Regen10 – Landscape Transition Pathways - Overview

- **Regen10** has developed **landscape-level transition pathways** across five significant agricultural regions.
- A **transition pathway** represents a switch from the conventional agricultural practices common in the landscape to regenerative ones, that helps **restore** and rebuild **natural systems**.
- A key element of this process is understanding the **economics of transitioning** to regenerative agricultural practices as well as the **potential environmental and social outcomes** of such transitions at landscape level.
- The combination between countries and agricultural products was made based on geographical **representation, impacts** of production, data **availability,** and **applicability** of results. The choice of landscapes was primarily driven by their **national-level importance** in the production and export of the specific products.
- Regen10 recognizes that there is **more than one way to create a regenerative food system**. The proposed approaches are not prescriptive, and practices were selected after careful contextual analysis of their relevance and evidence of their intended outcomes.
- Broader evidence linking practices and outcomes is still greatly needed and highlights the importance of developing an **outcomes-based framework**, which Regen10 is currently doing.

Selected Landscapes

Country	Landscape	Focus Ag Product
Brazil	Querência City	Soy & Beef
India	Punjab State	Rice
United States	North Dakota	Wheat & Maize
United Kingdom	East England	Potato
New Zealand	Waikato Region	Dairy

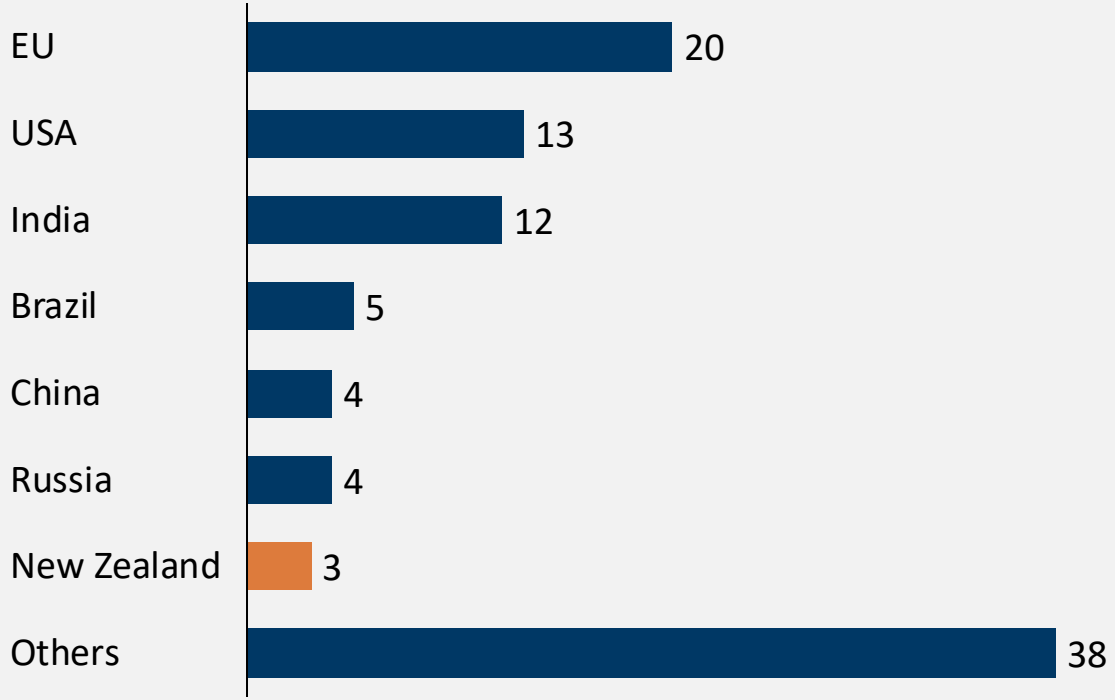
Source: Systemiq analysis.

