Droughts, earthquakes and other every-day challenges

Practical application of resilience concepts in land management.

Nick Cradock-Henry,
Governance & Policy

Landcare Research
Manaaki Whenua

Robust, resilient and antifragile

Ecocentric
All things green, from conservation to Capitol Hill

GOING GREEN

Adapt or Die: Why the Environmental Buzzword of 2013 Will Be *Resilience*

Memories of Superstorm Sandy are already fading — and with them, political will to adapt to the growing threat posed by global warming. But the need is greater than ever to establish resilient societies, cities and economies in the face of climate change

By Bryan Walsh @bryanrwalsh | Jan. 08, 2013 | 18 Comments

RESILIENCE

reˑsilˑience [ri-zil-yuhnz] (noun)
1 .The power or ability to return to the original structure, position, function, etc., after being disturbed, shocked or otherwise impacted by stress; elasticity.

2. The capacity to absorb shock before breaking or being forced across a critical transition, wherein the original structures, positions, functions are fundamentally altered.

Is existing practice sufficient?

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North Island drought worst in history

KIRSTY JOHNS

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Farmers adapt to dry weather

ANDREA FOX

Last updated 05:00 14/03/20

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English rules out future rise in drought relief funding

Updated at 5:47 pm on 11 March 2013

Deputy Prime Minister and Finance Minister Bill English says the Government has no plans to increase its support in future for farmers affected by drought.

Top Stories

- Black smoke signals no decision on pope
- Govt report backs Auckland Council's housing position

New Zealand drought hurting farmers and economy, some say it's a harbinger of climate change

By Associated Press, March 14, 2013

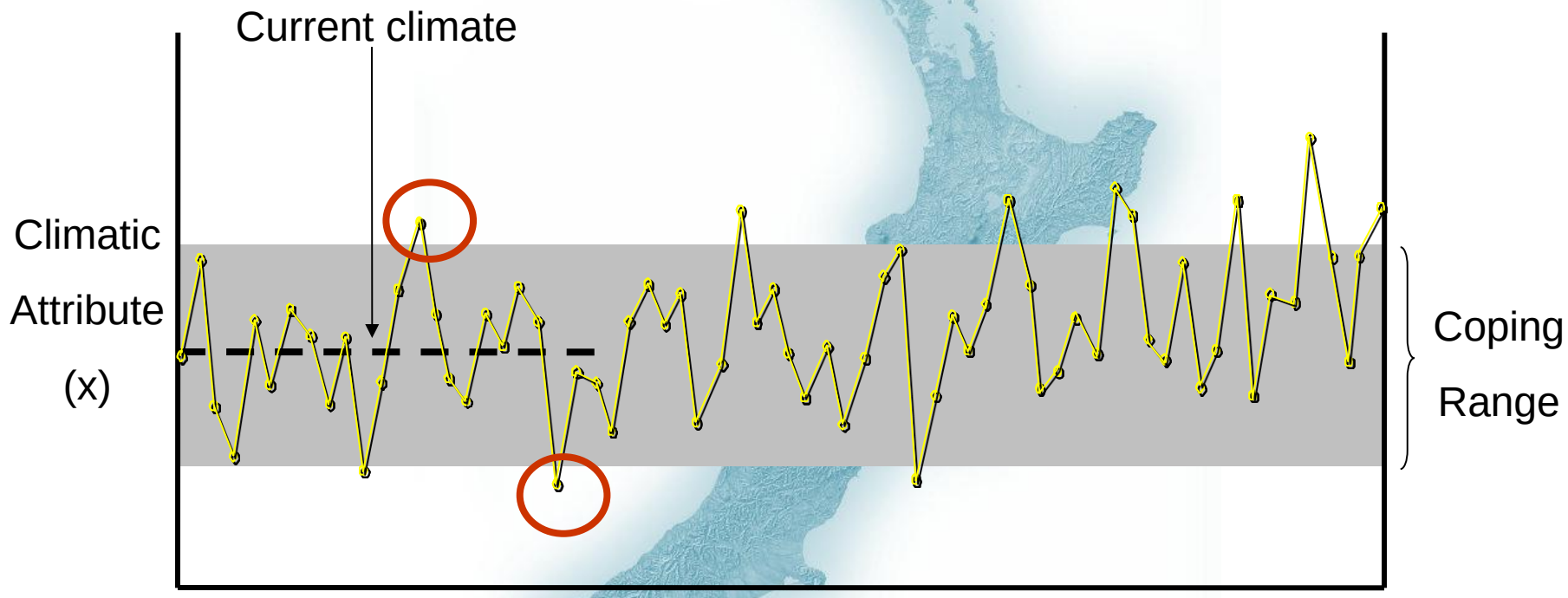
In this photo taken on March 11, 2013, farmer Peter Brown walks on the dry... (New Zealand Herald, Brett...)

CARTERTON, New Zealand — Dairy farmer John Rose has sent more than 100 of his cows to the slaughterhouse over recent weeks as a severe drought browned pastures in New Zealand's normally verdant North Island.

