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Near-term Opportunities for Value

Wairarapa Land Use Evaluation

Report prepared for
Wairarapa Water Ltd

Wairarapa Water

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TUAWHENUA

Leftfield Innovation Limited

Contents

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The opportunities identified in this report have been established as a result of engagement with individuals representing a range of local Wairarapa businesses and organisations linked to food and fibre in a range of capacities from the farm through to processors, consumers, and the community. We would like to acknowledge the time you have all given us, and the insights and knowledge you have shared.

We would also like to acknowledge the early engagement we have had to date with members of both Rangitane and Kahungunu Iwi.

Thank you.

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1.0 Executive Summary

The proposed Wakamoekau Community Water Storage Scheme ('the Scheme') is planned to provide a reliable supply of water for community use, industry use, environmental uses, and agricultural production.

This report has been commissioned by Wairarapa Water Ltd (WWL) to identify potential agricultural land use opportunities that can be enabled and/or enhanced through the supply of reliable water. Other work streams are underway by WWL to understand community, industrial and environmental uses and benefits and therefore are not the subject of this study.

Reliable water provides an opportunity to re-think land use in the Wairarapa by taking a holistic look at potential land use in the future and to design land use systems, predominantly farming systems, that are diversified and integrate a range of complementary land uses within a parcel of land suited to the soil type, water availability, climate, location and community.

To understand the agricultural production potential of the Wairarapa under reliable irrigation, it has been essential to engage with the community – farmers, food companies, processors and representatives involved with a range of economic development initiatives. Our role has been to listen, capture, assess viability and prioritise the ideas and opportunities into a structured format – this report, that can become the basis for further action.

Land use studies that have been undertaken in and the Wairarapa, in response to potential new reliable water via irrigation schemes, have usually identified areas that can undergo a complete change of land use from one type of farming enterprise to another (e.g. sheep to dairy). This will not be acceptable in the future and land within a farming enterprise needs to be considered for and undergo land use changes to the best purpose.

Wairarapa has a broad range of temperate land uses with varying degrees of intensity and irrigation usage. Horticulture currently includes apples, grapes, small areas of berries, some fresh vegetables, olives and high value seed production for sweetcorn, maize and onions; Broadacre seed production such as peas, grass seed and red clover; Broadacre crops, vegetables such as squash, grains both food and feed (wheat, barley and some specialist crops), forage crops for silage and feed, irrigated pasture for dairy, lamb, beef finishing and sheep milking; Dryland pasture for sheep, beef and some dairy; Apiculture (manuka and other honey), plantation forestry, plantation hard woods, conservation and indigenous forests.

Making the decision to invest in the Scheme stakeholders, in the case of this report the farmers, need to have confidence that they are able to increase productivity and generate adequate returns to pay the costs associated with the water. Understanding the value capture and value creation opportunities available to them will enable families to plan for successful family succession, particularly as the benefits of water may not necessarily flow to the current landowner, but to the next generation and future generations.

The scale, and/or intensity, of the diverse range of land uses in the Wairarapa are currently limited by a lack of reliable water and a lack of processing and supply chain capability to create and deliver specific market ready products.

The off-farm investment required to bring scalable industries to a region to enable land use diversification is not usually something that is within the individual farmer's control and becomes a chicken and egg scenario for farmers and investors, unless the investor is also the farmer.

The approach for this report is to outline those land use opportunities that currently exist, where more value (directly or indirectly) can be captured through a redesign of the value chain and enabling more collaboration between farmers, local processors and food companies. For most of these existing land uses, reliable water is the key to unlocking potential to provide certainty of production and consistent quality.

Eleven value capture opportunities of varying scales have been identified including future land uses which have been assessed under themes including conditions for growth, market size, sustainability, processing capability and actions required. There is no particular relevance to the order of the land uses listed.

Value capture opportunities identified for the Wairarapa include: -

1. **Grapes** - Wairarapa has unique growing conditions for high quality boutique wine for local, domestic and high value export. Collaboration across existing growers will help market Wairarapa uniqueness – cultivars, sustainability, and provenance.

2. **Olives** – There is opportunity for high value food products using an integrated business model for local processing for local/domestic and export markets.

3. **Local Fresh** – Potential may exist to supply a local and domestic market using an on-line integrated business model from farm to plate.

4. **Wheat** – Wairarapa could supply local and domestic markets with high quality wheat products using a farm to plate business model that builds on provenance and quality.

5. **Peas** – As well as recapturing the market for seed peas there is potential for new and novel food products based on specific varieties of peas with a redesigned value chain for local, domestic and export high value markets.

6. **Ancient Grains and Pulses** – A relatively small domestic market exists for whole and processed ancient grains and pulses that have provenance, remove biosecurity risks and are GE free.

7. **Eggs** – This potential land use maybe able to be integrated into existing farm businesses, with a novel partnership model to deliver ethically produced eggs to local, domestic and export markets.

8. **Meat** – Opportunity with irrigated finishing to supply high quality meat with provenance to local, domestic and export markets using a business model that ensures value is delivered into the Wairarapa.

9. **Indigenous plantings** – These plantings would be on land outside the main irrigator footprint to enhance the biodiversity, provenance of food and agri-tourism for the region.

10. **Provenance** –This aims to utilise on-line to create the opportunity through a new collaborative business model to provide food products with provenance, safety and quality directly to local and domestic consumers.

Value creation opportunities for the Wairarapa could be:

- Hops – Currently not grown in the area and would require considerable investment to establish a local industry supplying quality hops which, in time, could achieve provenance in local, domestic and export markets.
- Pipfruit and summerfruit – Some fruit is produced in the Wairarapa, but significant investment would be needed in orchard, post-harvest handling and storage, branding and marketing to develop a scale to supply beyond the local and domestic market.
- Vegetables for export – Significant market insight work would be required to identify both products and high value markets. Aligned with this would be the need to develop a suitable export hub and business model that ensured value returned to the region

- Sheep and goat dairy – The Wairarapa could be further developed for sheep and goat dairy but the market insight work would need to be undertaken to ensure there is a point of difference for the region.

The value creation opportunities that have been highlighted at a high level are hops, pipfruit and summerfruit, fresh durable vegetables for export, and dairy sheep and goat milk. These all require reliable water and have the potential for high returns per hectare. However, they all rely on the establishment of packing / processing and supply chain capability within the region, which does not currently exist. These opportunities could be developed in the future, but they would require groups of interested farmers and stakeholders to collaborate to bring them to life.

Activating Employment

Diversification of land use as a result of reliable water is likely to markedly increase the employment opportunities in the region, increase opportunities for longer term employment for seasonal labour due to the wider range of land uses and differing peak demands and also increase the skills required in the work force and the career opportunities. Career opportunities will range from vineyard and farm management to irrigation and machinery support, processing, and marketing roles beyond the farm gate. Based on this very preliminary assessment there may be potential to create over 200 new positions on-farm in the Wairarapa and to see increases in employment in the processing, logistics and farm support roles. As a part of the next steps, work will be undertaken to assess the employment opportunities beyond the farm gate in relation to activated industries.

Attracting people resources to the Wairarapa and retaining them is currently a challenge, and an opportunity. An investment is therefore required to develop a strategic coordinated approach to attracting labour, training and providing accommodation. An investment in resource and capability building is critical to support the investment in reliable water.

Engagement

Through a series of conversations and interviews with people across the value chain including growers, food companies, processors, and people involved in economic development initiatives, individuals have conveyed a vision for their Region for the next 15-20 years which is aligned and compelling.

We have grouped the vision for Wairarapa into four themes, all of which were based on the premise that they would each support and enhance a healthy environment: -

1. Food bowl for Wellington
2. Collaborative business models + capability sharing
3. Self-sustaining: grow, finish, process and add value within the Wairarapa
4. Infrastructure to enhance the community for locals becomes the authentic tourist experience

Iwi Engagement

In parallel with these conversations, we have also engaged with some members of local Iwi, Rangitane and Kahungunu, to explore their aspirations and values in relation to the proposed Scheme. While the level of discussion has been high level, and a great deal more engagement with a wider representation from both Iwi is required, some themes have emerged which have been captured in this report. We will continue to explore and expand on these themes as our engagement continues. The themes include:

- Developing an active partnership between Iwi and Wairarapa Water Ltd
- Understanding the role of the Scheme within the wider Water Resilience Programme
- Maori Trust land and potential future water requirements
- Regenerative farm practices

- Efficient use of water
- Provenance
- Conservation enhancement – Pukaha to Palliser

Four-phase Development Plan

The Wairarapa has three potential market segments each offering a level of demand that would suit a variety of land uses. Local (Wellington), Domestic (North Island), and Export. Further market insights work is recommended for each market segment and product category as a next step.

Linking provenance to products grown and processed in the Wairarapa builds on the Wairarapa Story which is relevant for local products, and some domestic and export products. The provenance story can be tweaked to focus on New Zealand provenance for products where it is difficult to link any unique attributes to the Wairarapa. The real opportunity for the Wairarapa is to develop a digital based provenance strategy which can be realised on product packaging using a QR code that consumers can access via their iPhone to understand specific information about how the food has been grown (environmental footprint – carbon, nutrients, water use efficiency, soil heath etc), and other health and functional attributes that are unique to the food. A coordinated approach would enable a wide range of producers to access the provenance application and create their own unique branding layer over the underlying data.

A four-phase development plan with 15 actions is proposed to test, validate and scale up value capture initiatives to meet each market segment. The first phase can commence prior to reliable water becoming available and would give many farmers a taste of what some of the opportunities could provide.

It is recommended that the immediate next steps are to road test the 10 opportunities with stakeholders - farmers, processors, Wairarapa Economic Development Strategy members and District Council's, to review and identify the opportunities that various stakeholder groups are keen to champion and thus commit to developing detailed work programmes to take the opportunities further.

Four Phase, 15 step Action Plan:

VALUE CAPTURE	1. Land Use Assessment ✓
	2. Recommended Next Steps
	3. Pilot 10 opportunities with stakeholder groups (farmers + processors + WEDS + district councils)
	4. Review & define qualified opportunities
LOCAL FRESH FOOD BOWL	5. Develop detailed business cases
	6. Establish collaboration models and formal supply chain
	7. Activate land-use conversion
	8. Establish water supply investments
SUSTAINABLE	9. Update Economic Development Strategy

	10. Developer broader strategic partnerships for market expansion
	11. Develop Market Insights programme
	12. Attract external investment for qualified opportunities
INTERNATIONALLY RENOWNED	13. Support niche, sustainable export-focused growth businesses
	14. Consolidate domestic and international sustainable tourism opportunities around export food brands
	15. Ensure the wider local community benefits in virtuous cycle

2.0 Purpose

Wakamoekau Community Water Storage Scheme (the Scheme) proposed for the Wairarapa is envisioned to supply reliable water for a range of uses to support the community, industry, environment, and food and fibre production.

'To have water when we need it, and when we do not it is being collected for when we do. In summertime, everyone is happy as there is an abundance of water'.

Reliable water is fundamental for the health and wellbeing of all communities. The proposed capacity for the water storage scheme will support a range of expected uses such as urban and industry uses and environmental flows. This storage capacity will include water to irrigate approximately 8,000ha for food and fibre production.

Each of these 'end users' require reliable water to varying extents, and the impact of potential future water restrictions if a water storage solution is not implemented will pose dire impacts across the community. Some of these impacts have been captured through the conversations we have had with various people and organisations. This is not an exhaustive list of water needs or consequences of a lack of future reliable water.

Reliable water is 'knowing that water is available when you need it'.	
Water needs	Consequence of unreliable water supply
Industry	A range of businesses and industries in the Wairarapa require water to operate. These businesses employ many local people, in some cases single businesses, such as local wood processing, employs between 300-500 staff. To other businesses such as animal meat processing water is essential for them to operate on a day to day basis. For some businesses reliable water is needed for health and safety, animal welfare, compliance and certification, processing products and wash down. Lack of water would have an immediate and detrimental impact on business viability. Without reliable safe water and thus the ability to operate, jobs will be lost. For some businesses they may look to relocate to other regions to establish their businesses where they would have access to reliable water.
Community	People in the Wairarapa, like all communities enjoy 'turning on the tap' to access water as and when they need it for all household uses and also enjoy the amenity and recreation benefits within their community from a reliable supply of water to maintain lakes, ponds, wetlands and gardens. Currently, managing low water levels as a result of droughts mean water restrictions. As we see the effects of increasingly longer warm and dry summers, the risk of low or no water available for domestic and amenity uses is increasing and will impact everyone's health and wellbeing, and the economic resilience of the community.
Environment	Low rainfall and longer dry periods over summer reduce the flows required to maintain healthy streams and waterways. The lack of rain events reduces opportunities for flushing which naturally help maintain waterway health.

	Through the Ruamahanga Whaitua Implementation Plan process, the community has set targets relating to healthy streams and waterways, which require a range of changes to current consented water abstraction. Alternative supply of reliable water will take the pressure off waterways and streams while maintaining the economic prosperity of the region. The proposed water storage reservoir could also have the potential to release water into streams and rivers to assist in maintaining the desired ecological flows at times of environmental stress due to prolonged dry spells.
Food and Fibre Production	Some irrigation exists in the Wairarapa for food and fibre production. The proposed Whaitua Plan proposes to restrict and/or cut off access to some consents in the future to protect the health of waterways and streams. To balance environmental and economic resilience and wellbeing of the community and maintain or create employment opportunities, an alternative solution to supply reliable water to continue sustainable food and fibre production is required. Our research has identified that more reliable water would enable a wider range of land use diversity including more crops to be grown in the Wairarapa or existing crops to be grown reliably.

Figure 1: Reliance on Reliable Water

This table highlights some of the diverse water needs across the Wairarapa Community. We acknowledge that they are all inextricably linked to each other and you 'can't have one without the other'.

The purpose of this report, however, is to identify sustainable land use opportunities for food and fibre production in the Wairarapa. Identifying opportunities that are fit for the future will provide confidence to farmers that they can afford to invest in the development of reliable water. As such, we have not investigated the needs and opportunities for industry, community, and the environment. These water needs are address by Wairarapa Water Ltd under separate work programmes.

The focus of this Report therefore is to provide the start of a high-level road map that can be used to help guide the next steps in land use diversification to capture and retain more value within the Wairarapa. This is not an exhaustive assessment of land use options or market insights. Rather, it is a stock take and snapshot to make some informed decisions and develop an initial road map for land use transition under or facilitated by reliable irrigation. The outcomes of this study will include identification of further work that is required to enable opportunities to be brought to fruition.

2.1 Why is this study important?

The viability of the proposed water storage scheme will depend on the stakeholders across the proposed uses seeing the potential of the Scheme to establish a resilient environment for the Wairarapa community to the extent where stakeholders commit investment to build and operate the Scheme.

For the food and fibre stakeholder group, each farmer will be required to make their decision to invest based on how they see a reliable supply of water will benefit their business; and they will need to have a clear plan on the adaptations they will make to their farm system to optimise the value of the water to their business.

For farmers, having clarity on how you can make irrigation pay from the time the Scheme becomes operational has been one of the challenges to irrigation uptake for a number of the schemes developed in the past 10 years – Central Plains Water Ltd, North Otago Irrigation Ltd; and a number of the mid-Canterbury Schemes that have invested in upgrading infrastructure.

Generally, there are many sustainable uses that benefit from a reliable water supply. However, one of the greatest limitations to land use change is the supporting infrastructure and supply chain to process and deliver product to market. The off-farm investment required to bring scalable industries to a region to enable land use change is something that is not usually within the individual farmers control and certainty around the beyond farm gate investment would markedly help farmers when they are making their decision to participate in the scheme.

The approach for this land use opportunities assessment has centred around developing an understanding of where the potential exists to capture more value from land uses in the Wairarapa which are supported by existing processing capability and links to markets. Value is not necessarily dollars; it is also the intangible values to the community and the environment. These opportunities need to be accessible to a range of farmers by either adding another layer of income through diversifying land use on parts of their farm, increase the returns from being able to scale up an existing land use or capture greater value from an existing land use.

Opportunities that require significant investment in supporting infrastructure are acknowledged in this study. They may have great potential but are not viewed as options that will result in near term opportunities due to the lack of certainty around the timing of when, if ever, investment would be made to transform those opportunities into reality. These 'future' opportunities are not helpful in supporting farmers decision to invest in reliable water.

It has been essential to engage with farmers, processors, food companies, and economic development leaders within Wairarapa to draw out the aspirations and opportunities from the community perspective. People with a connection to the region can often see where reliable water will unlock the greatest potential for food and fibre production.

Our role in developing this work and the enablement strategies has been to listen, challenge, assess and prioritise opportunities against a range of criteria, and identify actions that can be taken to enable these opportunities to be activated as next steps to this project.

The aim is to build some excitement, start to get farmers, processors and food companies engaging and developing these ideas now and capture the value that exists prior to reliable water coming online, ready for scaling up when it does.

3.0 Project Scope and Methodology

The scope of work focuses on three key areas which will enable a high-level assessment of land use opportunities: -

1. Value web assessment - existing (agri food/products related) manufacturing and processing capability, and logistics within the Wairarapa Region, local and export networks.
2. Current and proposed land use initiatives
3. Market opportunities/insights for New Zealand sourced grains, pulses, and horticulture

The near-term opportunities evaluation will prioritise the most viable opportunities and identify next steps to support enablement.

It was the intention of this work to include liaison with Iwi to determine land ownership and land use aspirations. We have started the engagement process but due to Covid-19 lock down, we have not been able to complete this part of the project. We will continue this work at the appropriate time.

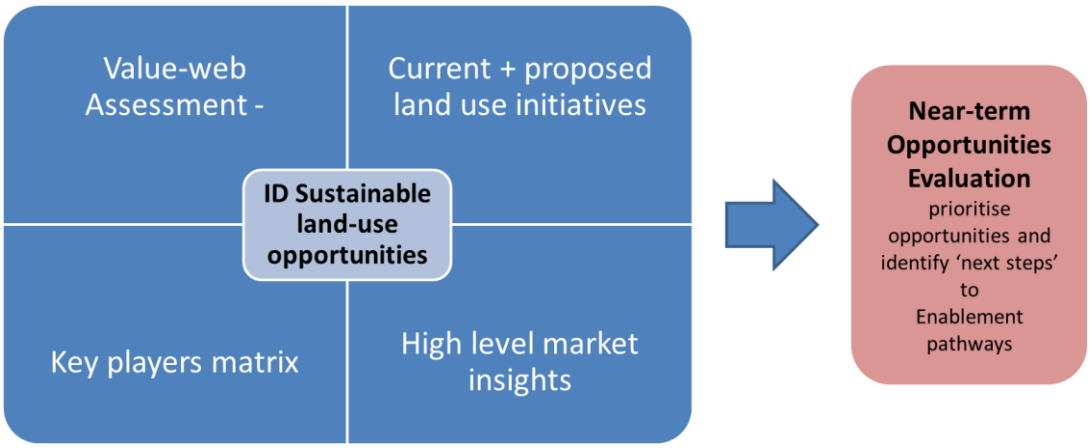


Figure 2 - Near-term Opportunities Value Capture Strategy

This project does not include preparation of on-farm land use case studies to evaluate the affordability of reliable water for farmer-investors. Rather, the approach is to understand a range of opportunities based on a high-level understanding of the potential market and value capture possibilities; enabling farmers to assess how these opportunities would fit with in their farm system.

