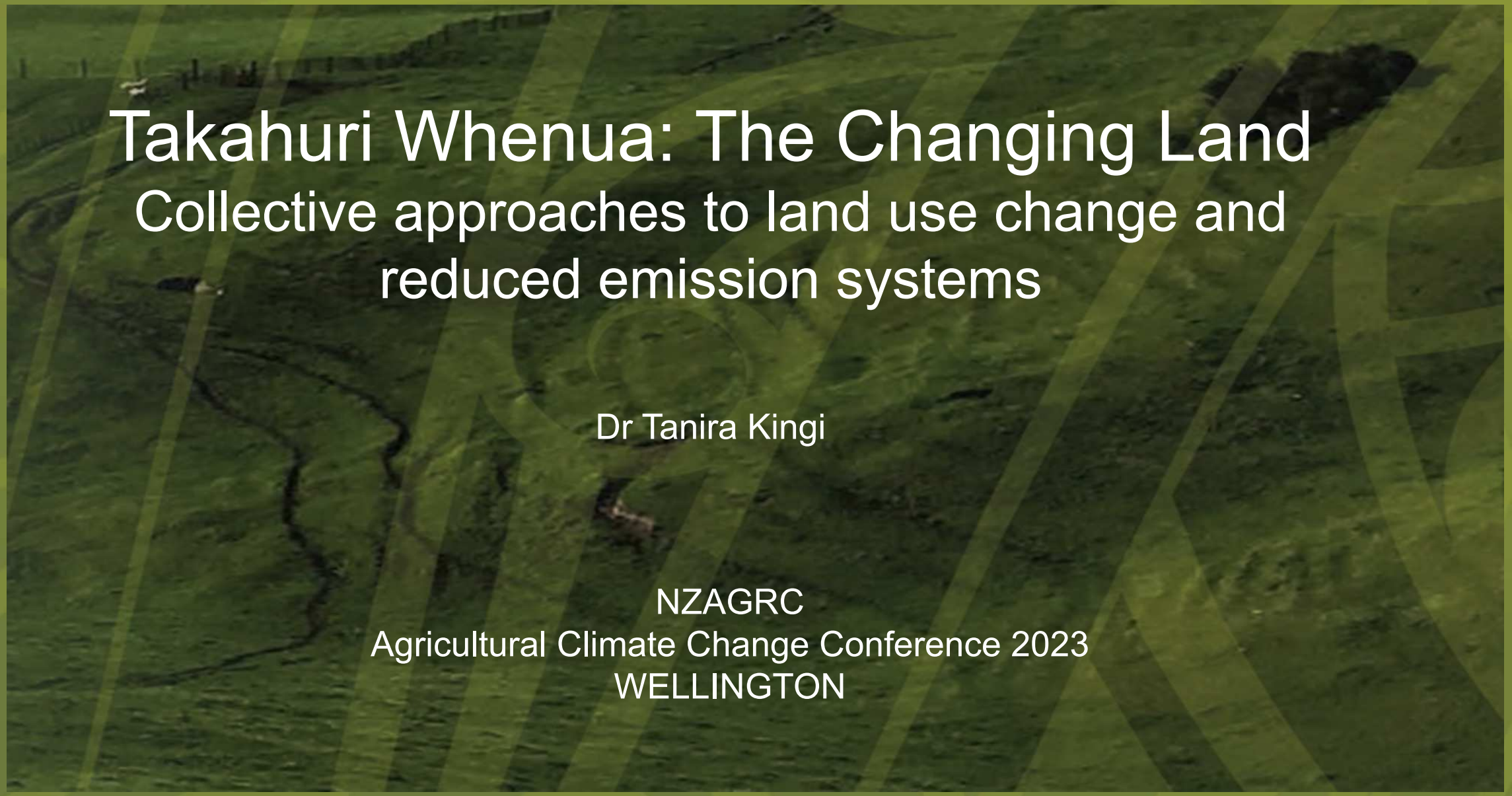


Takahuri Whenua: The Changing Land

Collective approaches to land use change and reduced emission systems

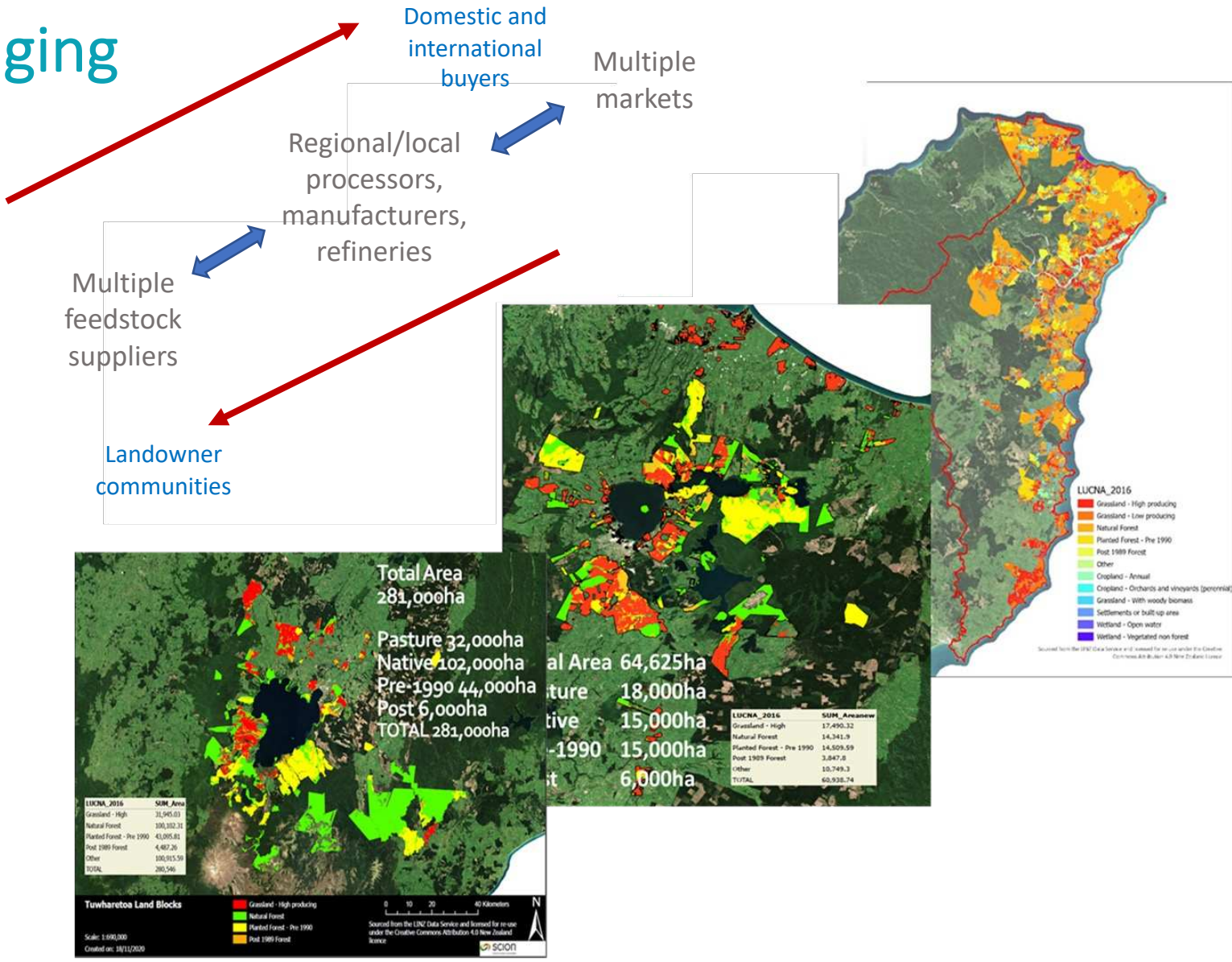
Dr Tanira Kingi

NZAGRC
Agricultural Climate Change Conference 2023
WELLINGTON

Takahuri Whenua: The Changing Land

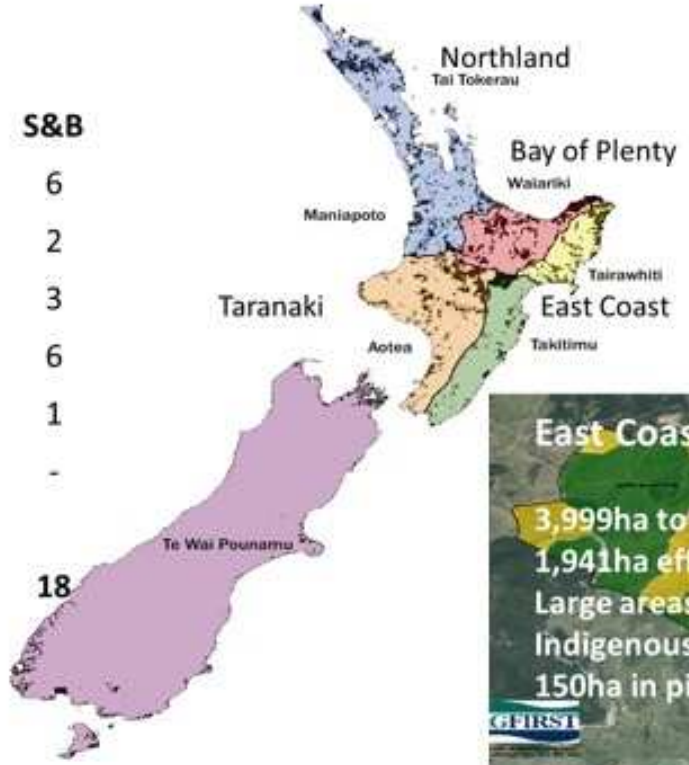
- Decision support framework
- 18 farms across 2 collectives and 1 partnership
- Stage 4 of a programme that started in 2014

1. How do we move from modelling single farms to **collectives of farms** (i.e. how do we scale up?)