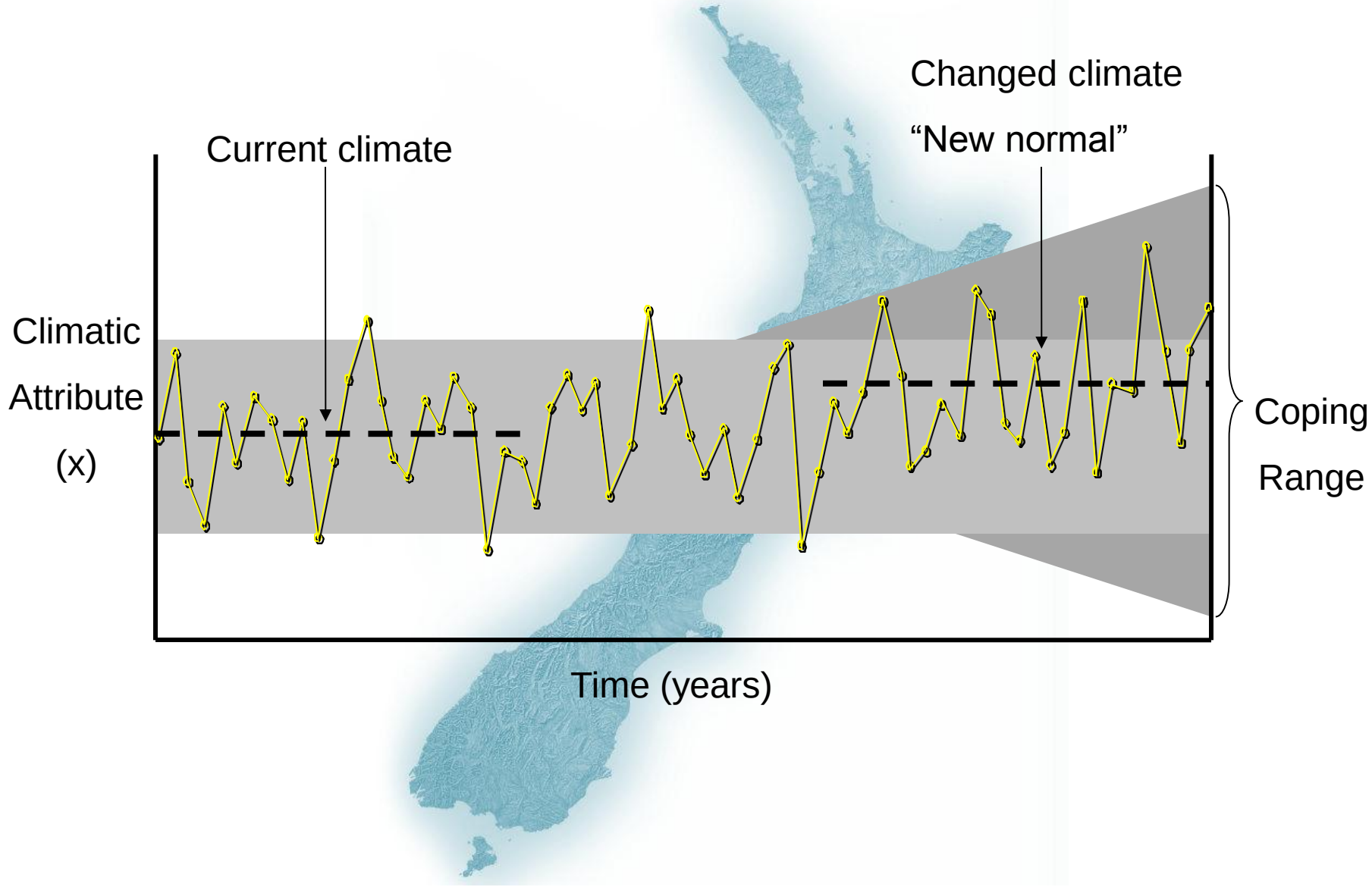
He said it was necessary to thin his herd so that his remaining 550 cows have enough to eat. He's supplementing their diet with ground palm kernel as the grass in his fields withers.

"We try and make sure they've got water and shade during the day and do the best we can for them," he said. "It's very hard to remember when the last rain fall was."

Is existing practice sufficient?



Is existing practice sufficient?



Assessment approaches

Impact approach

"Top down"

Start with climate scenario

Stressors selected

e.g. GDDs, ΔT

Researcher identifies risks

vs.