Waikato – New Zealand – Dairy

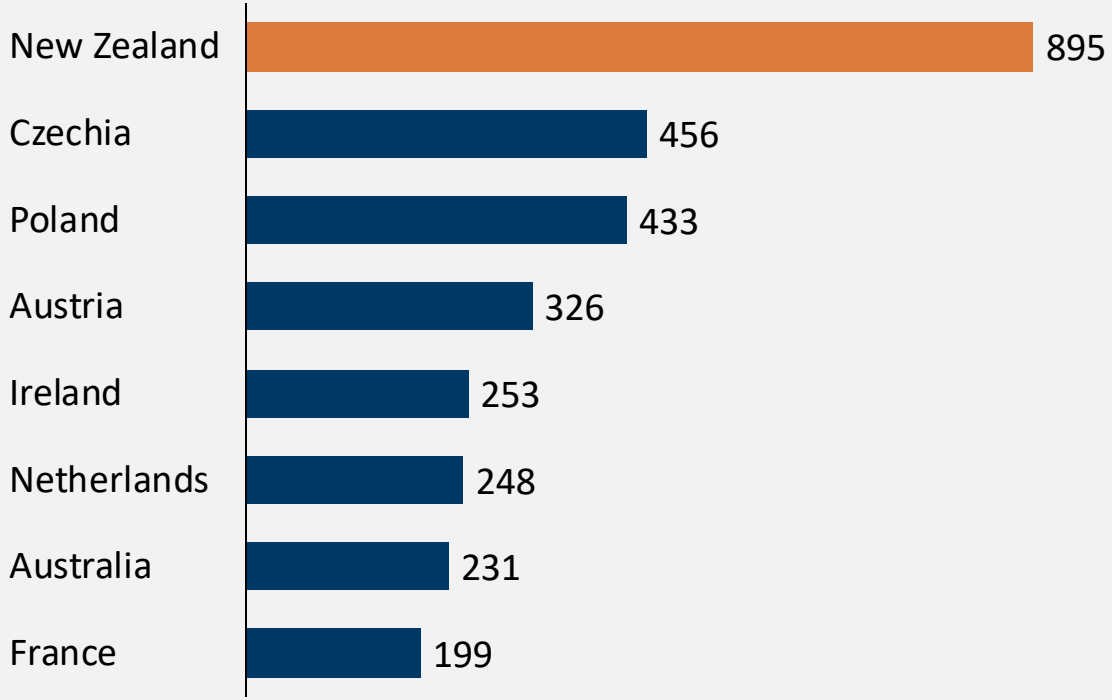
New Zealand (NZ) is the world's largest net dairy exporting nation

- The dairy sector plays a crucial role in meeting international demand for milk products and contributes significantly to the nation's economy, accounting for 35% of New Zealand's total merchandise exports and around 3% of GDP.

Raw Milk of Cattle Production (%)



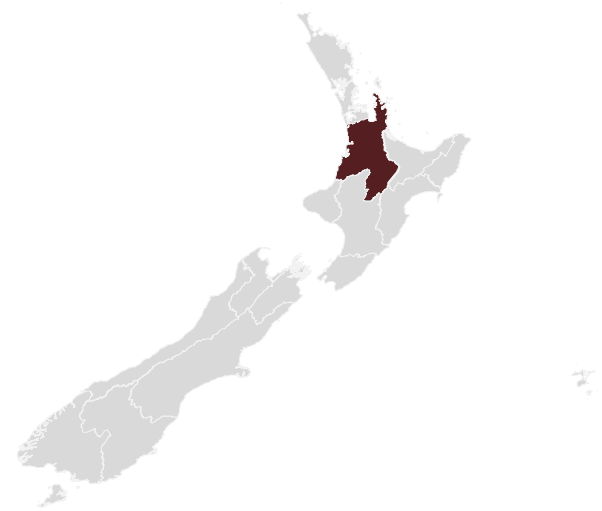
Net Milk Trade[1] (Millions of USD)



Notes: [1]Exports minus Imports
Sources: FAOStat21, OEC22

Waikato, a pasture dominated landscape, bears the benefits and challenges of holding NZ's largest cow herd

The mild climate and plentiful rainfall in the region make it ideal for pasture-based dairy farming, supporting 33% of the national herd.



Landscape information

- **Geographical Area**: 2.4M ha
- **Cultivated Area**: 1.3M ha
- **Population**: 0.45 million (41% rural)
- **Land holdings**: 8,600
- **Average farm size**: 155 ha

Current Challenges

Agronomic & Environmental:

- Highest emissions of agricultural GHG[1] in the country.
- Intense water use, farm inputs polluting waterways, and soil erosion at riverbanks.
- High animal density is damaging soil fertility, with animals trampling on wet soil and causing compaction (where soil particles are packed too tightly together).
- Changes in weather patterns and experience of droughts for the first time.

