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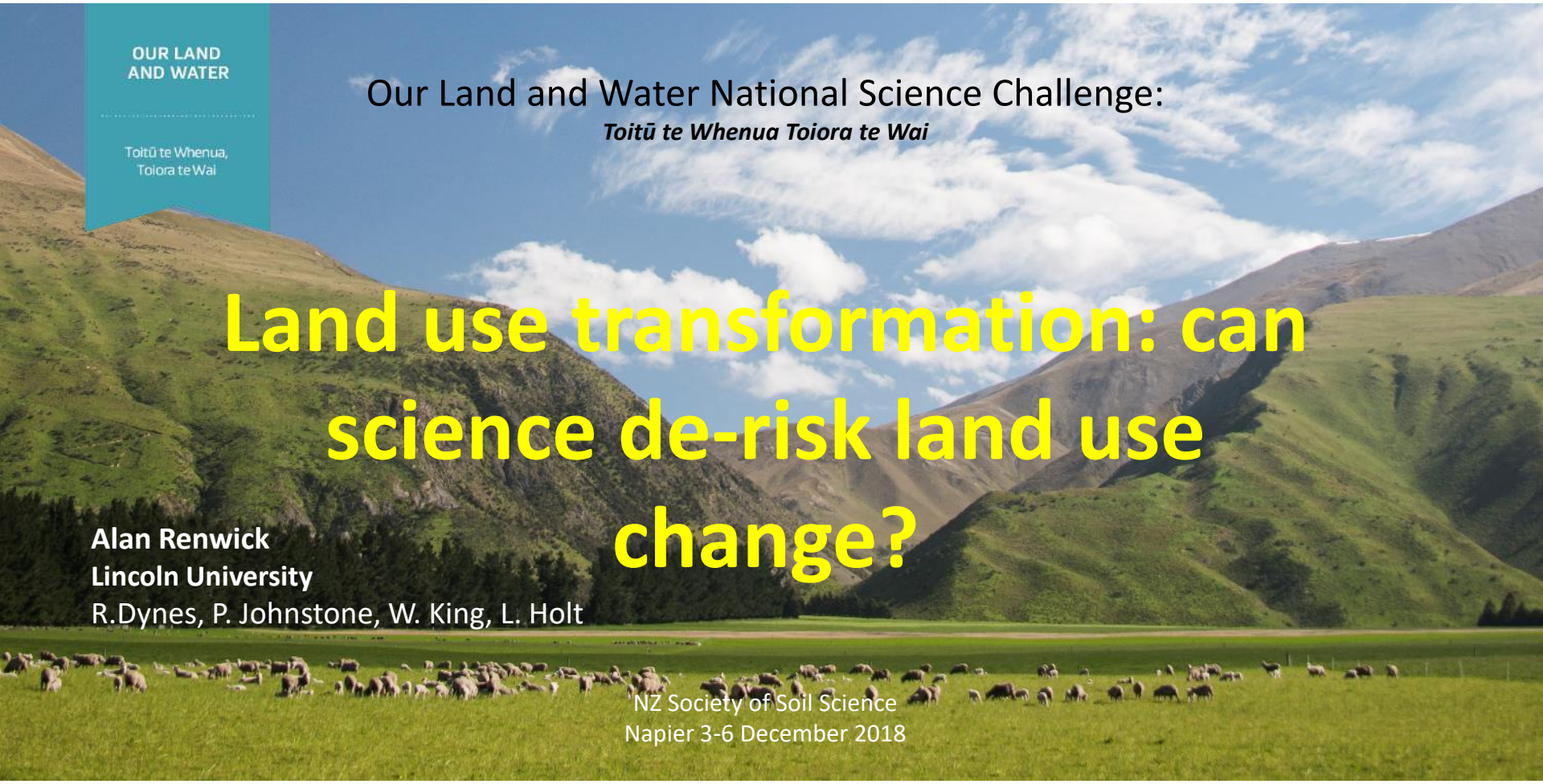

Our Land and Water National Science Challenge:
Toitū te Whenua Toiora te Wai

Land use transformation: can science de-risk land use change?