As well as interviews we have sourced readily available data from a range of sources, such as websites, Statistics New Zealand, Fresh Facts and a range of documents and papers. The sources of this information are not referenced.

Based on this assessment, suggested next steps are documented. To be completed outside the scope of this project, it is suggested that the next steps will include testing each opportunity with stakeholder groups; undertaking a deeper dive to validate key aspects of each opportunity, leading to a go-no-go decision. A go decision would require project participants to become champions of the opportunity to take it forward.

3.1 Value Capture and Value Creation Opportunities

A value capture strategy asks – how can we capture more value from what we know can be grown in the Wairarapa, and how can we transform these raw materials into higher value products within the Wairarapa (as much as possible) for a range of markets. Implemented, this approach will lead to the Wairarapa being more self-sufficient in terms of growing, finishing and processing locally, thus reducing reliance on importing product into the district and/or sending raw materials (animal and plants) out of the district for processing.

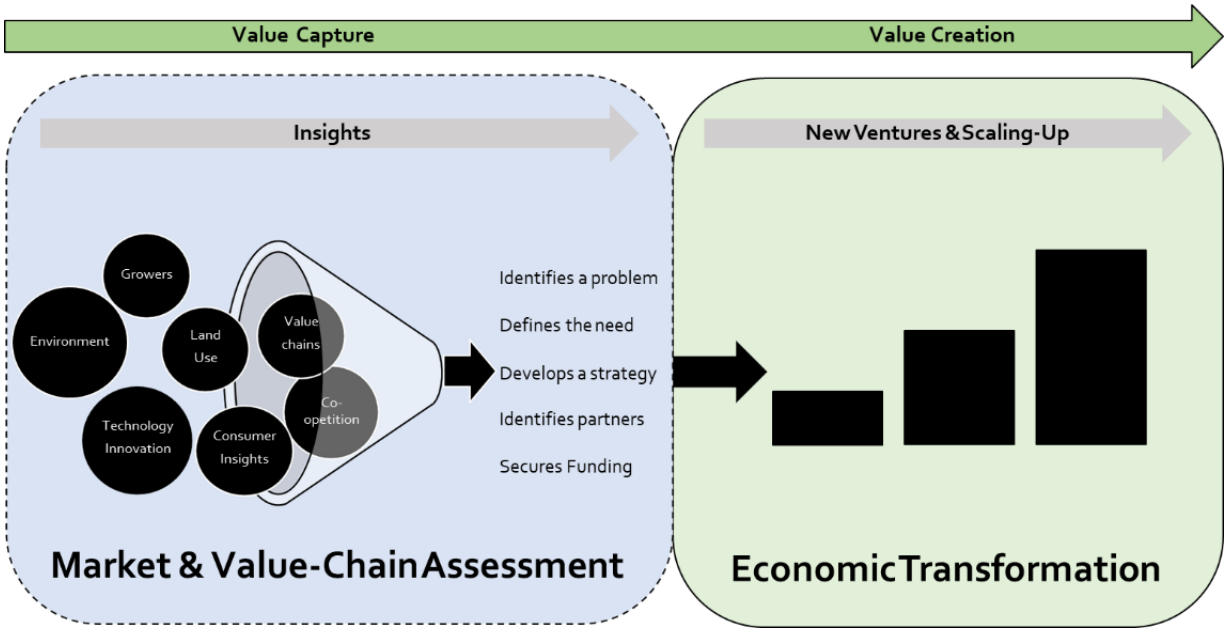


Figure 3 Value capture to value creation diagram

Value capture is the first step to economic transformation. Optimising existing capability and infrastructure through partnerships, collaboration and potentially new business models is an important phase of transition toward future value creation opportunities. As indicated, for individual farmers, value creation in terms of bringing new industries/processing capability to the region is largely outside of their control. However, improving prosperity, demonstrating potential and optimising existing infrastructure becomes an attractive basis for potential future investors and businesses to consider Wairarapa as an ideal region to establish new capability.

4.0 The Physical Environment

Based on land use capability there are a range of potential land uses within the Wairarapa. More detailed soil characterisitcs help to define potential land uses.

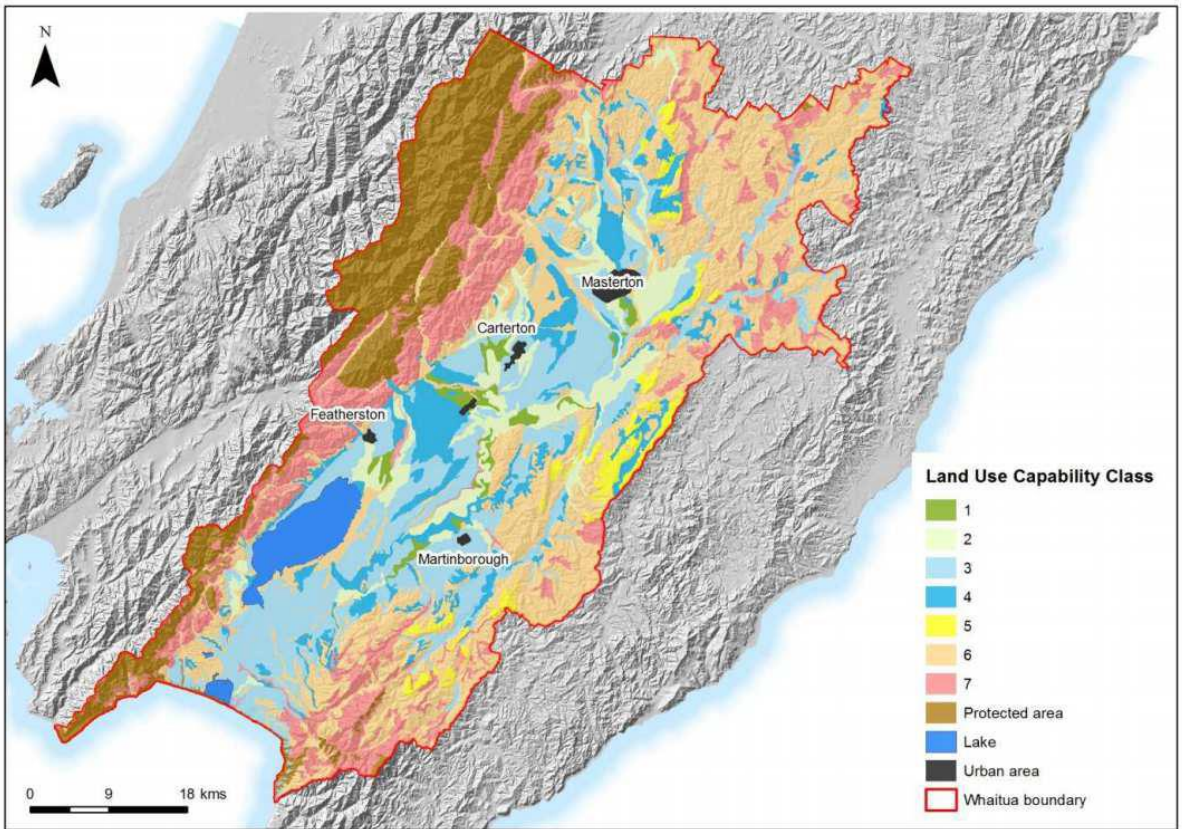


Figure 4: Distribution of soils by LUC Class in the Wellington region according to the NZLRI

LUC Class	Arable cropping suitability†	Pastoral grazing suitability	Production forestry suitability	General suitability
1	High	High	High	Multiple use land
2	↓	↓	↓	
3	↓	↓	↓	
4	Low	↓	↓	
5	Unsuitable	Low	Low	Pastoral or forestry land
6		↓	↓	
7		↓	↓	
8		Unsuitable	Unsuitable	Conservation land

Increasing limitations to use ↓ ↓ *Decreasing versatility of use*

Table 1: Summary of suitability of LUC classes for different uses

There are 57 different soil types within the proposed irrigation zone* in the Wairarapa. These vary from well drained to very poorly drained with the bulk of the soils pushing to either extreme. Based on this classification it is possible to start to define soil suitability for a land use. However, within each soil drainage type there is a huge range in the Potential Available Water in mm (PAW) and in some instances this will dictate the potential land use but it is more likely to determine how the land is managed, particularly with regard to irrigation and when crops can be sown and harvested on the more poorly drained land. It is unlikely that soils with a lower PAW would be suitable for intensive vegetable cropping, particularly if planting occurs in a moisture stress period and similarly intensive vegetable cropping and horticulture are not suited to soils with a high PAW at times of harvest as there will be considerable soil damage. Horticulture is probably not suited to the poorly drained soils.

Drainage	**Area (Ha's)**	**Percentage of area (%)**	**PAW range (mm)**	**Potential land uses**
Well Drained	13630	30.6	30-180	Horticulture, cropping, pasture, conservation
Moderately well drained	7197	16.1	41-186	Horticulture, cropping, pasture, conservation
Imperfectly drained	7200	16.1	40-188	Horticulture, cropping, pasture, conservation
Poorly drained	16071	36.0	60-201	Cropping, pasture, conservation
Very poorly drained	522	1.2	160-350	Conservation, wetlands

Table 2: Areas of different soil types based on drainage within the proposed irrigation zone*.

* **Irrigation zone definition** - The proposed capacity for the water storage scheme will support approximately 8,000ha of irrigation. Further capacity in addition to irrigation will be available for other expected uses such as urban and industry uses and environmental flows. In the absence of a Scheme or Command Area being defined at this stage, the irrigation zone is a broad area for the purposes of identifying soil types within the zone that could potentially receive reliable water in the future.

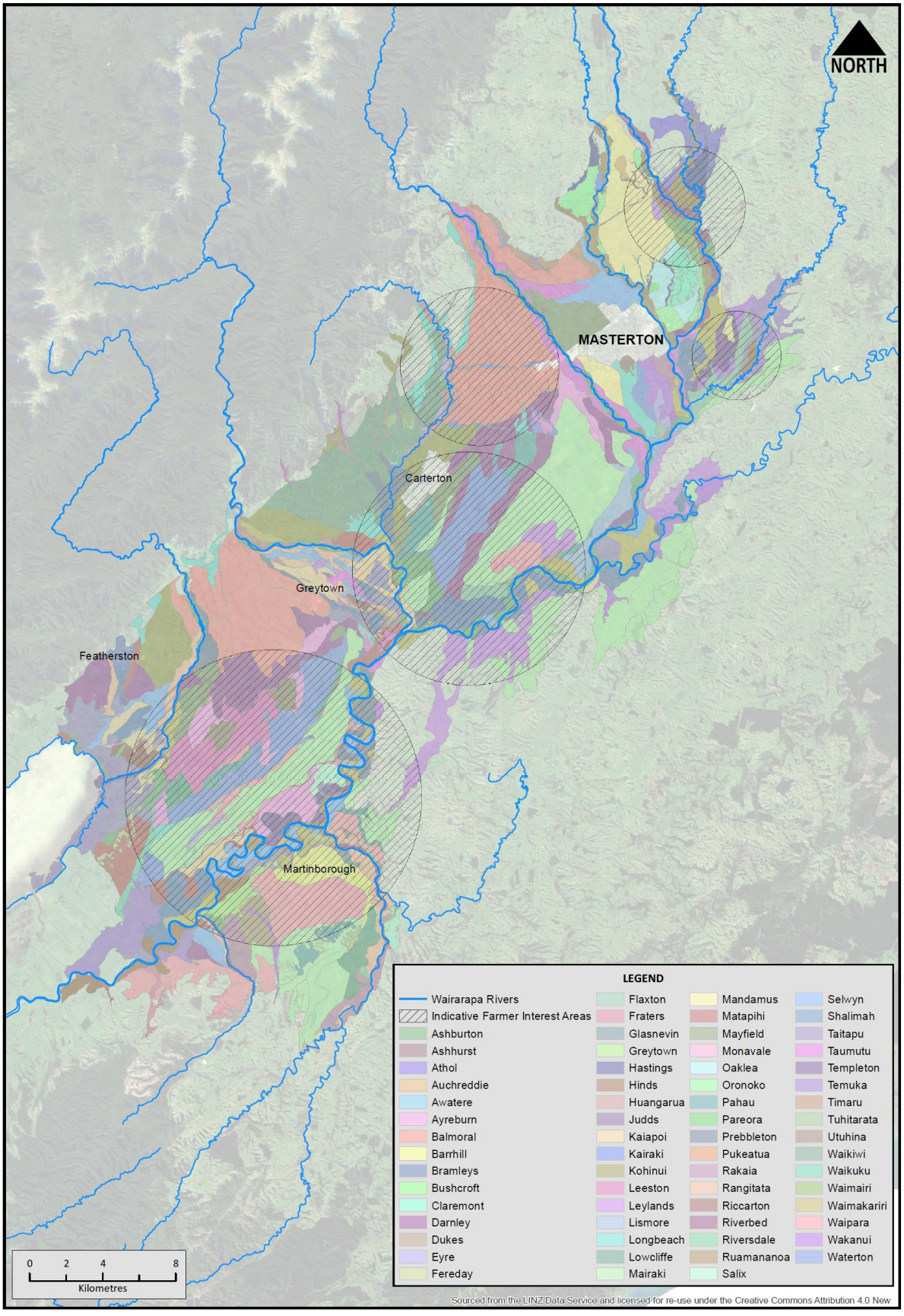


Figure 5: Soil types within the potential irrigation zone* with indicative farmer interest areas.

Climate and climate change

The climate in the Wairarapa is likely to warm significantly into the future. Annual hot days (>25°C) may increase from 24 days now to 30 hot days by 2040 and 94 days by 2090 for Wairarapa. Average temperature is expected to rise by 0.75 to 1C in all seasons. Frosts at higher altitudes in the Tararua Ranges are expected to decrease but the change in frosts in the Wairarapa is not clear. Growing degree days for the Wairarapa are around 1400 and are expected to increase to around 1500 by 2040 and to 1900 to 2000 by 2090.

Rainfall may decrease, particularly in summer with a 4-5% decrease in summer predicted by 2040 with a higher risk of drought. Rare, large extreme rainfall events are likely to increase in intensity due to more moisture being held in a warmer atmosphere, but the future impact of ex-tropical cyclones is uncertain. The mean annual low flow of rivers is expected to decrease.

Potential climate change implications and opportunities

Increases in drought in Wairarapa are expected to reduce crop and pasture growth and cause greater plant mortality. Crops may be sown earlier in the growing season and will reach maturity faster due to higher temperatures. The irrigation season is expected to get longer and requirement for water is expected to increase.

Due to warming temperatures and increased growing degree days, there may be opportunities to grow some new crop species or the region may be better suited to some different crops (e.g. kiwifruit, maize) or cultivars e.g. (early sown spring wheats). There may be a few crops that are less suited to the region in future such as spring sown barley and there may be a shift to more heat and drought tolerant pasture species.

Changes in temperature and rainfall may allow pest species to move into new habitats. 'Sleeper' pests currently in New Zealand may affect farming industries due to change in host-pest relationships (e.g. increase in different pasture grass species, more heat-tolerant pests favoured). Animals may be susceptible to increased heat stress. The number of days of very high and extreme forest fire danger are projected to increase by 100-150% by the 2090s.

A pre-feasibility evaluation of the Scheme has been undertaken by Lewis Tuckers & Co corporate advisory firm at the request of WWL to establish a view on the Scheme value proposition in the face of climate change. Their view included the following key points: -

A combination of drivers suggests that the status quo of water resources in the Wairarapa Valley, which are currently based on surface and ground water abstraction cannot be sustained, there is a need for systemic shift in water use policy settings. This is because:

- Water sources in the Wairarapa Valley are considered fully or over-allocated, there are no additional sources of water available for alternative uses;
- Forecast increase in demand for water due to climate change and the re-priorisation of water for environmental and amenity purposes; and
- The greater need for water reliability across all user groups; urban, industrial and agriculture. For these users, the capital at risk creates a strong case to support the development of a community scale water storage facility. In addition, greater water reliability will facilitate a shift to higher value land uses where the climatic conditions and soil type support such a shift'.

5.0 Reliable water provides an opportunity to re-think land use

The Wairarapa has the opportunity to take a holistic look at potential land use in the future and to design land use systems, predominantly farming systems, that are diversified and integrate a range of land uses within a parcel of land suited to the soil type, water availability, location and the community.

Land use studies that have been undertaken in New Zealand and the Wairarapa have usually identified areas that can undergo a complete change of land use, particularly when irrigation is available, from one type of farming enterprise to another (e.g. sheep to dairy). This will not be acceptable in the future and land within a farming enterprise needs to be considered for and undergo land use changes to the best purposes.

The water principles that are guiding the development of the Scheme are:

- Strengthen regional economies by shifting land use to higher value, sustainable uses, while avoiding increases in livestock intensification.
- Address disparities in Maori access to water for land development
- Support land use that does not increase – and ideally reverses – negative impacts on water quality.
- Maintain the health of waterways
- Incorporate activities that improve water quality.

This study supports the transition to diversified sustainable land use options.

For example, an irrigated dairy farm in the Parkvale area has some soils that would best be used to grow a crop like grapes and other soils that should be retired and planted in natives or similar. Farm case studies were undertaken in 2016 for an earlier version of the proposed Scheme, to look at land use conversion and affordability. The three farms were Elm Grove, Otahuao and Easterbro.

Elm Grove has soil types ranging from shallow well drained, gravelly silt loam which may suit perennial horticulture to deep poorly drained silt loams probably best suited to a light animal class, Otahuao has 17ha of limestone soils which may be suited to grapes depending on topography and Easterbro has significant areas of both Lismore and Templeton soils which should be well suited to cropping or horticulture. In a land use diversification strategy the major farming use of each of these properties may stay the same, but diversification of some of the farm area would be more sustainable from a financial, environmental and social perspective.

There are clear opportunities for land to be used for different uses or to be used with increased productivity from the same land use if irrigation is available. In reviewing land use it needs to be recognised that land being used for a current use may not be what the land is best suited to and this will be occurring on land that is currently both irrigated and dryland. However, any land use needs to be producing products that the market wants, driven by clear market insights.