Vulnerability approach

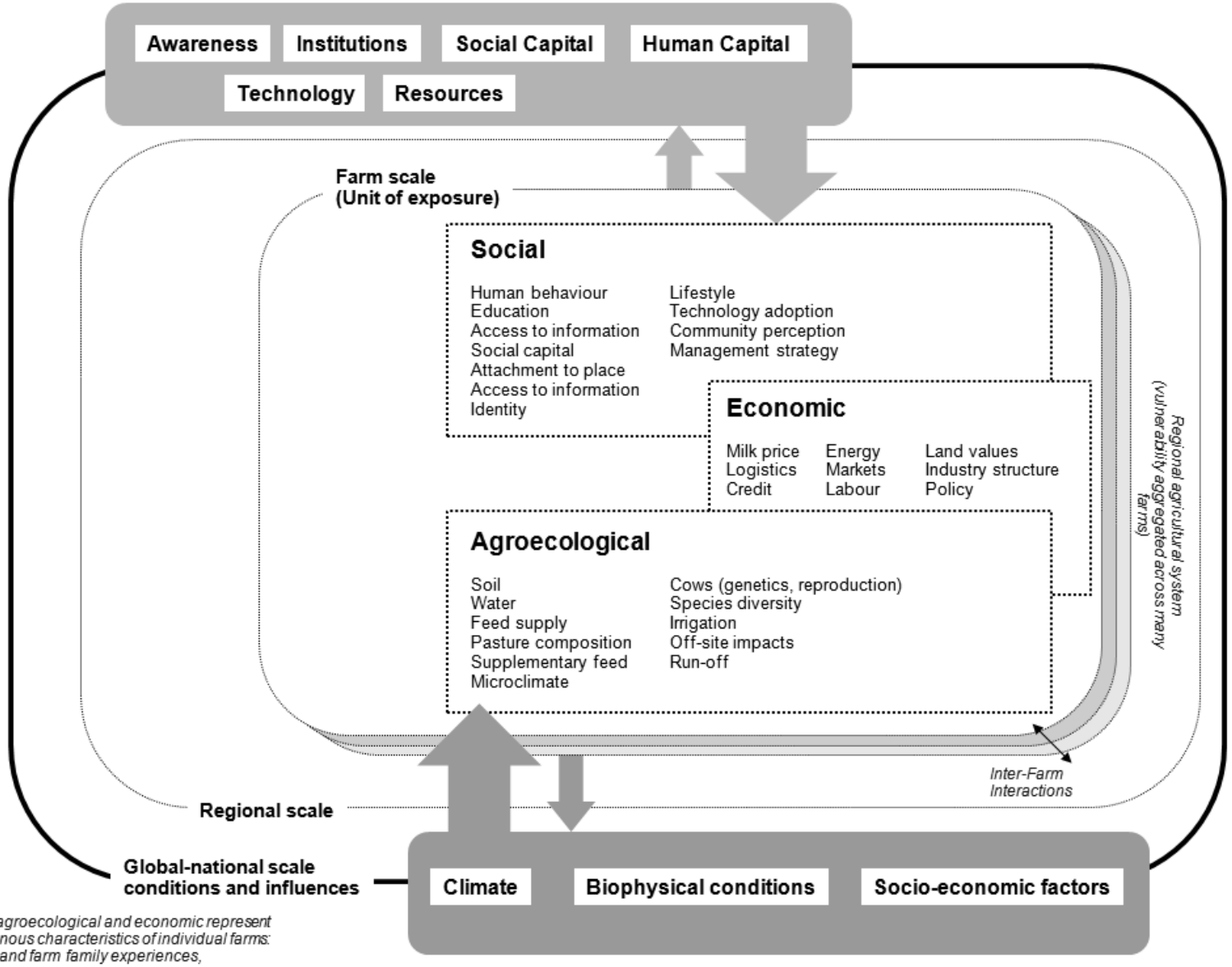
"Bottom up"

"Resilience assessment"

Interaction

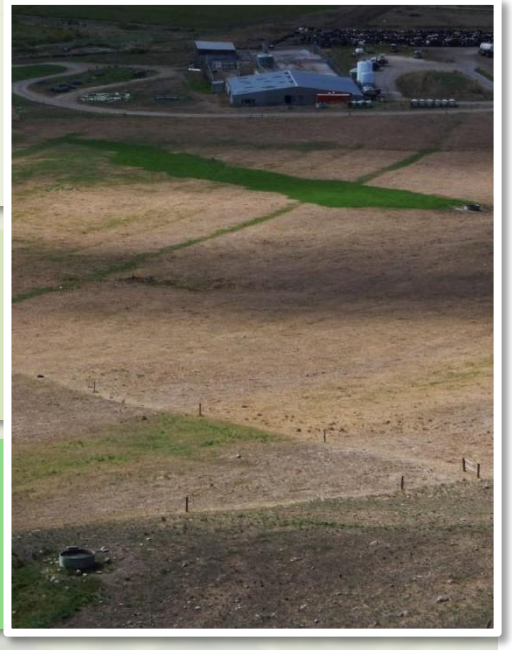
Farmers identify relevant risks

Farm-systems



Social, agroecological and economic represent endogenous characteristics of individual farms: Farmer and farm family experiences, perceptions, resources, farm location, condition, equity, etc.

Resilient systems…

	Buffering capacity	Self Organisation	Adaptability
Agro-ecological			
Social			
Economic			

Resilience-based Indicators

Identify Indicators

- Review literature
- Identify indicators
- Develop and validate framework for testing and application

Our assessment considered:

Suitability. Are the characteristics of 'resilient dairy farms' sufficient to characterize resilience? And are these, in turn, robust enough to indicate future adaptability to climate change?

Self-contained. Were there additional factors that needed to be accounted for, not present in the original framework? Are the indicators complete?

Scale. Were conditions at farm level influenced by higher scales? And if so, how?

