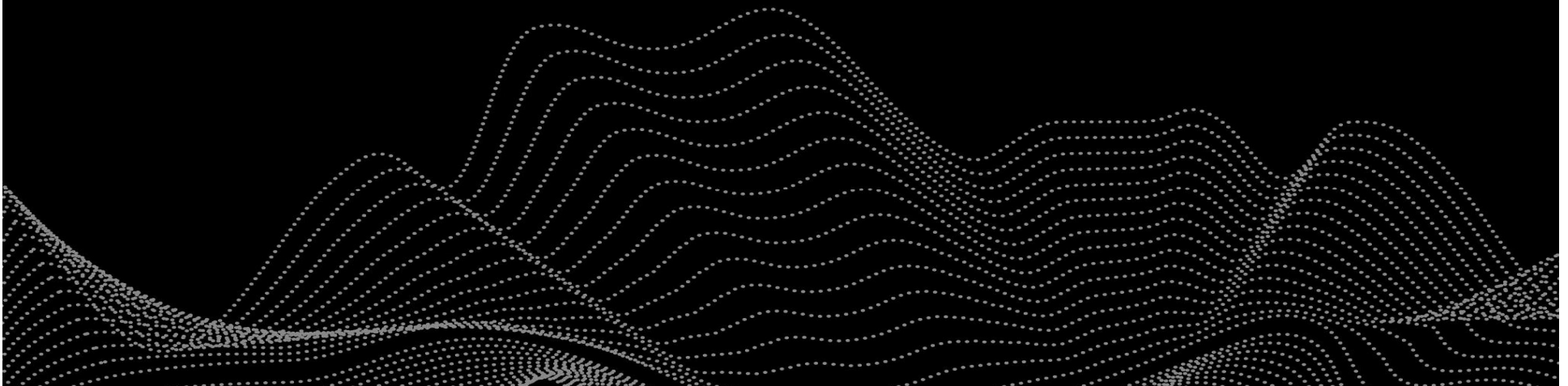




Manaaki Whenua
Landcare Research

Climate change challenges for the New Zealand agricultural sector

Anne-Gaelle Ausseil





**What are the current predictions for
New Zealand's changing climate?**



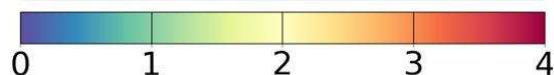
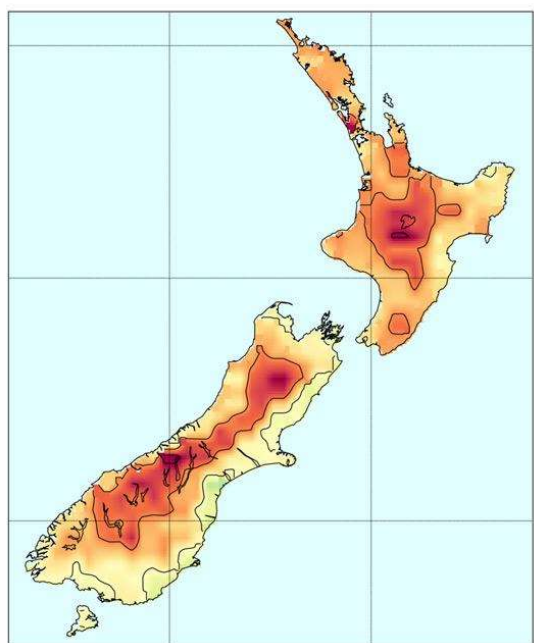
Climate Change long-term projections

Hotter everywhere

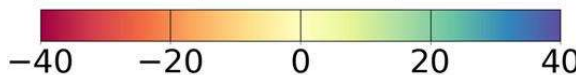
Drier in summer

Wetter on the SW in winter

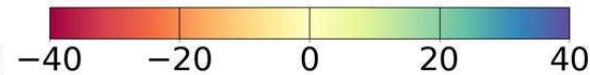
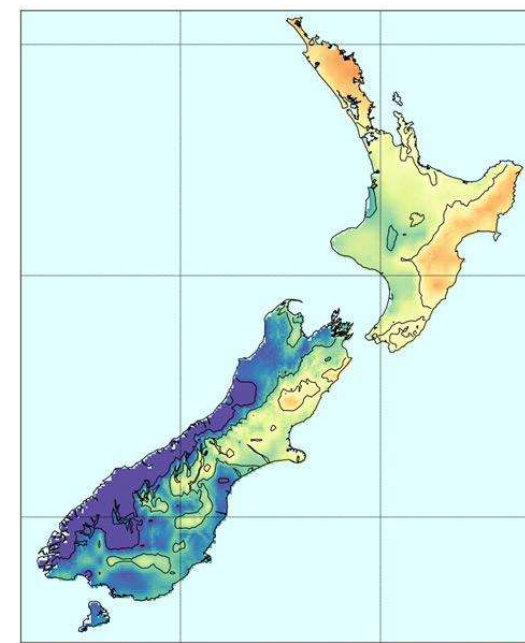
Tmean: RCP8.5, 2090, DJF



Precipitation: RCP8.5, 2090, DJF



Precipitation: RCP8.5, 2090, JJA



NIWA website: <https://niwa.co.nz/our-science/climate/information-and-resources/clivar/scenarios>

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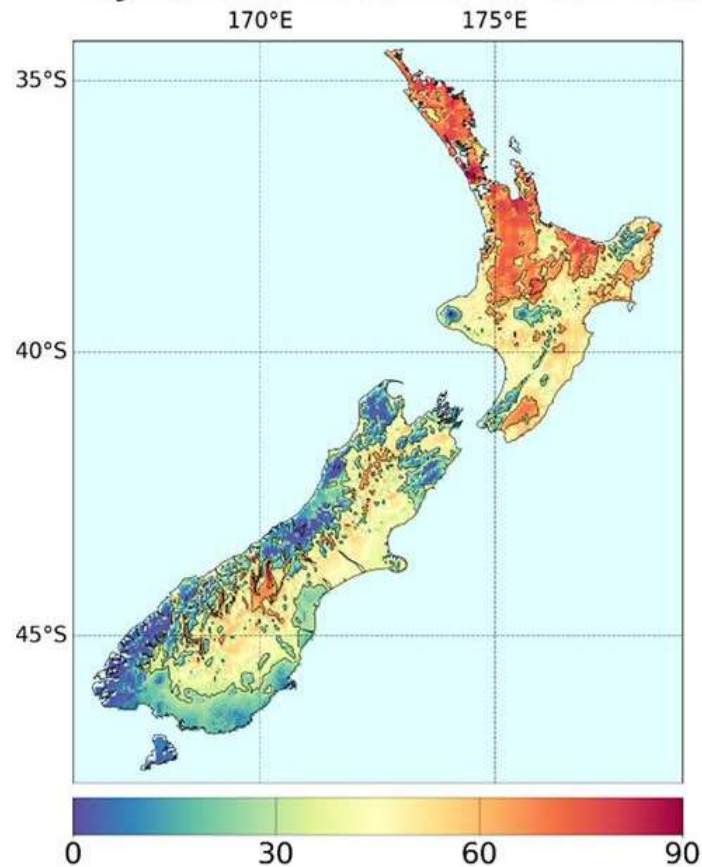
Projected changes in extremes



