Ministry for Primary Industries
Manatū Ahu Matua

Climate change in agriculture

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FW
THE NEW ZEALAND FARMERS WEEKLY
NZX Agri
2025
Sediment tax passed into law
Prime Minister Winston Peters believes the sediment tax essential to restore Southland waterways given increased risk of storm events
BLACK by POPULAR DEMAND
FW
THE NEW ZEALAND FARMERS WEEKLY
NZX Agri
Vol 12 No 8, March 18, 2025
Consent
to the Hi
Advisors on both sides at odds
BLACK by POPULAR DEMAND
FW
THE NEW ZEALAND FARMERS WEEKLY
NZX Agri
Vol 12 No 8, March 4, 2025
Farmers seek fairness on PGP
7
Schools keen on Fonterra milk scheme
www.fwplus.co.nz
Record sorghum crop from Otago
New varieties of sorghum and higher temperatures provide valuable summer feed.
BLACK by POPULAR DEMAND
$1999
$999
$249
36BLACK EDITION
630
360

Changes are afoot, the key to thriving will be planning for the future, not the past

Key messages

- Agricultural Industry:
  - Got to start thinking about a changing climate
  - This issue is as important as any other

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Outline

- **BACKGROUND**
- **RISK AND PROBABILITY**
- **FARM BUSINESS RESILIENCE**
- **SUSTAINABLE LAND MANAGEMENT REPORT**
- **ON-LINE TOOLS**
- **SUMMARY**

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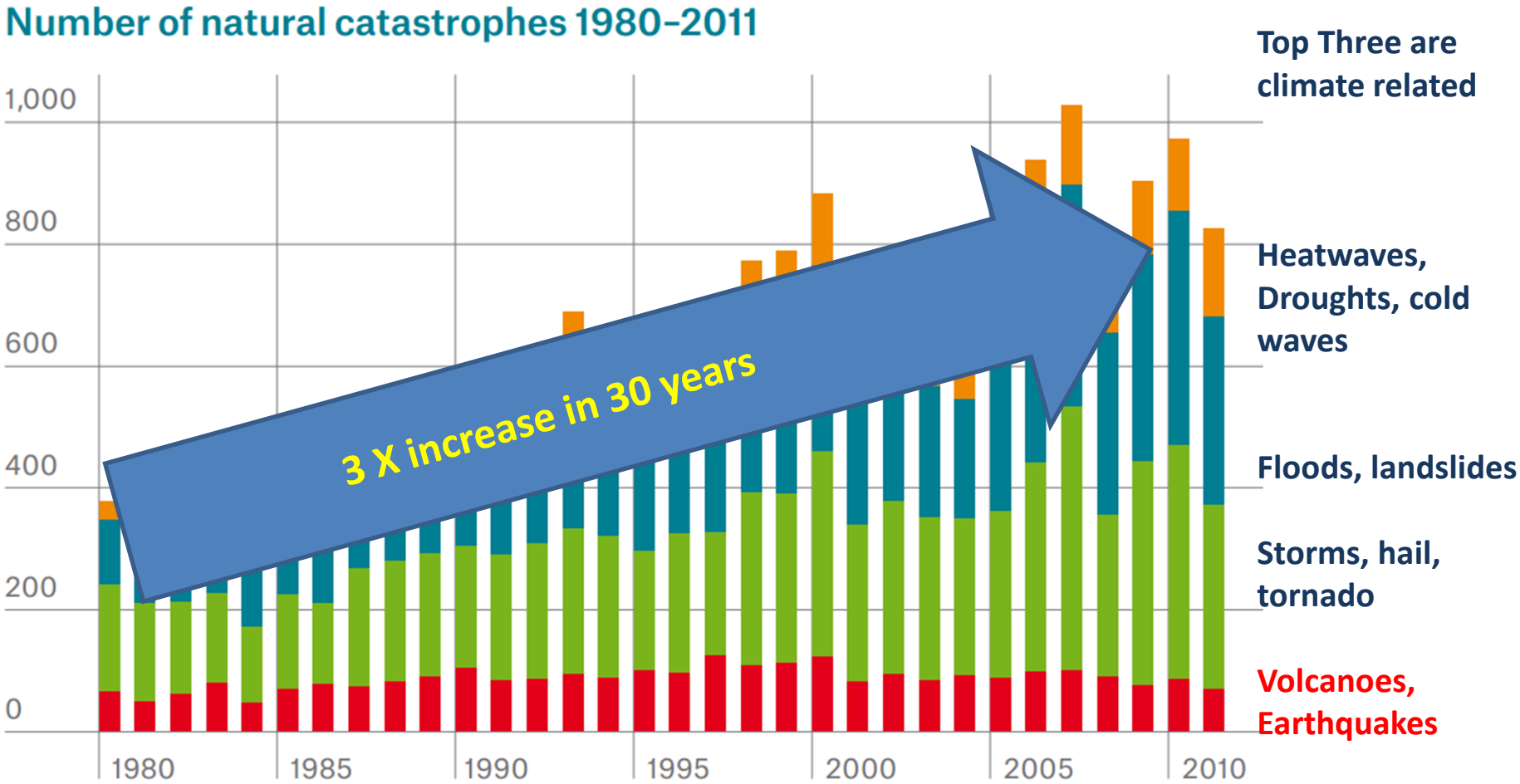
It’s not business as usual – ask the insurance industry