Synergy. Are there interrelationships between factors that influence resilience

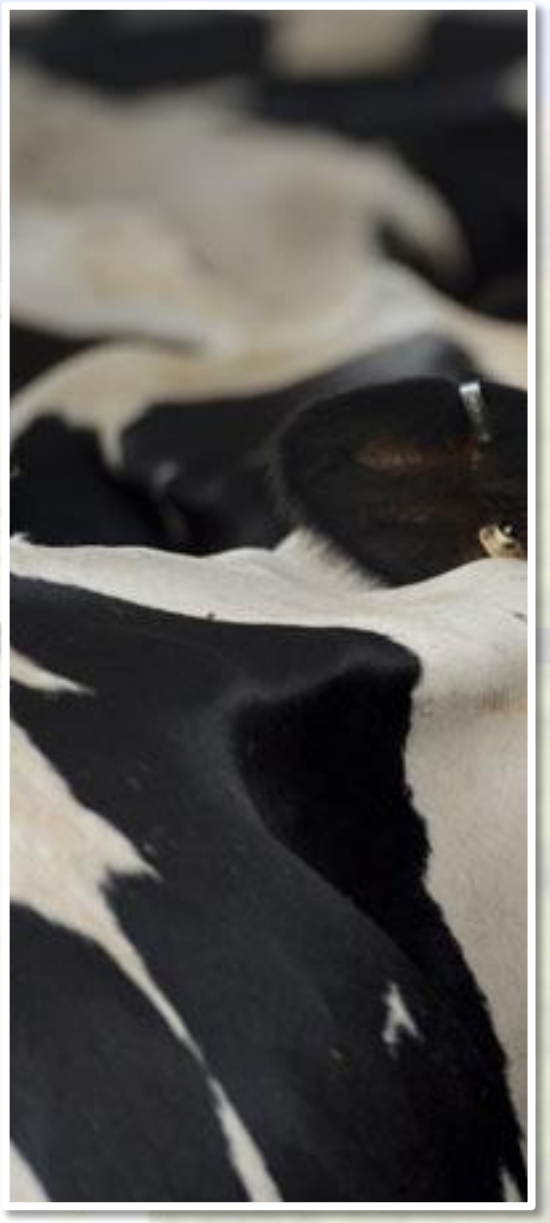
Agro-ecological

- Location constraints/opportunities
  - Exposure to flood, potential sea level rise
  - Rainfall amount
- Soil characteristics and management
  - Building buffering capacity of soil
  - Visual soil assessment
- Pasture, feed and stock management
  - Species diversity
  - Grazing management
  - Supply chain for feed
  - Stocking rate
- Water security and quality
- Trees for shelter, shade, stock fodder, bees

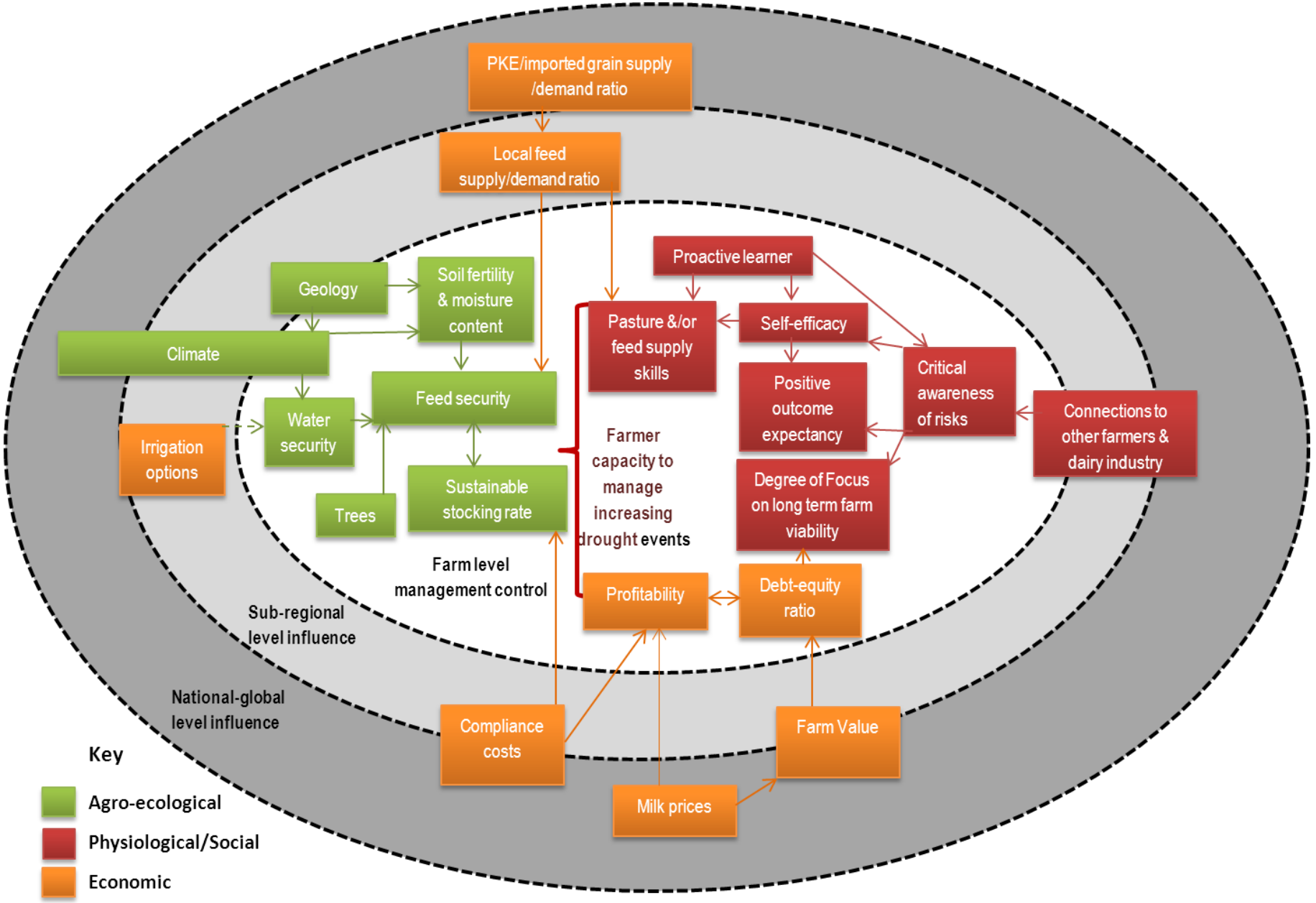
Social

- Awareness of risk
  - Understand risks associated with climate change
- Positive outcome expectancy
- Ability to plan, learn and reorganize
- Attachment to place
- Environmental values
- Social capital
  - Informal and collective life of a community
- Trust in and participation with government
  - Confidence in risk information
  - Participation in decision-making