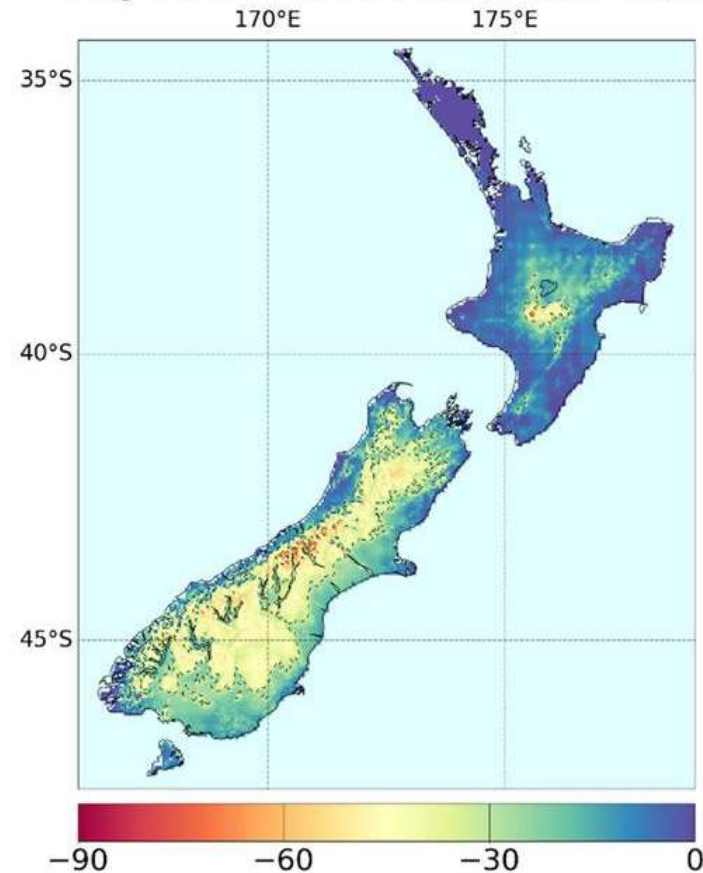
More hot days in summer (e.g. NI)

Less cold days (e.g. SI)

Days above 25: RCP8.5 , 2090 change



Days below 0: RCP8.5 , 2090 change



NIWA website: <https://niwa.co.nz/our-science/climate/information-and-resources/clivar/scenarios>

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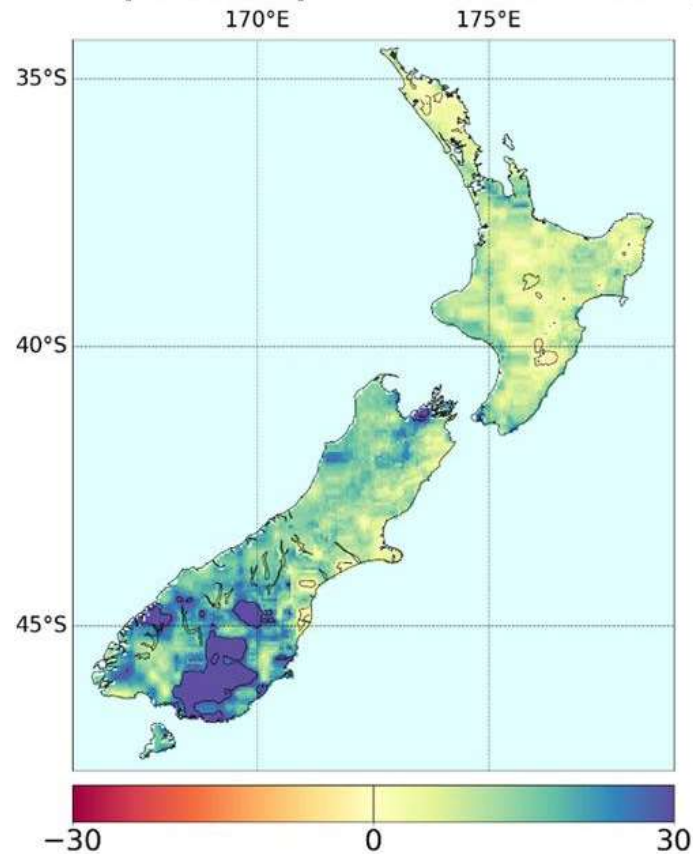
Projected changes in extremes



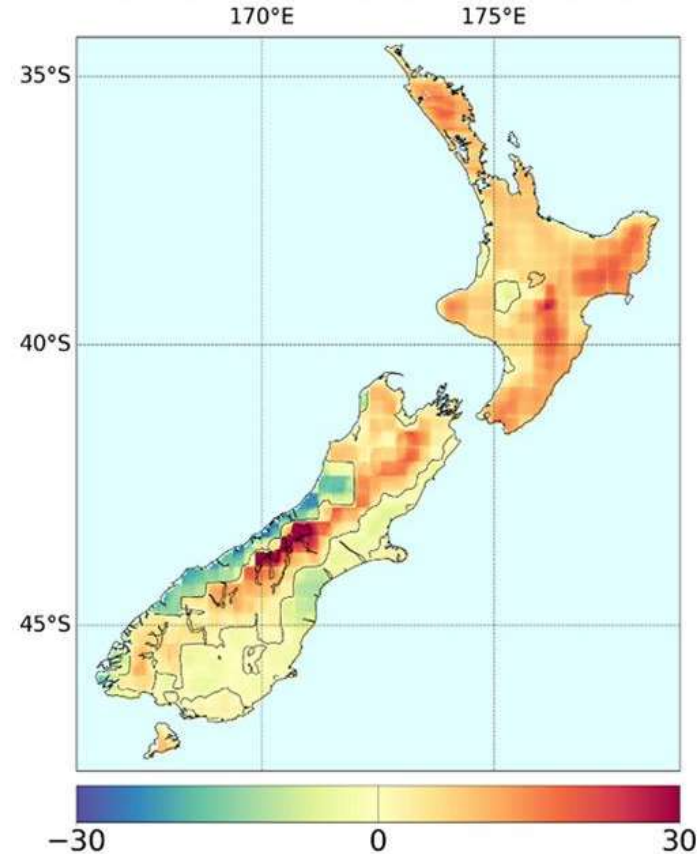
More intense rainfall in the South

More number of dry days in North Island

99-pctl Precip: RCP8.5 , 2090 change



Dry Days: RCP8.5 , 2090 change



NIWA website: <https://niwa.co.nz/our-science/climate/information-and-resources/clivar/scenarios>