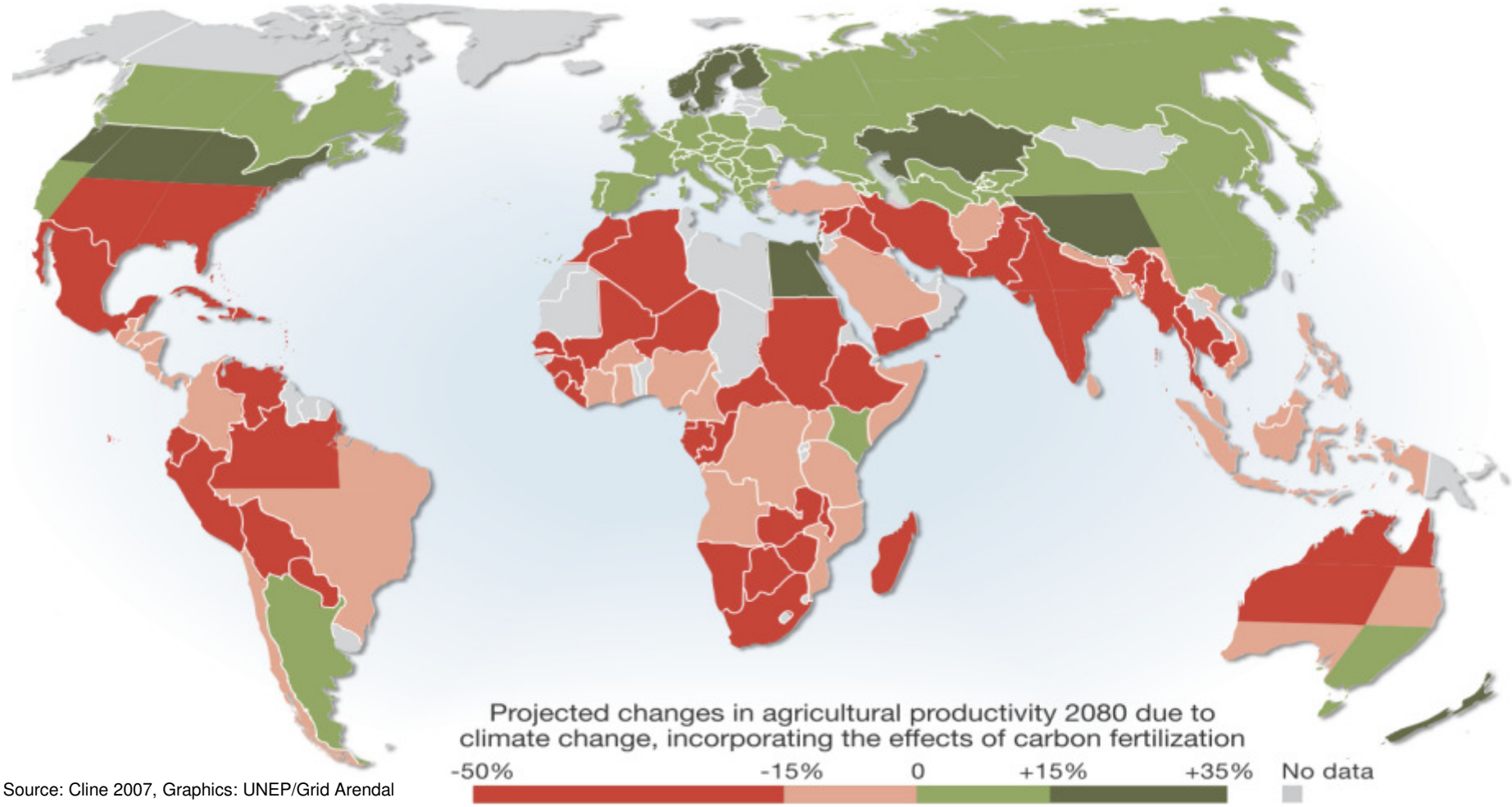


From Munich Re Topics Geo Natural Catastrophes 2011

Background

- NZ is in a relatively good position (cf Aus for example) because of our temperate, maritime climate.
- The biggest threat is the expected higher level of variability which production systems will need to cope with.