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NZ Society of Soil Science
Napier 3-6 December 2018

Summary

- Transformation is required in our land-use systems
- Transformation occurs at the land-manager level
- It is context specific
  - Spatially varies according to drivers
  - Individual situation
- System change is risky and this can hold up transformation
- Understanding the decision making process gives us insights into what is required to facilitate change:
  - Production Science
  - Supply chain development
  - Market development
- Science may not completely de-risk land-use transformation but by providing the right information to the right land-managers it may be possible to reduce the risks involved in transformation and speed up the process

Pushing Against our Boundaries?

New Zealand has had a successful growth model based on traditional farm enterprises

However, according to the OECD (2017), the country is experiencing:

- unprecedented levels of water scarcity and quality issues,
- very high per capita greenhouse gas (GHG) emissions,
- threats to biodiversity, and
- significant erosion.

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Transformational Change

NZ is facing both external and internal challenges to its current model of primary production

Business as usual or even incremental change is not sufficient to enable these challenges to be addressed

Cutting edge technology key to meeting GMP

News archives

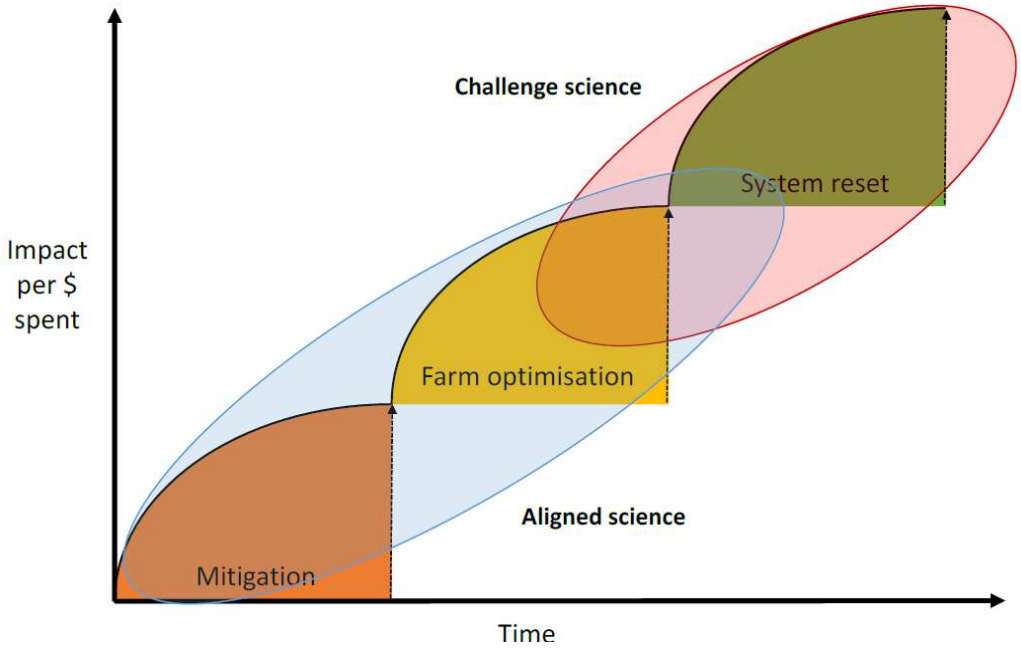
Transformational Change

Solutions to the complex challenges facing the land-based sectors must provide opportunities beyond systems optimisation to transformational change