Economic:

- Great dependency on a single activity and export market.
- Potential new regulations to measure and price agricultural emissions.
- Continuously growing plant-based milk alternatives market.

Social:

- Skilled agriculture labor shortages.
- Land use conflicts deriving from urbanization.

The Waikato River crosses the region

Figure: Shutterstock. Extracted from The Conservation

Animal farming dominates the landscape

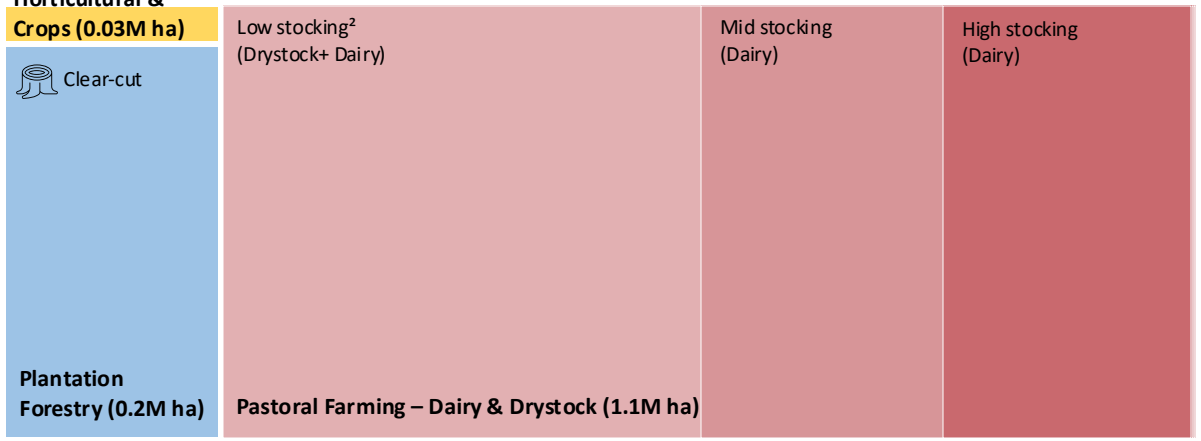
Extracted from Danone

Notes: [1]Greenhouse Gases

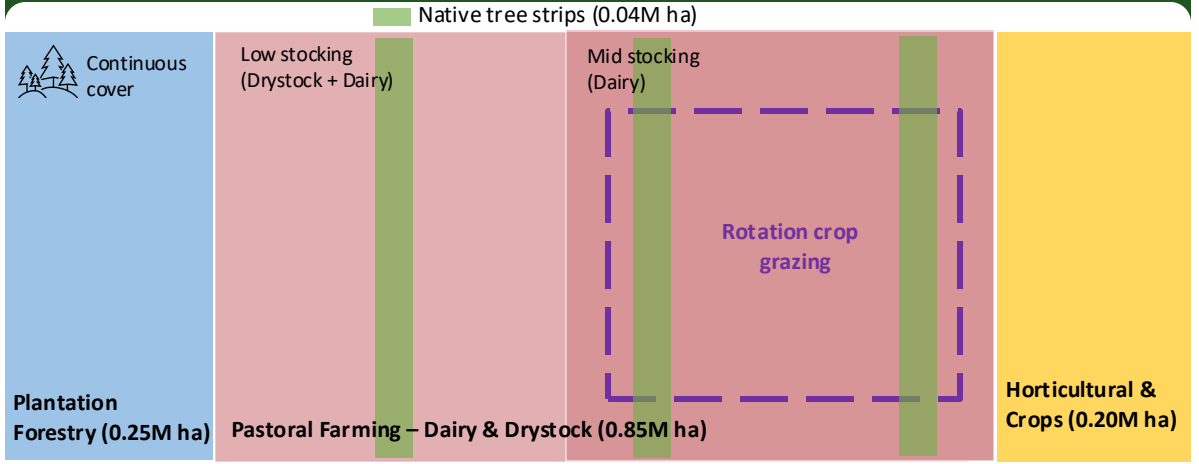
Sources: Ministry for the Environment, Figure.nz, DairyNZ, Waikato Regional Council, Expert interviews.