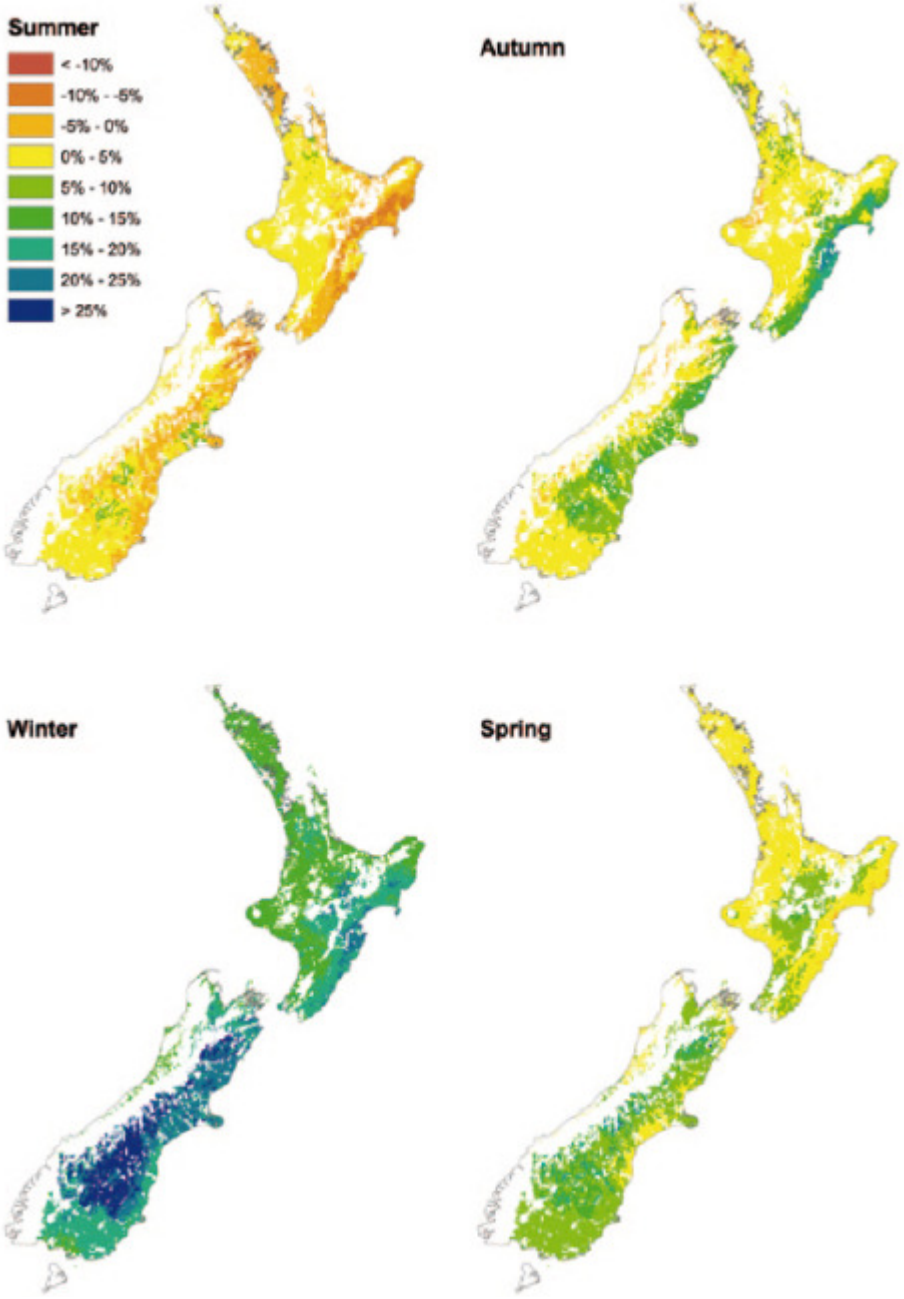
Uneven Challenge: Climate Resilience



Source: Cline 2007, Graphics: UNEP/Grid Arendal

Slides courtesy of Dr Andy Reisinger, Dep. Dir. NZAGRC

% Change in seasonal DM production



2030-2049 compared with 1980 -1999

More biomass at lower quality with sharper seasons

Impacts

- Primary Impacts
  - Temperature increase, increase dry, more rain
- Secondary Impacts
  - Change to pasture species, pests,
- Tertiary Impacts
  - Impact on nutrient cycling, changes to predators, changes to lake levels

Effects and Impacts Summaries by Region

CLIMATE CHANGE: A GUIDE FOR LAND MANAGERS

REGIONAL SUMMARY

Effects and impacts: Otago and Southland

KEY EFFECTS

- Warmer winters, reduced frequency of frost, and a longer growing season. The daily temperature range is already decreasing in Southland faster than anywhere else in New Zealand.
- More frequent hot, dry, summer conditions in coastal North Otago and possibly Central Otago.
- The possibility of a greater frequency of drought comparable to those experienced during the 1997/98 El Niño and the 1998/99 La Niña episodes.
- Increased rainfall in the main divide of the Southern Alps could increase river flows in the Clutha, Waitaki and Waiau rivers.
- The frequency and intensity of high rainfall events could increase.
- Runoff decreases could be experienced in coastal Otago if warmer and drier conditions are realised. Existing water-short areas, would anticipate significant problems with water supply for both rural water and community township supplies.

KEY CHANGES

- The greatest gains are likely to arise from possible productivity increases in existing crops and pasture, and the opportunity to grow a greater diversity of crops.
- Losses are likely to arise from the changes in extremes that might occur. Threats will arise from any increase in drought frequency and severity, and increased flood risk if more frequent and intense rainfall events are realised over time.

Otago and Southland are likely to become wetter with climate change, particularly in winter and spring. Average annual temperatures are likely to rise by about 1.0°C by mid-century and 2.0°C by 2100, with the possibility of winter temperatures increasing slightly more than in other seasons.

LIKELY IMPACTS AND OPPORTUNITIES

- Pasture productivity could increase in some areas and decrease in others. Potential increases are more likely to be realised in South Otago, Southland hill country and intensive farming systems. The Otago dry hill country could experience warmer winter conditions and higher average precipitation, which will improve conditions for sheep and beef farmers. However this benefit may not continue into the East Otago hill country if eastern regions of the South Island become more drought prone. Higher rainfall during winter in dairy farming areas will make the management of winter conditions more difficult.
- Higher average temperatures and reduced frost risk will benefit fruit production in Central Otago, the predominant fruit growing area in the region. The greatest benefits will arise from a longer frost-free season and warmer spring temperatures, which could increase fruit size and quality.
- With frost reduction and temperature increase, climate change could benefit cherries and apricots, both in yield and quality. There could be a change in the current "window of opportunity" with a reduction in the production of out-of-season produce and lower prices for export products.
- Similar comments apply to flower exports from the Southland and Otago area. There may be some loss of colour, increased disease and pest occurrence and a change to the out-of-season advantage that currently exists.
- Central Otago is the southern margin for cool-climate wine production in New Zealand. Wine grapes in this region will benefit greatly from warmer, drier conditions. It is unlikely that there would be any significant change in varieties over the next 50 years as a result of climate change, although this could occur further into the future if higher warming scenarios are realised.
- Pest and disease regimes for all fruit crops could change, particularly through warmer winters.
- A warmer average climate and higher precipitation in South Otago and Southland may have a mix of costs and benefits for arable cropping. More rain at harvest time would be detrimental. Higher temperatures and a longer growing season will be beneficial.
- Water security is most likely to be an issue in parts of Otago and Southland where drought is already a major constraint. Flood risk could also increase throughout the region over coming decades with projected average rainfall increases and the possibility of an increased frequency and intensity of rainfall events.

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What risk?

The risks

Floods

Slips

Wind

- Increased variability and intensity
- Increased frequency of extreme climatic events
- Changes in ecology
  - Heat Stress
  - Water use

Some of these changes will create opportunities.

Others will require higher levels of risk management.