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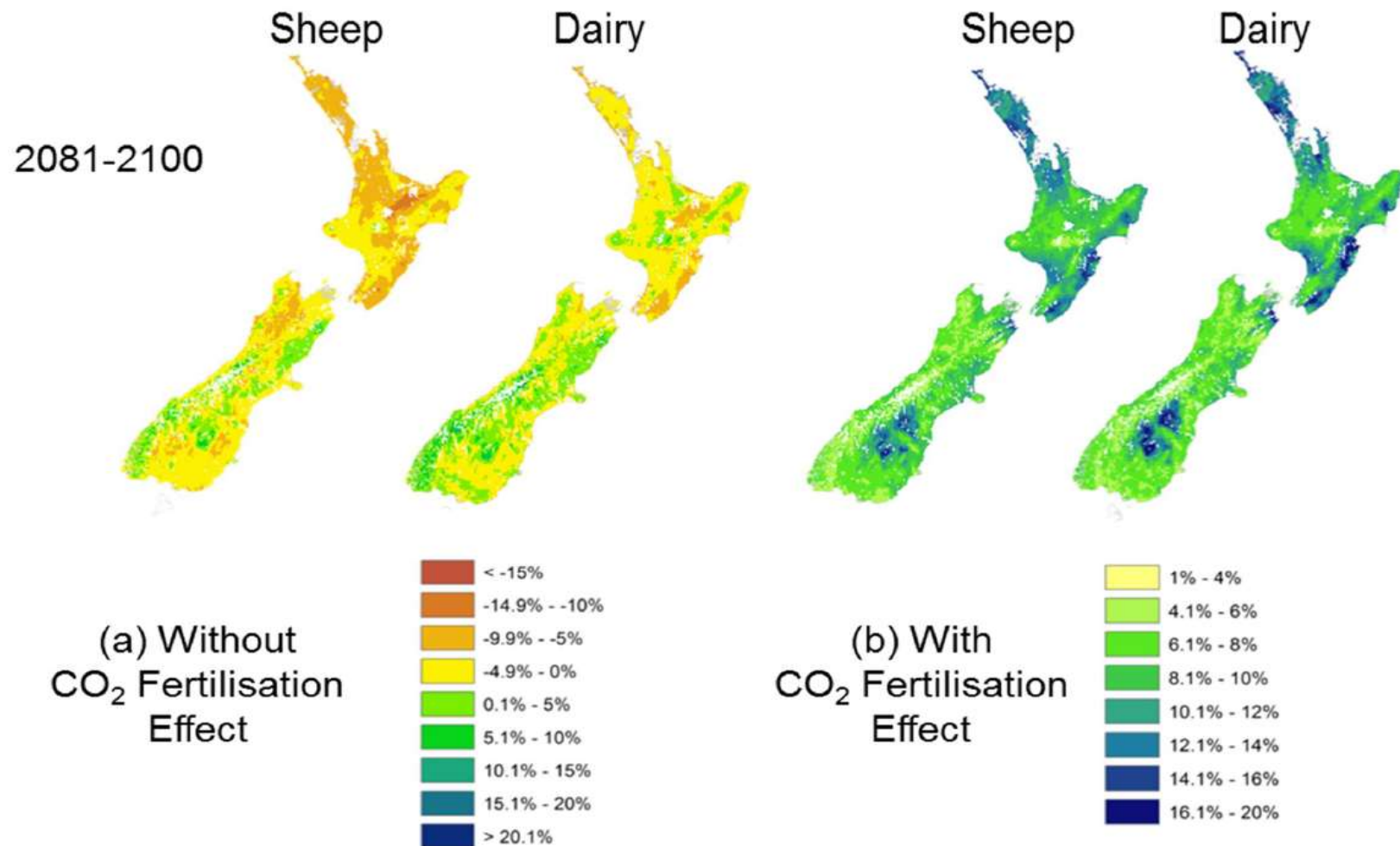
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How will the impacts of climate change be felt in the agricultural sector?



Annual pasture yield may change...



Rutledge et al (2017); Keller et al (2021)