2. What can farmers do to **position** themselves to diversify to meet regulations and more demanding market requirements?



Stage 1 (2014-2017): Network & Case Farms

	Farms	Dairy	S&B
Taitokerau	9	3	6
Maniapoto	4	2	2
Waiariki	5	2	3
Tairawhiti	6	-	6
Takitimu	2	1	1
Aotea	3	3	-
	29	11	18



Dairy 13.3t CO_2 eq/ha
S&B 3.9t CO_2 eq/ha

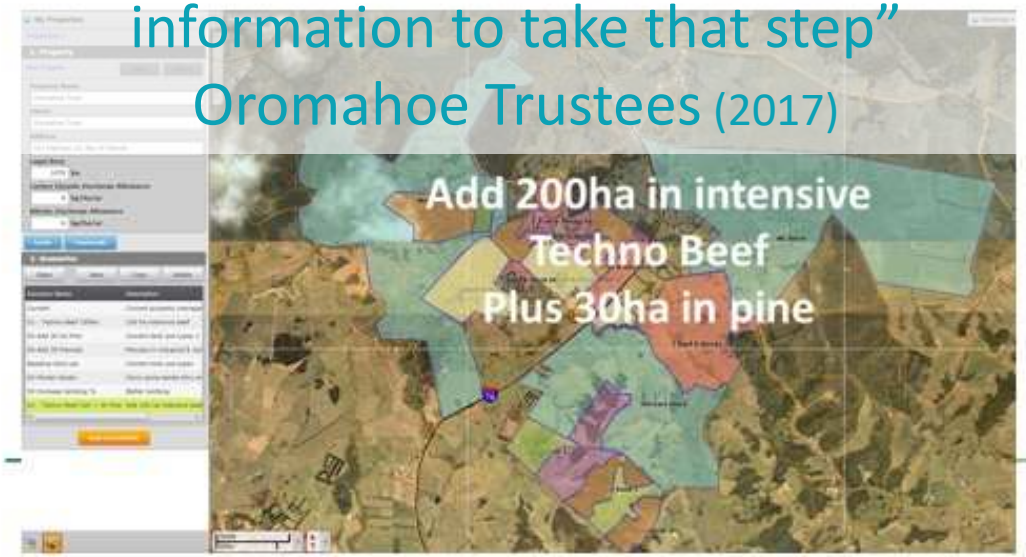
4 Case Study Farms

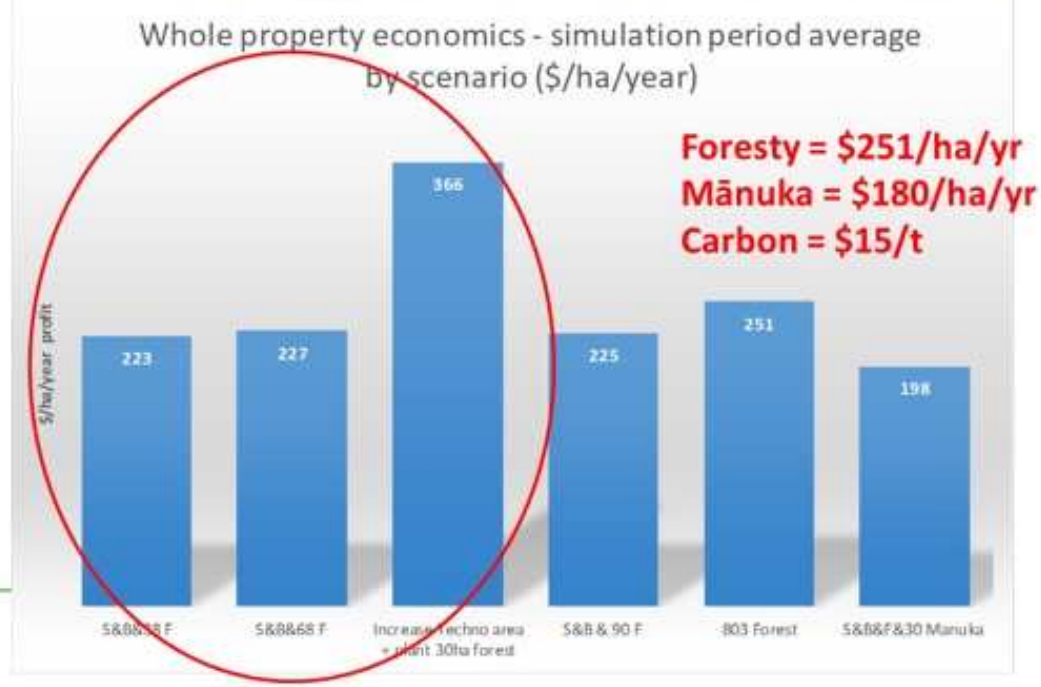
Project Team

Programme Leader:	Dr Tanira Kingi (AgResearch Ltd)
Programme Manager:	Phil Journeaux (AgFirst Ltd)
Research Team:	Dr Margaret Brown(AgR) Kelly Rijswijks (AgR) Dr Mark Shepherd (AgR) Steve Wakelin (Scion) Graham West (Scion)