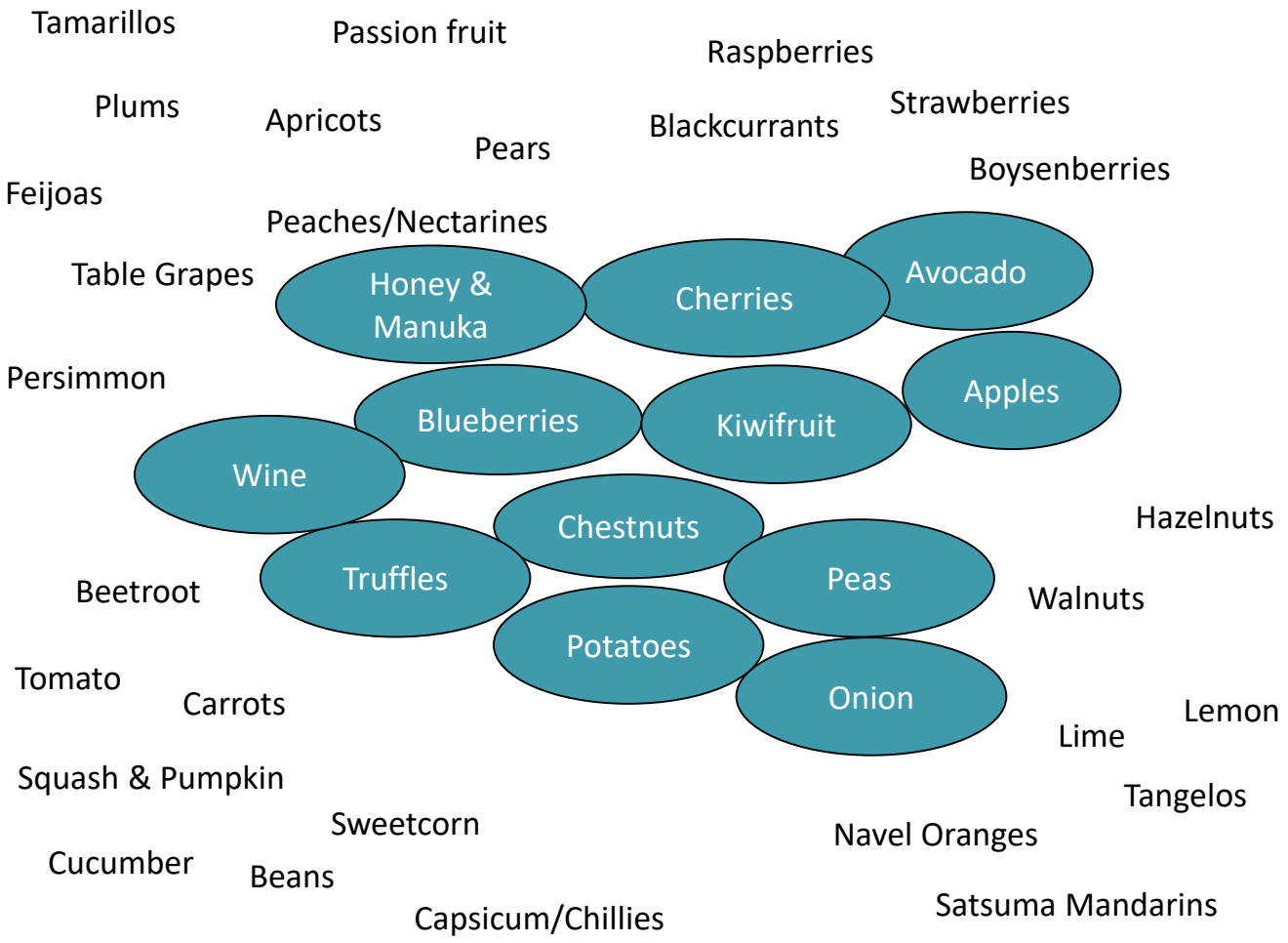
This is the area where the Our Land and Water National Science Challenge sits

Concerned with identifying NGS and engaging with land-use managers to support the process of transformation

De-risking Land-use transformation



Range of Land-Use and System Changes



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Where do Systems/Technologies Fit In?

Adoption of new systems/technologies generally involves some risk to the business

- Unproven in farm situation
- Require capital Investment
- Changes in management practice
- Changes in farm system
- Learning
- …

However also have the potential to be part of risk management strategies for businesses

- Selection of less risk systems/technologies
- Improved profitability
- Reduce variability in product
- …

Decision making and Risk

Decision-making takes place in an environment of imperfect knowledge of the future - *Uncertainty* - and is associated with **Risk** which is normally defined as "uncertainty of outcomes" resulting in losses negatively affecting an individual's welfare