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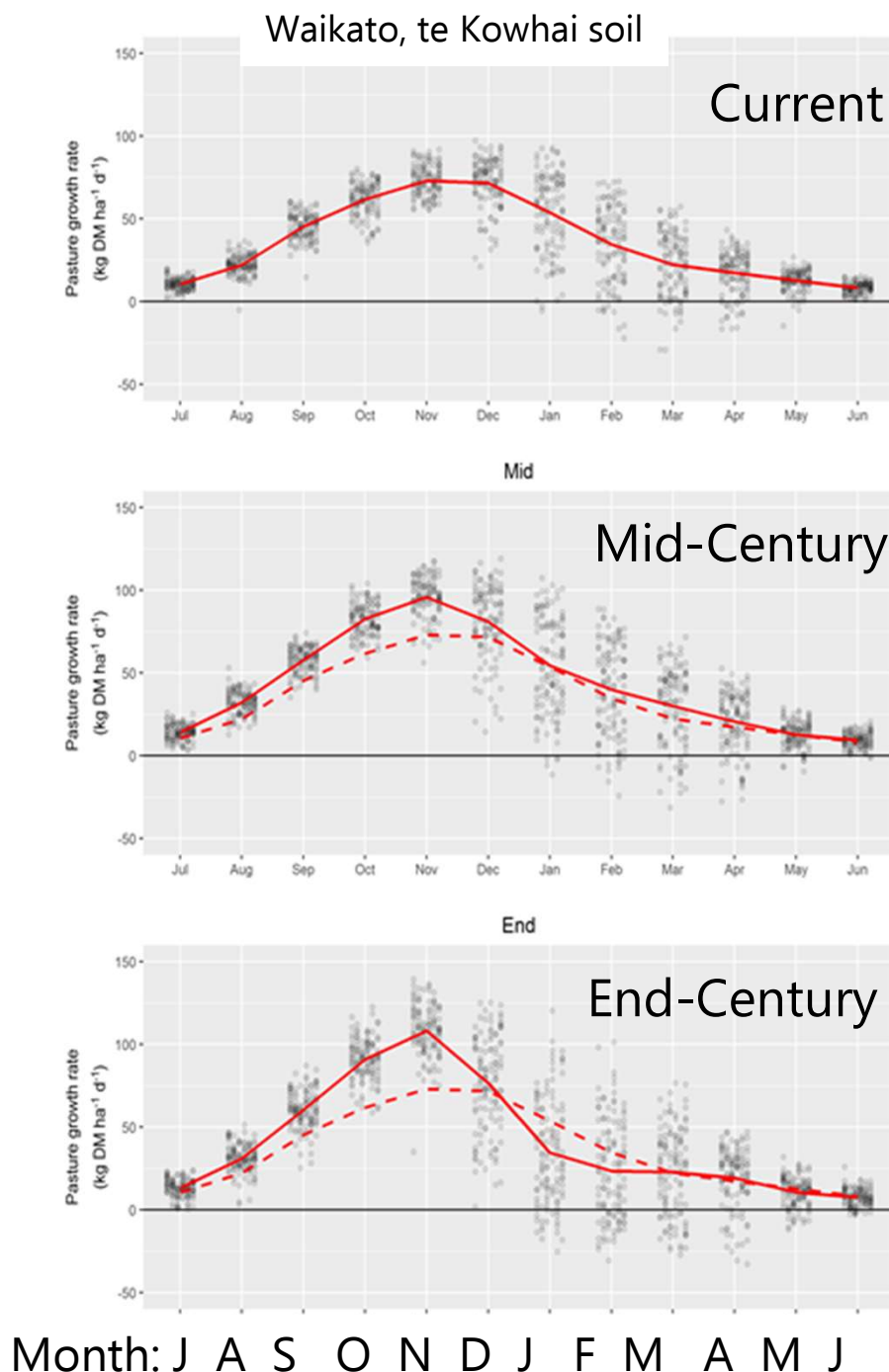
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... so is seasonality

- Shift in monthly pasture growth rates:
 - Higher spring peak
 - Lower in summer
- Influences feed stock management
- Variability in soils and regions and climate models

Ausseil et al (2019)



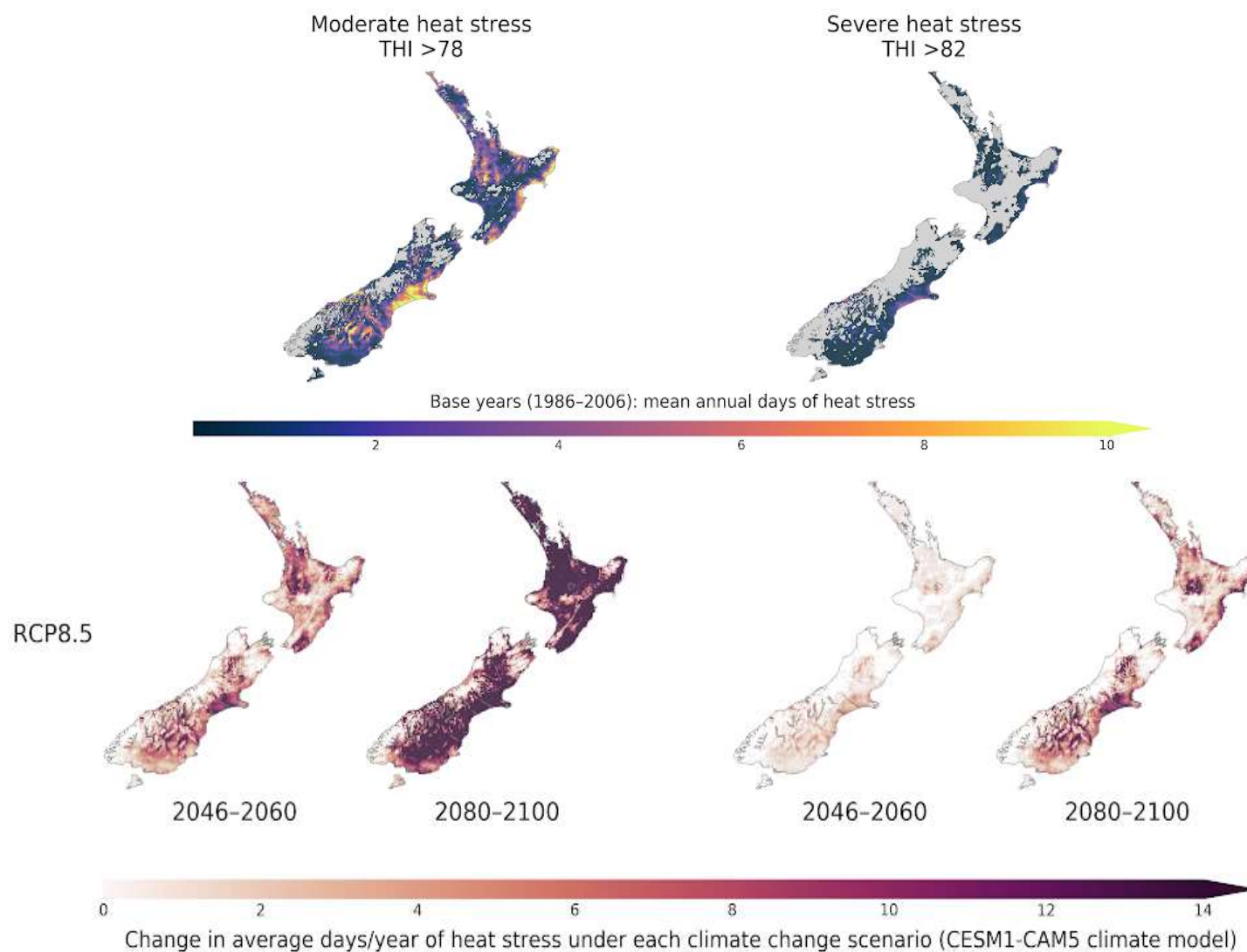
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Change in animal heat stress risk