Land Use Change Scenarios

"the framework helped us to make a decision that we'd been thinking about for a while but didn't have the information to take that step"
Oromahoe Trustees (2017)





Stage II Programme (2017-2019): Diversified Multi-Enterprise Entities

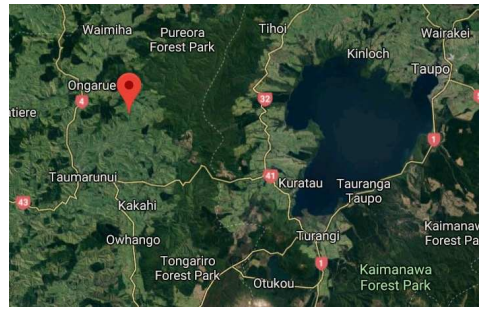
- What does it mean to be an elected representative with tiaki or guardianship responsibilities?
- Maintaining sustainable revenue streams for the landowners
- Onuku Trust diversification into dairy sheep & CNI collective

Onuku Maori Lands TRUST — Onuku, he taonga tuku iho; mo ake tonu atu.

2,362ha

TE URANGA B2

2,369ha



From Bovine to Ovine

From Country Life, 9:36 pm on 29 July 2022

Share this

Photo: Rudolph van Zuydam

Sparkle stands out in a crowd, you see she's the black sheep of the flock.

She was helped into the world two winters ago by the Onuku Māori Lands Trust chair Barnett Vercoe and she's one of 1800 mainly East Friesian sheep which the trust is milking on its property near Rerewhakaaitu, half an hour south of Rotorua.

https://www.rnz.co.nz/national/programmes/countrylife/audio/2018851354/from-bovine-to-ovine

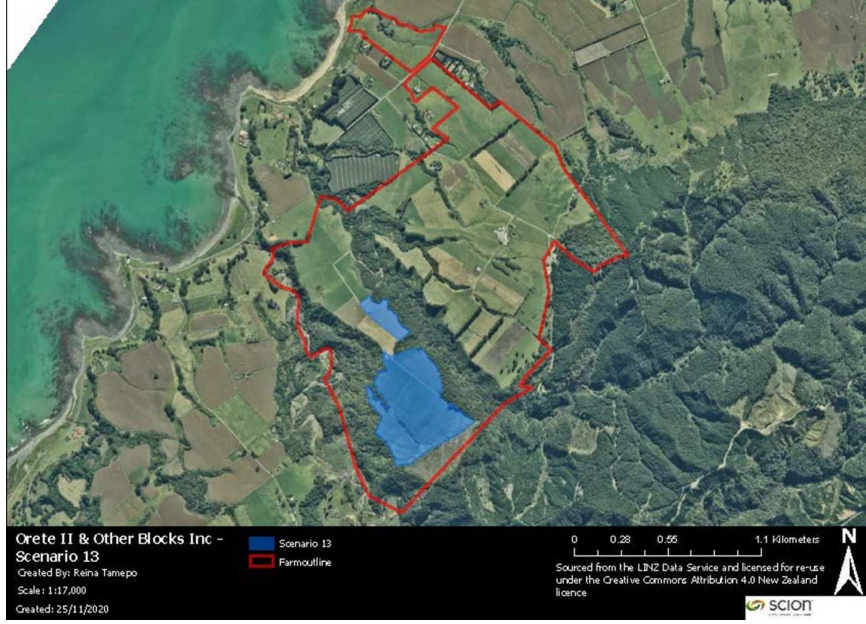
Stage III: Understanding the carbon price levy on dairy and livestock farms

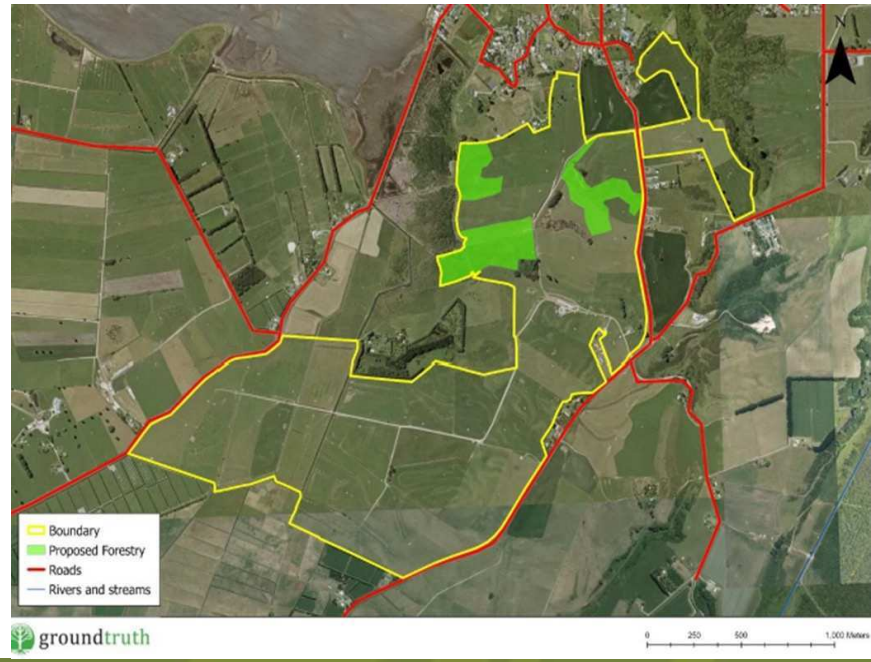
Table 12: Orete Scenario Impact on GHG Emissions and Farm Profitability

	Total property net CO_2e (T/ha)	Total GHG % change from Base	% Change in pastoral methane from base	% Change in pastoral Nitrous Oxide from base	% Change in methane from base, including forestry	% Change in Nitrous Oxide from base, including forestry	EBITDA ($ effective ha/yr)	% change from Base model
Base model	8.4						$1,056	
Reduce cow numbers 10% - no improvement in productivity	7.7	-8%	-8%	-9%	-8%	-9%	$685	-35%
Reduce cow numbers 10% - improve productivity	7.9	-6%	-6%	-6%	-6%	-6%	$1,409	33%
Reduce cow numbers 15% - improve productivity	7.5	-10%	-11%	-6%	-11%	-6%	$1,461	38%
Reduce replacement rate	8.3	-1%	-1%	0%	-1%	0%	$1,181	12%
No nitrogen fertiliser	7.8	-7%	-4%	-19%	-4%	-19%	$1,005	-5%
No bought supplementary feed	7.6	-10%	-12%	-1%	-12%	-1%	$837	-21%
No N fertiliser, No bought supplement	7.0	-17%	-16%	-20%	-16%	-20%	$883	-16%
10% of farm in pines	5.6	-33%	-8%	-9%	-33%	-34%	$981	-7%
10% of farm in pines, reduce SR 10%	5.1	-39%	-14%	-15%	-39%	-39%	$1,296	23%
31% of farm in pines	-0.3	-103%	-25%	-28%	-103%	-103%	$662	-37%
10% of farm in gold kiwifruit	7.7	-8%	-8%	-9%	-8%	-9%	$1,658	57%
24ha pines, reduce SR16%, differential offset	4.1	-51%	-13%	-12%	-38%	-100%	$737	-30%

Note: The "% change in pastoral methane/nitrous oxide" is the change in emission of the gasses from just the pastoral area, whereas the "% change including forestry" is the change in emissions where the forestry offset has been included.