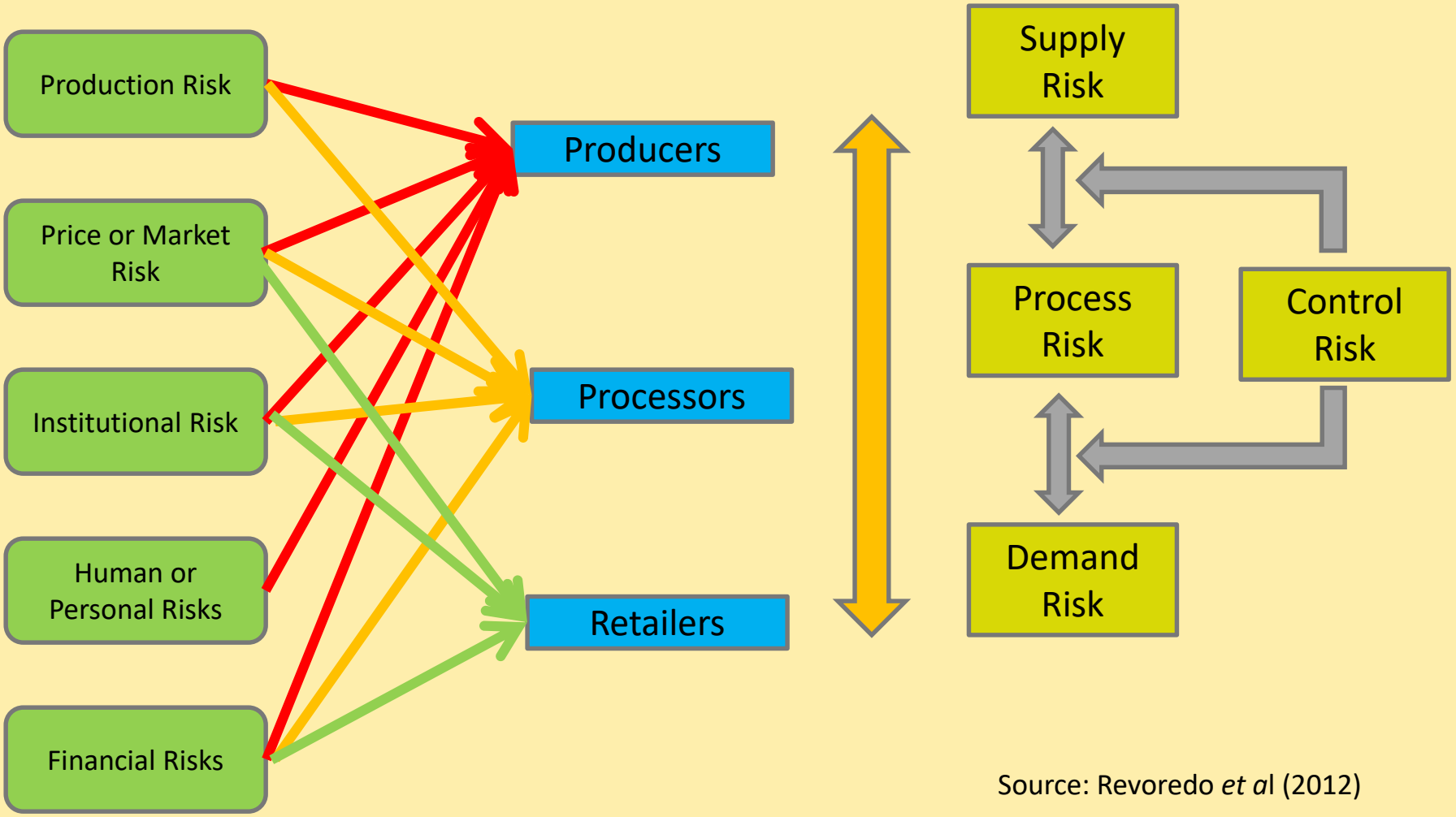
Resilience is simply defined here as the ability to withstand shocks to the business (Economic, Climatic etc)

Source: Hardaker, Huirne and Anderson 1997; Meuwissen, Huirne and Hardaker 1999

Risks at Individual Level

Who Bears the Risk?