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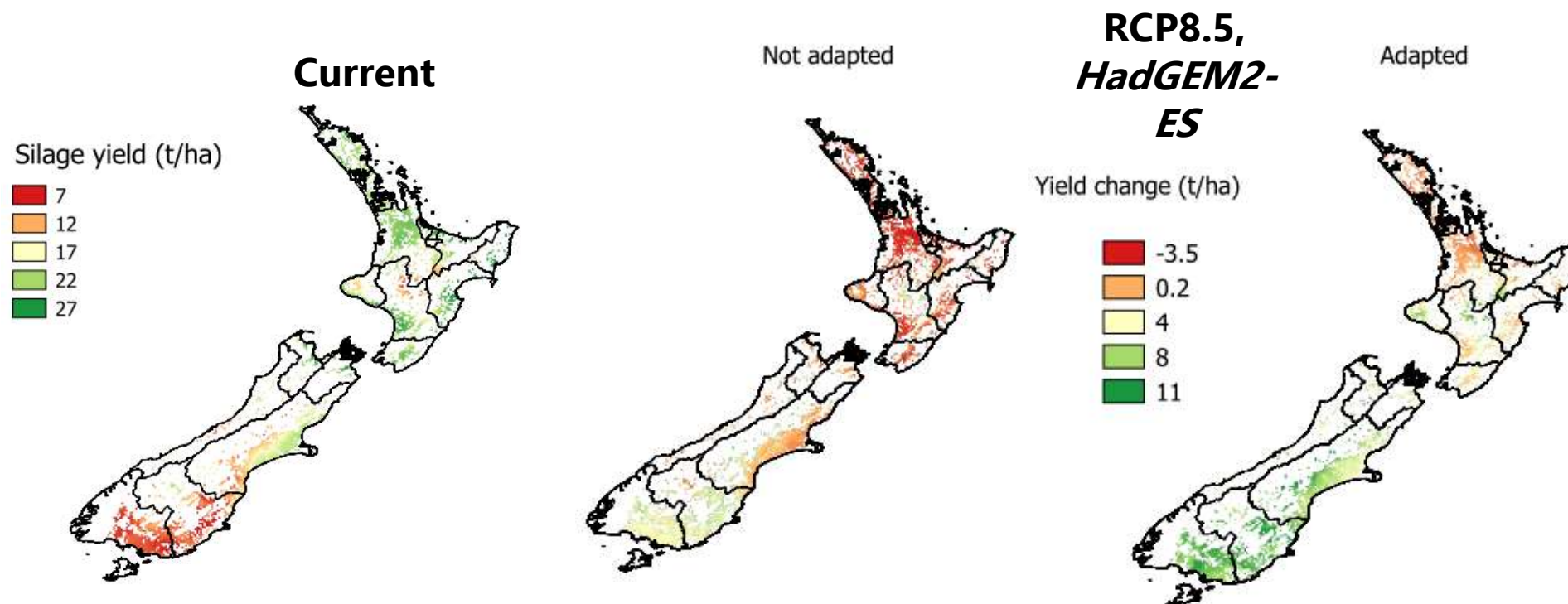
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Impact of climate change on irrigated maize production and adaptation



Higher yields in South Island, lower in North Island. Counter effect with adapting **genotype and earlier sowing date**

Rutledge et al. (2017). CCII synthesis report.

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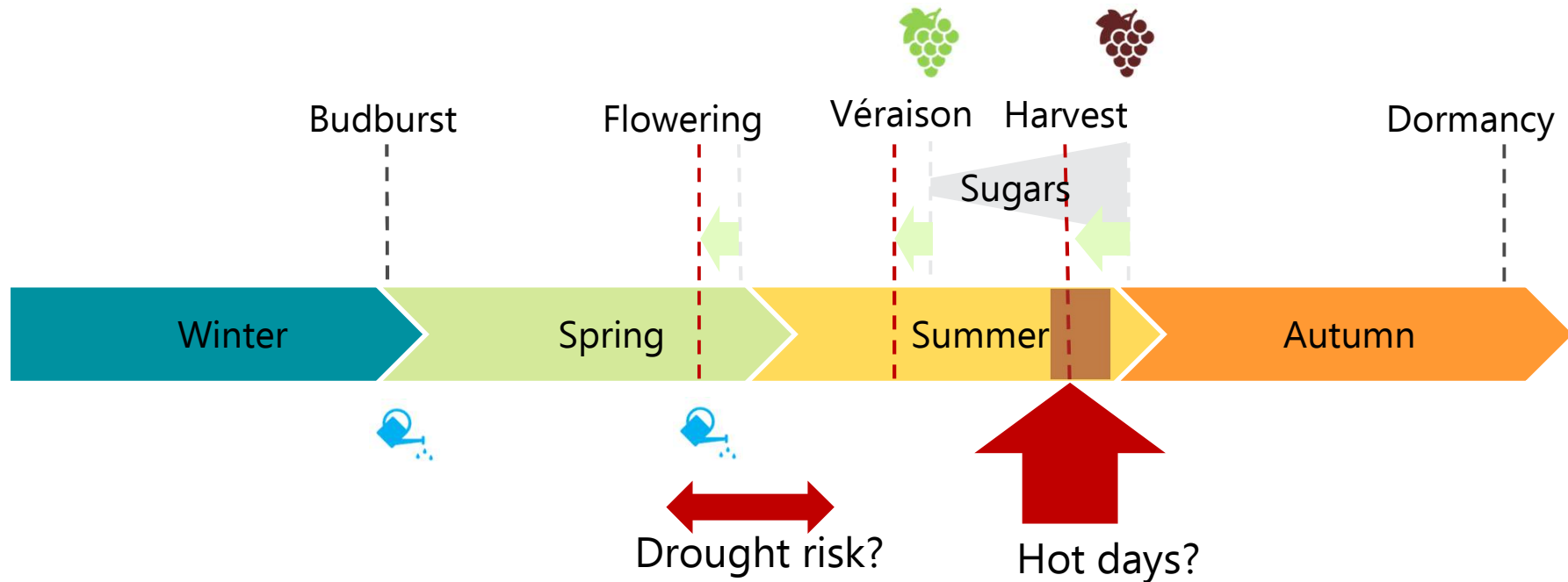
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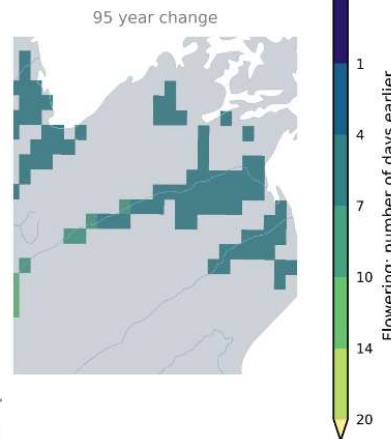
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Wine grape phenology