Droughts

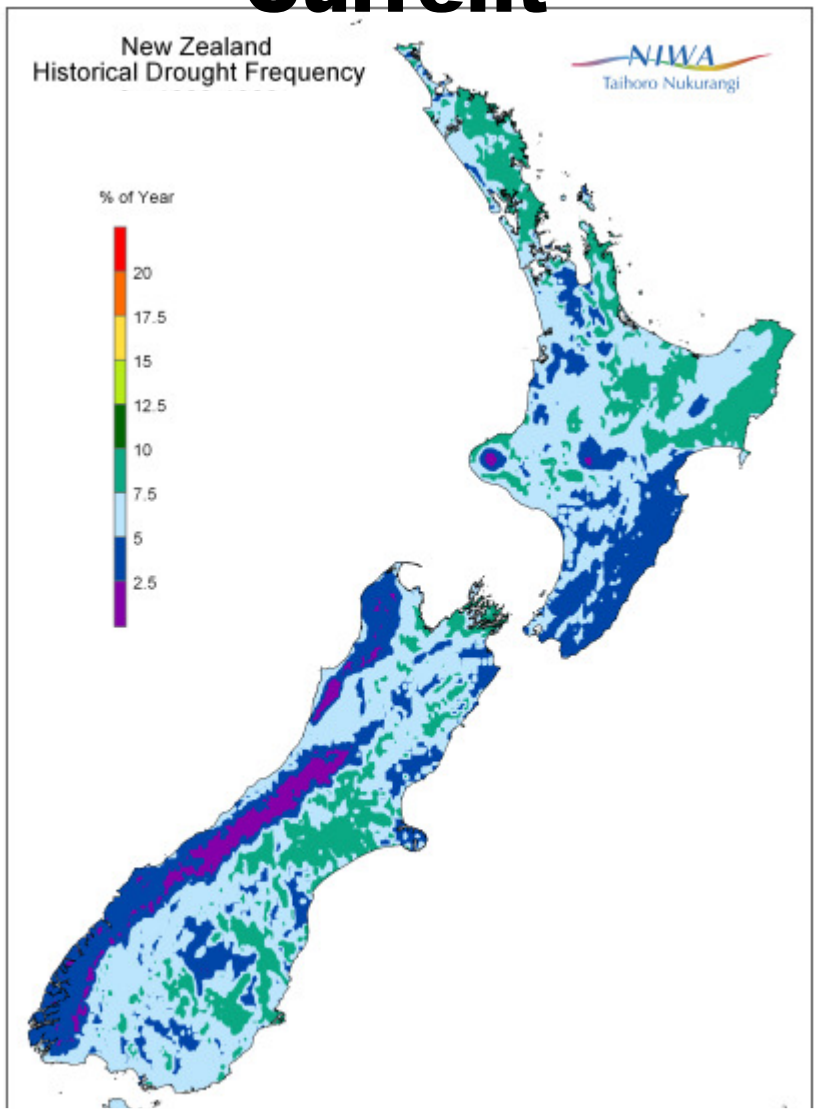
Pests and Diseases

Risk determined by...

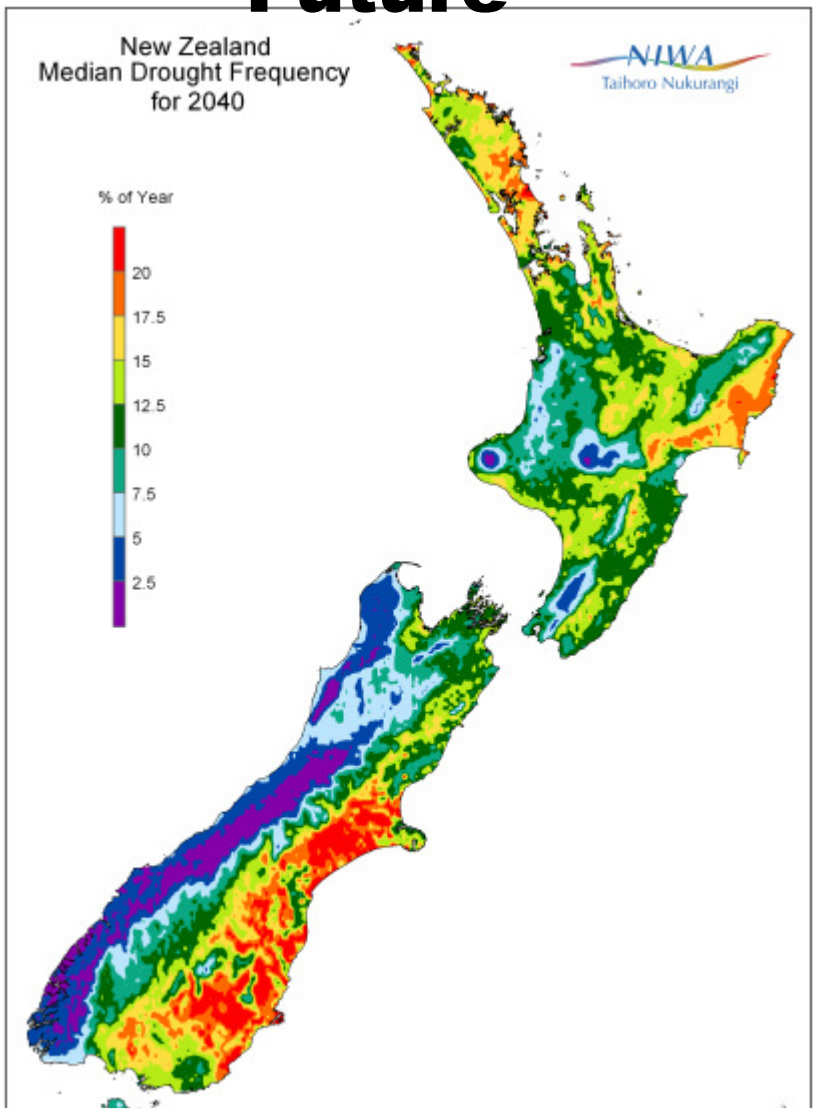
- Frequency
  - less time to recover between events - resilience
- Intensity
  - makes us more vulnerable
- Impact
  - but can we do something about that?