Note the high increase in EBITDA with 10% and 15% reductions in cow numbers reflects the 'theoretical' increases in productivity modelled in Farmax (total GHG reductions of -6% and -10% respectively also modelled in Farmax)





Stage III: Understanding the carbon price levy on dairy and livestock farms – assessing options

- Investment into kiwifruit diversification in the eastern BoP (Orete Incorporation)
- Identifying alternative forestry development for hard hill country S&B farms in the King Country (Pukepoto Trust)

Table 12: Orete Scenario Impact on GHG Emissions and Farm Profitability

	Total property net CO_2e (T/ha)	Total GHG % change from Base	% Change in pastoral methane from base	% Change in pastoral Nitrous Oxide from base	% Change in methane from base, including forestry	% Change in Nitrous Oxide from base, including forestry	EBITDA ($ effective ha/yr)	% change from Base model
Base model	8.4						$1,056	
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Reduce cow numbers 15% - improve productivity	7.5	-10%	[illegible]	[illegible]	[illegible]	-6%	[illegible]	38%
Reduce replacement rate	8.3	-1%	-1%	0%	-1%	0%	$1,181	12%
No nitrogen fertiliser	7.8	-7%	-4%	-19%	-4%	-19%	$1,005	-5%
No bought supplementary feed	[illegible]	[illegible]	-12%	[illegible]	-12%	[illegible]	[illegible]	-21%
No N fertiliser, No bought supplement	7.0	-17%	-16%	-20%	-16%	-20%	$883	-16%
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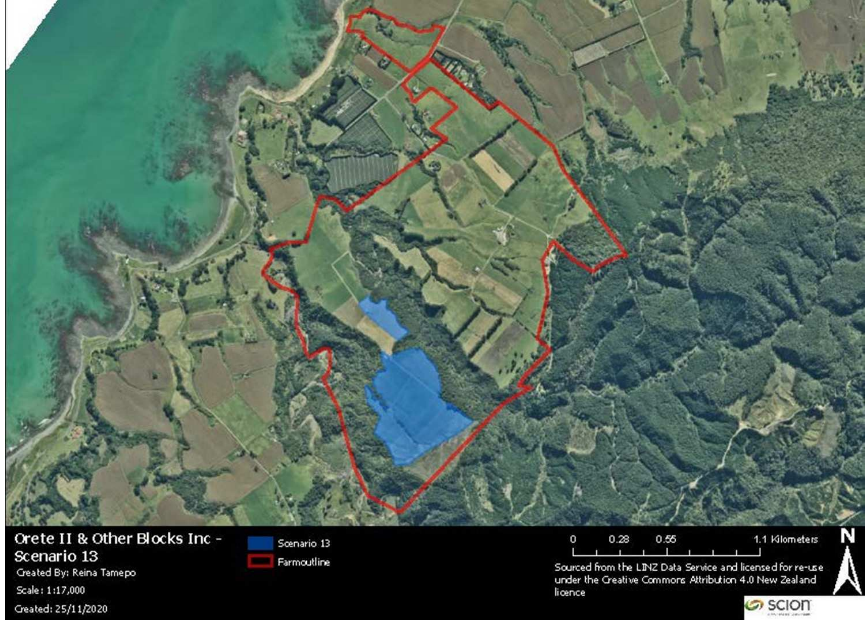
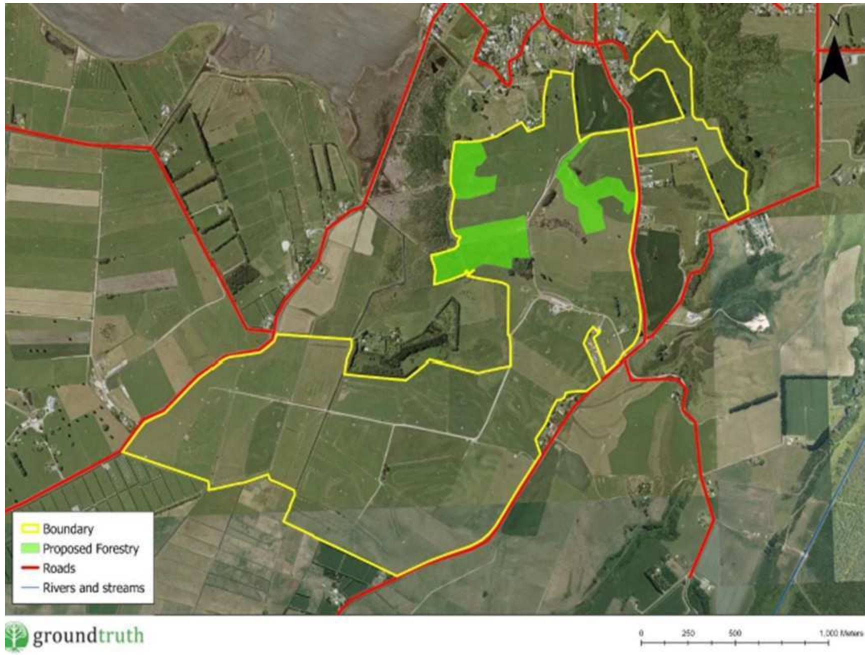
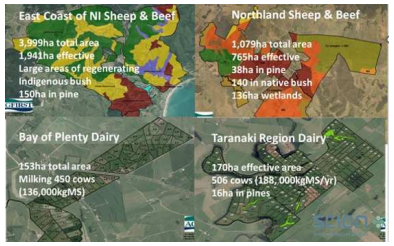




Our partners and the evolution of Takahuri Whenua 2014 - 2020

Stage I: Network & Cases

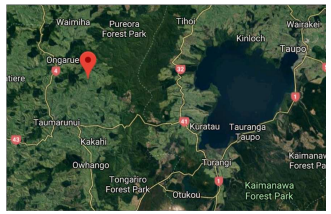
1. Oramahoe (18R2B2B2) Trust
   S&B Taitokerau
2. Pukehina M3 Trust
   Dairy Te Arawa
3. Rua te Moko Ltd (Partnership)
   Dairy Taranaki
4. Maroitiri Partnership
   S&B Tairawhiti



2014 -2017

Stage II - Diversified Entities

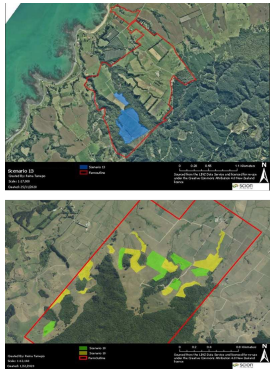
5. Te Urunga B2 Incorporation
   Maniapoto
6. Onuku Trust
   Te Arawa