An alternative for Waikato includes diversifying the land-use and broader sustainable practices for dairy and forestry

Current land use at agricultural landscape level



Alternative land use at agricultural landscape level[1]



Transition pathway hypothesis

- Diversify agricultural components by ambitiously expanding horticulture and crops[3] on suitable arable land[4] to reduce GHG emissions while seeking to maintain long-term landscape profitability.
- Enhance sustainability on dairy farms by de-intensifying[5] operations, enhancing pasture management (e.g., rotational grazing, diverse plant traits/species, Nitrogen use efficiency), and incorporating native trees for animal shelter and to meet, to some extent, environmental regulations.[6]
- Protect riparian margins and implement native tree strips, preferably placed near waterways and areas where intense soil conservation is needed for erosion control and nutrient runoff prevention.
- Increase forestry in areas with severe physical limitations[7] for GHG sequestration and use sustainable harvest techniques to maintain continuous-forest cover for habitat conservation.

Set of changes used

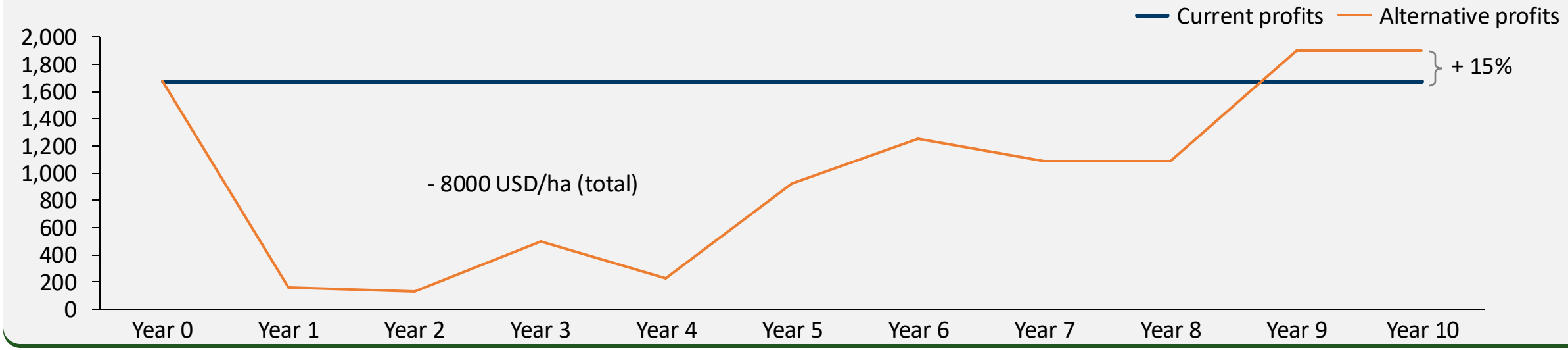
- **Diversification:** decrease pasture area and expansion of horticulture and cash crops.
- **Forestry/trees**: increase native and exotic trees.
- **Edge of the Field:** shelterbelts for animals and protection of riparian margins in pastoral waterways.[8]
- **Growing practices**: reduction in animal stocking rates, enhanced pasture management, continuous forest cover.

Notes: [1]Assumes pollutants runoff from the alternative land use will be equal or less than that from the current land use. [2]The stocking rate is defined as the number of animals grazing on a given amount of land for a specified time. [3]Modeled as 70% crops, 30% horticultural; examples of crops include wheat, barley, maize, and horticultural systems include berries, fruits, nuts and fibers (excludes water and nutrient intense vegetables). [4]LUC Classes 1-4. [5]Stoking rate: Low ~2.0, Mid ~3.0, High> 3.5 cows/ha. [6]NZ agricultural Emission Trade Scheme is under revision. [7]LUC Class above. [8]~40% of bank length not yet effectively protected.
Sources: Systemiq analysis, Landcare Research NZ Limited, Waikato Council, New Zealand Agricultural Greenhouse Gas Research Centre, Expert interviews.