NZ drought risk

Current



Future

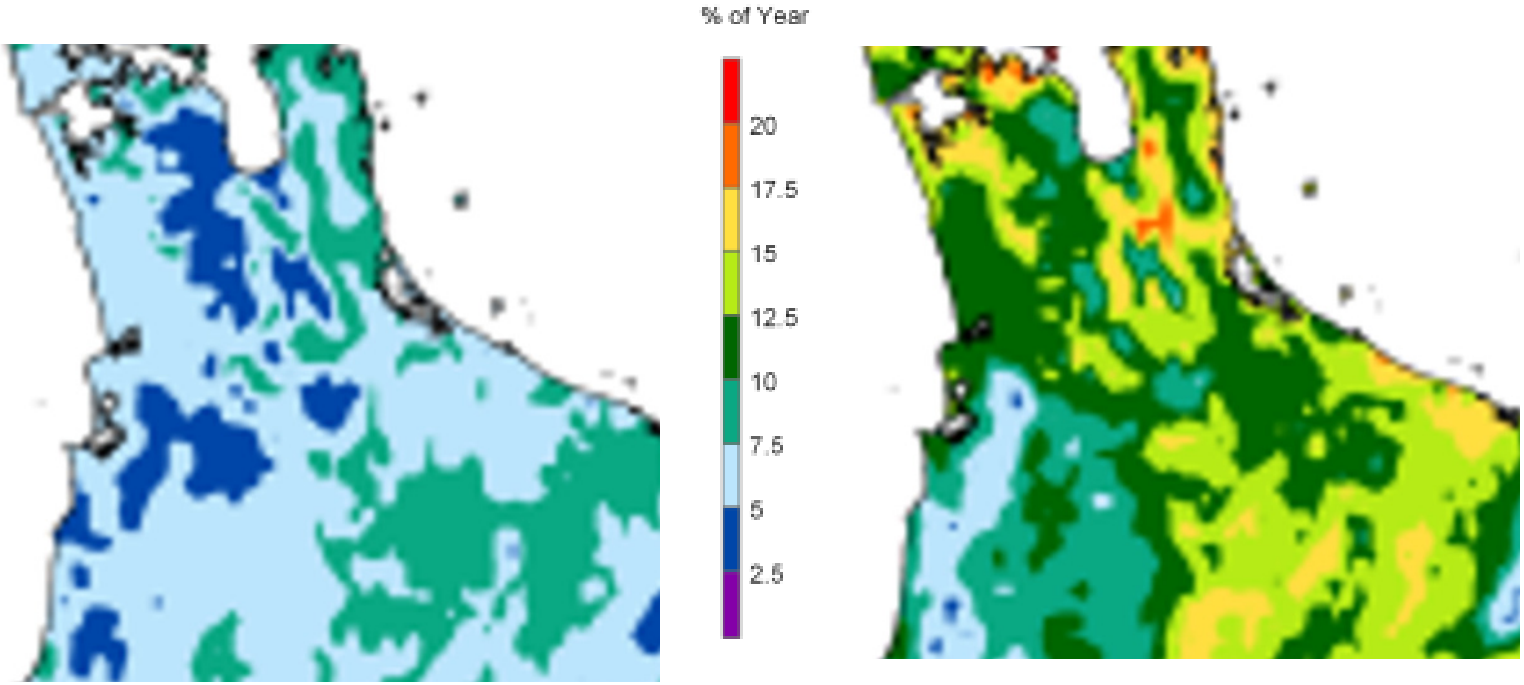


For a mid-range emissions scenario, farmers in most North Island regions, as well as those in eastern regions of the South Island – especially Canterbury and eastern Southland – can expect to spend around **ten per cent more time in drought** by the middle of this century.

NZ drought risk (Waikato)

Current Future

20% time in drought equates to 2 years in ten



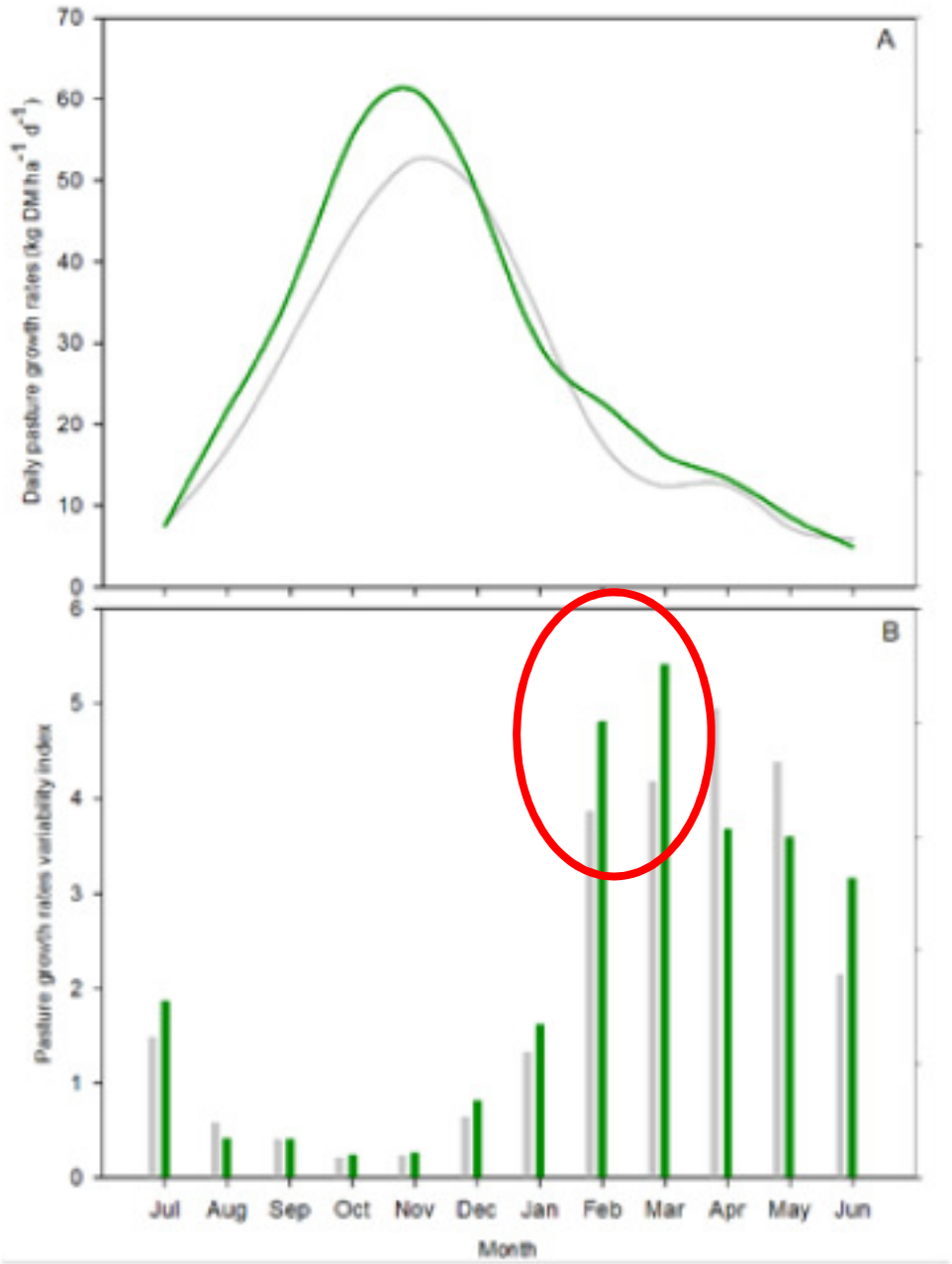
Current – 1 in 10 to 20+ years

2040 – 1 in 5 to 10 years

Maps include soil water holding capacity factor and can be found in Clarke et al. 2012: Impacts of Climate Change on Land-based sectors and Adaptation Options – *Stakeholder Report*

How does that translate to the farm?