Supply Chain Risks



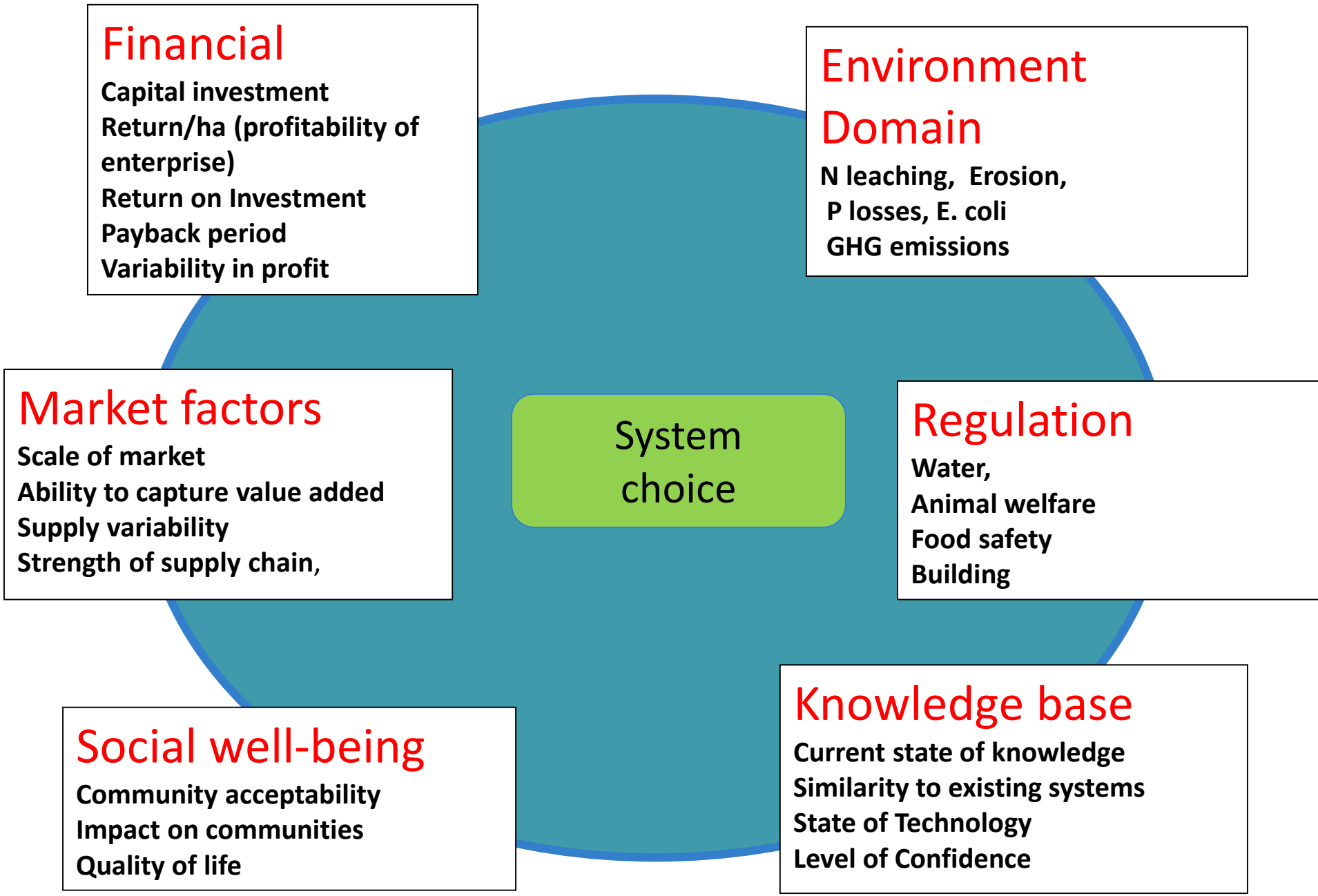
Source: Revoredo *et al* (2012)