NZ - WAIKATO

Significant initial investments to diversify from dairy result in a cumulative loss of $8,000/ha before profitability returns in year 9

Comparison between yearly net income: current vs alternative state, undiscounted cash (USD/ha)

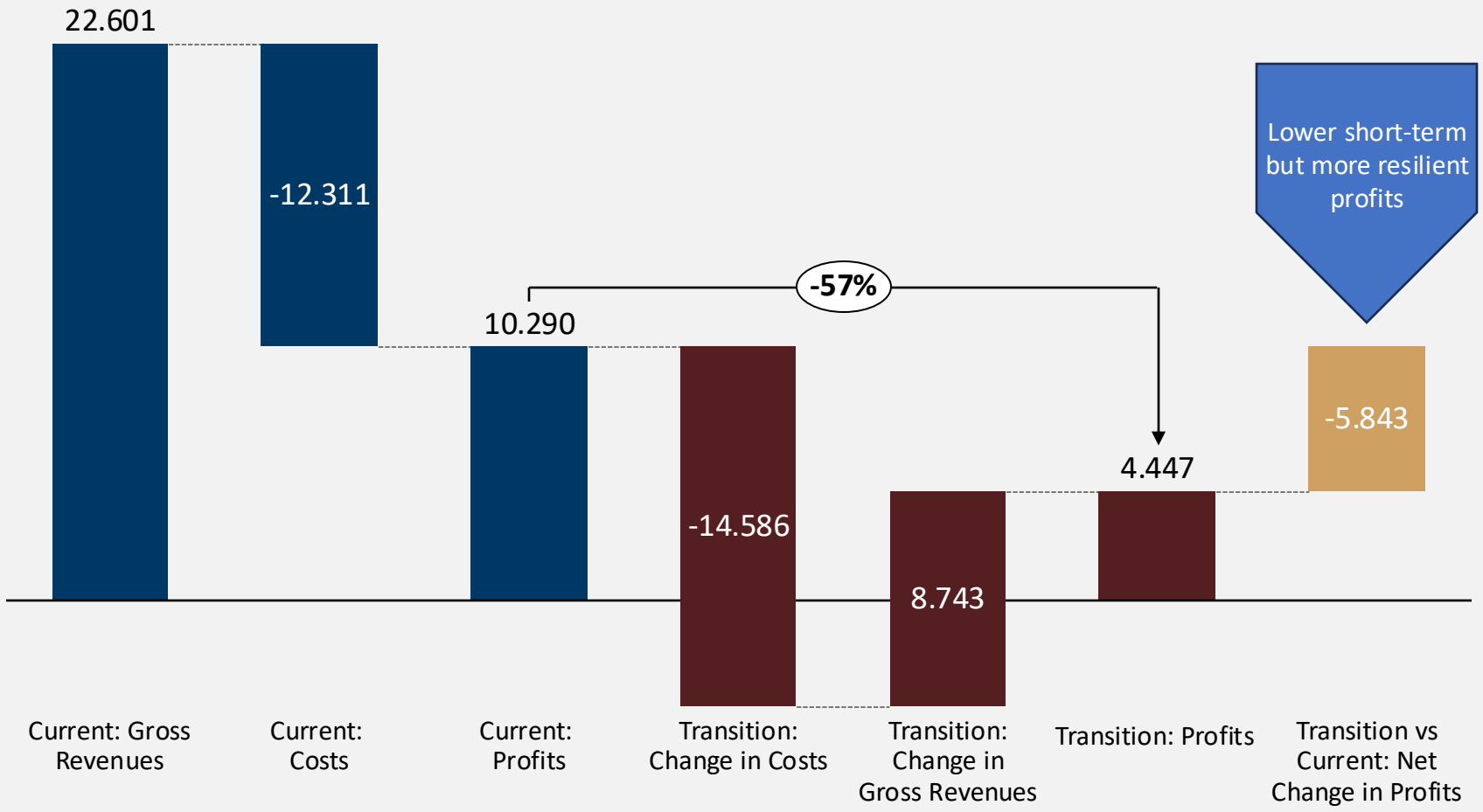


- Farms' profitability decreases during an interim transition period and reaches **a point of equilibrium that is approximately 15% higher** after year 9.[1,2]
- After an initial drop, profits start growing again after year four but don't return to previous levels until year nine, with further profits being seen after this year. This initial decline emphasizes the need for long-term and sustained financial support and shared responsibility across the food supply chain to enable the transition.
- The significant drop in profitability is mainly due to the capital recovery[3] required for investments in crop and horticulture setup and expansion and the reduction in animal stocking rates at dairy farms.
- The drop is partially offset by an increase in profitability per hectare from horticulture after development.
- Long-term profitability per hectare could increase with more land converted to horticulture; however, the high initial investment would further reduce overall agricultural profitability in the short term, making the transition even costlier.[4]
- Farmers would forgo **$8,000 USD/ha** in cumulative profits before profitability returns to current levels (Nominal value).
- For an average 155ha farm, a cost of ~$1.2M (profits lost in years 1-8) would only be offset in the following decades of the transition.[5]