- Detailed modelling by AgResearch using NIWA projected data
- The key message is increased variability in DM production



Production curve

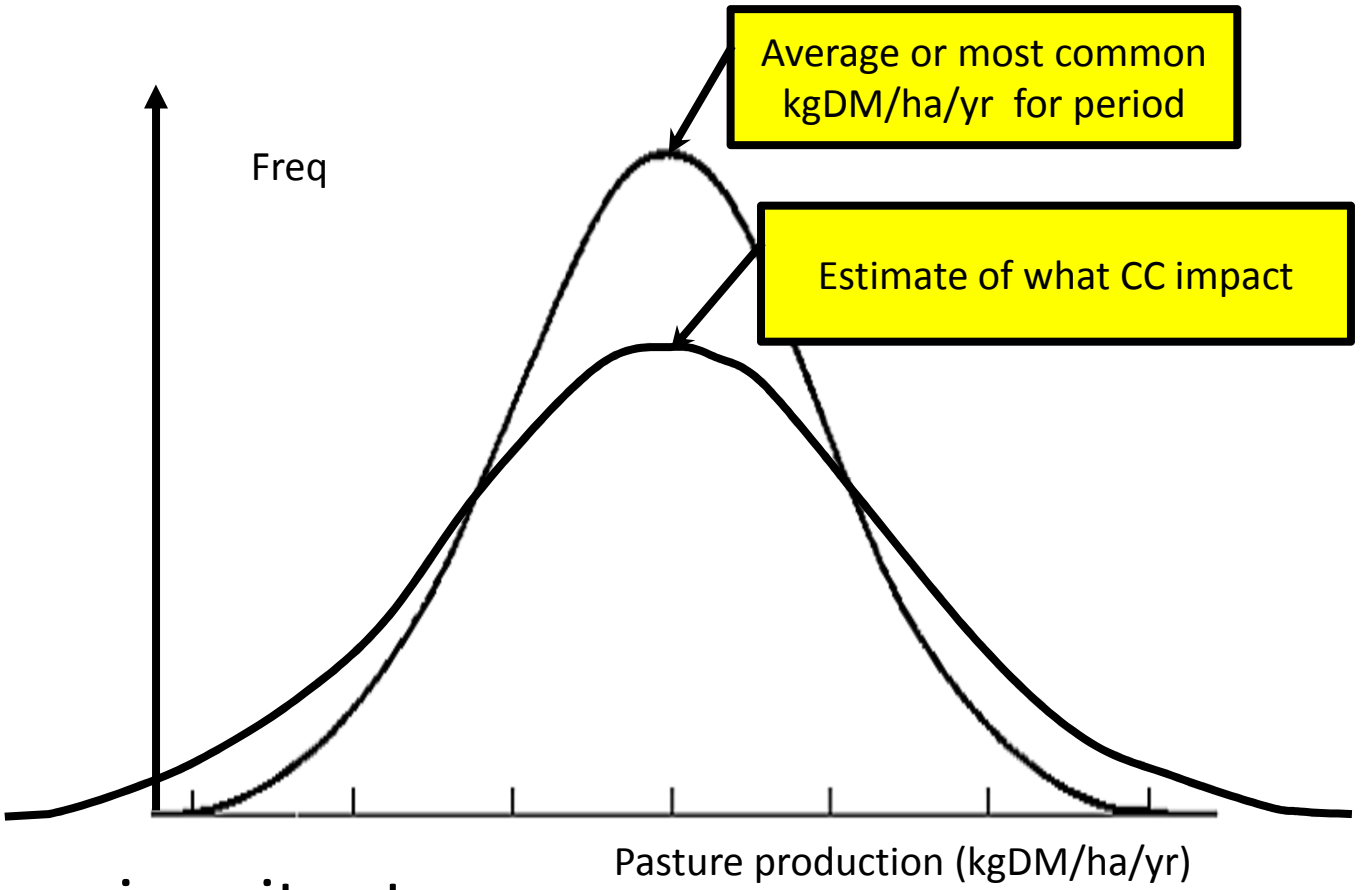
Grey = 1990

Green = 2040

More variability Feb-Mar

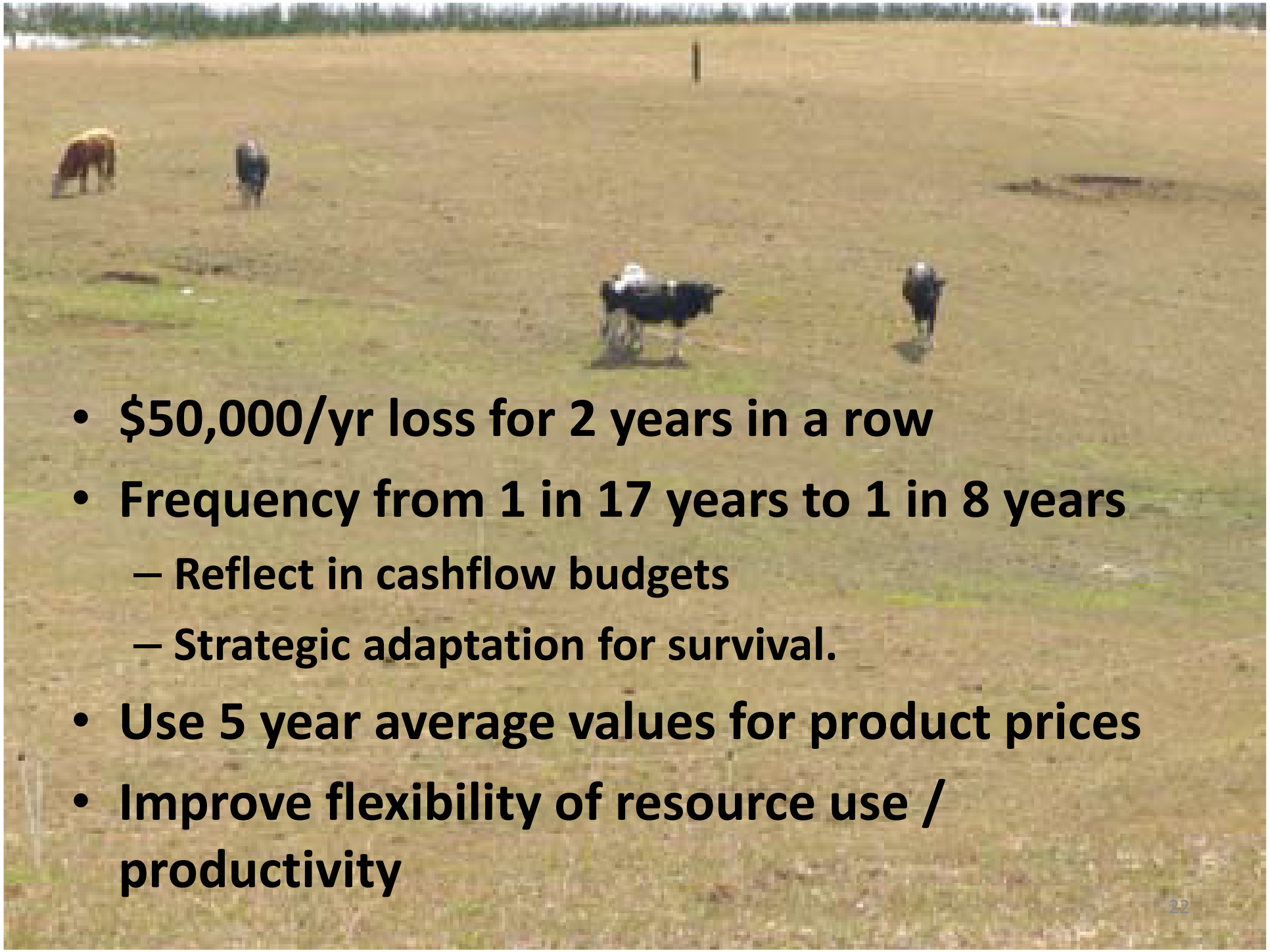
Variability Index

Bell curve for DM production (rules of thumb)



- Pasture curve is quite steep

Distribution of annual production in next 30 years is likely to get squashed flatter relative to last 30 years



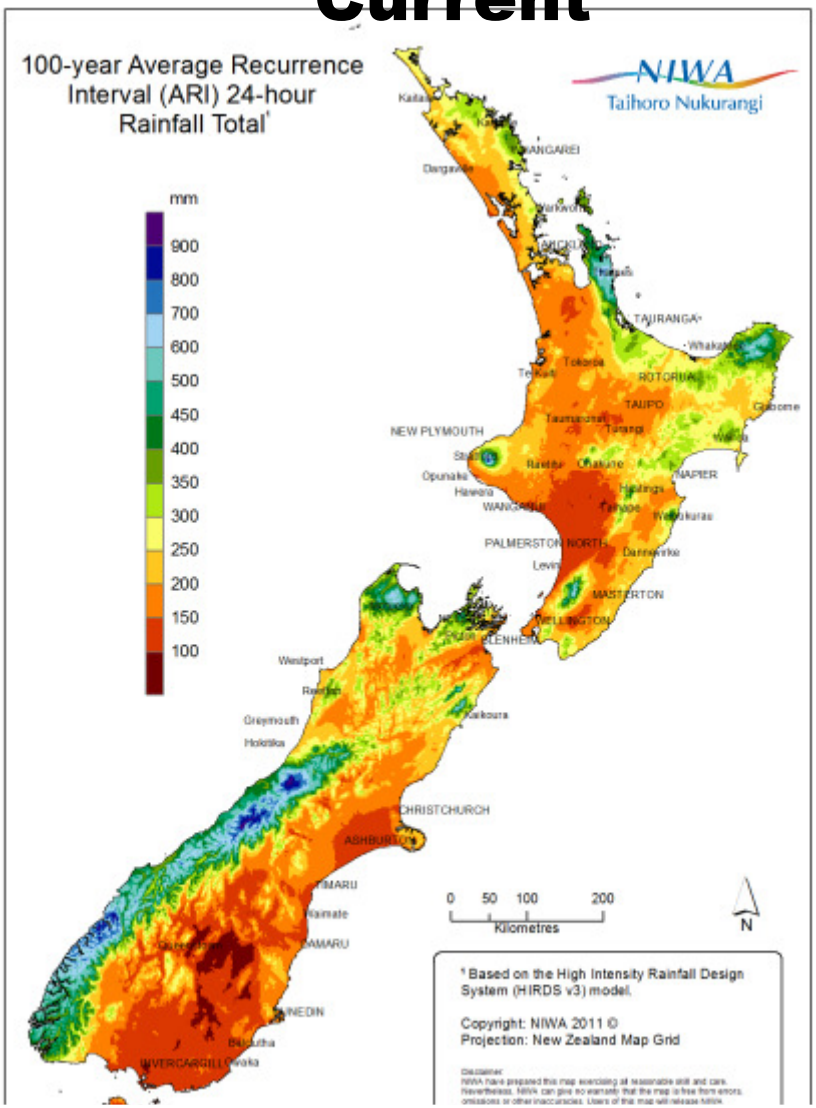
