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Strong biological networks for sustainable production

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Organisms don’t recognise boundaries

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Why are biological networks important?

- Current processes are degrading our landscapes:
  - Water quality decreasing
  - Loss of top soil
  - Climate change
  - Loss of habitat, reduced biodiversity
  - Reduced cultural values
- Pressure to change, e.g., reduce pesticides:
  - Food safety – reduced MRLs
  - Pesticide resistance in insect populations
  - Biosecurity incursions – disrupt pest control regimes

Biological Network Strength

- Strong biological networks can deliver environmental benefits and ecosystem services, including
  - Improved air, soil and water quality (e.g., biofilters)
  - Mitigation of natural hazards (e.g., natural barriers)
  - Pest and disease suppression (e.g., biocontrol agents)
  - Nutrient and water cycling (e.g., mycorrhizal communities)
  - Provisioning of habitat (e.g., increased biodiversity)
  - Cultural values (e.g., Aiopipi (the natural state of calm and balance between things)

- Can we enable land managers to produce resilient ecosystems for sustainable production by building strong biological networks?

Building biologically functional landscapes

Choice of plants to provide a number of benefits:

- Fuel, food, forage, fibre, medicine
- Soil stabilisation and erosion control
- Local climate regulation (e.g., shade)
- Spiritual values, inspiration
- Provisioning of stable habitat

Habitat for invertebrates:

- Pest and disease suppression
- Pollination
- Nutrient and water cycling
- Taonga, Biodiversity

Habitat for vertebrates:

- Pollination
- Pest control
- Taonga, Biodiversity

Habitat for micro-organisms:

- Soil formation
- Nutrient and water cycling
- Waste treatment
- Disease suppression

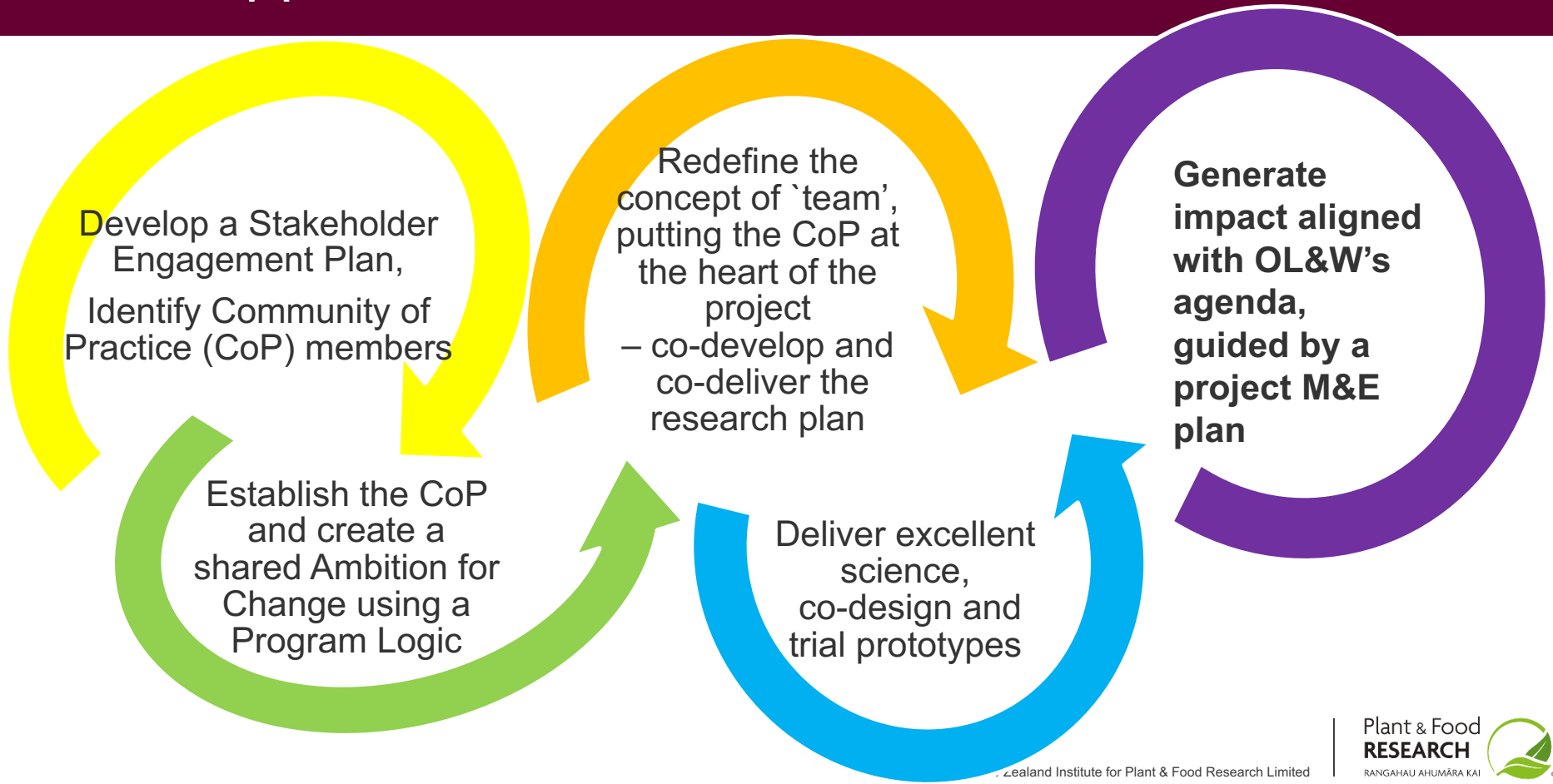
E.g.: Selecting plants to grow at crop margins