Note: [1]Model focuses solely on the agricultural landscape (aggregation of farms) and does not contemplate costs for eventual new landscape level infrastructure or market channels. Conservatively assumes no green premiums or increase in land value. Landscape transition happens all at once. [2]Current profits do not account for a potential agricultural emissions levy as the ETS is under revision by NZ government. [3]Assumes CAPEX repayment terms between 5-10 years. [4]Significant land-use changes may also lead to unintended consequences or be limited by factors like water and labor availability. [5]Costs and returns will vary based on the farm's size and portfolio.Source: Systemiq analysis

The end outcome is a diversified system with a lower net present value, but with more stable revenues and profits

10-year CUMULATIVE income and expenditures – NPV[1] discounted with 10% rate (USD/ ha)



- The first decade of the agricultural transition will **require substantial investment**, leading to a significant drop of $5,843 USD/ha in the NPV of cumulative profitability.
- While transition cumulative profitability is lower in NPV terms, it is more resilient due to **multiple income sources.**
- The main contributor to increased overall costs during this period is the **repayment of invested capital** needed to diversify land use.
- **Higher gross revenues** from value-added horticultural products partially offset the lower returns from reduced-intensity dairy farming.
- A **longer time horizon** is necessary for forestry revenues to begin contributing and for the transition to become economically attractive.

Notes: [1]Net Present Value [2]
Source: Systemiq analysis

The landscape short-term profitability challenge is compensated by better environmental and social outcomes

Regen10 Framework landscape level outcomes[1]	Indicative impact from transition
Economic / Environmental / Social	Negative — Neutral — Positive
Increase economic diversification and resilience	Positive
Increase landscape value creation	Negative
Optimize landscape biodiversity & habitat functionality	Positive
Minimize water, soil and air pollution	Positive
Improve water availability	Positive
GHG emissions minimization	Positive
Optimize carbon sequestration and storage	Positive
Enhance inclusivity and empowerment of local communities	Neutral
Enhance well-being of the local communities[3]	Positive
Increase employment, knowledge and education	Positive
Optimize access to safe and nutritious food	Positive

Key implications and recommendations

- Shifting land-use and reducing dairy intensity boosts the environment but burdens finances in the short term.
- Overcoming early implementation and financial challenges can lead to more diversified and stabler farmer incomes
- More labor-intensive horticulture could offset dairy job losses, supporting employment opportunities and livelihoods.

For transition to be possible, we need to:

- Improve farmers' knowledge of diversification options and skills in alternative crops and regenerative grazing techniques.
- Provide long-term financial support for farmers, develop market access for their new products, and reduce barriers to land-use change.[2]
- Implement public policies that address potential labor shortages by attracting and retaining quality seasonal and permanent workers.

Notes: [1]Regen10 Outcome Framework Indicators for Landscapes from zero-draft version. Qualitative base analysis. [2]Behavioral, organizational and informational barriers, for example. [3]Large and rapid shifts in land-use can potentially lead to unintended consequences that impose social burdens on the communities during the transition.
Source: Systemiq analysis