2018 - 2019

Stage III Net Zero Targets

7. Te Aroha Aggregation
   Dairy Waikato
8. Pukepoto Trust
   S&B Maniapoto
9. Te Paiaka Trust
   S&B Te Arawa
10. Orete Incorporation
    Dairy Whanau a Apanui

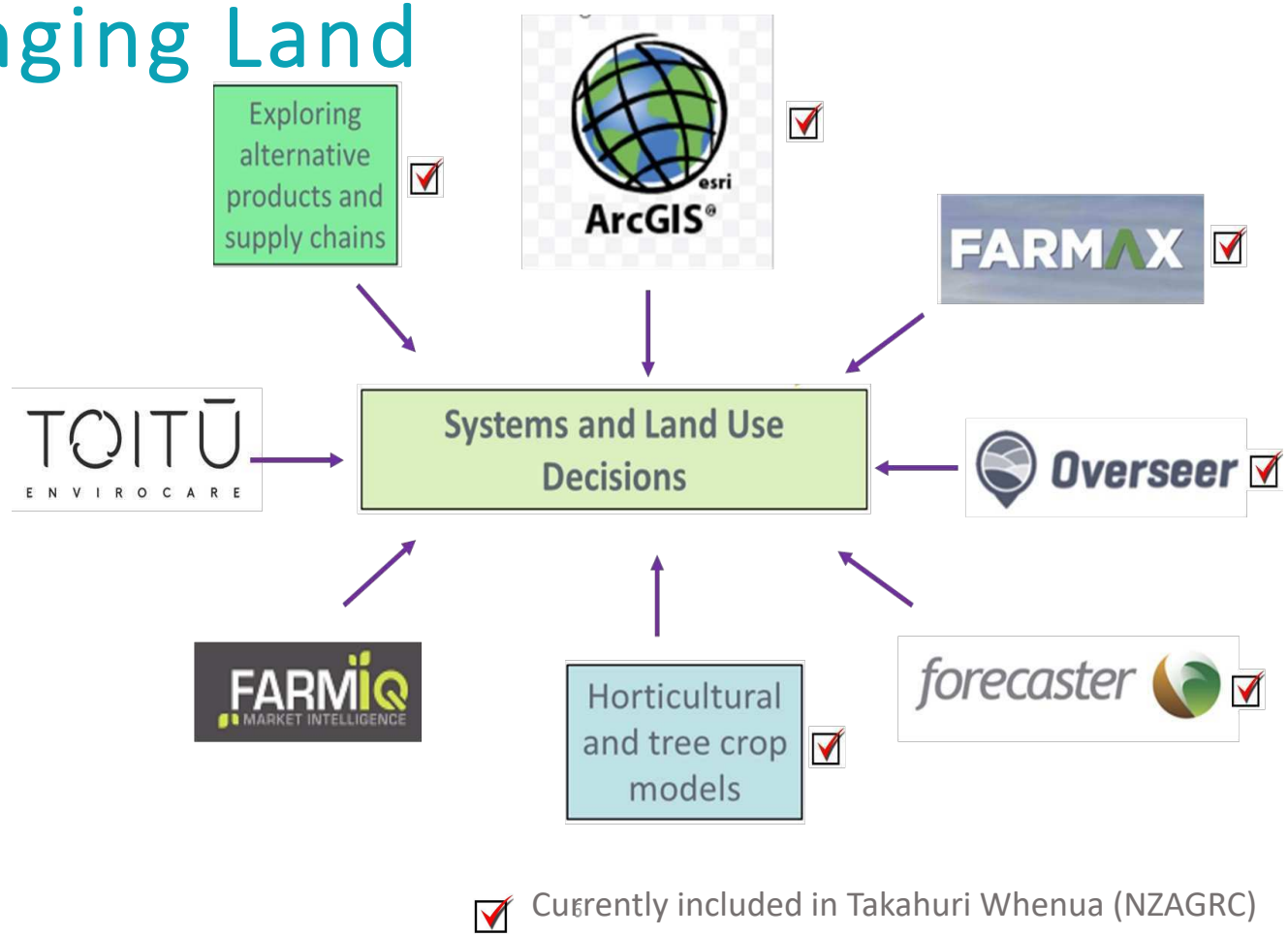


2019 - 2020

Takahuri Whenua: The Changing Land

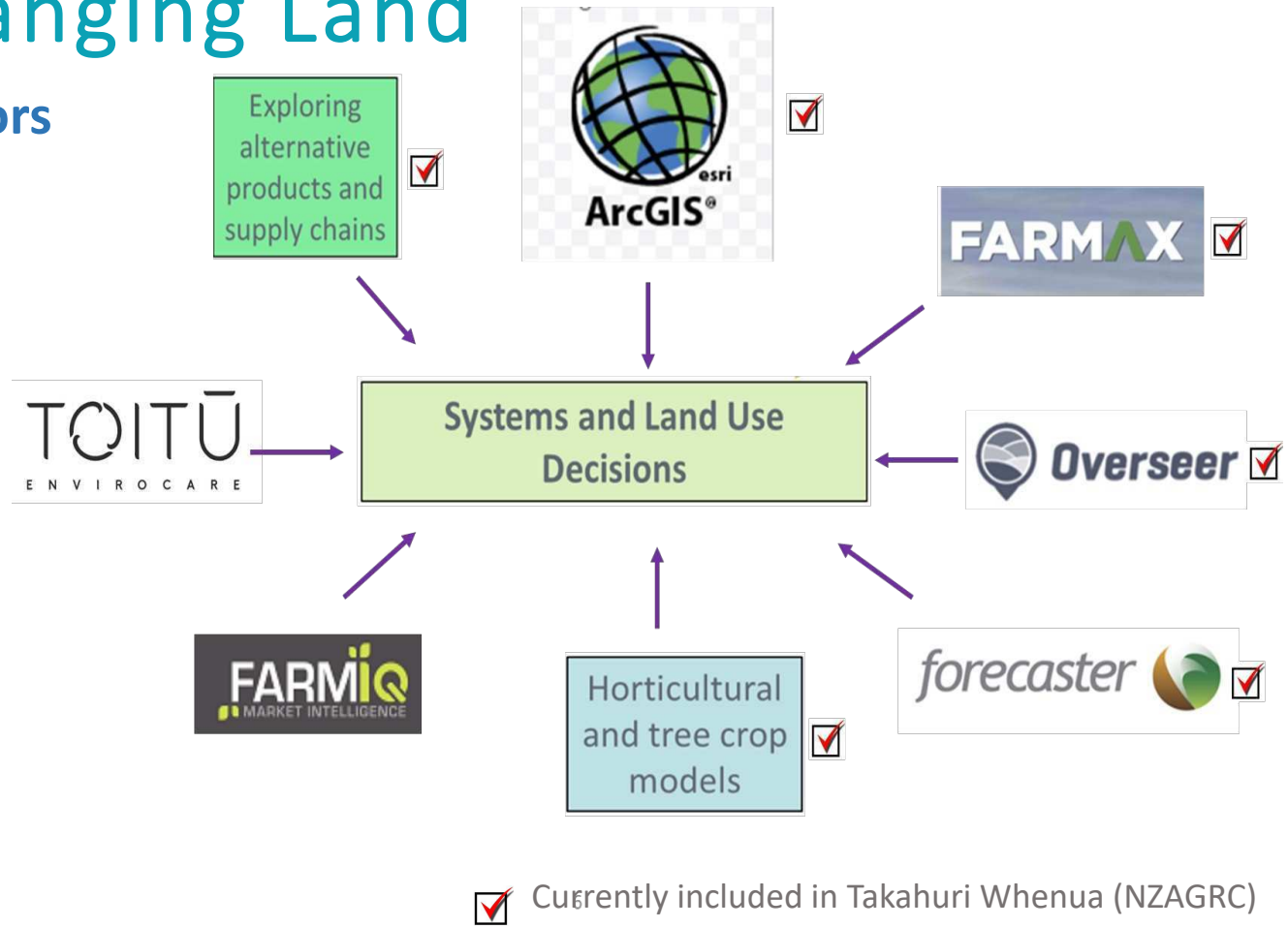
10 POINT METHOD

1. Determine owner/farmer objectives (short and long term) and access copies of strategic, management and environmental plans where available;
2. Interview owner governance i.e. trustees, directors, committees of management to understand their preferences, priorities and level of interest in environmental mitigation options;
3. Access on farm data including farm maps where available;
4. Interview farm managers and consultants to gain information and data on livestock policies, farm inputs and expenses, needed to develop Overseer and Farmax files along with mitigation options;
5. Produce base line status quo description of the farm system including GHG profile
6. Produce mitigation options including farm systems changes and land use changes
7. Produce status quo aerial map showing current land utilisation and potential land use changes