Economic



- Financial resources
  - Includes social capital, e.g., relationship with bank manager
- Profitability
  - Margin on production
- Pluriactivity
  - Additional sources of income
- Feed security
- Management practices that reduce impacts of climate events
- Diverse local economy
  - Local economy not solely dependent on agriculture


PKE/imported grain supply /demand ratio
Local feed supply/demand ratio
Geology
Soil fertility & moisture content
Climate
Water security
Feed security
Irrigation options
Trees
Sustainable stocking rate
Proactive learner
Pasture &/or feed supply skills
Self-efficacy
Positive outcome expectancy
Critical awareness of risks
Connections to other farmers & dairy industry
Degree of Focus on long term farm viability
Farmer capacity to manage increasing drought events
Farm level management control
Profitability
Debt-equity ratio
Sub-regional level influence
National-global level influence
Compliance costs
Milk prices
Farm Value
Key
Agro-ecological
Physiological/Social
Economic

Methodology

Identify Indicators

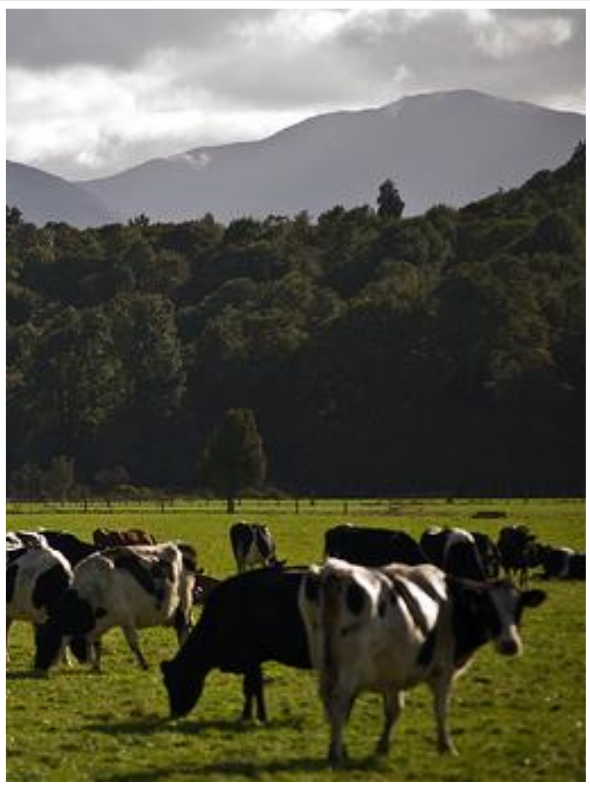
- Review literature
- Identify indicators
- Develop and validate framework for testing and application

Operationalize Indicators

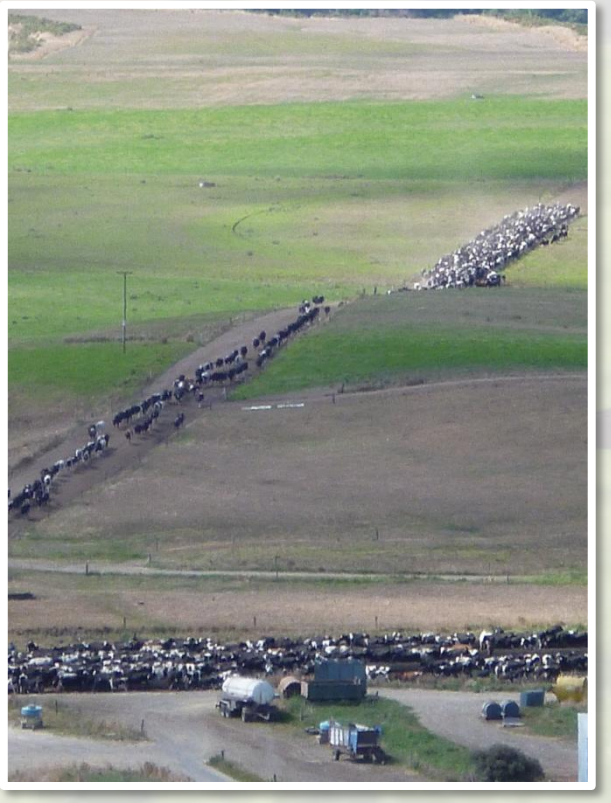
- Identify stakeholder-participants
- Operationalize indicators at farm level: data collection
- Characterise resilience

Dairy systems

Organic/Biological



Low input



High input

Study area

Catchment	Low Input	High Input	Organic/ Biological
Tauranga Harbour	**	*	
Te Puke	*	*	*
Rotorua Lakes	**	*	
Rangaitaki Plains		**	*
Opotiki	*	*	*