5.1 Existing agri-food products produce in the Wairarapa

Wairarapa has a broad range of temperate land uses: -

- intensive horticulture (apples, grapes and small areas of fresh vegetables and berryfruit)
- less intensive horticulture (olives), high value seed production (e.g. sweetcorn, maize and onions),
- broadacre seed production (e.g. peas, grass seed, red clover),
- broadacre vegetables (e.g squash),
- broadacre grains for food and feed (e,g wheat, barley, maize and some specialist crops),
- forage crops for silage and feed (e.g maize and brassicas),
- irrigated pasture for dairy, lamb, beef finishing, sheep milking, and hens for egg production
- dryland pasture for sheep, beef and some dairy,
- apiculture (manuka and other honey),
- plantation forestry, plantation hard woods, conservation, indigenous forests,

Most of the horticulture, higher value cropping, finishing and dairy properties utilise some degree of irrigation to ensure production, with sheep and beef being the predominant land use on the dryland areas. Based on these existing land uses, we have reviewed (where information is available) the various products produced, the current markets – local, domestic and export; agri-tourism, suitable land area, farm system opportunity, sustainability footprint, labour, processed products, processing capability, existing and future infrastructure and the potential to link the land use and value add to the food hub proposed for Carterton. Refer to table 3 (or Appendix 2 for an enlarged version)

5.2 Value Web Assessment

Landuse	Products	Markets			Agri tourism	Water		Suitable soil type	Farm system	Sustainability				Labour	Process products	processing capability	Infrastrucutre		Link to Food hub
		Domestic	Local	Export		Irrigation	Processing	Potential irrigable area	opportunity	water	nutrients	GHG	agri chemicals	requirements			existing	future	
Horticulture	grapes, olives	Predominant	oil/ wine	some	some wine	yes	yes	10500ha	yes - sheep & crop	yes	yes	yes	***	high sesonal	wine, olives - oil and processed	number small wineries, 4-oil presses	winery /oil press	picking, pickling, commercial kitchen	yes - small producers
Horticulture	apples, fresh veg, hops	yes	apples, veg	apples	possible	yes	Yes**	7000ha	yes - sheep & crop	yes	yes	yes	low	yes to harvest can be mechanised	yes, variety	yes (apples), veges limted, hops none.	trellis, packhouse, transport	packhouses drying/coolstore	yes - small producers
High value seed	sweetcorn, onion	no	no	yes	no	yes	no	7000ha	yes crop/ sheep	yes	yes	yes	low	yes can be mechanised	none	dryer / cleaner	harvester / dryer / transport	harvest, drying, storage, labour	no
Low value seed	grass, redclover, peas	yes	no	yes	no	yes	no	18000ha	yes crop/ sheep	yes	yes	yes	low	low	none	dryer / cleaner	harvester / dryer /storage / transport	harvest, drying, storage, labour	no
Broadacre Vege	squash	yes	no	yes	no	yes	no*	18,000ha	yes crop/ sheep	yes	***	yes	high	high harvest	yes -soups	none	transport	labour	no
Grains Food	wheat, specialty grains	yes	possibly	no	no	yes	no*	32000ha	yes crop/ sheep	yes	yes	yes	low	low	Baked products	Breadcraft bakery	harvester /storage / transport	milling / niche products, extrusion	yes
Grains Feed	wheat, barley, maize	yes	some	no	no	possibly	no	32000ha	yes crop/sheep	yes	yes	yes	low	low	Animal feeds	Sharpes feed mill	harvester / storage / transport	harvest, drying, storage, labour	no
Forage crops	maize, brassicas	no	yes	no	no	possibly	no	32000ha	yes sheep /dairy /crop	partial	***	yes	low	low	none	none	harvester /transport	labour/contractor co's	no
Irrigated pasture	dairy/ lamb /beef/ sheep milk	yes	possibly	yes	no	yes	yes	18000ha	yes crop	yes	***	yes stock and animal	low	low	meat /	Cabernet, Beehive	dairy shed / abbatoir/ coldstore / transport	Expansion of existing	yes
Dryland pasture	sheep / beef /pig/hens	yes	no	yes	possibly	no	yes*	44000ha	yes trees/ conservation	yes	yes	yes	very low	low	meat /bacon/eggs/wool	Cabernet, Beehive	woolsheds / wool buyers / transport	no scaling, Piggeries subject to suitable location	no
Apiculture	manuka / other	some	some	yes	possibly	no	yes		yes sheep / crop /conservation	yes	none	very low	none	low	honey	2-3 honey businesses	extraction plant	not near term	yes
Softwood forestry	pines	yes		yes	no	no	yes		yes sheep / conservation	yes	yes	positive	very low	low	timber	3 - Juken - wood products	sawmill / fibreboard / transport at harvest	existing is ok	no
Conservation	biomass plantings natives		yes		possibly	no	no		yes all farm types	yes	yes	positive	none	low	none	none	nurseries	scale up, labour	no
Indigenous forests	natives	yes	yes	no	yes	no	no		yes all farm types	yes	yes	positive	none	low	none	none	nurseries	scale up, labour	yes, small scale - flora with unique attributes as ingredients
Wetlands	ecosystem development - potential tourism opp				possibly	no	no	350ha	yes pasture / crop	yes	yes	n/A	none	low	none	none	nurseries	design and construct, labour	no
* = processed outside the region		xx = Area could occur outside Irrigation area																	
** = some processing available, more required																			
*** = subject to good management practices																			

Table 3: Value Web Assessment for the land within the proposed irrigation area. (NB. This includes the urban areas) (Refer to Appendix 2: Value Web Assessment for an enlarged version)

5.3 Overview - existing and future manufacturing and processing capability of food products

Wine

Large scale processing and manufacturing capability in the Wairarapa is limited. Key processing capability is in wine making with several wineries in the Martinborough or Gladstone area. However, these are mostly smaller scale wineries catering for boutique uses. There is some toll processing particularly of the smaller labels. An increase in grape production in the Wairarapa should, at some point, be supported by further investment in wine making.

Olives

There is capability to press olives (4 presses) to produce oil and there is potential to increase throughput. (E.g. Olive Press has a current throughput of 1500kg/hr and operates up to 12 hours per day). Interestingly, fruit processing is usually to use poor quality fruit in the fruit industry and, from limited discussion with the olive industry, there has been limited investment in processing high quality fruit for table olives, although a number of companies do supply small volumes.

Fruit

Fruit packing is undertaken at scale (two packing lines with electronic sorting;) by JR Orchards. Currently they pack only their own two brands for export. They have coolstore and transport capability and are at capacity. Smaller orchards supply the local market. Traditionally there have been challenges sourcing labour but there is an opportunity for orchards to work with other land uses to collectively provide long term employment for people. Mela press and bottle a wide range of fruit juices and cider vinegar from their base in Greytown. They have some capability to toll bottle for other customers. Mela source some apples from the Hawkes Bay but would prefer to source local, thus there is scope to increase local production. Pinehaven also have their own juice brand.

There are several boutique brands processing sauces, jams etc such as Martinborough Manner and Snooty Fruit.

Replicating the likes of JR Orchards model would require significant investment in on farm infrastructure, fully covered orchard; irrigated; packing and electronic sorting, coolstore capability and, importantly, having markets. Scaling fruit (apples) would create more employment.

Dairy

There are no large-scale dairy processors in the Wairarapa. Kingsmeade have a small sheep dairy processing facility for their own cheeses and toll packing sheep milk. There is potential to expand production through Kingsmeade, but the current local and domestic market is competing with other cheese and imported sheep cheeses.

Seeds + Grains

Masterton Vegetable Seeds have seed drying, cleaning, storing and packing capability for a wide range of higher value seeds. Although they have sophisticated equipment the scale of the plant is limited, however, they do operate to food grade. There is potential and space to add on to the plant with other grain related processing such as small scale flourmilling, humus milling and potentially extrusion.

There is limited on farm grain drying capability (Moki Farm dry some high value seed crops) and there is limited on farm storage for grain in the Wairarapa. If there is to be a significant grain industry and processing of grains within the Wairarapa then investment in either on farm or off farm storage will be necessary.

Feed manufacturers, Sharpes, produce a wide range of stockfeed for the full range of livestock. Some of the grains are sourced locally and there is potential to source more or all grains and pulses locally. In future the by-products from other agri-food businesses could form ingredients for stockfeed.

BreadCraft produce high quality baked products for the domestic market all from ingredients currently sourced from outside the Wairarapa. There is a clear focus to source local for both wheat and other grains. Currently milling is done outside the Wairarapa and flour shipped in bulk to BreadCraft. In future opportunities could exist to mill locally.

Honey

Honey is processed by a few businesses. Most are focused on higher value manuka honey.

Eggs

Free Range and cage free egg operations exit in the Wairarapa. Henergy Eggs is the largest cage free egg producer in New Zealand producing for the local and domestic markets. There is potential to expand through Henergy, or separately, as egg production and processing has a relatively low physical footprint, and a low environmental footprint.

Meat

Meat processing is undertaken by Cabernet Foods and Beehive. Cabernet Foods is a relatively small processor of higher value meat products to the domestic market. They have capability to process beef, lamb and pig and employ less than 20 people. The certainty of water for both irrigated finishing farms and the plant would enable the local or domestic story to be developed. Beehive Premier focus on bacon and hams under two key labels. Beehive have a significant work force (approx. 150). They appear to source product from outside the region and undertake the finishing processing. There could be opportunity to develop a Wairarapa food story around some of their products if grain and pigs were produced locally.

Timber

The largest forestry processor is Juken within the order of 300 staff making a range of processed timber products. Water is an essential part of their processing. Kiwi Lumber have a range of sawn timbers.

5.4 Overview - Infrastructure, logistics, networks - Local, Domestic and Export

Infrastructure post processing involves storage, transport and handling capability. The Wairarapa will be reliant on coolstores and dry storage space prior to shipping. There was no evidence that there is pressure on these facilities. Transport is possible by either road or rail for both local (Greater Wellington) and domestic (predominantly North Island). The quality of the road and rail networks will need to be upgraded if there are significant increases in freight. However, if the objective of the region is value not volume then speed to market may be more critical than being able to move large volumes and the high value of the product may overcome the freight costs which are related to both time and distance to market. Thus, any improvements to the network need to be mindful of both value and volume of products moved. Transport for export is likely to involve containers and volume – thus direct rail / road links to Ports with good container handling facilities and the ability to attract the right ships could be critical in future.

The transport costs associated with freighting grains to the point of processing have impacted on wheat and barley production for milling or malt in the region. Currently work is underway to investigate logistics solutions for wheat / flour movement. Similarly, there may be constraints on moving animal feed out of the area due to cost of transport.

Logistics businesses have nodes in the region except for businesses that specialise in refrigerated products or perishable goods.

Currently there is no airfreight from the Wairarapa. The need for airfreight for local or domestic markets is probably limited. Airfreight for some export products could be useful but the investment needed to support the infrastructure for a freight functioning international hub would be significant and the current range of products would not require such facilities.

Across the board existing processing in the Wairarapa is operating under capacity. With reliable water, and more coordination/collaboration of producer's capacity could be increased. There are opportunities for relatively minor enhancements to existing processing infrastructure to diversify and expand including toll processing e.g. Milling at Masterton Vegetable Seeds; olive processing (washing and pickling) at The Olive Press.

5.5 Labour

Based on the 2018 Census data, Wairarapa has a work force that is split 74% in full-time employment and 26% in part-time employment. This ratio is consistent across the labour force in Masterton, Carterton and Greytown/South Wairarapa. Unemployment rates in 2018 were 19% for Masterton and 5% and 3% for Carterton and Greytown respectively.

Seasonal employment opportunities for fruit, (grapes, apples, olives), include pruners, fruit pickers, packhouse graders, inspectors and office roles. PickNZ website, a seasonal worker coordination enterprise indicates that some growers and packing facilities offer work accommodation, and directs seasonal workers to look at backpacker and camping facilities or short-term rental accommodation

Engagement with horticultural related enterprises has highlighted the challenges attracting and retaining staff in the Wairarapa. There are several reasons: -

- The smaller scale operations of agri/hort businesses in the Wairarapa require additional labour at certain times of the year and many do not offer accommodation.
- Lack of coordination across the smaller businesses labour needs means short timeframes of employment are offered and are potentially less attractive.
- For longer term roles, the lack of training impacts on staff retention.

For land use diversification to occur as a result of more reliable water via the Scheme additional labour will be required, thus a coordinated approach will be important to address accommodation, training and staff retention.

Re-thinking how Wairarapa positions employment opportunities will be important. For example, a multi-industry coordinated approach may result in a job being advertised in a broader category of Land Management and offer the person a role that works across a range of enterprises in the region. This will take investment at a Regional level to coordinate and optimise the outcomes for both businesses and staff.

5.6 Employment, Careers and Career development in farming in the Wairarapa

The proposed water scheme in the Wairarapa will create a range of employment opportunities in the Wairarapa in a range of sectors both before and after water comes on stream. Some opportunities for employment, careers and career development in agriculture and horticulture are expected to occur with land use diversification as soon as there is confirmation that reliable water will be available to the region.

In the very recent report for the Masterton District Council, "Economic impacts of Covid 19 on the Masterton economy – early estimates, April 2020", there are forecasts of total job reductions of slightly less than 10% (1100 jobs) by April 2021 in the Masterton district. Of these 100 are forecast to be in the agriculture, forestry, and fishing sectors, of which half are forecast to be farmers and farm managers. These percentages are probably similar in other parts of the Wairarapa. It is noted these are very preliminary figures and in many regions it is expected jobs will become available in agriculture. The report goes on to suggest that infrastructure projects are the opportunity to reduce the impacts on employment.

While infrastructure, including building the scheme, may provide opportunity for jobs in the short to medium term, few of these jobs are likely to evolve to be long term or to provide careers which create a base of skilled people that are part of an essential contribution to Wairarapa's long term revenue stream. The work we have undertaken on opportunities for the land use in the Wairarapa indicate significant opportunity to provide potential for employment, careers, and career development in the Wairarapa.

Where useful information can be sourced a discussion is provided for each of the opportunity areas. Where this information allows it has been used to provide a very preliminary estimate of the potential employment and career opportunities.

Grapes

Grapes have a seasonal labour requirement with peaks in the winter for pruning and in the summer for training vines. In peak demand periods New Zealand vineyards require in order of 33FTE per 100ha. However, averaged over the year, this equates to around 16 FTE per 100ha. Given the more boutique nature of Wairarapa the labour requirements may be slightly higher with an emphasis on higher skilled labour as there are smaller vineyards per manager. Thus, recent Craggy Range plantings may employ around 30 people. New plantings will require labour for establishment. Certainty of supply of reliable water may enable people to divert some water from mature plantings to establish grapes on suitable land prior to water being available. There will also be increased opportunities in post-harvest processing.

Olives

The area of unmanaged trees in the Wairarapa is a significant opportunity for olives to immediately increase production and supply into a market which may change due to expected supply problems from Europe due to the epidemic tree decline disease problem. Pruning is reported to more than double tree yield. Thus, the peak labour requirement would be between winter and flowering and for harvest in April – May. Interestingly the peak labour demands are when less labour is required in the nearby vineyards. There is no readily available information on labour requirements to harvest and prune olives but if only 20% of the 45,000 unmanaged trees in the Wairarapa moved to active management this spring that is 9000 trees that will require skilled pruners this year.

Fresh Local

Knowledge of reliable water may enable the production of fresh local products very rapidly using existing water supplies diverted from lower value crops. Fresh vegetable production could be commenced this year in some areas if markets are secured and berryfruit plantings could also be started. The labour component of these fresh options is relatively high at harvest (spring, summer, autumn) with some requirement for labour for pruning and training in

winter for berries. The labour requirement is difficult to estimate as it will depend on the actual crops grown, but the timing of when harvest occurs is largely compatible with grape peak requirements.

Wheat, Peas, Ancient Grains and Pulses

These are all arable crops which are likely to be grown in a cropping rotation on the same land units.

Based on Canterbury data, the skilled labour requirement for cropping farms is around 1FTE per 120ha with limited seasonal labour demands (roguing and harvest). The average requirement for an easy hill country sheep farm in the North Island East Coast New Zealand (the category most aligned to dryland sheep farming in the Wairarapa) is approximately 1 FTE per 310ha so a move to cropping on land suitable for cropping would see an increase in labour requirement from approximately 1 to 2.6 for the same land area. The shift towards increased area in crop can occur in relation to markets and certainty of supply of water. Thus, if an extra 6000ha was in crop the skilled labour required on farm would increase by in the order of 30 people with approximately 2.3 positions beyond the farm gate for every on-farm position. PGGW have very recently announced the re-opening of the Masterton Vegetable Seeds complex and that it expects this will create 3-4 new jobs in the near future.

Meat

Water will enable more finishing to be undertaken within the Wairarapa. The average labour requirement for easy hill country sheep farm in the North Island East Coast New Zealand is approximately 1 FTE per 310ha, while finishing farms in the same area are around 1FTE per 250 ha, approximately one FTE extra per 1000 ha of finishing farm. Finishing could result in longer term employment and greater opportunity for development of skills. It could also enable increased processing in the Wairarapa with increased labour associated with processing

Conservation

The major labour inputs for indigenous plantings are during the establishment years. Planting is a significant labour input but weed management is also required through the first few years depending on tree development. If there is certainty around water work could start immediately to identify areas best suited for indigenous plantings.

Provenance

A Wairarapa provenance story could commence immediately and could engage a number of people in a range of roles including developing software, developing markets, developing a collaborative business model, developing the logistics and securing, producing and delivering high quality products direct to consumers. Estimating the employment opportunities is difficult until a business model is developed.

Diversification of land use, which would be stimulated if there was certainty of supply of water, is likely to markedly increase the employment opportunities in the region, increase opportunities for longer term employment for seasonal labour due to the wider range of land uses and differing peak demands and also increase the skills required in the work force and the career opportunities. Career opportunities will range from vineyard and farm management to irrigation and machinery support, processing, and marketing roles beyond the farm gate. Based on this very preliminary assessment there may be potential to create over 200 new positions on farm in the Wairarapa and to see increases in employment in the processing, logistics and farm support roles. As a part of the next steps, work will be undertaken to assess the employment opportunities beyond the farm gate in relation to activated industries.

6.0 Vision for Wairarapa 15-20+years – aligned values from the community

Engagement with local people in Masterton, Carterton and South Wairarapa districts highlighted how aligned values and aspirations for their community are. Building a healthy and robust economy based on agri food and conservation for the local community will attract and retain people to live and work in the Wairarapa, and domestic and international tourists will visit to enjoy an authentic local experience.

From these discussions, the vision for the Wairarapa can be grouped into four themes, all of which were based on the premise that they would support and enhance a healthy environment**: -**

Food bowl for Wellington by way of diversification of land use

A resounding shared belief was that the Wairarapa could be the food bowl for Wellington. With reliable water, this could be achieved through the diversified land use that is appropriate for the soils and climate; - more horticulture and fruit production, and land uses that achieve scale to ensure they are viable and which add to the provenance story of Wairarapa. It was believed that reliable water will enable farmers to scale up the production of quality products - grains, pulses, meat, fruit (apples, grapes, berries, olives and hops) and fresh vegetables to Wellington and the North Island. Improved production from reliable water would also enable farmers to contribute to exports across these categories. Opportunities for expanding niche product options for local and domestic markets would also be improved. While the niche products may rely less on reliable water via the proposed storage reservoir, they would indirectly benefit from increased processing capability and thus the new product development opportunities in conjunction with the proposed Food Hub in Carterton.

