - Wind
 - Monthly scale
 - Objective combination of guidance