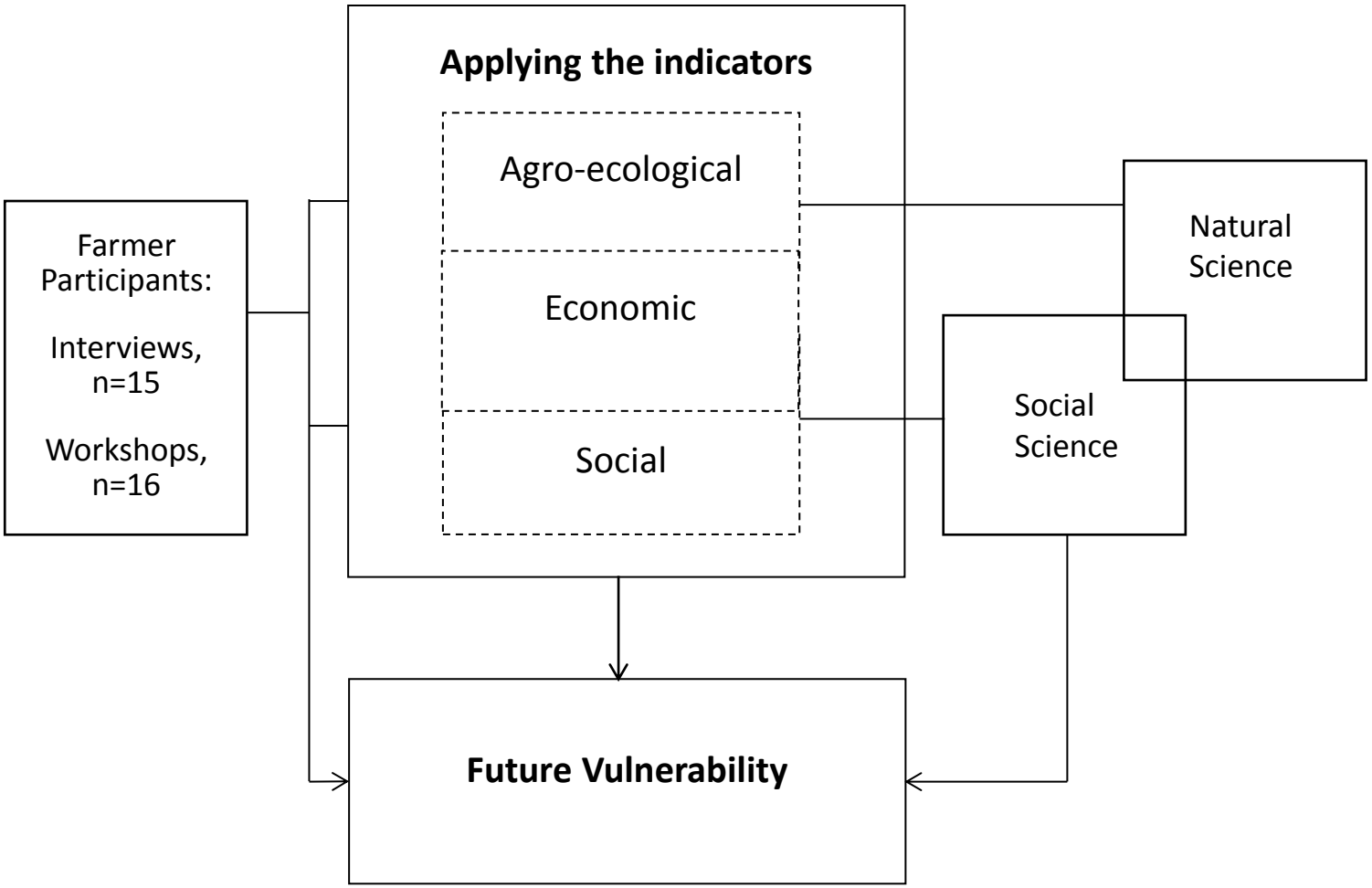
n = 15

Study Area

"Legacy effects" and historical development

- Drainage of the Rangaitaki
- Prograding shoreline
- Tectonic activity
- Peat shrinkage

Framework



Spatial and temporal analogues, case studies

Climate change

- Biosecurity effects
  - Spread of new and existing pest plants
  - Greater abundance of existing animal pests
  - Greater survival of a range of insect pests
- Indigenous biodiversity effects
  - Shifts in suitable climate zones
  - Strong impacts from increased weather extremes
  - Changes to ecosystem productivity
  - Disruption to coastal and freshwater ecosystems

Pastoral farming

- More extreme weather events
- Changes in pasture composition
- Increased prevalence of pests and diseases
- More difficult to manage to the climate
- Animal health issues

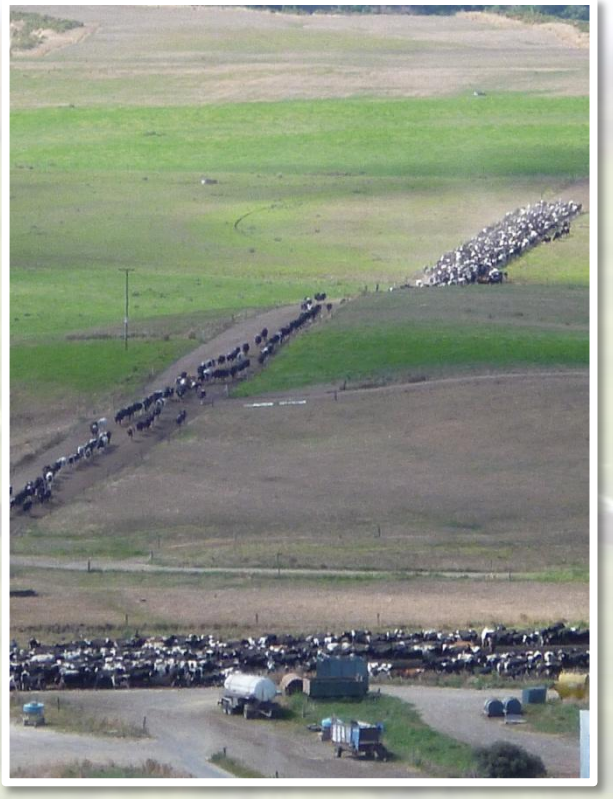
Dairy systems

- Impacts on pasture production
- Buffered:
  - Financially - premium for milk
  - Ecologically – improved soil fertility
- Rules and regulations *(less flexible)*
- Less-resilient overall (short-term)