Collaborative business models + capability sharing

Many farmers are aware that they have a variety of soil types on their farm and that a reliable water supply would enable them the opportunity to look at how to best utilise the soils for higher value and sustainable uses. Stepping outside their comfort and expertise zone to take up other land uses was recognised as a great opportunity for collaboration with other growers in the Wairarapa to share skills, capability and capacity to support sustainable land use transformation. It was envisaged that this collaboration could lead to innovations in farming practices, business models and production, creating many win-win benefits for farmers, their staff and the community.

Self-sustaining – grow, finish, process and add value within Wairarapa

The third theme is the beneficial impact reliable water will have to enable the Wairarapa to become as self-sustaining in production and processing as possible. Farmers could grow, finish and add value to the product in the Wairarapa before sending it to market – local, domestic or export. For example, avoiding sending stock out of the Wairarapa for finishing and processing, and/or avoiding importing feed into the district. A self-sustaining approach would capture and retain more value for the Wairarapa.

Infrastructure to enhance the community for locals becomes the authentic tourist experience.

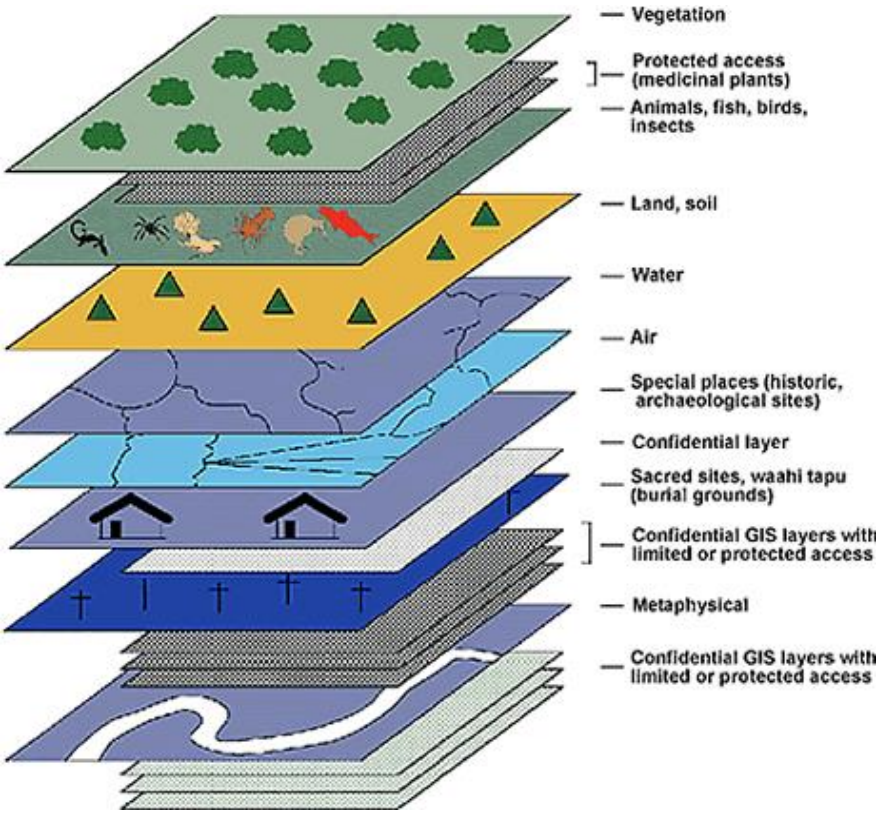
Covid-19 has shown the vulnerability of niche businesses that rely on tourism (domestic or international). Investing in infrastructure to support and add value to resident's day to day life, such as cycle trails connecting the towns and the Wairarapa to Wellington will build on the sense of community. Assets such as this will support Wairarapa to become an attractive destination for local, domestic and international tourists who want to share in the authentic Wairarapa food and excursion experience.

6.1 Iwi Aspirations – engagement to establish values, priorities, and outcomes.

In parallel with the conversations we have had with food producers, food companies, processors and various economic development agency members, we have also had some initial discussions with people from both Rangitane and Kahungunu Iwi. It is important that aspirations and expectations are heard, understood and incorporated into the layers of the project where possible.

While the level of discussion has been high level, and a great deal more engagement, learning and sharing is required some themes have emerged which have been captured in this report. We will continue to explore and expand on these themes, and others as they arise in the discussions as our engagement continues.

- **An active partnership** – active partnership is important to Iwi to ensure that there is genuine engagement throughout the project to seek to understand where key values and outcomes could be incorporated in design, development and operations of the proposed Scheme.
- **Matauranga Maori** – *a cultural system of knowledge about everything that is important in the loves of the people (Mead 2012, p13,* https://www.nzqa.govt.nz/assets/Maori/ConversationsMMv6AW-web.pdf*)* . Working with Iwi to understand and explore how the Scheme should/could interact with natural, physical and metaphysical 'layers' of knowledge and meaning.



Matauranga Maori – layers of knowledge and meaning

- **Understanding the role of the Scheme within the wider Water Resilience Programme –**demonstrate (via summary/diagram) the ways in which the Scheme/Reservoir delivers on key aspects of the broader water resilience programme for the Wairarapa.
- **Maori Trust Land** – There are a number of land parcels within the Wairarapa that are owned by Maori Trusts and have been leased on a long-term basis to farmers. Some of these parcels are incorporated within larger

farms and in some instances are 'land locked' Understanding future aspirations for these parcels of land and the potential for Iwi to be able to access water for this land in the future will be discussed.

- **Regenerative practices –** minimising the use of and need for water through applying regenerative farming practices which build up the soil's organic matter and thus the moisture holding capacity is an expectation of sustainable water use.
- **Efficient use of water** – is water currently being used efficiently? Does more water mean there would be less care given to the efficient use of water? These questions are important and imbedding good management practices into the operational regime of the Scheme via the resource consents will be important. However, a mindset shift by water users is also expected to ensure there is genuine commitment to using the water resource efficiently.
- **Provenance** – exploring the opportunities for Wairarapa provenance that communicates Iwi values and knowledge. Are there opportunities for food products with unique attributes from local flora? How could Iwi groups be supported to develop these opportunities?
- **Conservation enhancement - Pukaha to Palliser** – is a collaboration of people and organisations concerned with the environment and conservation in the Wairarapa. To build on the work already done to date by various Wairarapa Care Groups, there is an opportunity for the Scheme to utilise their GIS capability to produce a map that identifies existing conservation projects, and potential additional conservation areas that could be developed on farms that would contribute to the overall conservation network from Pukaha to Palliser. This would be a 'live' tool and updated as conservation initiatives were developed and enhanced over time.

7.0 A Market Led approach

Largely New Zealand agriculture produces commodity foods and ingredients which are processed outside of New Zealand. As a country we capture a mere 15% of the in-market value of foods we export.

Capturing more value requires value to be added in New Zealand before the food leaves our shores; and it requires provenance to be linked to the food.

Value add and provenance are important but understanding the market and consumer is critical to ensure the products are fit for purpose.

The established consumer values of taste, convenience and nutrition have largely been the focus of high value products. Emerging consumer values of unique health attributes of the food (nutrients for heart, gut and brain health), environmental values of sustainable packaging, the impacts of how the food was produced and reducing food waste along with ethical values of people and animal welfare are now influencing consumer food choices.

Figure 6: Consumer Values

Wairarapa producers are in a strong position respond to consumer preferences for highly nutritious, sustainable and ethically produced food. However, we need to tell more than just the story. We need to provide evidence to prove it. Farmer data presented in an engaging way demonstrating how food is produced will become the basis on which trusted and authentic food is inextricably linked to New Zealand. For some products, this will mean the consumer is connected to the farmers and growers and is able to develop a deeper understanding of the farmer's values and story.

Digitally captured provenance transforms the value chain, into a value web.

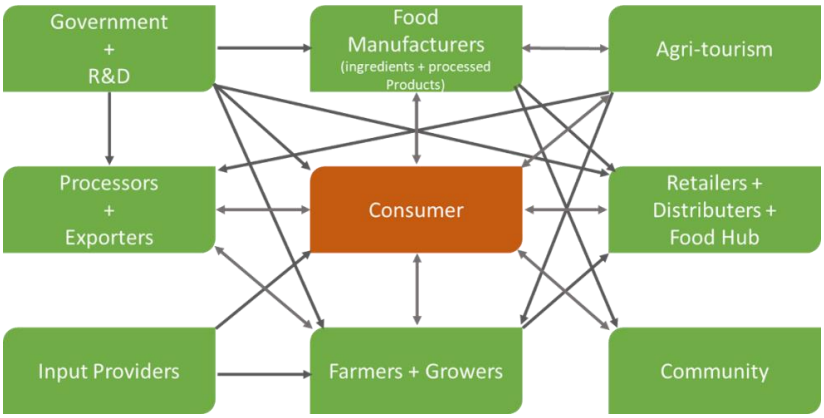


Figure 7: Value Web

7.1 Three Market Segments

The Wairarapa has three potential market segments, each offering a level of demand that would suit a variety of land uses: -

Market Segment No. 1: Local – the aspiration to be the food bowl for Wellington. More particularly the food bowl for discerning Wellington consumers. The population of Wellington Regional Council is approximately 520,000 and growing at 1% p.a. The Wairarapa produce, if not managed to the market, could rapidly swamp this population, except for some niche products and agri-tourism.

Market Segment No. 2: Domestic – Wairarapa could supply the North Island with a range of higher value foods such as wine, grains, flour, baked products, sheep and goat dairy, olives, honey and to a lesser extent high quality meat product. This provides a target population of 3.7million people.

Market Segment No. 3: Export – Wairarapa has few clear advantages for export as compared to other regions in New Zealand. Some of these are seeds, high quality wine and specialist meat, wool and dairy products. Some products such as meat, wool, dairy, grain and timber may be difficult to link the provenance to the Wairarapa, particularly if it is processed outside of the Wairarapa, or does not have a distinct point of difference.

There are several land use opportunities discussed in the following section of this assessment. For each of these, further work will be required to obtain market insights to evaluate the market potential, undertake economic assessment, review environmental and social impacts as part of the 'next steps'.

8.0 Value Capture + Value Creation

We have reviewed and summarised a number of value capture and value creation land use opportunities at a high level that would be suited to the Wairarapa with a clear focus on land use diversification opportunities that build on existing capability. Building on what exists via scaling and redesigning the value chain to capture more value back to the farmer is a tangible strategy that local farmers and processors can activate in response to reliable water becoming available.

We have identified 9 land uses that exist to some extent in the Wairarapa and have the potential to capture more value and/or expand in the near term. These value capture opportunities, with the addition of the Wairarapa Provenance story, could be advanced within the current environment and consented water use. However, to scale up and provide certainty in the future to all participants in the value chain, reliable water is essential.

Not all of the land diversification opportunities identified require full irrigation and not all require large areas of land. Some of the opportunities could be complementary to a primary existing land use and thus by diversifying land use income streams are developed to improve the overall outputs generated from a farm therefore improving the return on irrigation investment for the overall farm. The value of some of the opportunities may not directly generate income streams but may contribute to the biodiversity and aesthetic value of the area.

Refer to Appendix 3: Value Capture Summary for key highlights across land, market, processing and actions in relation to the 10 opportunities identified and expanded on in Section 9 of this report.

Land use diversification opportunities that could create new value for the Wairarapa include a range of intensive perennial crops – hops, pipfruit, summerfruit; and annual crops – a range of fresh durable vegetables for export. Dairy sheep and goat milk production has also been identified as having a compelling export opportunity for high value foods, beverages and infant formula. All of these land uses require reliable irrigation, have a high capital investment on-farm per hectare, and require investment to establish supporting processing infrastructure and value chains to market.

For this reason, we are suggesting that these opportunities may be more likely to occur into the future, rather than be enabled in the initial stages of the proposed Scheme becoming operational.

Refer to Appendix 4: Value Creation Summary for key highlights across land, market, processing and actions in relation to the value creation opportunities identified.

9.0 Overview - Potential Land Use Opportunities Enabled by Reliable Water

Based on the three market segments, the temperate climate, soil types, the availability of water and suitable infrastructure and logistics there are a range of potential land use opportunities.

- **Perennial crops**

A wide range of perennial temperate crops could be grown but some that may be well suited to grow in the Wairarapa include grapes, pipfruit, summerfruit, kiwifruit, olives, a range of nut crops, hops and berryfruit. Many of these could be integrated permanently into existing farm systems to utilise particular soil types or microclimates on parts of a farm. Some of these will focus on the local market (wine, fruit, berries, olives) while many may have a domestic focus (berries, hops) and some may have an export focus (pipfruit, kiwifruit) if the transport and logistics are suitable.

- **Annual crops**

A wide range of crops can be successfully grown in this region and, with January and February being the two driest months of the year, the region is well suited to harvest of grain and seed crops including the following: -

1. **Hybrid, high value seed crops and grains** (peas), pasture seed crops and high quality wheat flour, specialty grains and pulses for a range of dry and processed uses, with provenance to Wairarapa, have the potential to expand beyond the current land use area and to integrate well into a diversified farm system with pasture or perennial crop land uses.
2. **Fresh vegetable** supply into the local market appears to have potential to expand and process vegetable production of species that are durable during transport to process centres could be grown in similar diversified systems to grain and seed.
3. **Exports of fresh vegetables** may be an opportunity in future but will be reliant on an export hub and will need to be of durable temperate vegetables with a particular market fit.
4. **Growing crops for animal feed** should provide an on-going and increased opportunity. As well as cereals (barley, wheat and maize) there could be new opportunities to produce protein crops, such as faba beans, to replace imported protein such as PKE or soy. Supply of animal feed is probably largely to local customers.

For perennial crops and annual crops, please refer to the following Appendices for further detailed information:

Appendix 5: Existing Knowledge Base and Appendix 6: Sustainability Evaluation

- **Animals**

Pasture, both irrigated and dryland, will provide potential for a range of animal enterprises some with higher value end uses, in both meat and dairy, which will need to be undertaken on irrigated pasture to achieve quality and consistency of supply. Opportunities may exist for supply to local and domestic markets through existing processors. High value export markets could also be supplied with specific products. Exports of a range of products with no clear links to Wairarapa by processors outside the region are projected to continue.

There could be opportunities for free range intensive livestock products (pork and poultry) fed local feeds and supplied into the domestic market.

- **Conservation / biomass**

Within most farms there are areas of the farm which are not productive and are potentially losing money. These areas could be planted to either natives and build biodiversity and potentially receive some carbon credits or could be planted in a biomass crop for bedding or energy. While these areas are small on individual farms, collectively in the Wairarapa this could contribute significantly to the Pukaha to Palliser plan. There will be a need for nurseries to support this activity.

- **Provenance**

There is an opportunity for food and fibre products produced in the Wairarapa to include evidence of provenance. For local (Wellington); provenance should be Wairarapa focused. For products supplied into the domestic/North Island and export markets, provenance should focus on New Zealand grown and the nutritional attributes, environmental and ethical values of production and food safety. Wine may be an exception, where regional provenance has value.

Opportunity categories

The existing land uses in the Wairarapa that can be extended and/or more value captured are discussed in detail under the following 10 categories.

1. Grapes
2. Olives (oil and processed)
3. Local Fresh (vegetables and berry fruit)
4. Wheat (milling and durum for pastas and high value flours)
5. Peas (seed and processed
6. New Zealand Source – Ancient Grans and Pulses
7. Eggs
8. Meat (Beef, lamb, pork and poultry)
9. Conservation
10. Provenance

These categories will be evaluated using the following framework of topics.

- The land use – conditions for growth.
- The market size – local, domestic, export.
- The New Zealand supply – current constraints
- Wairarapa production -current and potential
- Impact of water and sustainability
- Processing capability
- Future opportunities – Wairarapa unique position.
- What is needed to make it happen.

9.1 Opportunity 1: Grapes

The land use – conditions for growth.

Grapes are well suited to the climate of the Wairarapa. With a semi-maritime climate, the Wairarapa is sheltered by the westerly Tararua Ranges, and exposed to blustery, devigorating winds. The region experiences cool spring and autumn seasons, and very hot summer days with cool nights. This climate enables a long growing season and the development of intense varietal character and complexity. Ideal winter/spring rainfall patterns and long, dry autumns create excellent conditions for wines. Wairarapa soils are predominantly silt loam over free-draining gravels, with clay loam and limestone featuring in certain vineyards.

The market size – local, domestic, export.

New Zealand wine exports are about NZ$1.8 billion, an increase of 6% over the previous year, or around 275 million litres. New Zealand's domestic market is also strong, with domestic wine sales exceeding NZ$800 million in 2017 and around 50 million litres which is a decrease in volume of around 4%. The continued growth of the wine market internationally indicates there is significant opportunity for growth, while the domestic market indicates that high quality wines with provenance could further increase.

The New Zealand supply

The New Zealand wine industry continues to grow steadily from 35,182ha (345,000t) in 2013 to 37,969 in 2018 (419,000t). Export sales have also increased from around $170 million in 2000 to around $1 billion in 2013 to $1.7 billion in 2018.

Wairarapa production -current and potential

A boutique region, Wairarapa has just 2.6% of New Zealand's land under vine and contributes 1% (4500t) of New Zealand's total production from just over 1000ha in grapes. Craggy Range recently entered the area and have planted 200ha of grapes.

A range of styles and varieties are produced, such as Pinot Noir, Sauvignon Blanc and aromatics, as well as stylish Chardonnay, Syrah and dessert wines. Due to the climate and the lower yields the region focuses on making higher quality higher value wines. A major constraint is the lack of coordinated marketing of the region. Although exports occur to over 40 countries, the region labelled itself Wellington Wine Country in 2017 to associate itself with the city and the local market. This marketing approach has not worked, and the region has recently labelled itself Wairarapa Wine Country. Unfortunately, there are a number of smaller wineries who are not part of a coordinated approach to market Wairarapa as a wine region.

There are over 20 vineyards in three main sub-regions in the area, Martinborough, Gladstone and Masterton. These sub-regions share a similar climate and soil structures yet offer subtle differences in character. North to south, Masterton's gravel riverbeds offer local limestone, Gladstone's more variable silt loam has clay pockets, whilst the shallower river terraces of Martinborough and nearby Te Muna are free draining soils with good aspect.

S-map indicates that there are over 10,500ha of well drained soils in the proposed irrigation area that may suit grapes. While not all of these will be suited to grapes due to flooding risk, slope, aspect etc, there are areas that will be suited to grapes.