Environment Risk

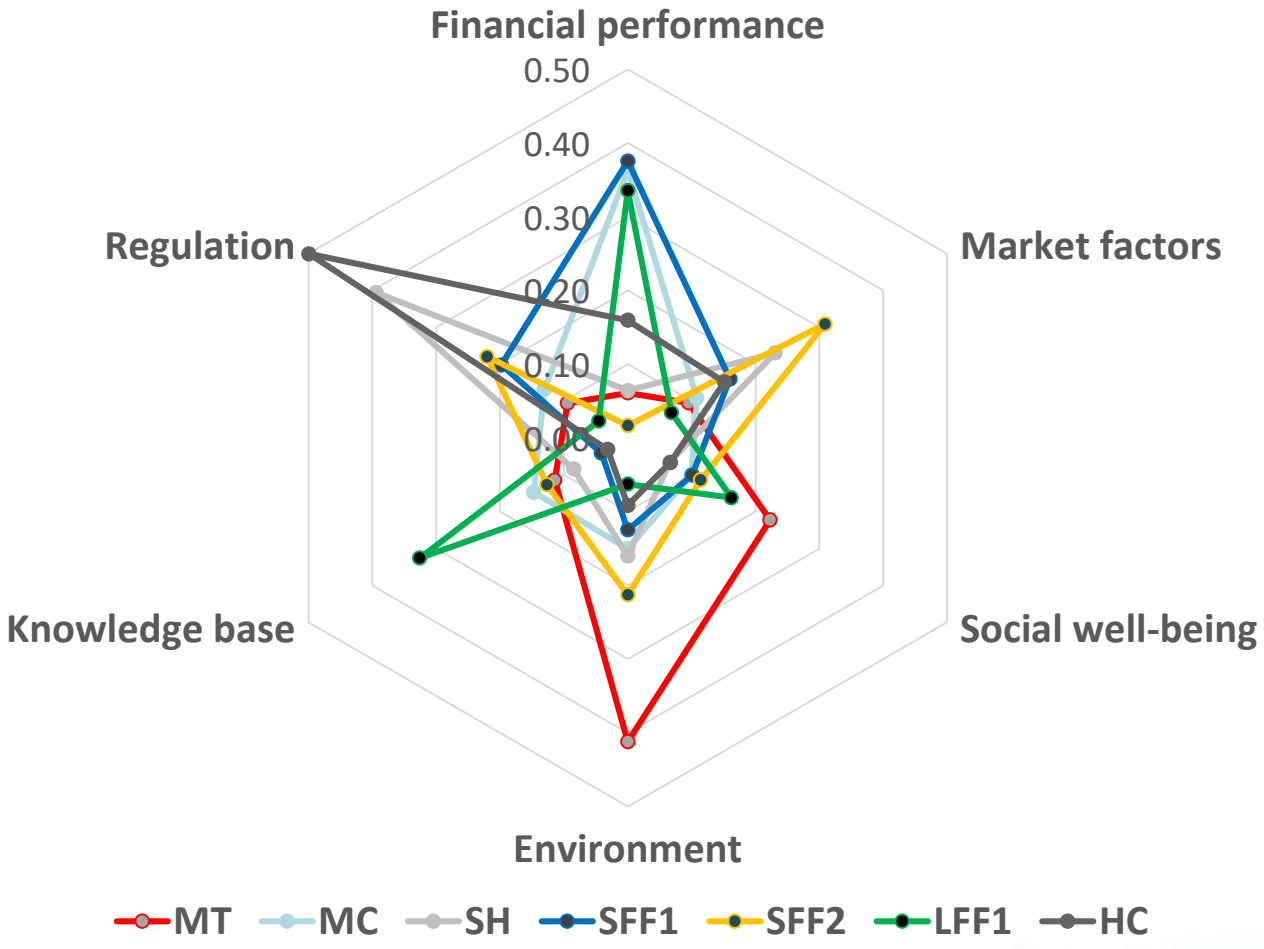
Using MCDM to understand

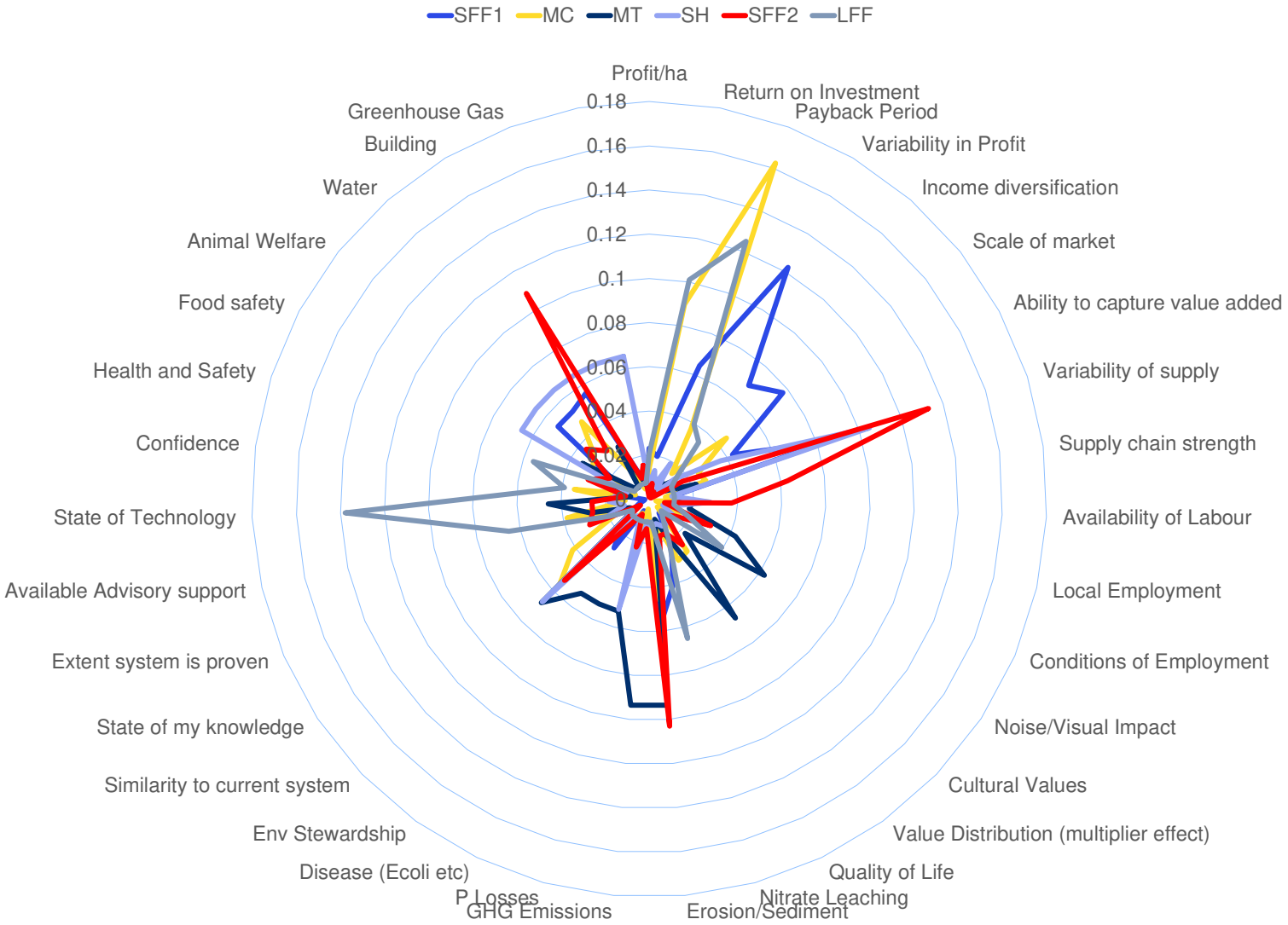
Change of system or land-use is obviously a complex decision making process involving trade-offs across a number of dimensions – social, environmental, economic etc.

Multi-criteria Decision Making Analysis is well suited to capturing these trade-offs and has been widely used including in projects considering sustainable land-use


Financial
Capital investment
Return/ha (profitability of enterprise)
Return on Investment
Payback period
Variability in profit
Environment Domain
N leaching, Erosion,
P losses, E. coli
GHG emissions
Market factors
Scale of market
Ability to capture value added
Supply variability
Strength of supply chain,
System choice
Regulation
Water,
Animal welfare
Food safety
Building
Social well-being
Community acceptability
Impact on communities
Quality of life
Knowledge base
Current state of knowledge
Similarity to existing systems
State of Technology
Level of Confidence