8. Present report to the governance and management team to discuss results and options
9. Provide background and context information on carbon policy and the science behind the mitigation options
10. Agree on mitigation options and produce final report with systems and land use changes showing the economic and environmental impacts; along with other social impacts of options including diversification to forestry or horticulture.



Takahuri Whenua: The Changing Land

1. **Meet with the owners, managers and advisors**
2. **Determine priorities and objectives**
3. **Collect/confirm property data and Identify land use change options**
4. **Model status quo system with baseline indicators**
5. **Agree on land use change options Access data/info on options**
6. **Reconfigure the base animal system Model alternatives and present in maps and the metrics/indicators in tables**



Stage IV: 18 Farms - 2 Collectives and 1 Partnership

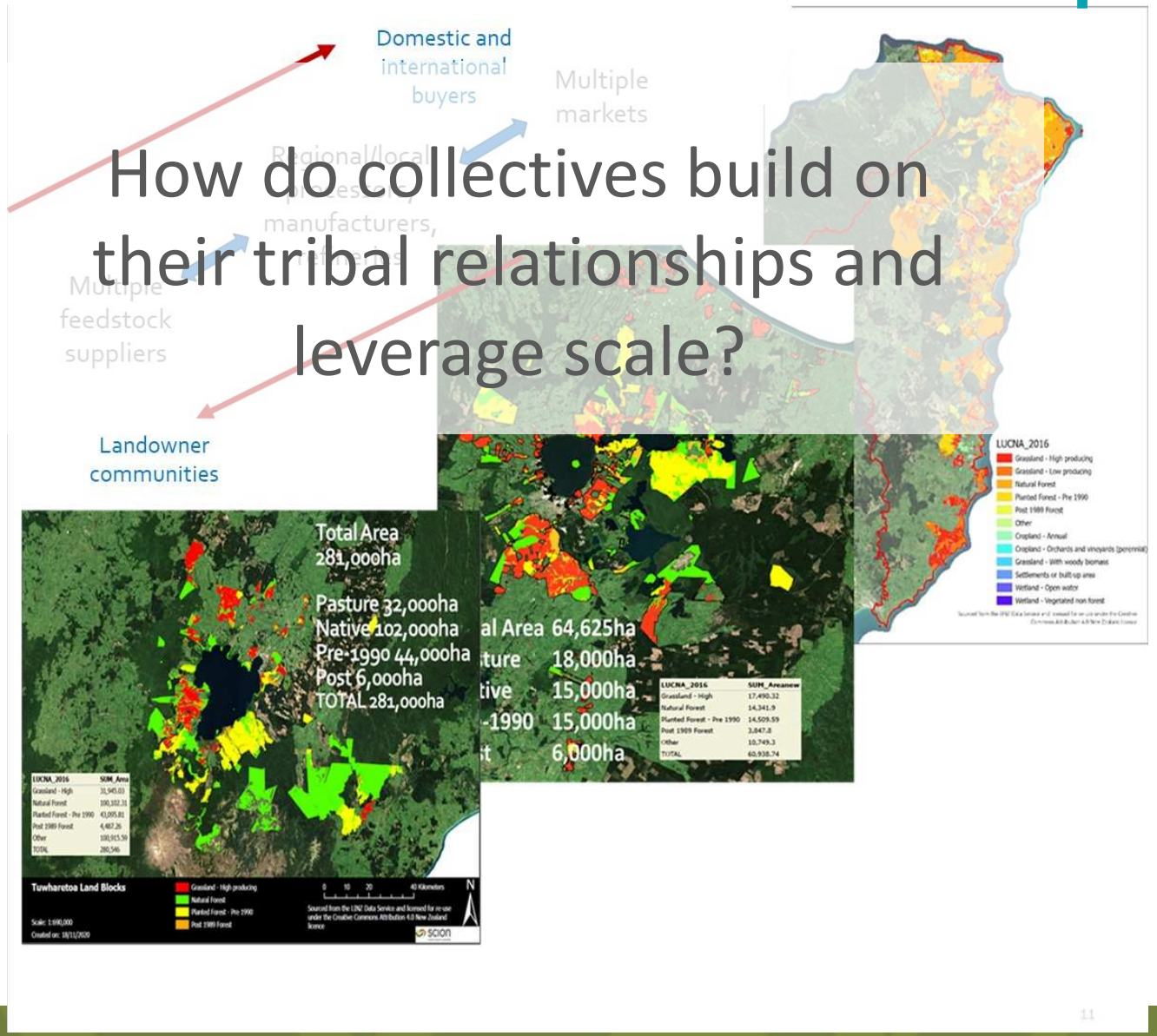
Te Arawa Arataua Collective

- Maraeroa Oturoa Trust
- Otukawa Trust
- Te Arawa Management Ltd
- Tumunui Trust
- Waerenga Incorporation
- Waipupumahana Trust

Tuwharetoa Farm Collective

- Rangiatea Trust
- Tuatahi Partnership (2 x farms)
- Taurewa Trust
- Waihi Pukawa
- Whakarawa Trust