Impact of water and sustainability

While some vineyards do not irrigate on particular soil types, irrigation is usually used to establish grapes (5- 7 years) and most vineyards do irrigate. On the lighter well drained soils that are suited to grapes irrigation is required. However, grapes are a fairly water use efficient crop and could be an important land use in an integrated farmed landscape that, through diversification, is a very efficient user of the water resource.

Many vineyards in the Wairarapa are a part of the Sustainable Winegrowing New Zealand program which as a well-recognised world leading sustainability program. The climate in the Wairarapa suits sustainable production systems due to the long dry summers and rainfall often from the south which is cool and does not promote diseases.

Processing capability

Most of the wineries are smaller boutique wineries and many of them have extra processing capability. Matahiwi Estate, Martinborough Vineyards / Te Kairanga and Palliser are the larger wineries in the region. Scaling up to produce more wine is relatively easy with the major investment needed in more tanks. Thus, processing is not a major constraint for the region.

Future opportunities – Wairarapa unique position

Wairarapa has a large number of unique opportunities which mean it should be able to grow as a largely boutique high quality, high value area. The focus may be on local for vineyard sales, local / domestic for on-line high value sales with some wine to the international high value markets. To achieve this Wairarapa need to collaborate to market their uniqueness, which aside from very high quality of some varieties include the sustainability, developing towards carbon zero wines, the potential to benefit from climate change and its unique geographical position which protects it from biosecurity incursions. The attempt to unite under the Wellington Wine Country did not gain significant traction, whereas the new Wairarapa Wine Country website (2020) does appear to involve many wineries.

What is needed to make it happen.

The growth of the wine industry in the Wairarapa is constrained by a lack of coordinated marketing of the attributes of the region and the wine quality from the region. This means the region is not as well recognised as other regions in New Zealand. Wairarapa Wine Country may be a means to develop this, but it will need a clear strategy, investment and buy in from the range of wineries in the region.

Already there are increasing and competing demands for labour and accommodation for employees. International labour is difficult to get compared to other regions. A coordinated effort with other industries may be required to provide long term labour and accommodation.

Access to water is essential within the winery and is also generally required in the vineyards to produce both yield and quality grapes. The water requirements in the vineyard vary with climate annually thus reliability and risk also needs to be considered.

9.2 Opportunity 2: Olives

The land use – conditions for growth.
Olives are a dryland crop in most areas of the world and are well adapted to Mediterranean type climates. Long, warm dry summers will result in good quality fruit and cool conditions are required through winter. They can be damaged by frost but there are varieties that can be grown in most parts of New Zealand and there are plantings from Northland to Central Otago. They require a well-drained but not highly fertile soil with a pH 6.5 -7.5.

The market size – local, domestic, export.
The New Zealand olive oil market is estimated at 4.5million litres, worth about $35 million. However, more than 90% of the oil sold here is imported, mainly from Europe, thus New Zealand production is around 450,000l. There is a large difference in price from imported oil at around $10/l to New Zealand olive oil around $20-$30/l while premium Extra Virgin may command a price of $80/l. Currently some growers export to Asian markets – China and Japans Middle and Upper class. Table olives are produced on a small scale by around 10% of producers with the largest being Telegraph Hill in Hawkes Bay and may command a retail price of $35 - 40/kg. Total New Zealand production is in the order of 7.5 tonnes.

The New Zealand supply – current constraints
Although the olive industry expanded markedly in the 1990s many of the plantings were on lifestyle blocks and there has been limited collaboration with a view to develop the industry and as such it is not very mature. Hence there are many constraints on the industry from low production due to poor management, to uncoordinated processing, no collective marketing and negative competition in the market. Currently there is potential to produce significantly more olive oil from existing plantings with good management.

Wairarapa production -current and potential
There is a large variation in the varietal oil yield in the Wairarapa with some varieties yielding as high as 14% while the overall average for the Wairarapa 11.75% which is slightly above the country average of 11.7%. Approximately 30% of the New Zealand processed olive oil is produced in the Wairarapa.
Around 60% of the table olives in New Zealand are grown in the Wairarapa at around 4.9 tonnes.
With 50,000 trees planted this equates to a planted area of around 160ha. Of these only around 5,500 are actively managed. Based on an average tree yield of around 10kg then the potential production from the Wairarapa may be around 500t whereas if tree yields increased towards their potential of 20kg/tree then production could be around 1000t. Based on tree numbers alone, it could be around 10-15% of New Zealand's olive production.

There is significant potential to expand plantings of olives on suitable soils if there is a viable market for the products. The recent spread of Xyella, a severe bacterial disease of olive trees, in olive groves in Europe is expected to have a very significant impact on the industry internationally and oil prices and availability are expected to be influenced. Thus it could be an excellent time to start active management of the existing trees (45,000) in the Wairarapa and consider new plantings of preferred cultivars for oil and table use.

Impact of water and sustainability
Olives can be grown without irrigation. Irrigation is often used during tree establishment. 35% of New Zealand olive groves are irrigated. Reliable water is as much about resilience/risk management as about opportunity.
Inputs of fertiliser and particularly Nitrogen are low as are agrichemical inputs with a number of olive groves being organic. Olives can fit very effectively into an integrated farm system and utilise areas of the farm outside the irrigator footprint or on lighter free draining soils.

Processing capability

There are four olive presses in the Wairarapa some of which toll process. Olives need to be pressed within 12-24 hours of picking to maximise quality. There is some capacity to increase the production of oil as existing presses are not operating 24hrs per day through the harvest season. In future selecting varieties and areas planted could extend the harvest season and increase the use of existing facilities. The equipment needed for table olive processing is not sophisticated and could be integrated within existing olive processing facilities.

Future opportunities – Wairarapa unique position.

Wairarapa has a unique opportunity to increase olive oil and table olive production if the economics are viable. For olive oil there is the potential to actively manage the existing trees and more than double production as well as to plant new areas within an integrated landscape. This integrated landscape could provide grazing for lambs within the olive groves. There is an opportunity to create distinct flavoured oils which integrate New Zealand aromatic native plants for the boutique high value market. With the current situation in Europe with Xyella, and the impact of Covid 19 there may be an impact on supply and price of imported olive oil and New Zealand consumers are expected to increasingly shop domestic thus there may be a window in the next 12 months to increase Wairarapa production from existing plantings and plant new areas. As well there is potential to increase table olive production overtime by selecting and growing the right cultivars.

Olives are not expected to become a large-scale industry but could be a critical land use in an integrated farm system.

What is needed to make it happen.

The olive industry is fragmented with a number of smaller players. Collaboration is needed or a business entity would need to commit to expanding. Thus there is work needed to better understand the economics of olives and the potential impact of Xyella on the industry, to develop effective business models that can work in this industry, to undertake the market insight work, to implement the improved tree management to increase yields, to review processing and if needed set up suitable systems and facilities.

9.3 Opportunity 3: Fresh Local

The land use – conditions for growth.
The Wairarapa region is suited to growing a wide range of temperate annual crops both from the perspective of climate and soil types. Many of these would be best grown in an integrated farm system that includes both animals and crops. A range of fresh vegetable crops and berry crops are well suited to a range of soil types in the region and can be effectively grown in many farm systems. Many of the fresh vegetable crops require cultivation to establish the crops and need to be harvested when mature irrespective of soil conditions at the time of harvest so are not suited to heavier soils. Berryfruit are likely to need some shelter and are not suited to either heavy or very light soils. Thus, these land uses should probably be on well drained soils with higher potential available water which are not prone to water erosion.

The market size – local, domestic, export.
The local market of Wellington associates fresh vegetables with the Horowhenua area where there are approximately 60 commercial vegetable growers with good access for product by road to Wellington. This region has reasonably reliable rainfall and suitable soils. There are also a number of berryfruit growers in the Horowhenua region where the climate can be detrimental as it favours some fruit rot diseases.
The domestic market would predominately be the Southern North Island for the range of fresh vegetables and berries. South Auckland and Waikato growers focus on supply to the Northern North Island.
The major export markets for New Zealand fresh export vegetables are potatoes, onions and squash with blueberries the major fresh berryfruit export. Wairarapa is not well positioned to supply bulk commodity fresh vegetables or high value fresh vegetables or berries which need to be delivered rapidly to market due to distance from ports and international airfreight hubs.

The New Zealand supply – current constraints
The areas supplying fresh vegetables and berryfruit to urban areas are being encroached by housing from urban sprawl and this is forcing production out to new areas. This is particularly the case in South Auckland but is occurring to a lesser extent in the Horowhenua area. Currently New Zealand has adequate supplies of fresh vegetables but is limited in berryfruit supply in some years. Fresh vegetables and berryfruit have a significant labour requirement for harvest and this is increasingly becoming an issue.

The demand for grown in New Zealand and grown locally may change in response to the Covid 19 pandemic and this could put increased pressure on local supply.

Wairarapa production -current and potential
Fresh vegetable and berry production in the Wairarapa is small. Currently there is only around 12ha of berryfruit within the Wellington / Wairarapa region and 154 ha of fresh vegetables, the largest single crop type by area is brassicas.

There are suitable soils and climates for growing increased areas of vegetables for local production and the dry climate and good free draining soils should be well suited to growing strawberries and brambles (blackberries and raspberries) to supply local markets and some domestic markets. Vegetable crops could be grown in rotation with other annual arable crops on some farms. Thus, there are significant areas of suitable soils available to grow these crops.

Impact of water and sustainability
Both fresh vegetables and berryfruit will require reliable irrigation.

Fresh vegetables usually require cultivation to establish the crop and post-harvest which could place some soils at risk from erosion or loss of soil quality. Some of these crops also have a high nitrogen input and there are risks associated with leaching. However, if these crops are integrated into a farm system with other crops and livestock their impacts should be minimal. Berryfruit often have a high agrichemical input to manage pests and diseases but the Wairarapa climate should minimise these inputs.

Processing capability

Both fresh vegetables and berryfruit will require packing and coolstore facilities. These may be available within the region and be underutilised at the time of harvest or a suitable coolchain could be developed to Wellington. Fresh supply of vegetables to local markets will require a good logistics infrastructure.

Future opportunities – Wairarapa unique position.

Both fresh vegetables and berryfruit fit extremely well with the concept of being part of the Wellington Food Bowl and could feed extremely well into a supply web utilising electronic ordering systems for a home delivery service and building on the provenance of the region. This could be undertaken on a regional basis and would provide a significant point of difference from the uncoordinated supply from the Horowhenua. Fresh vegetable and berryfruit production could compliment other high value foods from the region. Growers of these crops will need assured supply of irrigation and some water for washing and packing.

What is needed to make it happen.

This opportunity is dependent on reliable irrigation water and will also require the development of a local market industry which builds on the provenance of the products. It is also dependent on developing good local market insights and appropriate logistics and value chain to retain value to the Wairarapa.

Production of these crops will require a ready supply of labour at key times mostly for harvest and packing. The labour peaks may fit well with lower labour requirements in other industries.

9.4 Opportunity 4: Wheat (Milling and Durum) – pasta and high value flours

The land use – conditions for growth.
The Wairarapa region is suited to growing a wide range of temperate annual crops both from the perspective of climate and soil types. Many of these would be best grown in an integrated farm system that includes both animals and crops. Wheat, for milling or feed, is a crop well suited to a range of soil types in the region and can be effectively direct drilled in most farm systems. The availability of both autumn and spring types means crops can be grown in many areas.

The market size – local, domestic, export.
The market size is dependent on both the end use and the ability to source and deliver wheat to the customer. There is a limited feed market for wheat into the local feedmill who tend to use barley and maize but there is potential for more wheat to be used in the feed industry, potentially to substitute other grains.
Historically milling wheat was grown in the area and milled at Wellington Flour Mills until 2014. The closure of the Wellington Mill and the cost of transport to mills elsewhere in the North Island reduced the opportunity to grow wheat for milling. As a result of this very little milling wheat is grown in the North Island with some South Island wheat and imported wheat being used in the milling industry. The Arable Food Industry Council has set an objective to supply more New Zealand flour for baking and a target of 250,000 extra tonnes of milling wheat from 25,000ha in the South Island and 10,000ha in the North Island
https://www.nzherald.co.nz/the-country/news/article.cfm?c_id=16&objectid=12233017 . This wheat is all aimed at the baking industry but within the industry there are different end uses (bagged flour, supermarket bagged bread to premium niche bakers) and a wide range of quality of flour. Recently Countdown has made a commitment to use only New Zealand flour in its instore bakeries.

As well as the baked goods market there may be potential for other flour uses. Durum wheat was grown in New Zealand and supplied to Bluebird Foods in Timaru to make Diamond Pasta until 2005. Internationally durum wheats are milled to semolina flour and extruded to make pasta. The majority of pasta in New Zealand is imported ($85M in 2018) and sold dried, apart from canned spaghetti (Heinz Wattie) there are a few smaller companies making fresh pasta in New Zealand. Canned pasta accounts for most of the $21M exported. Internationally there are some pasta companies that associate provenance with their products e.g. Pangkara Foods https://pangkarrafoods.com.au/ (paddock to plate).

The New Zealand supply – current constraints
Most of the flour in the North Island is milled from imported wheat. Wheat is a commodity and price is a major component in the purchasing of wheat unless there is a specific requirement for quality or provenance. Thus imported wheat can often be landed at a mill in the North Island cheaper than wheat grown in Southern North Island or the South Island and freighted to North Island mills. New Zealand produces extremely high quality flour. Thus if cheaper freight could be identified and / or the customer / consumer demanded quality and or flour from New Zealand then it may be viable to supply to North Island mills.

With regard to pasta traditionally durum wheat has been very susceptible to sprouting and hence the quality has not been of a high standard and had poor colour. As a result, when the processing equipment needed upgrading the decision was made to close the Timaru plant. To operate at scale would require an investment in a large scale extruder. However, a more niche pasta business in a region which can grow very high quality durum wheat, could be a business opportunity.

Wairarapa production -current and potential

Currently there is very limited wheat production for human consumption in the Wairarapa. The 2020 harvest was of only a small quantity (200 tonnes) from three farmers to test a system of delivering wheat to the mill and understand the quality of wheat grown in the Wairarapa. As well as this there have been two seasons of trials with both milling wheat and durum wheat which indicate the quality is extremely good and the yields are acceptable both with and without irrigation. There is in the order 35,000 ha of land in the Wairarapa proposed irrigation area which could be very well suitable to grow wheat, obviously much of this land is already committed to other uses but a significant area could be available. A commitment of 6,000ha – 8000ha per year in wheat would require an increase in other arable crops to align with wheat and fit a crop rotation (18 – 24,000ha of crop per year) and / or a commitment for areas that are primarily pasture to be planted in wheat for one year as part of a pasture renewal programme. Wheat is likely to be mainly spring sown and therefore is compatible with autumn sown forage crops and then potentially with other crops such as peas, maize, barley and ryegrass seed. An increase in land in wheat would require investment in harvesting equipment and storage capacity within the region.

Impact of water and sustainability

While wheat can be grown without irrigation both the yield and quality will fluctuate markedly depending on the season. The availability of irrigation will ensure quality and yields are consistent and, as wheat has a high water use efficiency, this crop could result in very effective use of water. Wheat can fit very effectively into a sustainable farming system. It can be direct drilled, is a deep rooting species that can utilise Nitrogen from depth in the soil reducing N leaching risk and N can be supplied in relation to crop demand. It is a very effective crop in the cropping or pasture crop rotation. Wheat is readily direct drilled which minimises the risk of soil erosion, phosphate loss and improves soil quality.

Processing capability

Currently the closest flour mills are in the Waikato / Bay of Plenty. For example, Champion Flour Mill at Mt Manganui has capacity and capability to process a range of flours. Champion have been working with BreadCraft in Masterton and the growers to explore the potential to backload wheat to Mt Manganui in the flour transporter. This solution may provide access to processing capability.

Masterton Vegetable Seeds complex has a food grade certification and other infrastructure to handle grains. Some options around adding processing capability at this, or other sites may exist for small scale processing (milling) such as is associated with providing provenance for local or domestic baked or extruded products.

Future opportunities – Wairarapa unique position.

Wairarapa has a unique opportunity around milling wheat. With water and good growers, linked together in a grower group to provide assurances on supply and quality for the long term, it should be possible to produce significant quantities (perhaps in the order of 40,000 tonnes) of high quality milling wheat to a large scale mill if the right relationships are developed with the mill and their flour customers. A business model with an integrated supply web from the plant breeder to the consumer could be created. As well as this the Wairarapa could be well positioned to develop a smaller scale artisan, niche milling business linked to bakeries with provenance or a niche pasta business. Both of these opportunities could be met by growers investing beyond the farm gate.

What is needed to make it happen.

Further work is needed to foster either the large scale or small-scale opportunities.

Large scale - the evaluation of cultivars suited to the milling industry in the Wairarapa is needed to ensure quality requirements are met. Along with this is the need to strategically and operationally review the logistics plans for storage and transport of both wheat and flour. Aligned with this is the need for market insights and marketing to ensure that the provenance of either Wairarapa or New Zealand flour is recognised and will be rewarded by consumers selectively sourcing these products.

Small scale – the potential business opportunity for pasta needs to be fully explored. Initially some market insight work is needed to assess the market opportunity and then a range of different business models should be explored to ensure the value created is captured back into the Wairarapa as much as possible. Business models that empower grower groups to be part of the value chain beyond the farm gate have significant potential for the small scale opportunities.

9.5 Opportunity 5: Peas – seed & processed

The land use – conditions for growth.
Peas have been grown as a seed crop in the Wairarapa for many years. Unfortunately, the biosecurity incursion of the pea weevil resulted in a ban to growing peas for a number of years. Pea weevil has been successfully eradicated and peas can now (2020-21 season) be grown in the Wairarapa. There are a range of soil types that are suitable for growing field, seed and potentially processed peas and the temperate climate suits this crop.

The market size – local, domestic, export.
The market for seed / field peas from New Zealand is around 28,000t grown across a range of regions for a range of uses (field, garden, processed) mostly for export. Prior to pea weevil around 10% of the pea seed was grown in the Wairarapa (in the order of 2800t on 1200ha). It is expected the seed pea areas and tonnage should, over the next few years return to these levels as seed pea companies diversify risk across growing regions. While there are significant areas of peas grown for processing to frozen peas in other regions in New Zealand the distance from a processor potentially precludes this option. Marrowfat peas are grown and exported for human consumption and small quantities of peas are used for splitting and other uses in New Zealand. Some peas (whites and blues) are grown for animal feeds. Internationally peas are grown on large scale in areas such as Canada for protein extraction.

The New Zealand supply – current constraints
Currently New Zealand production is meeting demand for both seed and process. Farmers can have problems with soil borne diseases and the use of paddocks that have never grown peas or not grown peas for a number of years can reduce the impact of these diseases on yield. If large areas of peas were required the availability of suitable paddocks may become a problem. To secure suitable paddocks process companies in Canterbury and Hawkes Bay have extended the range from their factories where they grow peas over the last 10 years.