Flowering time
Ex Marlborough
Sauvignon blanc (RCP8.5
end- century)



Ausseil et al (2021)

Harvesting time (RCP8.5)

- **2 weeks earlier** for a Marlborough Sauvignon blanc
- **4 weeks earlier** for a Central Otago pinot noir

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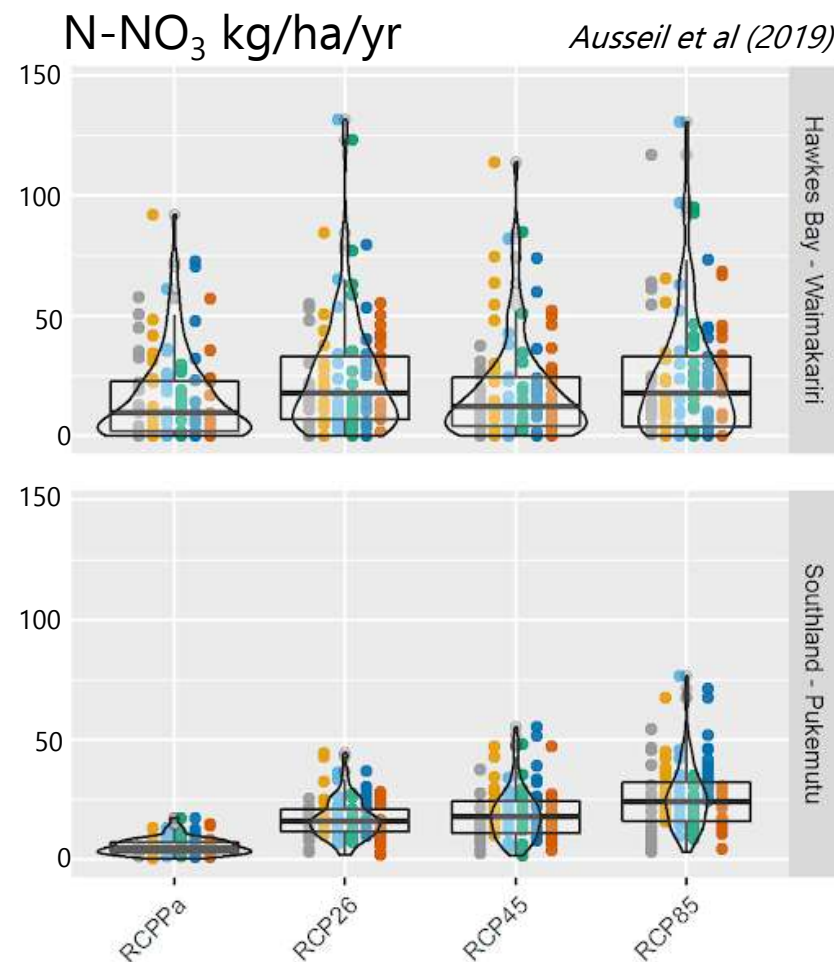


**What about environmental
impacts?**



Nitrate leaching in pasture/maize

- 3 case studies (Southland, Waikato, Hawkes bay)
- Pasture:
 - N leaching tends to be higher especially Southland
- Maize/wheat:
 - Higher N uptake by catch crop
- Higher inter-annual variability in N leaching



Examples from pasture (End of century)

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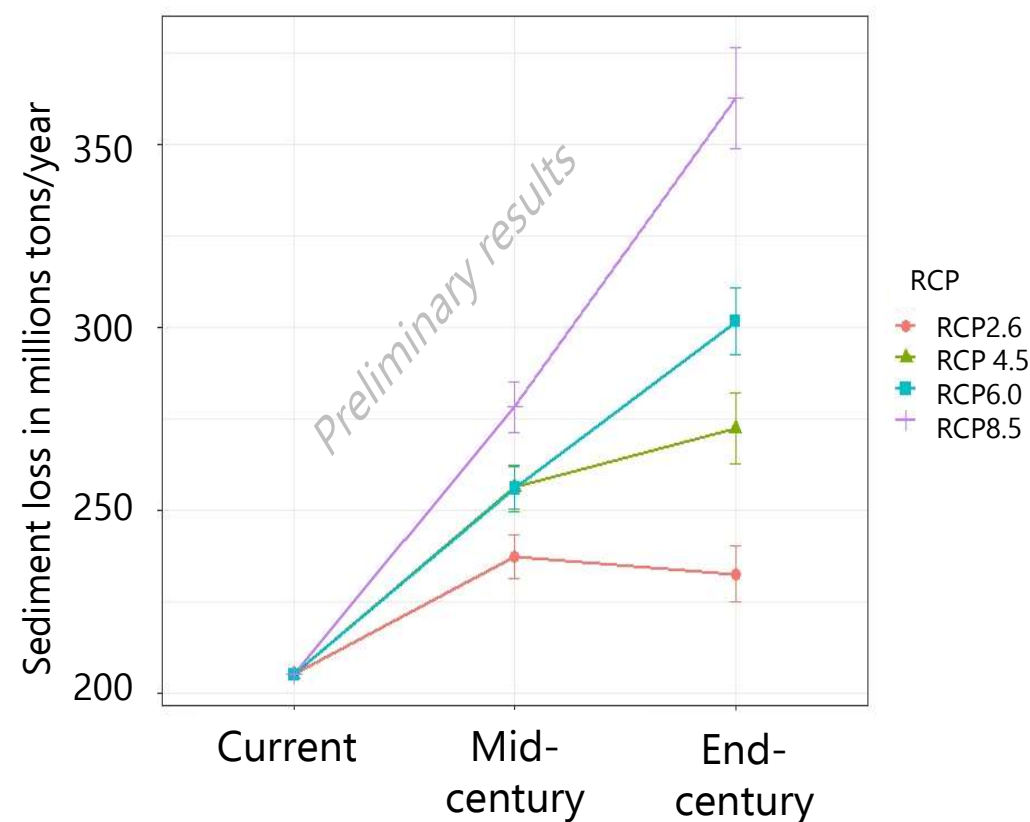
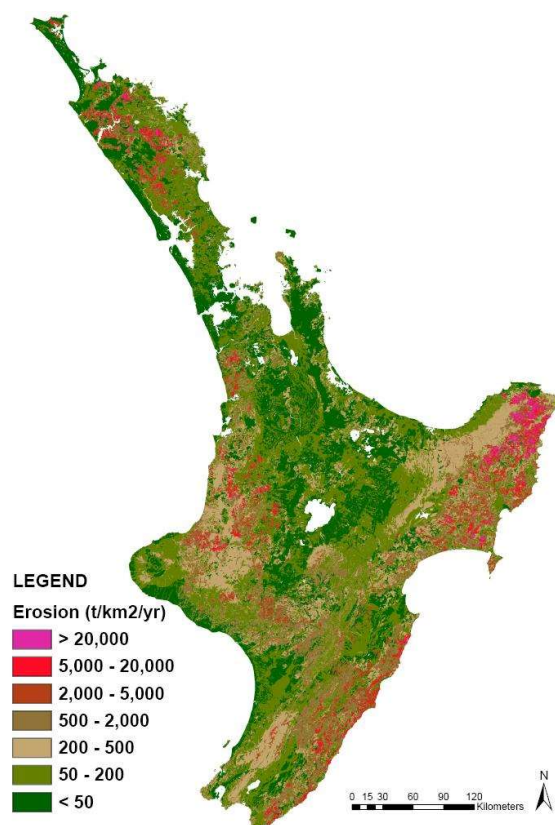
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Erosion and climate change