Organic/Biological

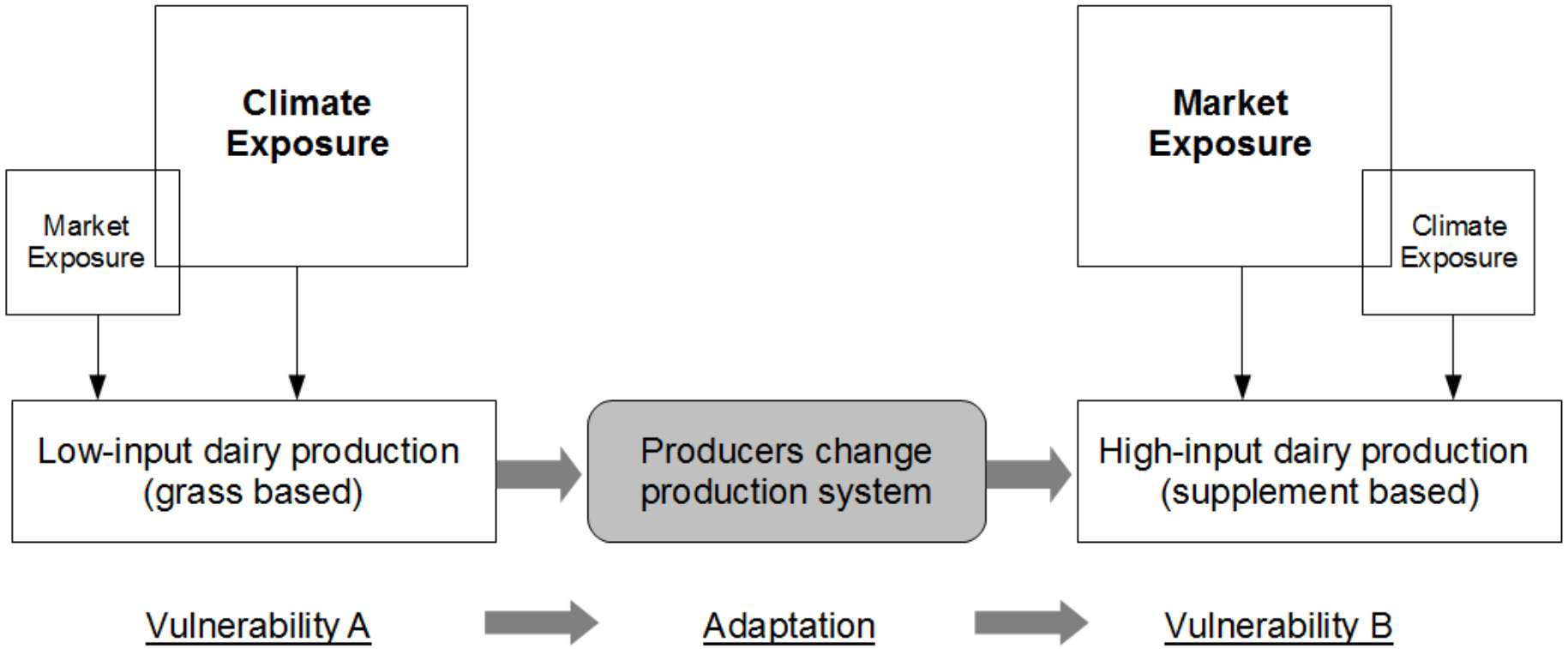
Dairy systems

- Exposure to volatile costs
  - Price
  - Availability
- Long-term security of supply
- Environmental limits
- More resilient in short-term;
  Long-term?



High input

‘Dynamic’


Climate Exposure
Market Exposure
Market Exposure
Climate Exposure
Low-input dairy production (grass based)
Producers change production system
High-input dairy production (supplement based)
Vulnerability A
Adaptation
Vulnerability B

Dairy systems

- More exposed to climate, and not immune from market risks
- More proactive
- Capacity for change?

Low input

Methodology

Identify Indicators

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Operationalize Indicators

- Identify stakeholder-participants
- Operationalize indicators at farm level: data collection
- Characterise resilience

Evaluate Indicators

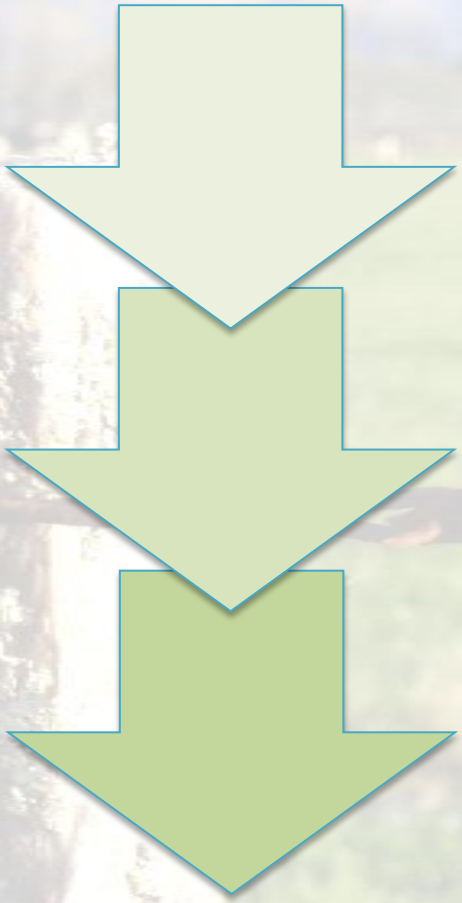
- Analysis and reporting
- Evaluate potential for scaling up, and longitudinal study
- Scoping of pathways into sustainability frameworks