Plant attributes	Some data sources
Will grow in current environment – including consideration of surrounding land-uses	NZ Soils, topographical maps, satellite data, Local and Māori knowledge
Will not support crop pests	Plant-SyNZ, MPI PPIN
Will support beneficial invertebrates (e.g., crop pollinators, natural enemies of pest insects)	PFR Invertebrate database LCR Invertebrate collection
Support mycorrhizal and bacterial communities that benefit the soil (e.g. improved structure or decreased contaminants) and water (e.g. Biofilters)	NZBH eDNA database CAREX OVERSEER?
Adaptation or reduction of climate change effects	Known plant functions/uses
Improved cultural values	IPBES

Aim

- Combine existing and new data to enable land managers to build strong, resilient biological networks across landscapes
- Maximise beneficial biota + ecosystem services
- Minimise pests, weeds, diseases
- Te Ao Turoa (the generational concept of resource sustainability)
  - Harmsworth and Awatere 2013
- Co-innovate within a transdisciplinary community

Our approach to co-innovation



Establish a community of practice (CoP)

CoP directed research:
Diverse community,
Open engagement,
All knowledge valued,
Flexible,
Adaptable,
Inclusive

Listening

Toolbox:
Mentor: Tracy Williams
Develop a shared vision
Using programme logic
Monitoring and evaluation plan

Not just science- driven

Critical stakeholder analysis:
Regular workshops
Ongoing testing and development
Co-design next steps
Solutions from interactive learning

Changing perspectives

Community of Practice

- Connections established:

Zespri	Bay of Plenty Regional Council	Manaaki Whenua Landcare Research
FAR		
DairyNZ	The Catalyst Group	Waikato University
Macadamias NZ	AgResearch	Canterbury University

- We need to engage with more groups, through stakeholder engagement plan, for example:
  - Iwi and hapu
  - DOC and environmental groups
  - Other regional councils
  - Land managers/owners

Links to increase outcomes across programmes

- National Science Challenges NZBH + Deep South + OLW (Current and future)
- The New Zealand Sustainability Dashboard
- BEST
- IPBES
- CAREX
- ...

Needs:
Data sharing
No duplication
Mutual benefits

Existing databases:

- MPI PPIN
- PlantSynz
- NZ Soils
- Eco Invertebase
- Satellite data
- ...

How can we measure the impact of stronger biological networks?

- Many options – physical and cultural measurements
- Guided by our CoP who will help monitor and evaluate impact
- Some possibilities:
  - Change in land-use/vegetation across landscapes:
    - Monitor via satellite data
    - Land-manager survey: what changes and why (e.g., economic or environmental)?
  - Change in water quality:
    - Monitor via physical and biological properties
    - Fewer media reports of water contamination?

How can we measure the impact of stronger biological networks?

- Fewer pest and disease outbreaks:
  - Monitor (e.g., using environmental DNA (eDNA) samples)
  - Reduced agri-chemical purchase and usage?
- Restoration of biodiversity through landscapes:
  - Monitor (e.g., citizen science, eDNA samples)
  - Increased use of biodiversity in marketing of produce?
  - Survey of cultural values: e.g., has Aiopipi been restored?
- Food Safety concerns:
  - Monitor (e.g., meeting MRLs, biosecurity requirements)
  - Producers using proof of sustainability (e.g., Synlait ‘Lead with Pride’ programmes)?
  - Consumer preferences for sustainably produced product?

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Thank you

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