- Could negate soil conservation efforts
- Model being improved and applied across NZ



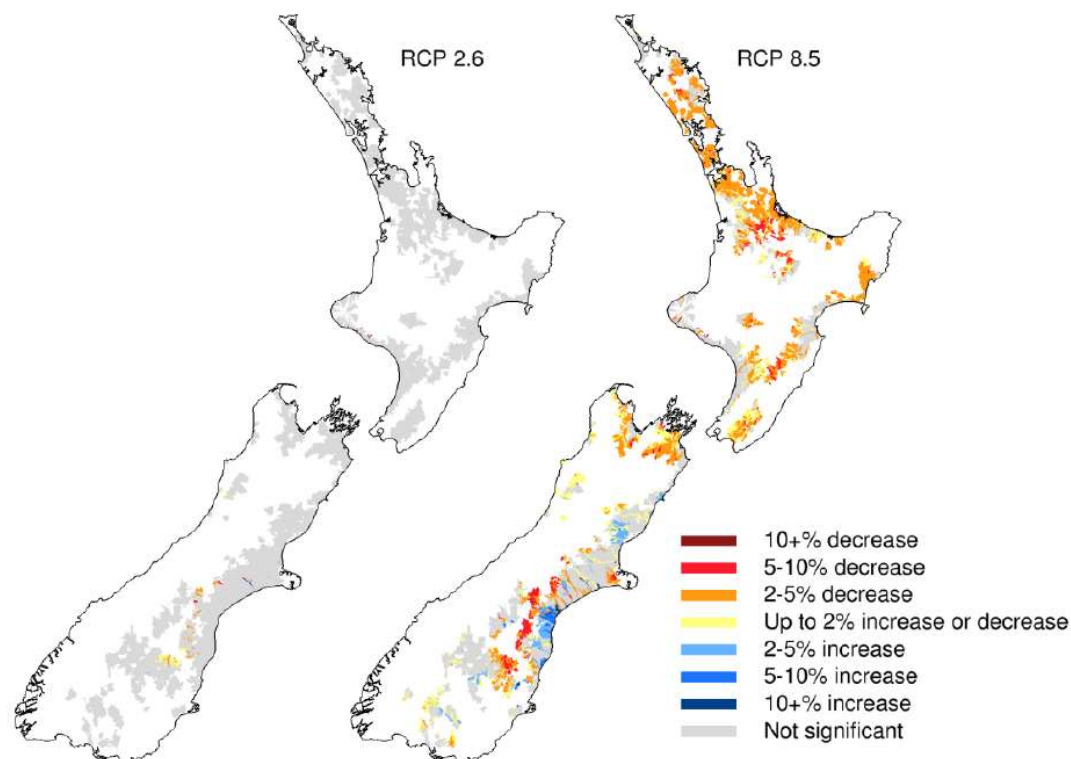
Change in river water supply

- Seasonal irrigation water demand likely to increase
- Decline in riverine water supply reliability
- No real change in irrigation duration but earlier onset/offset and more frequent restrictions
- Points toward transition to drought-resilient options

NIWA (Collins et al, 2019)

Deep South

<https://deepsouthchallenge.co.nz/resource/water-availability-under-climate-change/>



Late century relative changes in irrigation season supply reliability

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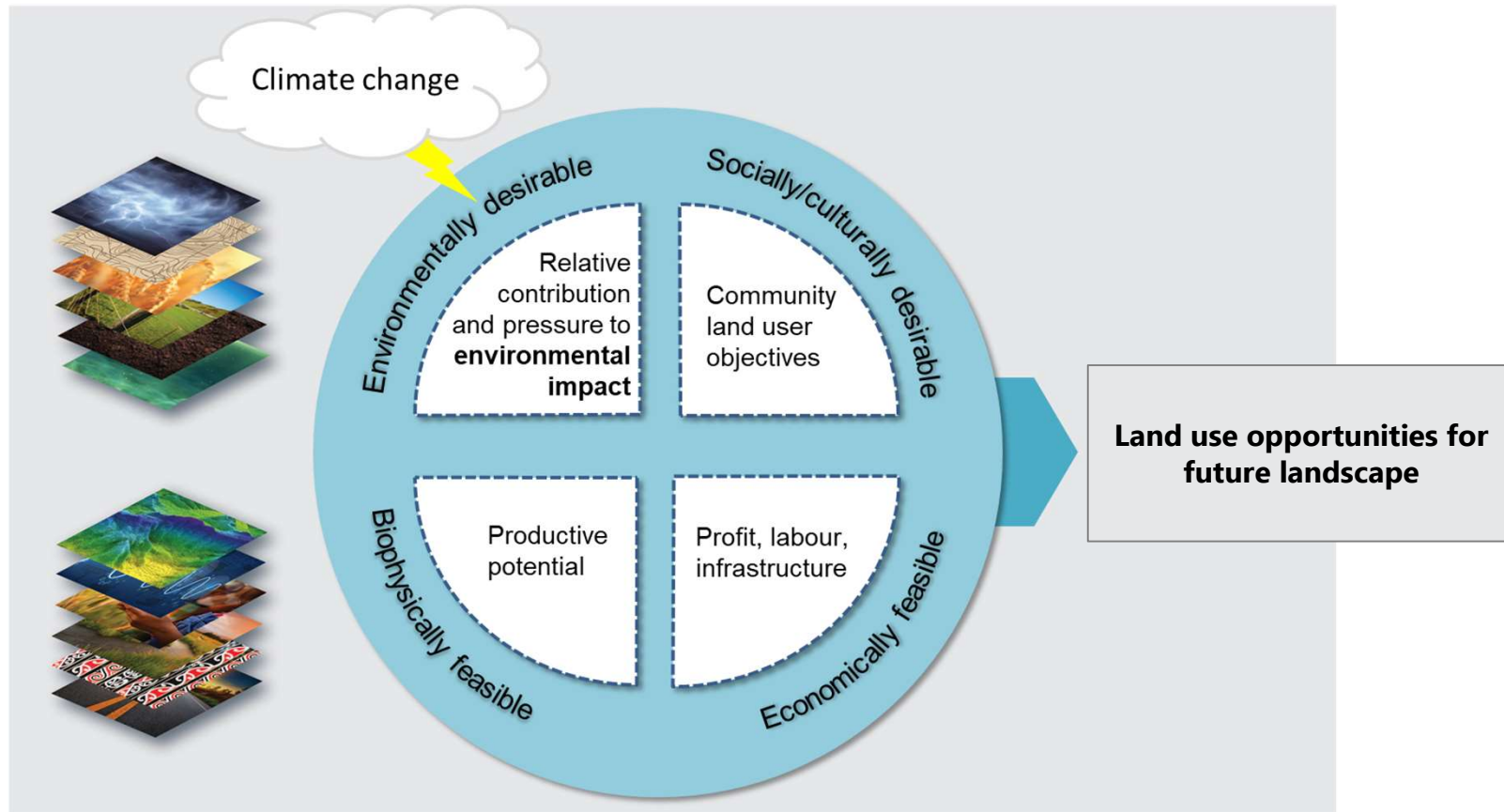
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WhitiWhiti Ora – land use opportunities