Domain Importance for System Change

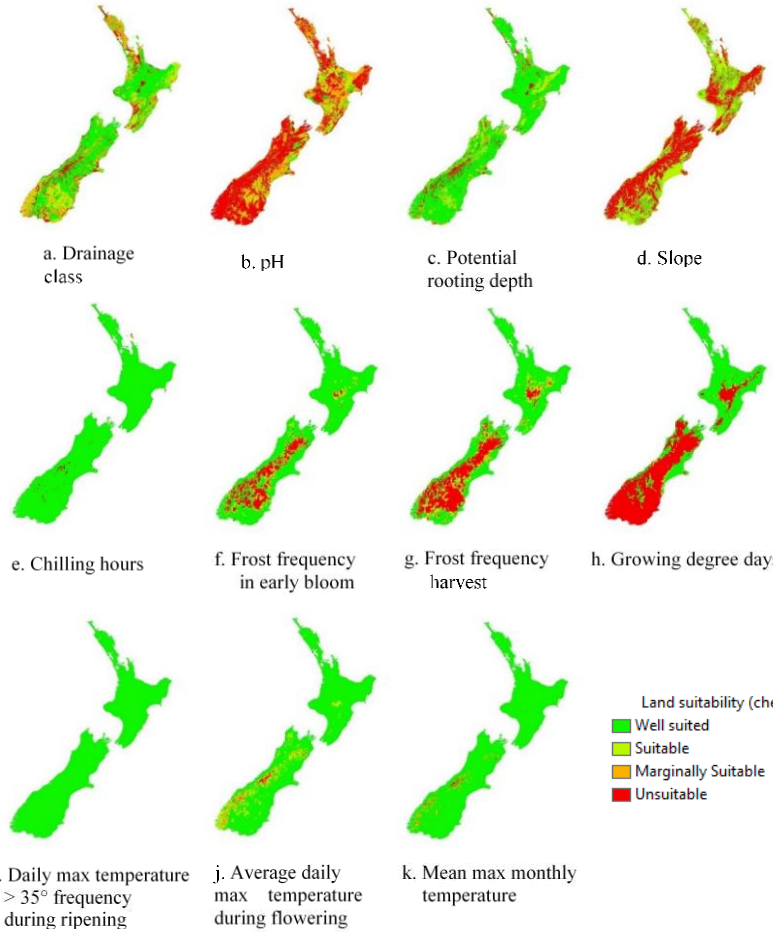


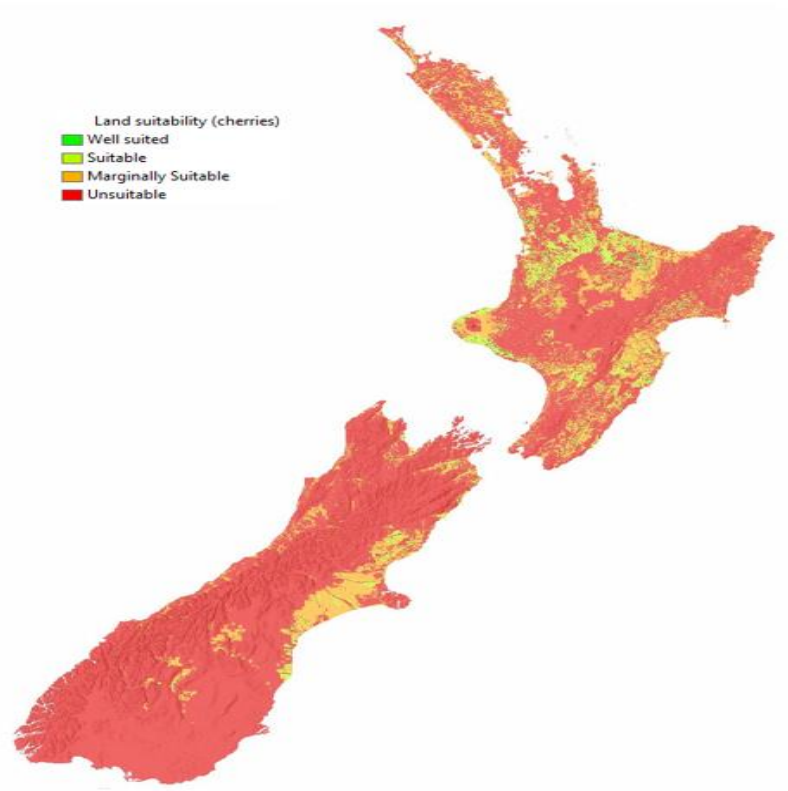

SFF1
MC
MT
SH
SFF2
LFF
Profit/ha
Return on Investment
Payback Period
Variability in Profit
Income diversification
Scale of market
Ability to capture value added
Variability of supply
Supply chain strength
Availability of Labour
Local Employment
Conditions of Employment
Noise/Visual Impact
Cultural Values
Value Distribution (multiplier effect)
Quality of Life
Nitrate Leaching
Erosion/Sediment
GHG Emissions
P Losses
Disease (Ecoli etc)
Env Stewardship
Similarity to current system
State of my knowledge
Extent system is proven
Available Advisory support
State of Technology
Confidence
Health and Safety
Food safety
Animal Welfare
Water
Building
Greenhouse Gas
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04

Can Science De-risk

- In this context it can highlight the areas where *knowledge/information* can support the transformation:
- What is important to the decision maker?
- Do we know the answers?
- If not what *Science* is needed to fill the gap*?*
  - Production (how to grow, suitability for the farm etc)
  - Environment (nitrate leaching, GHG emissions etc)
  - Supply chain (existence of processing, logistics etc)
  - Markets (is there a market, where is it)
  - Etc
- Filling the gaps can reduce the risk if not remove it

An Example: Suitability





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