References

1. Agricultural emissions for dairy farms: the cost (2024). New Zealand Treasury.
2. Aligned Farms Financial Findings. Available at: https://alignfarms.co.nz/regenerative-study/study-findings/financial-findings/ (Accessed: March 2024).
3. Choosing the right tree (2021). Scion. Available at: https://www.scionresearch.com/__data/assets/pdf_file/0019/66115/Right_tree_infosheet.pdf (Accessed May 2024).
4. Cooperaitken accountants (2022). Waikato Dairy Farming Benchmarking 2022. Available at: https://www.cooperaitken.co.nz/wp-content/uploads/2022/12/2022-Benchmarking-FINAL-for-web.pdf (Accessed: March 2024).
5. Curran-Cournane F, Donovan M, Merfield C, Taitoko M (2021). Place-based approach to assessing the impact of Regenerative Agriculture in New Zealand.
6. Future Farm Systems Results 2021/22 (2022). AgFirst for Northland Dairy Development Trust.
7. Future Proof Strategy (2024). Waikato Region Government.
8. Getting riparian planting right in the Waikato. DairyNZ. Available at: https://www.dairynz.co.nz/media/leojopce/waikato_riparian_management.pdf (Accessed May 2024).
9. Grelet G., Lang S., et al. (2020) Regenerative agriculture in Aotearoa New Zealand – research pathways to build science-based evidence and national narratives.
10. How forest land is defined in the ETS. Ministry for Primary Industries. Available at: https://www.mpi.govt.nz/forestry/forestry-in-the-emissions-trading-scheme/about-forestry-in-the-emissions-trading-scheme-ets/how-forest-land-is-defined-in-the-ets/ (Accessed: May 2024).
11. H. Jones, M. Kimberley, R. Hill, D. Borman (2020). Riparian characteristics of pastoral waterways in the Waikato region.
12. IDH The Sustainable Trade Initiative. (2021, February). LANDSCAPE APPROACHES: Raising the bar through sustainable production, environmental protection and social inclusion.
13. Inness, M. (2023) Potentially Hemp. An analysis into the opportunity for commercial expansion of hemp production in New Zealand.
14. Juan J. Monge, Warren J. Parker and Stefania Pizzirani (2017). Identifying complementarities for the dairy and forestry industries in the Central North Island.
15. Land Cover Database V5.0, Landcare Research New Zealand Ltd. Available at: https://www.waikatoregion.govt.nz/environment/land-and-soil/land-and-soil-monitoring/land1-report-card/
16. LIC and DairyNZ (2023). New Zealand Dairy Statistics 2021-22. Available at: https://www.dairynz.co.nz/media/uzeekwgr/nz-dairy-statistics-2021-22-web.pdf (Accessed: November 2023).
17. McQuillan-Reese, L. (2022) Market forces or market failure? An analysis into the opportunity for expanded milling wheat production in New Zealand.
18. Miller, B. What is the true cost of transience to the New Zealand dairy industry? Kellogg Rural Leadership Programme Course 42.
19. Mitigation and cost of on-farm Greenhouse Gas Emissions (2019). AgFirst for New Zealand Agriculture Greenhouse Gas Research Center.
20. MPI (2022). Regenerating Aotearoa: Investigating the impacts of regenerative farming practices. Ministry for Primary Industries, Wellington, New Zealand. Available at: www.mpi.govt.nz. (Accessed: November 2023).
21. One Billion Trees Programme (2022) - Putting a value on the benefits of planted forests. Available at: https://www.canopy.govt.nz/assets/content-blocks/downloads/Putting-a-value-on-the-benefits-of-forestry.pdf (Accessed: March 2024).
22. Schroder, B. (2023) Blossoming Blueberries? An analysis into the opportunity for commercial expansion of blueberry production in New Zealand.
23. Statistics New Zealand. (n.d.). New Zealand Official Yearbook. Available at: https://nzdotstat.stats.govt.nz/wbos/Index.aspx?_ga=2.25163962.1632279769.1695712511-161461432.1695712511 (Accessed: March 2024).
24. Stone, C. (2023) Scale-up or continued stagnation? An analysis into the opportunity for commercial expansion of chestnut production in New Zealand.
25. Tiki-Toki. (n.d.). New Zealand Emissions Trading Scheme. Available at: https://www.tiki-toki.com/timeline/entry/356365/New-Zealand-Emissions-Trading-Scheme/ (Accessed: March 2024).
26. USDA (2022) Dairy and Products Annual. Available at: https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Dairy%20and%20Products%20Annual_Wellington_New%20Zealand_NZ2022-0015.pdf (Accessed: November 2023).
27. Waikato Regional Council Technical Report 2011/17 (2019) - Dairy farming grazing management practices in the Waikato region. Available at: https://waikatoregion.govt.nz/assets/WRC/WRC-2019/TR2011-17.pdf (Accessed: March 2024).
28. Waikato Regional Council Technical Report 2019/27 (2019) – Land use change diversification in the Waikato. Available at: https://www.waikatoregion.govt.nz/assets/WRC/WRC-2019/TR2019-27.pdf (Accessed: March 2024).
29. Winter forage crops: management during grazing (2024). Beef + Lamb New Zealand with AgResearch.