Management adaptation examples



Tactical

Water management
Nutrient management
Variety/breed change
Biotic control
Sowing dates
Shading for livestock

Strategic

Irrigation infrastructure
Establish new species
Develop new genotypes
Precision agriculture
Monitoring & Forecasting

Transformational

New technologies
Land use change

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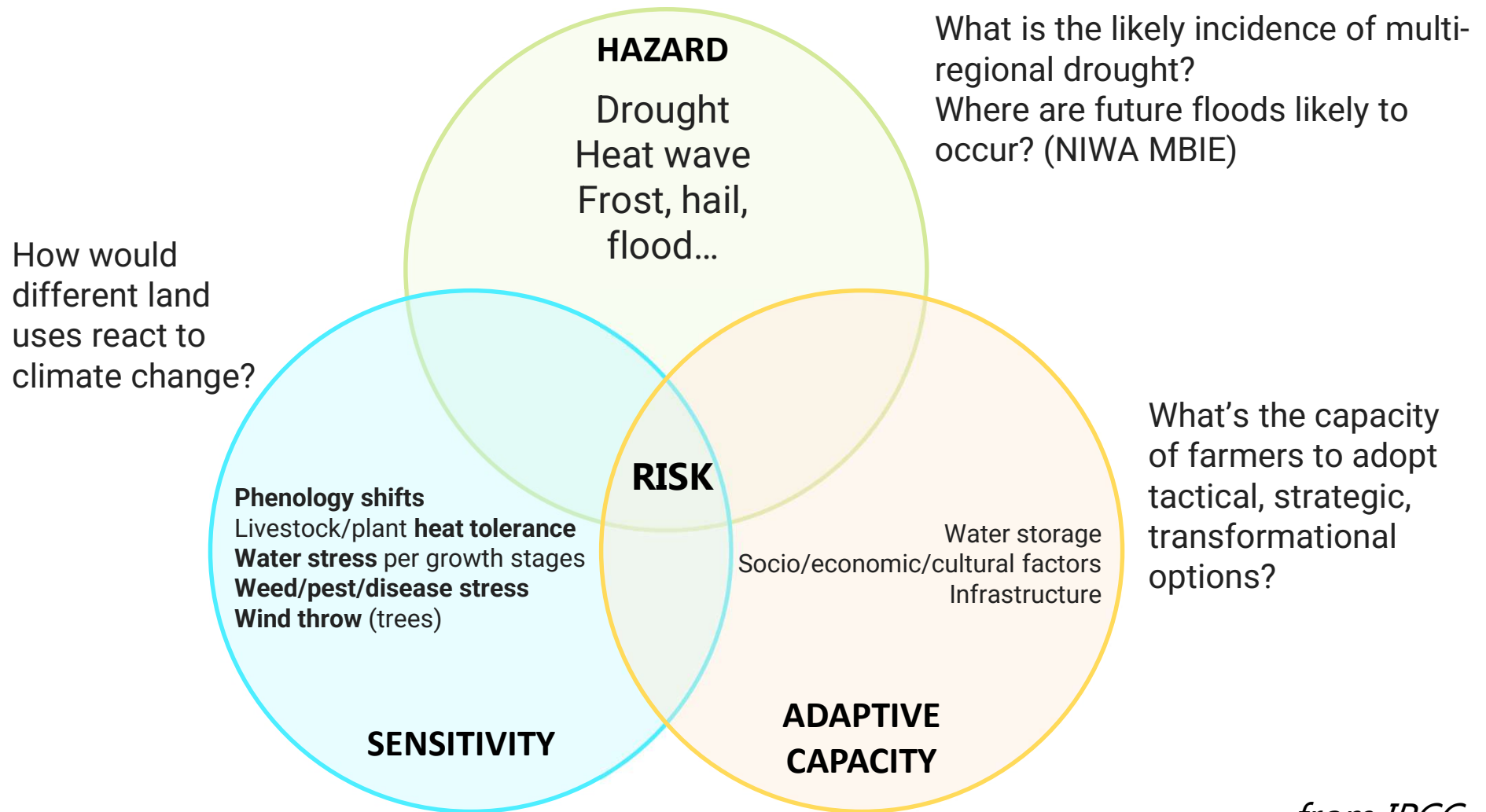
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Land use decisions in context of climate change: understanding risk



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from IPCC



Conclusion

- Many compounding effects of climate change, long-term shifts and extreme events
- Increased variability in extreme events requires an integrated approach to assess future risks
- Need for adaptation strategies now to prepare for the future



Acknowledgements

Abha Sood, Liz Keller, Tony van der Weerden, Mike Beare, Troy Baisden, Edmar Teixeira, Mark Lieffering, Jing Guo, Richard Law, Amber Parker, Andrew Tait, Christian Zammit