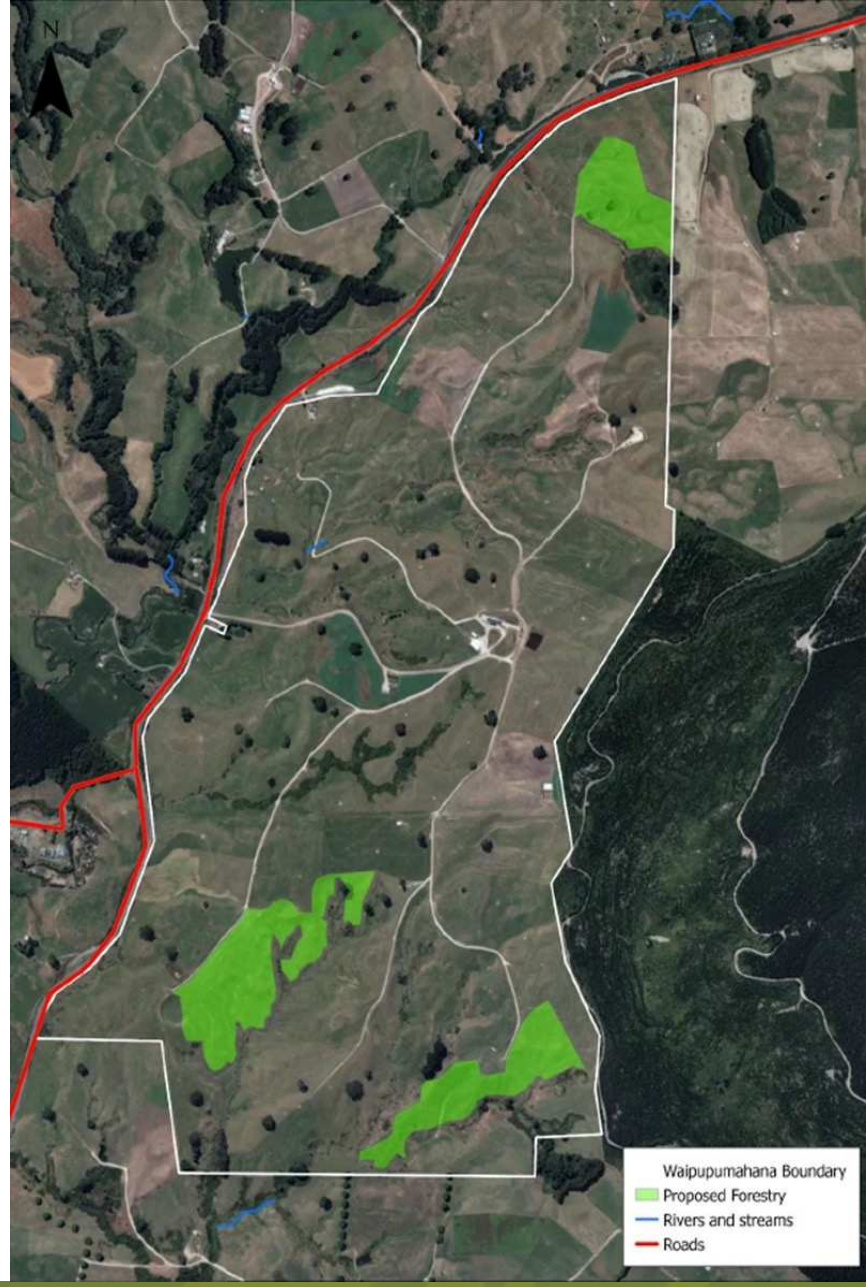
Whangara Farms (x 6 invidivaual farms)



Carbon price levy on dairy and livestock farms ($85T/$CO_2$e)

Table 3: Carbon Levy as a Proportion of EBITDA

Dairy	2025 Levy	2030 Levy	2025 levy as a proportion of EBITDA	2030 levy as a proportion of EBITDA
Farm 1	$8,613	$27,966	1%	4%
Farm 2	$20,635	$67,004	2%	5%
Farm 3	$7,664	$24,887	1%	3%
Farm 4	$7,484	$24,302	1%	5%
Farm 5	$11,404	$37,028	2%	6%
Sheep & Beef			**Mean 1.4%**	**4.6%**
Farm 1	$35,212	$114,336	6%	20%
Farm 2	$35,682	$115,862	13%	41%
Farm 3	$50,168	$162,900	5%	17%
Farm 4	$56,554	$183,635	2%	8%
Farm 5	$22,242	$72,220	4%	14%
			Mean 6%	**20%**

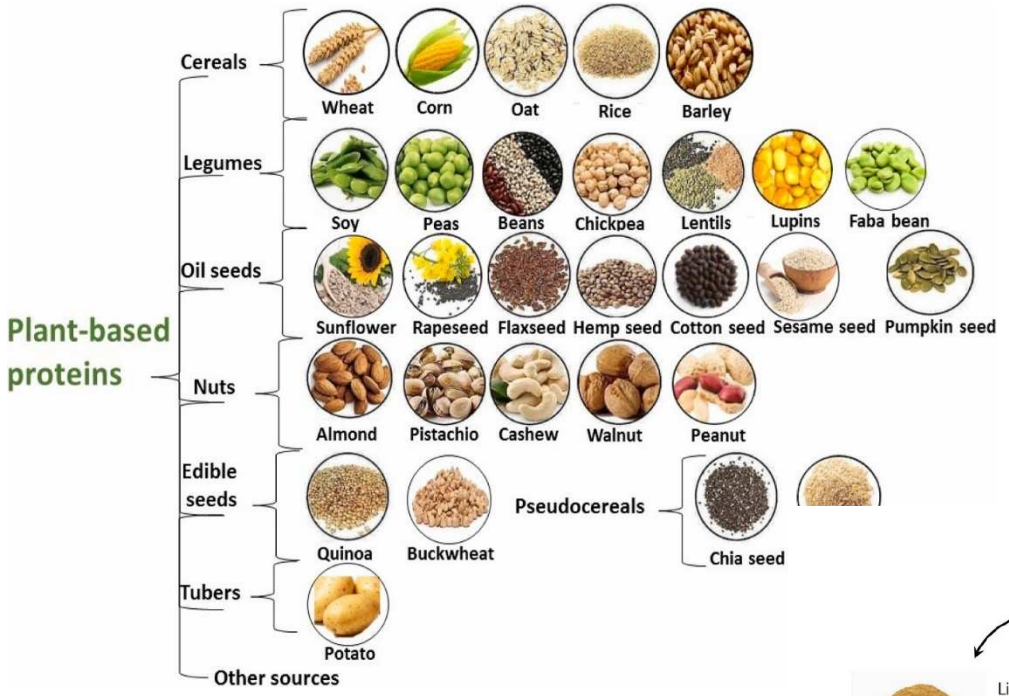


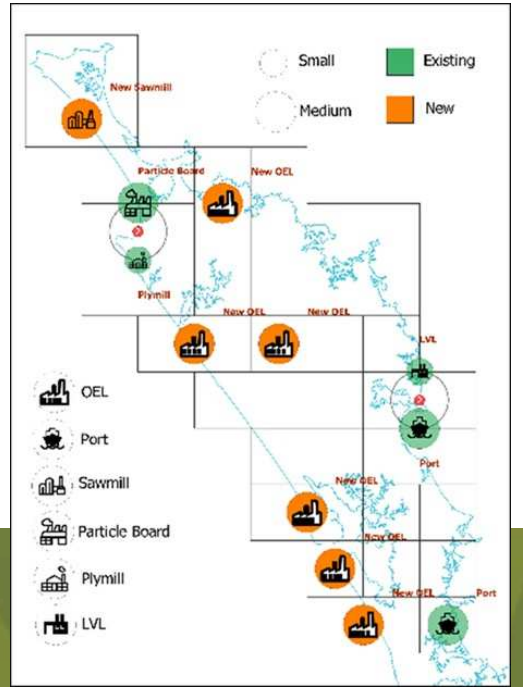
GHG/ha of av sheep & beef farm is 38% of that of the average dairy farm
Av sheep & beef farm is 4.5 times larger in area