New Zealand could grow peas for protein extraction. However, the cost of the processing infrastructure to produce a product that is a commodity means this is extremely unlikely to be a viable use for peas in New Zealand as we would be competing with large scale commodity producers on an international market.

Wairarapa production -current and potential
Due to the pea weevil incursion Wairarapa has not grown peas for the last few years. Prior to the pea growing ban the area grown was around 1200ha. There is in the order 35,000 ha of land in the Wairarapa proposed irrigation area with soils well suited to growing peas, obviously much of this land is already committed to other uses but a significant area could be available. A commitment of 4,000ha – 6,000ha per year in peas would require an increase in other arable crops to align with peas in a four year or longer crop rotation (16 – 24,000ha of crop per year) and / or a commitment for areas that are primarily pasture to be planted in peas for one year as part of a pasture renewal programme. Peas are spring sown and therefore are compatible with autumn sown forage crops and then potentially with other crops such as wheat, maize, barley and ryegrass seed. An increase in land in peas for seed would require investment in harvesting equipment and storage capacity within the region.

Impact of water and sustainability
While peas can be grown without irrigation both the yield and quality will fluctuate markedly depending on the season. The availability of irrigation will ensure quality and yields are consistent. Peas can fit very effectively into a sustainable farming system as they are a legume which plays an important role in the crop rotation with regard to weed management and nitrogen fixation. Peas are readily direct drilled which minimises the risk of soil erosion, phosphate loss and improves soil quality.

Processing capability

Masterton Vegetable Seeds complex has effective storage, cleaning and grading systems for pea seed and could extend operations to handle larger volumes. They also have a food grade certification and other infrastructure to handle grains. Some options around adding processing capability at this, or other sites may exist for small scale processing such as is associated with providing provenance for local or domestic pea-based food products.

Future opportunities – Wairarapa unique position.

Wairarapa will grow peas for seed starting in the 2020-21 season. It is expected that seed companies will overtime increase the area grown in this region in relation to demand and the capacity of Masterton Vegetable Seeds. Thus it may return to 1200ha for seed.

There is currently limited opportunity to grow green peas for processing due to the distance from the processor in Hawkes Bay. However, peas are sourced from the Manawatu for processing.

There may be opportunities to grow specific varieties of peas for very specific uses in the food industry. Peas are used to make a number of dairy replacement products, milk, cheese and yoghurts and there is a very small amount of pea cheese available in New Zealand. There is also potential for peas to be used to replace other pulse crops in making products such as hummus or possibly tofu or tempeh. A recipe and the varieties to make a high-quality hummus from peas could create an opportunity for Wairarapa incorporating the group of farmers within the value chain. In New Zealand humus is made by Life Health Foods (Lisa's) and some other small companies using imported ingredients.

Peas can also be processed into high health snack foods. There is a unique opportunity for a business to be set up to manufacture pea-based foods and there is access to genetic material that is suitable for this purpose.

What is needed to make it happen.

Pea seed production is reliant on seed companies contracting farmers to produce seed. Some seed companies are already active in the region.

To capitalise on the potential to manufacture food products from peas needs some work to ensure the peas grown in the Wairarapa are of a suitable quality for processing into different products. The next steps are to undertake some market insights work to understand the opportunity for local, domestic and export products and the potential scale, develop a suitable business model (this could involve farmers enabling them to move up the value chain and could involve companies already involved in manufacturing products of this type), determine the processing equipment needs and where and how it should be placed and utilised. This has the opportunity to create a high value boutique to niche business providing local and domestic markets which build on unique genetic material and captures and excellent provenance story from the Wairarapa. There is potential for investment from external parties, councils, funding bodies or investors, to accelerate the evaluation and development of this opportunity.

9.6 Opportunity 6: New Zealand Source – Ancient grains and pulses

The land use – conditions for growth.
The Wairarapa region is suited to growing a wide range of temperate annual crops both from the perspective of climate and soil types. Many of these would be best grown in an integrated farm system that includes both animals and crops. Some ancient grains (e.g. quinoa, buckwheat) and some pulses (e.g. chickpeas, soybeans and other beans) should be well suited to a range of soil types in the region and can be effectively direct drilled in most farm systems. Most of these crops would be spring sown, with some early summer sown, thus should be suited to a range of soils but irrigation will be required for both yield and quality. The dry weather through summer and into autumn are ideal for many of these crops as it will reduce disease pressure during plant development and provide good condition for crop drydown and harvest.

The market size – local, domestic, export.
The local market is unlikely to be large enough to justify growing these crops on scale and even the domestic requirements for many of the grains is not large. Thus, the potential market is unlikely to be large in the short term. There may be some export opportunities for either the grain or the processed seed particularly for some grains with safety concerns (e.g. GE free soybeans) or where the provenance value can be captured.

The New Zealand supply – current constraints
There is some production of quinoa for the local market and in the past there has been production of buckwheat and some bean species but most of these grains and pulses are imported.

There is a major biosecurity risk from imported grains and pulses some of which are being sold in unprocessed form to the consumer. The risk of this will vary depending on the country of origin and the biosecurity risk. Many storage pests can infest the range of imported grains and pulses.

As well as the storage pests there are the food safety risks. Several of the grains and pulses are susceptible to infection with mycotoxin-producing fungi which are more prevalent in countries we import from and the levels of the fungi or the mycotoxin are rarely considered in importing grains and pulses. There is the potential to introduce a new disease, weed or pest, to New Zealand with these grains and there are food safety risks of contamination with agrichemicals. Finally, while New Zealand remains GE-free for viable grains, there is a risk of some products, particularly soybean, being GE.

Wairarapa production - current and potential
There have been plantings of chickpeas in the past and more recently there have been experimental plantings of a range of pulse and grain crops. The trial results indicate that a number of these could be successfully grown in the Wairarapa. As well as this there have been some small plantings of buckwheat in the last couple of years.

There is potential for these crops to form part of a sustainable crop rotation, ideally within an annual cropped area. The Wairarapa has suitable soils and climate to produce a number of these crops. The scale of production will not be large but there may be demand for up to 1000t (300ha) of some species depending on the markets.

Impact of water and sustainability
As most of these crops are spring sown and the quality requirements often include grain size, irrigation will be required to meet the specifications.

These species are all important in sustainable cropping systems. The pulses fix nitrogen, buckwheat fosters biodiversity and they all form a breakcrop in the crop rotation which assists with weed, pest and disease management. Most of these species can be direct drilled or minimum cultivation reducing the risk of soil degradation or erosion.

Processing capability

Masterton Vegetable Seeds complex has effective storage, cleaning and grading systems for a range of seeds. They also have a food grade certification and other infrastructure to handle grains. Some options around adding processing capability at this, or other sites, may exist for small scale processing.

Future opportunities – Wairarapa unique position.

Wairarapa has an opportunity to be the region where a wide range of these crops are produced. With water it has suitable soils and climates and is well located to supply into the New Zealand domestic market. These crops are unlikely to command large areas of land so will be less attractive in regions where cropping is undertaken on a larger scale.

What is needed to make it happen.

Irrigation will be essential for the long-term viability of these crops. For most of these crops there has been very little planned development in New Zealand. The first steps are to define the market size, the specifications required by the market. There is limited genetic material in New Zealand of these crops and it will be necessary to source and test a range of species and cultivars to select those that fit the market requirements but also those that perform agronomically within the region.

9.7 Opportunity 7: Eggs

The land use – conditions for growth.
Small footprint and benefits from irrigation. Can fit within an existing farm system, preferably not on heavy soils.

The market size – local, domestic, export.
Retail sales of eggs are worth upwards of $286 million with Supermarkets accounting for $221 million (2017).

New Zealand supermarkets:

- Conventional cage eggs (being phased out) – $3.61/dozen
- Colony eggs (being phased out) – $4.05/dozen
- Barn-raised – $6.43/dozen
- Free-range – $7.34/dozen
- Free-range is therefore 50% more expensive than cage eggs and 45% more expensive than colony eggs.

Exports:

- Currently, 3% of commercially farmed eggs purchased in New Zealand are from barn operations.
- Egg exports are increasing to Pacific Islands, New Caledonia and PNG.
- Singapore is an emerging market which apparently will not import free-range products due to biosecurity concerns – Salmonella and avian influenza
- New Zealand's freedom from disease is a major factor in a growing export trade for eggs.

The New Zealand supply – current constraints
A reliable water supply is required in the Wairarapa in order to enable barn and/or free-range egg production to expand. Water is critical for animal welfare; and to produce grains for chicken food - maize, wheat, barley, pulses.

Wairarapa production -current and potential

Henergy Cage Free Ltd (8.8km from Masterton) – New Zealand's biggest producer of barn eggs (70% of the market), which is 7% of the total egg market.

Smaller niche players opt for online/delivery business models

Wairarapa Free-range Eggs - Smaller scale, fully traceable, sustainable packaging made from grass; online ordering and delivery.

Excellent potential exists for barn raised eggs in the Wairarapa particularly if more irrigated land is available.

Regulation to cease the production of caged produced eggs by 2022 is seeing a transition toward barn raised hens. Further impetus for change is the commitment by Progressive -Countdown, Fresh Choice and Super Value to also cease taking colony (slightly larger 'cage') produced eggs by 2024. New World and Pak n Save have committed to ceasing procurement of colony eggs by 2027.

Barn raised hens will replace the current caged production model. In barn egg farming, hens are housed in large sheds with a litter floor. There are perches for hens to roost and sleep on, and nest boxes are available for egg laying. Unlike free-range farming, the birds do not have access to the outdoors. The marketing term 'cage-free' is often used to describe barn farming.

The NZSPCA recommend 7 hens/m^2 for indoor stocking density and a maximum of 5,000 hens per enclosure resulting in a barn area of 35,000m^2

Impact of water
There is a significant opportunity for barn egg business expansion across New Zealand, and in the Wairarapa (if more reliable water becomes available).

Processing capability
Processing for barn eggs to domestic and export markets exists within the Wairarapa and can accommodate an increase in production output.

Future opportunities – Wairarapa unique position.
Increasing production of barn raised eggs is a key opportunity for the Wairarapa, building on existing capability of Henergy Cage Free Ltd.

There is potential to develop additional traditional fixed location barn systems similar to Henergy's. There is also currently a potential business opportunity underway by Henergy to develop a pasture wagon for free-range egg farming which can be moved around paddocks allowing hens to feed, perch and lay and thus improving soils at the same time. It could be used by other livestock farmers to diversify their operations and naturally regenerate pasture, create employment and another 'layer' to farmers income.

Domestic and potential export opportunities to the Pacific Islands, Oceania and regions in Asia.

For Henergy Cage free Ltd, an opportunity exists to develop shelf ready egg products as a way to create more value and to move up the value chain. Increasing egg supply to support high value food product opportunities would be required.

What is needed to make it happen.
Mobile Barn/free range concept - develop prototype and commercialise. Assist Henergy to secure co-funding from the Sustainable Food and Fibre Futures Fund or similar, to scale and develop faster.

Self-ready egg food products - Market insights (Agmardt) and innovation funding (Callaghan) to develop shelf-ready egg products.

9.8 Opportunity 8: Meat (beef, lamb, pork, and poultry)

The land use – conditions for growth.
There are opportunities for increasing land use relating to beef, sheep, and pigs in the Wairarapa subject to more reliable water being available to farmers.

More reliable water would enable more pasture and crops to be grown to support feed supply for beef and lamb finishing; and cereal crops for pig feed.

The market size – local, domestic, export.

Wairarapa produces around 10% of the sheep, 7% of beef and 5% dairy cattle in New Zealand. One meat processor exists in the Wairarapa having capability to process beef, lamb, pork and a range of by-products.

There is no local poultry raised for meat production in Wairarapa.

A relatively small amount of locally grown and processed meat is branded for the domestic and export market. 10,000 locally raised pigs are processed in Wairarapa; 20,000 are imported from outside of the region for processing.

Wairarapa production -current and potential
Wairarapa has a large number of lamb breeding and some finishing properties in the dryland hill country. While some of these lambs are finished on these farms and some are finished on irrigated land many are shipped out of the region for finishing as there is no surety of feed so farmers cannot actively manage liveweight gain and deliver lambs from the Wairarapa to market at preferred weights. Reliable water would allow more lambs to be finished within the region.

Impact of water
Reliable water to support sustainably raised beef, sheep and pigs in Wairarapa is a critical factor. Current irrigated land is limiting the ability for stock to be retained and finished in the region. Reliable water would enable farmers to supply product continuously. Due to the drought and resultant lack of feed for the 2020 season, many local farmers have destocked early. As such, this has been the first year that local meat processor Cabernet Foods Ltd has had to source and process lamb in Oamaru and, transport it to the North Island for their branding and distribution.

The impact of reliable water has flow on effects for Cabernet Foods processing operation. Reliable water is critical for this business, which currently uses consented groundwater takes for processing, washdown and animal welfare purposes. Without a secure supply of water, the business would potentially lose compliance certifications. There are risks to this water take in relation to potential future reductions to consented annual volumes which put operating the business at risk, including maintaining employment for 15 staff.

Processing capability

Within 150km radius of Wairarapa there are a range of meat processors. The most centrally located being Cabernet Foods in Carterton.

Cabernet Foods Wairarapa NZ (Carterton) – are an independently family owned and operated meat wholesalers and processors located in Carterton. They process meat of 120,000 sheep, 10,000 cattle, 30,000 pigs and sundry

other animals to distributors and retailers throughout New Zealand annually. They specialise in boning, cutting and packaging of meat products to consumer specifications. They produce products for a range of brands including Pirongia Pure Bacon, Cabernet Foods Everton Dry Aged Beef, Hereford Prime Beef NZ, and Cold Stream Pure Lamb Wairarapa. Currently they source stock from within the Wairarapa and import from other regions.

Taylor Preston in Ngauranga, Wellington City (98 km from Masterton) is a multi-species plant and processes around 1,500,000 head of sheep, lambs, goats, calves and beef annually. It is one of the largest 100% New Zealand owned privately held meat processors. Taylor Preston is halal certified and fully EU and USDA licensed for the export of sheep, lambs, goats, calves and beef.

Brands include the household brand Taylor Preston Ltd, which has been supplying the domestic and export market for around 25 years; and 3 premium brands. Export destinations include North America, UK, Europe, Asia Pacific, Middle East, and Africa. They produce various cuts of meat and offer a range of packaging styles and sizes. Associated with food companies Taylor Foods Ltd which specialise in further processing and cooking; and New Zealand Direct which exports chilled and frozen meats into France and related French territories.

AFFCO Manawatu Plant, Fielding (114km from Masterton). Processes 150,000t of meat products and by-products each year. Supplies the domestic and export market (US, Europe and Asia), halal capability. Beef, lamb, veal, mutton, goat and a wide range of by-products. Owned by Talley's Group.

Ovation NZ Ltd, Feilding – (116km from Masterton) Integrated lamb sourcing, slaughter, processing and export business, 100 % grass fed lamb. Has JV's with complementary companies to produce products for export – pickled pelts, wool, skins, slipe wool and bulk cuts of meat for manufacturing into pet food. Has products processed at Progressive Meats Ltd.

Venison Packers Feilding (117km from Masterton) a small unique meat works and distributor specialising in venison. Some of its product is processed by Progressive Meats, Hastings.

Alliance Group Ltd – Levin (136km from Masterton). Farmer co-operative exporting beef, lamb, venison and by-products to more than 65 countries. Brands include Pure South, Te Mana Lamb, Silere (merino), Handpicked (venison), Ashley (sheep meat to Europe).

Silver Fern Farms Ltd – Takapau (148km from Masterton) procurer, processor, marketer and exporter of premium quality lamb, beef and venison. Exports to 60 countries, $2.4b turnover. Grass fed story, links family farming stories to product. 20 farms in Wairarapa currently have a supply agreement with Silver Fern Farms.

Progressive Meats Ltd Hastings (215km from Masterton). Specialist toll processing company, vertically integrated supply chain; partnered with **Atkins Ranch** (Mark Guscott, Wairarapa) supplying chilled lamb to the US market.

Turks Poultry, Foxton (132km from Masterton) employ over 200 staff, supply corn-fed free-range chicken raised on various farms in the Horowhenua. Process into various cuts and formats – flavoured, smoked, and stuffed. Domestic market focus.

Bostocks - Flaxmere, Hastings – organic processed chicken – various cuts and formats. Compostable packaging. No toll processing.

Future opportunities – Wairarapa unique position.

Lack of reliable water to irrigate the flat land and grow crops and pasture limit the capacity for raising stock on the hill country and transferring them to the flats to finish. Reliable water would unlock the potential to finish stock in the Wairarapa.

The cost of importing feed for pigs has been a limiting factor for growth in the Wairarapa. Local pig supply could increase by around 50% if a local feed supply were available. However, this is subject to developing the piggeries within areas that are acceptable to the community; and following good management practices to limit impacts on water quality.

Improving production through reliable irrigation to benefit the wider red meat sector is an obvious benefit to the industry and to the Wairarapa. There is an opportunity to build a 100% Wairarapa provenance brand across many food categories including meat. Local processor Cabernet Foods have capacity to process more local meat across all categories – pig, beef, and lamb. The opportunity for a 100% local provenance brand would need to be supported by full traceability to convey farm location, sustainable farm practices, animal welfare, certifications, and the overall environmental footprint. Fully traceability 100% Wairarapa would provide a point of difference that processors and brands outside the region could not claim.

If this provenance brand is established, it could contribute to an on-line purchase and delivery food concept servicing the Greater Wellington region, the North Island domestic market and potentially niche export markets.

Direct benefits from this opportunity may be more local employment; and a beef, lamb and pork food category offering for the Wairarapa as a 'food bowl' concept.

What is needed to make it happen.

We expect that the increased production as a result of reliable water, and thus supply to existing processors across the region, will occur without any need for intervention or support. However, the 100% Wairarapa provenance opportunity will need to be developed from an engagement with local farmers to establish their interest, what this would mean for them and the processor. Assuming farmers and the processor are excited about this opportunity, a next step could be the development of a longer-term value share business model.

9.9 Opportunity 9: Conservation

The land use – conditions for growth.
The Wairarapa has areas of land within and outside the proposed scheme area that may be suited to conservation either as indigenous plantings or as wetlands. These areas within the scheme area are likely to be pockets of poor-quality land that don't suit more intensive land use or the corners of paddocks which are difficult to manage or to irrigate or are non-productive. The scale within the scheme area has not been defined.

The market size – local, domestic, export.
There is no direct market for the product from these areas. Over time these plantings may increase the aesthetic value of the region and increase the agri-tourism potential or indirectly be linked to the provenance claims of products.
There is also a potential in the carbon market to sell carbon credits.

The New Zealand supply – current constraints
There are a number of potential challenges with planting and establishing areas of indigenous forests or wetlands and there is very limited return on investment that farmers may make in these developments.