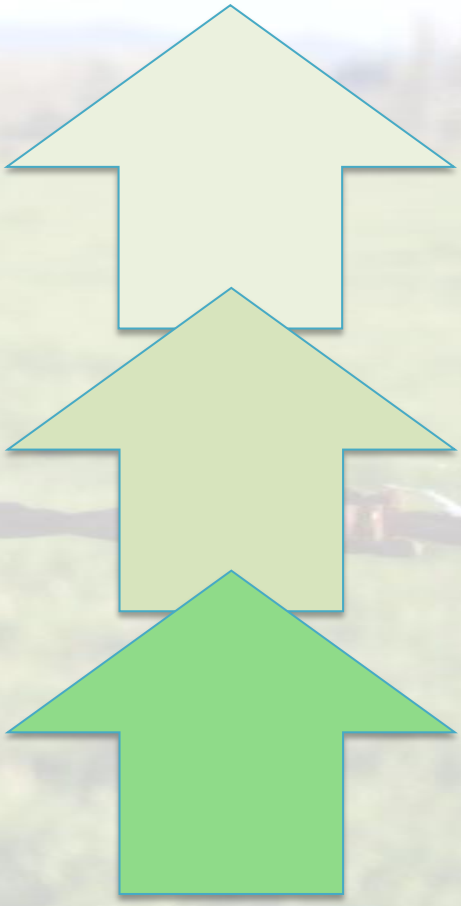
Key-findings

- 'Multi-risk multi-opportunity' f broad scale climatic, biophysical, social, institutional and economic forces
  - Resilience to climate change should not be considered in isolation
- Adaptive strategies reduce vulnerability; varies between management practices.
- Future vulnerability f changed climatic conditions and context
- New Zealand agricultural producers are (uniquely) exposed to global pressures that may exacerbate risks.

Across scales

- Micro (farm)
  - Exposure
  - Soil condition
- Meso (local, regional)
  - Functionally diverse
  - Catchment limits
- Macro (national, global)
  - Long vs. short chains
  - High-/Low-carbon pathways





Building resilience

Drought that ravaged US crops likely to worsen in 2013, forecast warns

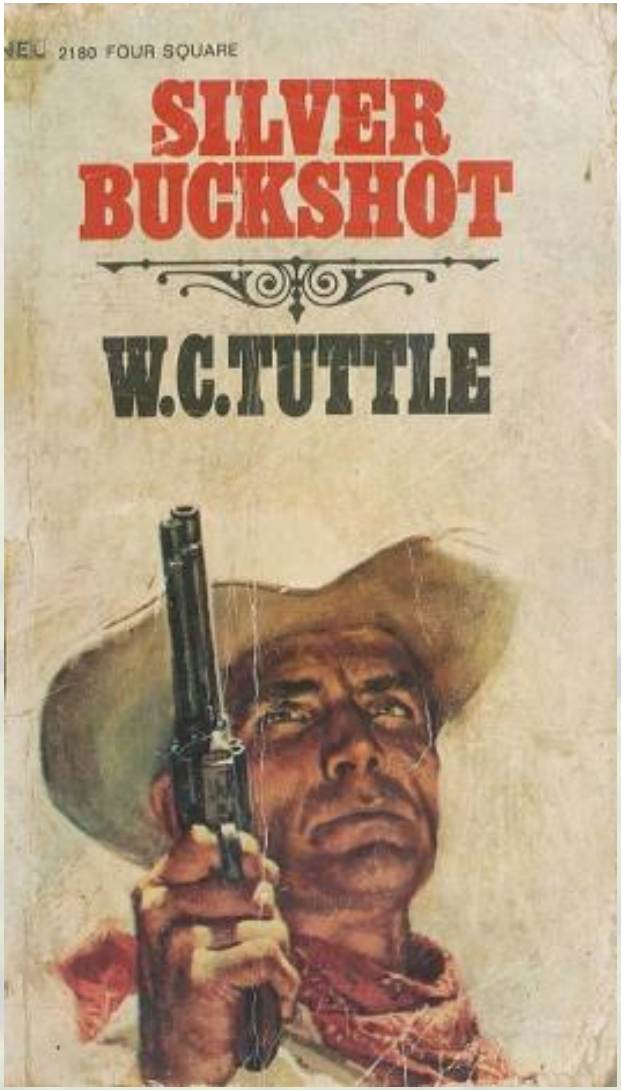
"…The NOAA scientists hope their prediction that this year's drought season is starting off worse than last year's—and that it will last at least another six months—can help farmers make better decisions about what to plant.

But Bob Young, the chief economist for the American Farm Bureau Federation, the nation's largest farm organization, said that while the heads-up may influence some crop decisions, most farmers probably won't pay attention to the scientific findings."

Belief in the risk, belief in the solution, belief in ability to implement that solution.

Building resilience

- Identify:
  - Thresholds and tipping points: safe operating space
  - Adaptation interventions
  - Policies to increase resilience and support transformation
  - ‘Cloudburst approach’
  - “Honest brokers of adaptation options” (Pielke 2007)




A drought has no effect
on the N.Z economy
Yeah right.
Tui
ABC

Ministry for Primary Industries
Manatū Ahu Matua

SLMACC-LCR30487

Landcare Research
Manaaki Whenua

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