Journeaux, P. & Kingi, T.T. Impacts of the proposed carbon price levy on NZ farmers. Presented paper to the NZARES 2022 Conference, Nelson

- Limited alternatives for farmers
- Lack of alternative processing infrastructure
- High risks for individual farmers

Farmers must psition themselves to participate in “net zero market” requirements





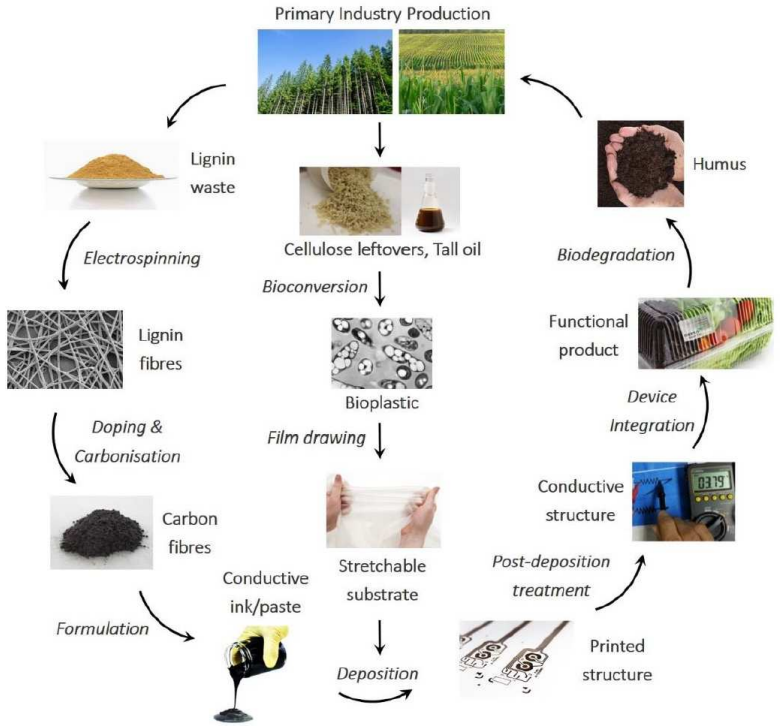


Fig. 1: GPE as an industry contributing to the circular bio-economy

PHAs for Digitalization of packaging

How do we go beyond collectives and develop networks of farms?

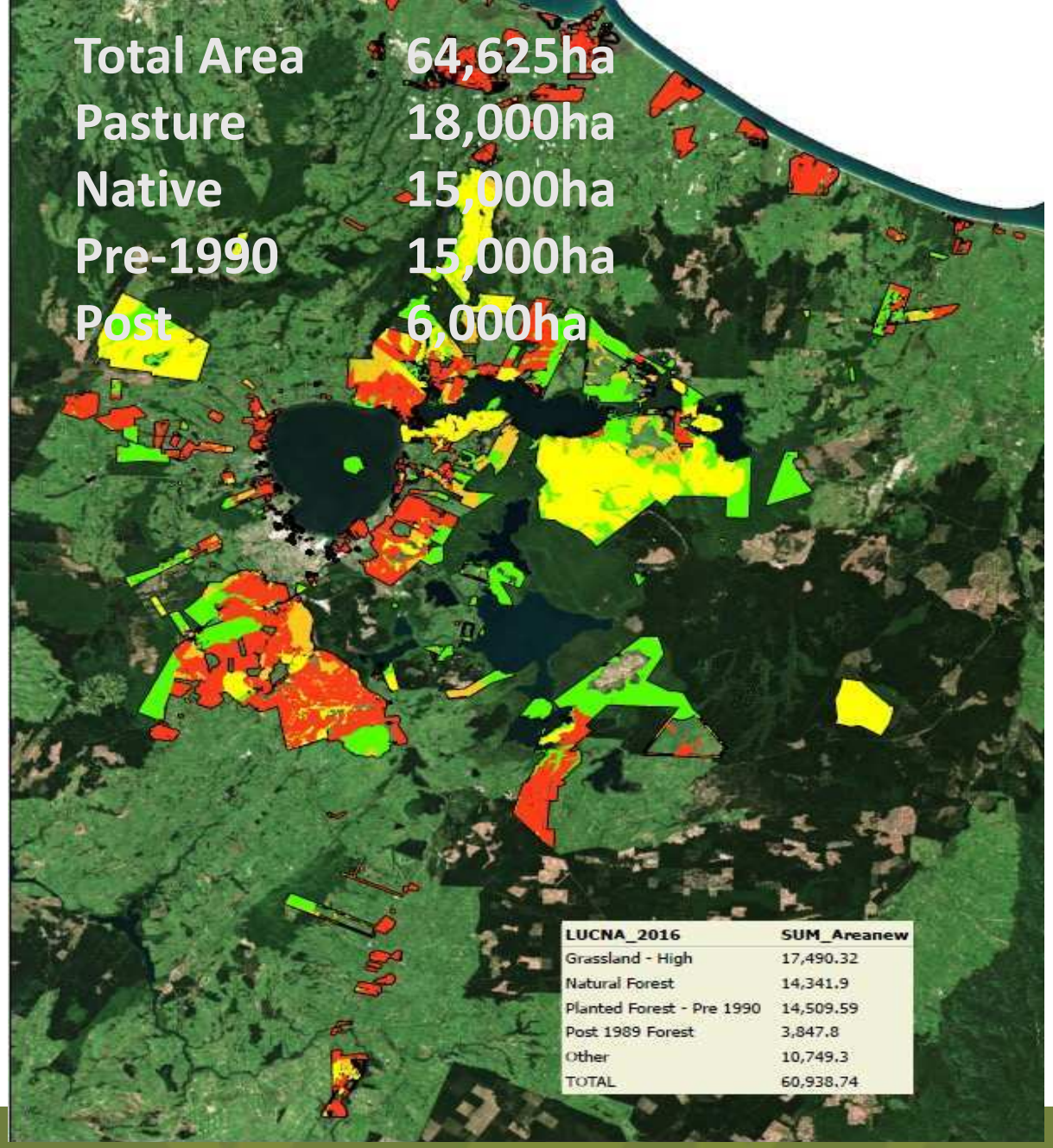
Te Arawa Rohe = 64,625ha*

> 2,600 land blocks
~ 30% of land is in pasture

~ 110 entities >80ha (pasture)

20 entities control 60% of the land

* Excludes treaty settlement land



Te Arawa Arataua
Te Arawa Primary Sector, Inc.

Takahuri Whenua Team

Tanira Kingi – Science Lead
Phil Journeaux – Programme Manager
JP Praat – Ground Truth
Conrad Bird – Ground Truth
Peter Handford – Ground Truth
Reina Tamepo – Scion
Sandy Scarrow – Fruition Horticulture
Sophie Twiggy – Fruition Horticulture