Wairarapa production -current and potential
There are some areas of wetlands and indigenous plantings throughout the region. The largest wetland developments are towards the bottom of the catchment near Lake Wairarapa.

Impact of water and sustainability
Water is unlikely to be used on scale to establish indigenous plantings. However, water is a critical component as it enables farmers to review their land use options in relation to land value. It is also possible these plantings will be aligned with irrigation infrastructure and be planted in areas which fall outside irrigator footprints e.g. outside pivots.
It is also possible that wetlands could form an important part of opportunity supplied with water. Wetlands can slow water flows, augment aquifer recharge, improve water quality and increase biodiversity all of which could be important outcomes for the Wairarapa.
These plantings will contribute significantly to the sustainability of the region and can be a part of the Pukaha to Palliser plan.
It is possible to secure carbon credits from indigenous permanent plantings and this will occur at approximately 10t/ha/year which at today's carbon price is around $250/ha/year.

Future opportunities – Wairarapa unique position.
Wairarapa has the opportunity to integrate any indigenous plantings into initiatives that are already underway such as Pukaha to Palliser. It also has the opportunity to integrate wetlands into the overall plan for water within the Wairarapa.

What is needed to make it happen.
Currently few farmers would consider planting areas of native plants or creating wetlands except in riparian areas. There is an opportunity for this opportunity to be led by the community, possibly through the districts or regional council, and to fit with local programmes Pukaha to Palliser and national programmes such as Trees that Count. The community involvement may reduce the risk and costs to farmers of undertaking such plantings. Skilled people are needed to assist with planting plans and to support such activities.

9.10 Opportunity 10: Provenance – linking the Wairarapa story to food

Food authenticity and provenance

Internationally there has been a growing concern and awareness regarding the authenticity of food, both from a food safety perspective and consumers becoming more conscious of what they put into their bodies.

Over recent years the impact that social media "influencers" have had on younger consumers in particular (millennial and Gen-Z) has driven greater attention to nutrition and natural health, while growing awareness of climate change and social issues has led to more consumers considering environmental impact of food (including water, energy and packaging). This is particularly evident in the growth in niche retail and online purchasing decisions.

Food safety scares such as the romaine lettuce E.coli outbreak in the USA in 2018 have made food retailers more aware of the need to maintain good provenance and traceability in their supply chains, driving suppliers to tighten record-keeping and information systems.

The Covid 19 global pandemic is likely to further reinforce this trend leading to more consumers seeking out products that can guarantee quality and safety, and which are produced by businesses that are conscious and committed companies who demonstrate they are good corporate citizens. Consumers are more likely to now look to those companies that are doing good in the broader sense – commitment to the health and wellbeing of people and the planet.

The combined drivers of compliance and consumer preference create an opportunity for leadership for New Zealand producers. Farmers in New Zealand recognise the importance of not only improved production practices, but also in the value of data on how their food was produced. They are aware that consumers are starting to ask for information regarding emissions, water efficiency, agri-chemical use and animal ethics.

New Zealand has a privileged opportunity where diverse interest groups can readily converge on market opportunities, combining the skills of primary producers, market experts and technologists to not only produce food of exceptional quality, but also tell its story in way that consumers will engage.

A number of food companies are starting to include provenance as part of their own brand story; however, this is often done at a high level, without detailed data to back it up. The complexity of the food supply chain means that it is typically only more artisan producers who have control over the complete supply chain who are providing full traceability back to the farmer, whereas most other traceability solutions tend to focus on food safety (recall) processes from the retailer to the manufacturer, which does not necessarily incentivise consumers when making their purchasing decisions.

There is a growing opportunity to ensure that provenance and traceability information accompanies the production of good, healthy food, as the consumers which care about natural health, tend to also be the ones which care about good information. The traceability needs to start with the farm, and progress from there.

When considering information captured for compliance purposes, we should consider the opportunities this creates for delivering value to consumers.

Food produced in New Zealand for local, domestic and export markets has an opportunity to capture provenance at two levels – Local provenance, in this instance Wairarapa: scaling up to New Zealand provenance for domestic and export products. This distinction is important. The potential scale of food production in the Wairarapa would exceed local demand and the impact of a regional provenance for many products becomes lost or not as important at a national or export scale, particularly when multiple New Zealand grown ingredients are combined in one product. In

saying that, there are some products, such as wine, where regional provenance is important for local, domestic and export markets.

Online- food deliveries to the Major Centres

United Fresh, New Zealand's only pan-produce industry organisation produced their inaugural New Zealand Food Trends Report in 2019. The report highlights the rise in food delivery companies which has been steadily growing over the past few years and expects further growth to meet the demands of millennial consumers and busy families who are tending to lean on food delivery options for fresh ingredient based ready meal options such as My Food Bag and Fresh Start enabling food to be fast, fresh and fun. The report highlights that the primary producers are also seeing the value in this online delivery market with producers signing up to supplying direct to consumers in the major centres.

Ready to eat and ready to cook kits available in supermarkets are expected to see a big increase – peeled and chopped produce, fresh sauces, quality frozen products and wholefood 'good for you' treats.

Internationally there has been a surge in "meal-kit" related investment, with an estimated 56% year-on-year growth in investment (according to Pitchbook). Consumers are not only seeking fresher food, they are seeking more information on its origin, and it seems likely that an emphasis on "authentic story-telling" in food will continue to accelerate as a key value driver.

Technology has a big role to play as ecommerce grows both online and instore, enabling consumers to shop smarter. Greater tracking of products and consumers product choices will enable greater traceability from farm to plate as customers want more in-depth information about where their food comes from. The Report highlights consumers want to meet the primary producers. They want to hear the producer's stories and make a personal (albeit virtual) connection with the origin of the contents of their pantry.

Online fresh food delivery businesses published on the WellingtonNZ website includes 8 organisations providing local food and drink delivery to homes and restaurants, which include a range of products sourced from producers outside of Wellington in the likes of Eketahuna and Hastings. These do not include the larger scale nationwide organisations such as My Food Bag, Hello Fresh, Bargain Box, Woop etc.

10.0 Future Opportunities – Wairarapa unique position

Provenance App

Capturing value from products grown and made in the Wairarapa that appeal to consumers who care and are willing to pay a premium must link provenance to the products. Provenance is more than origin, it is evidence, presented in a compelling way, of how the food is grown in a safe and sustainable manner and could include information about water use, soil health, agri chemical use, carbon footprint and animal welfare, and alignment with the relevant United Nations Sustainability development Goals (UNSDG's).

Utilising data farmers already capture on farm to provide evidence of provenance aligns with consumers desire to shop smarter and understand where their food comes from. Linking farmers to consumers via a Smartphone App that scans a QR code on the product to tell an evidence-based provenance story is an opportunity for Wairarapa farmers, processors and food companies, either as a group or individuals.

The App could be designed to tell the unique Wairarapa provenance story for products supplied to the local market. A version of this App could also be developed to tell the New Zealand provenance story for larger domestic (north Island) and export markets.

Wai On-line

Wairarapa has the potential to become the food bowl of Wellington. The ability to produce a wide range of sustainably grown fresh and processed food and beverage products as a result of reliable water presents an opportunity for a strategic approach to entering the on-line home delivery food bag/box market either to support existing businesses and/or to establish a unique Wairarapa brand.

What is needed to make this happen.

Market insights – understand the scope and scale for a Wairarapa brand on-line fresh and processed food products concept and the opportunity to supply existing home delivery businesses and restaurants. An evaluation of the supply chain and food preparation infrastructure required at scale to support the proposition would be required. Evaluate how/if this concept could be integrated with the proposed Food Hub concept in Carterton.

10.1 Recommended Action Plan

VALUE CAPTURE	1. Land Use Assessment ✓
	2. Recommended Next Steps
	3. Pilot 10 opportunities with stakeholder groups (farmers + processors + WEDS + district councils)
	4. Review & define qualified opportunities
LOCAL FRESH FOOD BOWL	5. Develop detailed business cases
	6. Establish collaboration models and formal supply chain
	7. Activate land-use conversion
	8. Establish water supply investments
SUSTAINABLE GROWTH	9. Update Economic Development Strategy
	10. Developer broader strategic partnerships for market expansion
	11. Develop Market Insights programme
	12. Attract external investment for qualified opportunities
INTERNATIONALLY RENOWNED	13. Support niche, sustainable export-focused growth businesses
	14. Consolidate domestic and international sustainable tourism opportunities around export food brands
	15. Ensure the wider local community benefits in virtuous cycle

Table 4: Recommended Action Plan

10.2 Framework to Scale Impact

The Wakamoekau Community Water Storage Scheme will enable, in the near term farmers to increase the productivity of their current farm system and start to diversify parts of their land that are suited to other uses adding layers of income to build a cash flow to afford the cost of irrigation. A good number of these options can be developed to some extent prior to more reliable water becoming available. This transition stage would allow various collaborative partnerships and business models to be developed and tested prior to being scaled up via new water.

The value capture stages based on the 10 opportunities and some enhancements to existing infrastructure and capability in the Wairarapa include four phases. Phase 1 is pre-reliable water; Phases 2,3 and 4 can start to occur with the knowledge that reliable water coming on-line.

Figure 8 Four Phased Value Capture Strategy (refer to Appendix 8 for enlarged view)

11.0 Wairarapa Economic Development Strategy

Value add is a key component of the Wairarapa Economic Development Strategy (WEDS). Value added food and beverage products leverage the current and proposed environment and conservation enhancements to create a destination and 'active' tourism opportunities in the Wairarapa. This study has highlighted 10 value capture/add opportunities including an authenticated provenance digital concept.

Undoubtedly, reliable water via the Scheme will unlock benefits to the Wairarapa Region. However, a number of supporting resources and infrastructure will need to be developed to enable the economic potential of agri-food and fibre production to be realised. Labour, housing and skills development will need to be developed in tandem with the land diversification and value add opportunities.

A key anchor of the WEDS is the proposal for a Food Hub (Carterton) to improve economic growth and education for small and medium food businesses. The ambition is that if successful, the Food Hub will be in place within 3 years, attract 100 people with various skills and add $12 million to the economy. The vision is to supply the local market, and potentially the domestic market (Auckland).

The Food bowl/Wai On-line concept aligns with the Food Hub aspirations. The opportunities could build on the Food Hub concept and potentially justify extending the proposed infrastructure such as dry stores, coolstores and commercial kitchen capability to produce food at scale.

Part of the next steps is to present the opportunities and the four phased value capture strategy to the District Councils and Stakeholders to establish which opportunities various stakeholders in the community wish to champion. Subject to gaining support, various next steps will be enabled. Ideally a number of these should progress prior to the release of the Wakamoekau Community Water Storage Scheme Product Disclosure Statement (PDS) for water user investment.

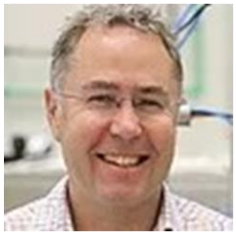
12.0 About Leftfield Innovation Ltd (LFI)

Leftfield Innovation aims to provide new, novel or diversified sustainable land use options to farmers who wish to actively engage within the value chain through understanding consumers who care and utilising technology to add value to their products.

Enabling transformation requires deep understanding. We each have on average 25 years of leadership in our respective domains.

Nick Pyke
Land use and Agronomy

Susan Goodfellow
Strategy and Sustainability



John Morgan
Food innovation and processing

Ed Butler
Science and Plant Proteins

Patrice Feary
Consumer and Market Insights

Andrew Plimmer
Digital Innovation and Consumer Marketing

12.1 Wairarapa Land Use Project Team - Bios

Nick Pyke

Land use and Agronomy

Nick has been actively involved in leading primary industry research, development and governance in New Zealand. As well as having his own business, Ag Innovate NZ Limited, Nick is a co-founder and Director of Leftfield Innovation with five other innovative and future focussed individuals. Nick was Chief Executive Officer of the Foundation for Arable Research for over 20 years, and prior to that worked as a scientist in HortResearch, Agriculture Canada, MAF and DSIR. Nick has received a number of awards in recognition of his contribution to New Zealand's cropping industry.

Susan Goodfellow

Strategy and Sustainability

Susan is a co-founder and Director of Leftfield Innovation Ltd and has been actively involved in the irrigation sector in New Zealand for the past decade including seven years as the General Manager Environment, delivering the Central Plains Water Enhancement Scheme (CPW) from consent through to delivery of irrigation systems.

Susan brings a wealth of experience to Leftfield Innovation in business strategy, stakeholder management, funding and operations that enables her to deliver large-scale, complex projects from inception to fruition. As demonstrated during her time working on the CPW Scheme that resulted in successful farmer investment commitment, Susan has great ability to engage with farmers and provide confidence in the Leftfield group through the delivery of beneficial outcomes.

13.0 Appendices

Appendix 1: Soil Types, Drainage and Profile Available Water (PAW)

Drainage	Area (ha)	FamilyName	PAW to 1m (mm)	PAW to 1m
Well drained	1734	Ashburton	49 -49.7	Low
Well drained	6	Ashhurst	30.5	Low
Well drained	3	Awatere	142.5	Moderate to High
Well drained	3546	Balmoral	49.1 -70	Low to Moderate to Low
Well drained	205	Barhill	135.2	Moderate to High
Well drained	223	Eyre	78.3 -111.9	Mod to Low to Mod to High
Well drained	34	Fereday	84.8	Moderate to Low
Well drained	258	Huangarua	103.8	Moderate
Well drained	613	Kohinui	83.3	Moderate to Low
Well drained	465	Lismore	50	Low
Well drained	1404	Mandamus	92.4 -102.9	Moderate
Well drained	234	Oronoko	101.9 - 154.5	Moderate to High
Well drained	539	Rakaia	64.5 -110.5	Moderate to Low to Mod
Well drained	193	Rangitata	30.8 -72.7	Low to Moderate to Low
Well drained	974	Ruamananoa	85 -136	Mod to Low to Mod to High
Well drained	6	Shalimah	45	Low
Well drained	1065	Taumutu	54.3 -88.3	Low to Moderate to Low
Well drained	736	Waikiwi	94.5 -107.8	Moderate
Well drained	73	Waikuku	74.1	Moderate to Low
Well drained	1319	Waimakariri	144.9 -179.3	Moderate to High to High
Total	**13630**			
Mod well drained	2516	Darnley	41.1 -76.6	Low to Moderate to Low
Mod well drained	301	Greytown	193.4	High
Mod well drained	1240	Mayfield	101.2 - 112.9	Moderate
Mod well drained	811	Prebbleton	176.5 -186.5	High
Mod well drained	730	Templeton	124.1	Moderate to High
Mod well drained	1599	Selwyn	100.2 - 191.9	Moderate to High
Total	**7197**			
Imperfectly drained	447	Oaklea	122.3	Moderate to High
Imperfectly drained	954	Pahau	101 -107.3	Moderate
Imperfectly drained	187	Salix	76.9 -90.1	Moderate to Low to Mod
Imperfectly drained	38	Timaru	86	Moderate to Low
Imperfectly drained	49	Tuhitarata	84.2	Moderate to Low
Imperfectly drained	1526	Waipara	94.5	Moderate
Imperfectly drained	647	Wakanui	92.9 -114.2	Moderate
Total	**3848**			
Poorly drained	63	Athol	121.1	Moderate to High
Poorly drained	1267	Ayreburn	145.1 -166.5	Moderate to High to High

Drainage	Area (ha)	FamilyName	PAW to 1m (mm)	PAW to 1m
Poorly drained	333	Claremont	90.5	Moderate
Poorly drained	595	Flaxton	187.7	High
Poorly drained	218	Hastings	126.6 -201.6	Moderate to High to High
Poorly drained	68	Judds	116	Moderate
Poorly drained	832	Leeston	87.1 -129.3	Mod to Low to Mod to High
Poorly drained	559	Leylands	60.1 -86.4	Moderate to Low
Poorly drained	813	Longbeach	158.8 -165.1	High
Poorly drained	6142	Mairaki	85.8	Moderate to Low
Poorly drained	631	Matapihi	219.2	High
Poorly drained	58	Riccarton	197.5	High
Poorly drained	945	Taitapu	178 -245	High
Poorly drained	282	Temuka	153.5 -168.3	High
Poorly drained	3265	Waterton	102.9 -118.1	Moderate
Total	**16071**			
Very poorly drained	342	Utuhina	280.8 -346.8	Very High
Very poorly drained	180	Waimairi	164.7	High
Total	**522**			
Hectares in the area	**44620**			

Appendix 2: - Value Web Assessment (enlarged format)

Landuse	Products	Markets			Agri tourism	Water		Suitable soil type	Farm system	Sustainability				Labour	Process products	processing capability	Infrastrucutre		Link to Food hub
		Domestic	Local	Export		Irrigation	Processing	Potential irrigable area	opportunity	water	nutrients	GHG	agri chemicals	requirements			existing	future	
Horticulture	grapes, olives	Predominant	oil/ wine	some	some wine	yes	yes	10500ha	yes - sheep & crop	yes	yes	yes	***	high sesonal	wine, olives - oil and processed	number small wineries, 4-oil presses	winery /oil press	picking, pickling, commercial kitchen	yes - small producers
Horticulture	apples, fresh veg, hops	yes	apples, veg	apples	possible	yes	Yes**	7000ha	yes - sheep & crop	yes	yes	yes	low	yes to harvest can be mechanised	yes, variety	yes (apples), veges limted, hops none.	trellis, packhouse, transport	packhouses drying/coolstore	yes - small producers
High value seed	sweetcorn, onion	no	no	yes	no	yes	no	7000ha	yes crop/ sheep	yes	yes	yes	low	yes can be mechanised	none	dryer / cleaner	harvester / dryer / transport	harvest, drying, storage, labour	no
Low value seed	grass, redclover, peas	yes	no	yes	no	yes	no	18000ha	yes crop/ sheep	yes	yes	yes	low	low	none	dryer / cleaner	harvester / dryer /storage / transport	harvest, drying, storage, labour	no
Broadacre Vege	squash	yes	no	yes	no	yes	no*	18,000ha	yes crop/ sheep	yes	***	yes	high	high harvest	yes -soups	none	transport	labour	no
Grains Food	wheat, specialty grains	yes	possibly	no	no	yes	no*	32000ha	yes crop/ sheep	yes	yes	yes	low	low	Baked products	Breadcraft bakery	harvester /storage / transport	milling / niche products, extrusion	yes
Grains Feed	wheat, barley, maize	yes	some	no	no	possibly	no	32000ha	yes crop/sheep	yes	yes	yes	low	low	Animal feeds	Sharpes feed mill	harvester / storage / transport	harvest, drying, storage, labour	no
Forage crops	maize, brassicas	no	yes	no	no	possibly	no	32000ha	yes sheep /dairy /crop	partial	***	yes	low	low	none	none	harvester /transport	labour/contractor co's	no
Irrigated pasture	dairy/ lamb /beef/ sheep milk	yes	possibly	yes	no	yes	yes	18000ha	yes crop	yes	***	yes stock and animal	low	low	meat /	Cabernet, Beehive	dairy shed / abbatoir/ coldstore / transport	Expansion of existing	yes
Dryland pasture	sheep / beef /pig/hens	yes	no	yes	possibly	no	yes*	44000ha	yes trees/ conservation	yes	yes	yes	very low	low	meat /bacon/eggs/wool	Cabernet, Beehive	woolsheds / wool buyers / transport	no scaling, Piggeries subject to suitable location	no
Apiculture	manuka / other	some	some	yes	possibly	no	yes		yes sheep / crop /conservation	yes	none	very low	none	low	honey	2-3 honey businesses	extraction plant	not near term	yes
Softwood forestry	pines	yes		yes	no	no	yes		yes sheep / conservation	yes	yes	positive	very low	low	timber	3 - Juken - wood products	sawmill / fibreboard / transport at harvest	existing is ok	no
Conservation	biomass plantings natives		yes		possibly	no	no		yes all farm types	yes	yes	positive	none	low	none	none	nurseries	scale up, labour	no
Indigenous forests	natives	yes	yes	no	yes	no	no		yes all farm types	yes	yes	positive	none	low	none	none	nurseries	scale up, labour	yes, small scale - flora with unique attributes as ingredients
Wetlands	ecosystem development - potential tourism opp				possibly	no	no	350ha	yes pasture / crop	yes	yes	n/A	none	low	none	none	nurseries	design and construct, labour	no

* = processed outside the region

xx = Area could occur outside Irrigation area

** = some processing available, more required

*** = subject to good management practices

Appendix 3:- 10 Value Capture Opportunities – Summary

The following summary table captures the high-level information discussed in detail in relation to each opportunity in Section 9 of this report.