Summary

Regenerative systems lead to a diversified land-use with initially lower, but more resilient, revenues and profits for Waikato

New Zealand
Waikato

High initial investments to diversify from dairy result in a significant drop in landscape profitability before it surpasses current levels in year 9 of the transition.

Current state of agricultural landscape

Agronomic & Environmental

- Highest emissions of agricultural GHG[1] in the country with intense use of water, nutrient runoff and erosion to riparian areas and wetlands.

Economic

- Great dependency on a single activity and export market, regulatory risks linked to upcoming regulations to measure and price agricultural emissions, and competition with a continuously growing plant-based milk alternatives market.

Social

- Skilled agriculture labor shortages and land use disputes deriving from urbanization.

Transition pathway hypothesis

Diversify agricultural components

- Ambitiously expand horticulture and crops on suitable arable land to reduce GHG emissions while seeking to maintain long-term landscape profitability.

De-intensification of dairy

- Reduce stocking rates, enhance pasture management and incorporate native trees for animal shelter and to meet environmental regulations.

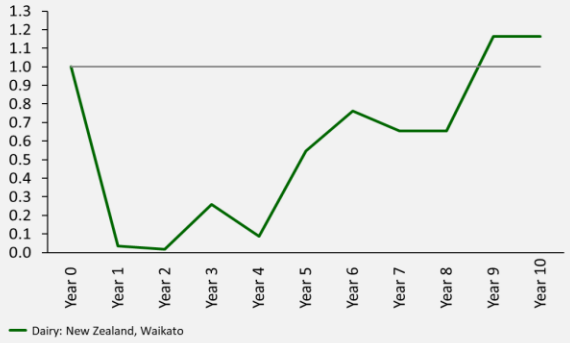
Native vegetation and plantation forests

- Use native trees to protect riparian margins and waterways. Increase forestry in areas with severe physical limitations for GHG sequestration and adopt sustainable harvest techniques.

Results of economic modeling

- The first decade of the agricultural transition will lead to a drop of $5.843 USD/ha in the landscape cumulative profitability (NPV).[3]
- Profitability lowers during an interim period and reaches a point of equilibrium 15% higher after year 9.
- The drop in profitability relates mostly to borrowing costs to farmers for investments in the set-up of crops and horticulture, and lower dairy stocking rates. The higher profitability levels after transition are associated with higher gross revenues from value-added horticultural products.

Change in net profitability over a 10 years period for proposed transition pathway (alternative state/current state) Indicated in relative terms



Implications and recommendations

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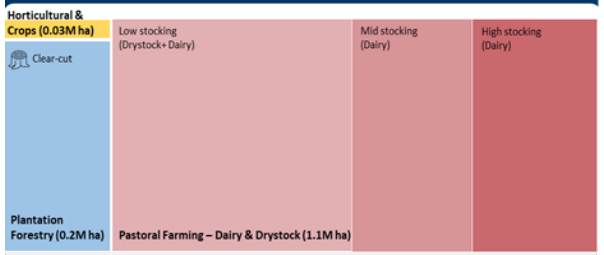
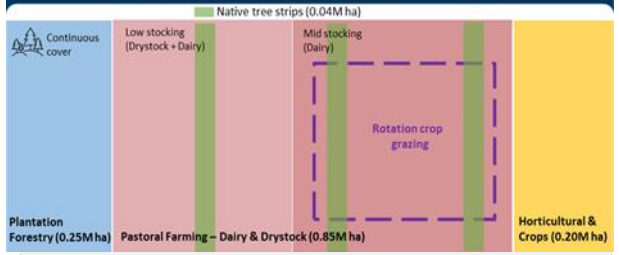


Alternative land use at agricultural landscape level



Note: [1]Green House Gases. Net Present Value 10% rate. [2]Behavioral, organizational and informational barriers, for example [3]Net Present Value 10% discounted. Costs and returns will vary significantly based on the farm's portfolio. Model focuses on the agricultural landscape and does not contemplate eventual investments in new landscape level infrastructure and market channels. Conservatively assumes no increase in land value or green premiums. Landscape transition happens all at once. Systemiq analysis for **Regen10.org**