- $50,000/yr loss for 2 years in a row
- Frequency from 1 in 17 years to 1 in 8 years
  - Reflect in cashflow budgets
  - Strategic adaptation for survival.
- Use 5 year average values for product prices
- Improve flexibility of resource use / productivity

What about Rainfall?

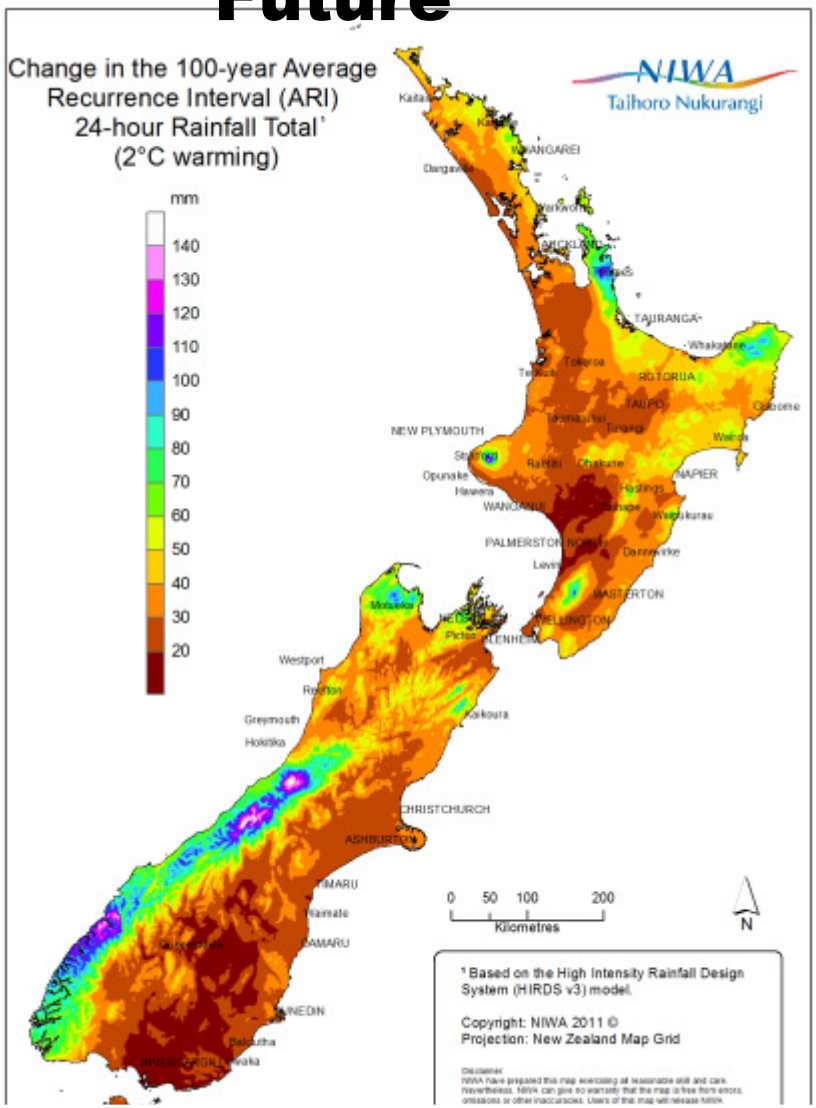
- Capture high river flows
- Higher risk of
  - Erosion
  - Nutrient runoff
  - Sedimentation
- Greater risk soil damage
- Increase in stock deaths
- Increased crop losses

NZ heavy rainfall risk

Current



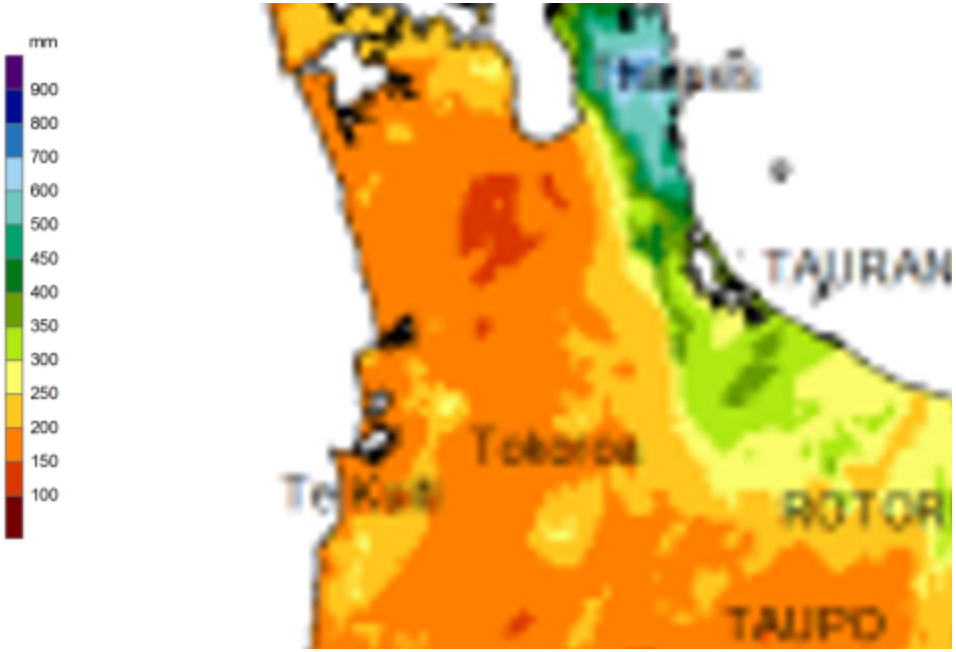
Future



Given a 2°C temperature increase for New Zealand, a present-day 24-hour extreme rainfall with a 100-year average recurrence interval (ARI) is projected to occur about twice as often by 2080–2099, compared with 1980–1999.

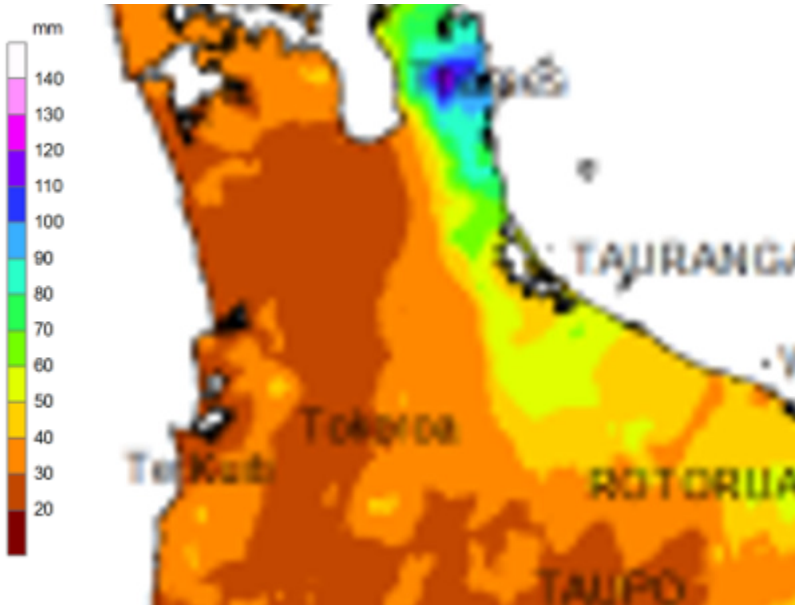
NZ heavy rainfall risk

Current



Waikato – 100 to 150 mm in 24 hrs once in 100 years

Future (2090)



This increases by 20-60mm

Projections – how confident?

Table 1. Summary of climate change expected in New Zealand.

	Change	*Regional distribution*	*Level of certainty*
Temperature	Increase	Relatively uniform across the country	High
Annual and seasonal rainfall averages	Positive & negative Wide range	East (decrease) to west (increase) the dominant pattern	Change: High Estimates of direction and magnitude: moderate to low+
Major drought	Predominantly increasing in eastern regions	East (increase)-west (decrease) the dominant pattern	Moderate
Variability	More variability in seasonal rainfall patterns	No dominant pattern	Moderate
Extreme events	Increased magnitude of events	No dominant pattern	Moderate

+ The range in rainfall projections and level of confidence varies by region and season.

From Clarke et al. 2012: Impacts of Climate Change on Land-based sectors and Adaptation Options – Stakeholder Report

Key Message

- There are challenges for farmers, growers, foresters and rural communities
- There is now enough information to understand what the impacts might be