#	Land use	Land	Market	Processing	Opportunities	Actions
1	Grapes	Partially irrigated opportunity. Large area of suitable land. can be a diversification of land within existing farm systems	Local, domestic and high value export.	Multiple existing smaller scale with potential to expand.	Wairarapa has unique growing conditions for high quality boutique wine – build on Wairarapa Wine Country proposition.	Collaboration across existing growers to market Wairarapa uniqueness – cultivars, sustainability provenance.
2	Olives (processed)	Optimise existing groves, + area for new varieties, minimal irrigation.	Local/domestic and export	Exists within the region – some investment to extend capability to include wash/pickle and commercial kitchen capability	High value process food product. Integrated business model for local processing.	Market insights. Existing cultivar variety trials via test kitchen. Trials for new varieties.
3	Local Fresh*	Irrigated, small land areas	Local and domestic	Storage required within the region -Investment in washing and packing. Link with existing coolstore and refrigerated distribution	Integrated business model for Wai on-line farm to plate concept	Market insights Business case and model development
4	Wheat*	Large area irrigation	Local/ domestic baked products and pasta	Not within region. Transport an issue	Integrated business model Local processing	Develop business model. Market insights
5	Peas*	Large area irrigation	Local, domestic and export value add products	Basic processing within region. Commercial kitchen capability	Plant protein food product; integrated business model (farmers/processor); local processing	Market insights, Business case development. Crop trials.
6	Ancient Grains and Pulses*	Mid-sized area, irrigated	Local and domestic (unprocessed and processed, export for value-add products	Basic processing exists; value add processing outside of the region.	New Zealand source of some ancient grains and pulses (GE free). Value add products for export	Market insights. Business case development. Cultivar selection and crop trials; New product development
7	Eggs	Small area, irrigated, structure within existing farm systems	Local/ domestic and export	Exists within the region	Partnership /collaboration opportunity	Business model and prototype for mobile barn concept (SFFF). Market insights for value-add food product (Agmardt) - Domestic and/or export markets High value food product development (Callaghan)
8	Meat	Large area irrigation for feed (grains) and pasture finishing.	Local/ domestic and export	Exists within the region	Integrated business model local processing	Develop supply agreement to provide longer term certainty. Market insights for provenance opportunities.
9	Provenance	Applicable to all agri food production.	Developed for local business to market their products to consumers who care about sustainably grown food products.	Local, domestic, export	Develop a Provenance strategy that works in layers and thus scalable – Unique Wairarapa story; and the Domestic and export provenance story (food safety, quality)	Link provenance to Wairarapa food and fibre products. Work with WEDS to establish framework for development and implementation. Stakeholder engagement. Technology App development proposal and implementation.

(Note* refer to the following Appendices for further detailed information: Appendix 5: Existing Knowledge Base and Appendix 6: Sustainability Evaluation)

Appendix 4: Value Creation Opportunities Summary

The following table provides a high-level overview of potential land use diversification opportunities that could create significant new value for the Wairarapa if they became established. All require a reliable supply of water.

Opportunity	Land	Market	Processing	Opportunities	Actions
Hops	Irrigated land is essential. Establishment costs expensive. New initiative not yet established in the Wairarapa.	Local (Wellington) craft beer market; export to Australia, Asia and North America Export Hops to North America, UK and Europe.	Does not currently exist. Unique on farm set up; and requires drying and palletising and packing capability.	$45k/ha return once hops are mature. MPI have co-invested in a $13.25m 7-year hops cultivar breeding programme (announced Oct 2018). Cultivars developed for unique New Zealand growing conditions. Could be an opportunity for Wairarapa to supply hops with unique provenance to New Zealand's craft beer capital – Wellington; and export markets (craft beer and hops).	Would require an interested stakeholder group to work together to establish scale of production, and make on-farm and off farm investment viable
Pipfruit and summerfruit	Irrigated land is essential Set up costs similar to Hops if permanent cover is implemented. Additional costs for packhouse, grading, coolstore and smart fresh technology.	Local, domestic and export.	Does not exist on a co-operative basis; and current capability is at full capacity.	Local and domestic opportunities; some export if scale was achieved. If investment in processing was available, opportunities to process second grade fruit into food products such as purees for baby food, juices, smoothies etc could add value.	The most efficient way to proceed would be to establish an interested stakeholder group to work together to establish scale of production, and make on-farm and off farm investment viable
Vegetables for export	Irrigated land is essential Fresh durable vegetables such as - carrots, beetroot, sweetcorn, green beans, broccoli.	Asia (Japan, Taiwan, Hong Kong, China, Australia, Middle East.	Current does not exist. Packhouse, grading, coolstore and smart fresh technology.	Local and domestic opportunities; some export if scale was achieved. If investment in processing was available, opportunities to process second grade fruit into food products such as purees for baby food, juices, smoothies etc could add value.	The most efficient way to proceed would be to establish an interested stakeholder group to work together to establish scale of production, and make on-farm and off farm investment viable
Dairy Sheep and Goat milk	Smaller land parcels 20-50ha (200-1000 stock units) irrigated essential.	Local, domestic and export – high value food products and infant formula.	Does not exist at scale in the Wairarapa. North Island options include: Origin Earth, Havelock North. Dairy Goat Co-op Hamilton. Yashili and New Image in Auckland and Food Waikato.	Full analysis has been undertaken – market insights, on-farm and off farm analysis. https://sheepandgoatmilk.nz/ Unless processing capability is established closer to Wairarapa, this opportunity will be difficult to develop	Monitor the dairy sheep and goat milk industry development.

Appendix 5: - Existing Knowledge Base

Crop	Growing conditions	Potential yield / cultivars	Water needs	Issues / opportunities	End use
Arable crops					
Quinoa	Short daylengths and cool temperatures for good growth. -4 to 35C.	3-5t/ha Number of varieties and colours. Light colour lower saponins.	375 -450mm Drought reduces plant height and yields. Responds well to irrigation.	Saponins – bitter taste. Selected for low saponins	High in lysine. High in iron. Good protein. Flour, soups, salads etc
Spelt	Autumn sown same conditions as winter wheat. Also some spring varieties. Can grow on low fertility heavier soils.	2.4-4 t/ha. There are awnless varieties and higher yielding varieties. Spring lower yielding CDC Zorba at 2.2t/ha	Similar to winter wheat 450-600mm so benefit from irrigation.	Can lodge. Dehulling of grain is needed. Lower N requirement.	Flour for breads and pasta. 11-12% protein. Soft flour high in resistant starch. Does contain gluten. High in riboflavin. Also used in specialty beers.
Hemp	Short day plant flowers when daylength is less than 12 hours. Soil temp 7-15C. 100-110 growing days grain. 70-90 growing days fibre. Most areas. Avoid heavy soils.	800-1000kg/ha seed. 5-7 t/ha for fibre. Early sowing for fibre. Later for shorter for seed.	250-300mm water. Lack of moisture reduces yield.	Harvesting is a problem due to fibrous nature of plant. 12% for grain dry to 9% Less than 16% MC for fibre after retting. Requires 100 -130 kg N/ha.	Seed – oil, flour, beverages Fibre – carpets, insulation
Sunflower	Temperature 21-25C for growth. Soil temp 9C for germination. 90- 100 days growing season to mature. Dryer areas to avoid disease.	Hybrids Yields 2.5-4.8 t/ha Growing November to March.	Inefficient water user. Drought sensitive – irrigate 20 days pre and post peak flowering. Water use 470mm.	Deep rooting extract N and water from depth. Susceptible to birds close to harvest. Some lodging and shattering also Low N input 50-70kg/ha	39-49% oil in hybrids. High smoke point oil. High in oleic acid. Human snack foods and seeds. Bird seed.
Durum wheat	Spring sown. Low rainfall close to harvest. Long days through grain fill.	7-8t/ha Limited varieties in New Zealand	450mm. can grow dryland but benefits from irrigation.	Very susceptible to sprouting. Relatively disease resistant but use fungicides for stripe rust. No processing capability in New Zealand.	Pasta – higher protein over 12.5%. Initial trials - good Golden colour due to higher carotenoids. Very hard wheat. 45-y gliadin -protein for good pasta. High water absorption. Low alpha amylase.
Rye	Winter sown Low rainfall close to harvest.	6-9 t/ha There are preferred varieties.	450mm Fairly drought tolerant.	Susceptible to sprouting and also to shattering.	Rye breads – lower gluten as more soluble protein (80% vs 20% for wheat) Protein similar to wheat.
Emmer (Farro)	Tolerates poor soils.	Low yield - 1.5 -2.5t/ha in US.	Drought tolerant	Dehulling is needed. Disease resistant	Emmer bread – High protein 9-13% Has gluten. Pasta

Crop	Growing conditions	Potential yield / cultivars	Water needs	Issues / opportunities	End use
Proso Millet	Plant above 18C soil temp Sensitive to cool weather <13C. 85 days to mature. C4 grass. Short maturity. Probably too cold.	2.5- 5t/ha	Drought resistant	Non-determinate. Difficult to define harvest – windrow. Susceptible to lodging. 25-70kgN No disease issues.	Bread – no gluten Flat bread Roti Porridge 12.5% protein.
Malting Barley	Spring or autumn sown. Can be grown in a range of soil types from light to heavy.	Yields 6-9t/ha Number of varieties.	Responds to irrigation – particularly spring sown	Distance from malting company in Marton and freight costs. Limited on farm storage	May be an opportunity to supply specific quality for certain malts.
Milling wheat	Spring or autumn sown. Can be grown in a range of soil types from light to heavy.	Yields 7-11t/ha Number of varieties.	Responds to irrigation – particularly spring sown	Distance from flour mill & freight costs. Limited on farm storage.	Local provenance possible with BreadCraft. Increased demand for New Zealand flour through Countdown. Produce high quality wheat for specific end-uses.
Buckwheat	Free draining soils can be low pH. Low N requirement less than 50kgN/ha. 10C for germination, frost sensitive especially until 2 leaf stage.	1.5-2t/ha Number of varieties but limited breeding. Need to select varieties with quality and suit New Zealand conditions.	Very drought sensitive. Needs irrigation	Allelopathic to weeds No disease or pest issues low agrichemical input Soil improver High anti-oxidant – Rutin Reduces blood cholesterol	Gluten free Flour – mostly to soba noodles not suitable for bread. Sprouts Honey Nutraceutical High protein 13-15%
Soybean	Soil temperature over 10C for germination. Mature after 140 days	2-5t/ha Huge number of cultivars. Less clear hilum cultivars available for food consumption	Needs irrigation	GM free – any seed imports need a GE test which has to be done in Australia. Tolerant to wide range of soils. Harvest around 13% MC lower can shatter Legume fixes N, no N input Susceptible to insects.	Milk Tofu Miso Edamame
Adzuki bean (red mung bean)	Soil temperatures over 10C for germination. 15-30C for growth. Frost sensitive Mature 110 – 120 days	1.4-4.5t/ha Large number of cultivars have been developed.	Some tolerance to drought but is responsive to irrigation.	Not very competitive susceptible to weed pressure. Some diseases no insects. Indeterminate – windrow, shattering losses if late in season.	Mostly eaten as a whole bean Some sprouted.
Yellow pea /pea	Temperate legume Wide range of soil types	3-6t/ha Range of cultivars with a range of end-uses	Responsive to irrigation but reasonable dry tolerant.	Very susceptible to diseases in New Zealand Need protein extraction and no plant available in New Zealand - $4 mill plus	21-25% protein High lysine tryptophan Milk Snacks Meat substitutes Yoghurt, humus, seed.
Lentil	Well drained soils Frost tolerant in spring	2-3t/ha Number of cultivars of each colour	400mm - rainfall In drought get cracking and shattering. Benefit from irrigation	Wide range and susceptible to diseases Susceptible to waterlogging. Not competitive with weeds. Susceptible to lodging and shattering. Green usually higher priced but are easily discoloured near harvest.	22-35% protein deficient in methionine and cystine. High lysine. Therefore when mixed with cereals a good balance of protein. Ethnic foods – curries, soups etc Red /Green Flour

Crop	Growing conditions	Potential yield / cultivars	Water needs	Issues / opportunities	End use
Chickpea	Temperate legume average temperature of 15C. Well drained soils – sandy loams. Seedling frost tolerant. October sown. 130 days growing season.	2- 4t/ha Kabuli type – number of varieties.	Reasonably drought tolerant. Will benefit from having irrigation.	Deep tap root. Susceptible to diseases when wet / waterlogged. Not competitive with weeds. Harvest at 13% -will shatter if too dry. Seed size is important	20% protein deficient in methionine and cystine. Kabuli types – wide range of foods and uses humus, salads, falafel, flour etc.
Faba bean	Spring or winter types Frost tolerant Well structured soils pH 6-7	6-8t/ha Number for varieties suited to a range of end uses. Yield declines as sowing delayed in spring.	Susceptible to drought - irrigate	Susceptible to foliar diseases need to manage irrigation accordingly. Shattering can be a problem if too dry at harvest. Brackling or lodging if too tall. Number of potential health benefits.	27-32% protein, lysine rich Low tannin varieties available. Widely used as a cooked bean throughout the world Snack foods Flour – improve nutritional value of other flours. Excellent animal protein source to replace soy.
Navy bean / Haricot / red / black	Well drained structured soils Frost sensitive pH 6.5-7 Optimum Temp for growth 24C 85-115 days – sown Nov / Dec	1-2 t/ha Wide range of types, maturities, cultivars	Susceptible to drought - irrigate	Number of potential health benefits. Susceptible to waterlogged soils. Disease susceptible. Not very competitive with weeds Prone to discolouration at harvest. May need polishing for some markets	22% protein amino acid profile complements cereals. Baked beans, refried beans. Could be demand for seed production eg Watties.
Vegetable seed	Well drained, well structure soils	Range of temperate crops – peas, onion, sweetcorn, Asian vegetable, carrot, beet etc	Need irrigation.	High value but high risk. Limited areas due to pollination separation distances for bee pollinated crops	Seed
Vegetable crops – some examples					
Beans	Soil temp 16C. Free draining soils. Sow Oct to Jan.	10-12t/ha for process. Higher fresh. Huge range of types and cultivars.	Need irrigation.	Susceptible to heavy /wet soils. Some diseases.	Probably fresh local and domestic. There is potential for export to some markets. May be potential for process.
Sweetcorn	Soil temp over 12C. need 80 -120 frost free days. Warm day temps.	13 – 22t/ha. Wide range of varieties.	Need irrigation. High water requirement.	Need warm weather for pollination. Labour intensive if fresh harvested.	Fresh local. Could be potential for increased seed production.

Crop	Growing conditions	Potential yield / cultivars	Water needs	Issues / opportunities	End use
Leafy greens	Well drained soils. Warm days 25c cool nights. Best suited to autumn.	Wide range of species types and cultivars.	Need irrigation.	Susceptible to a wide range of pests, diseases. Need cultivates soil so susceptible to erosion. Needs to be cooled after harvest.	Fresh local.
Broccoli	Wide range of soils – silt to clay loams, well drained. Suited to temperate climate.	Number of cultivars. 7-9 t/ha	Needs adequate moisture so irrigation in the dryer periods.	Susceptible to a range of pests and diseases. Product needs to be cooled rapidly after harvest.	Fresh local or domestic. Is a relatively durable vegetable so could be exported.
Perennial crops – some examples					
Apples	Warm, dry summer cool winter. Well drained fertile soils.	Wide range of varieties. Some are closed eg Rockitt	Lack of water reduces fruit size, need irrigation.	Susceptible to hail, wind and frost. Range of pests etc. use Integrated management approach to reduce agrichemicals. Large labour requirement for harvest and pruning. Significant investment required for post harvest packing and storing.	Any scale would need to be exported. Limited processing capability locally for second grade fruit.
Summerfruit	Cool in winter, not too frosty or windy in spring, warm days and cool nights for fruit to develop, dry harvest. Well drained / structured soils	Number of species and varieties	Irrigation is essential and water could be used for frost protection.	Susceptible to hail and wet at harvest. Susceptible to a range of diseases. Significant agrichemical usage. Large labour requirement for harvest and pruning. Significant investment required for post harvest packing and storing.	Some local / domestic opportunities. For scale would need to consider export. Limited local processing ability for second grade fruit.
Kiwifruit	Cool winter to stimulate budbreak, frosts can damage buds and trunks, fine warm weather for pollination. Well drained / structured soils	May be better suited to gold varieties than green.	Irrigation is essential for fruit fill	Susceptible to frost, hail and wind damage. Large labour requirement for picking, thinning and pruning. Significant investment required for post harvest packing and storing. Distance from export.	Fresh export.
Grapes	Silt loams over gravel. Some limestone. Dry autumns for harvest.	Number of varieties already grown in the area – Pinot Noir	Most are irrigated. Some unirrigated vineyards eg Gladstone	Opportunity to link with local / domestic tourism. Production systems well mechanised. Challenge to increase recognition of region in relation to other regions	Local, domestic and export. 3 distinct growing areas can be capitalised on.
Berries (not blueberries)	Deep free draining soils. Temperate climate. Dry through fruiting.	Number of species and varieties. Raspberries 18t/ha	Irrigation essential to ensure good fruit size and quality.	Local market value chain not developed. Can be machine harvested. Disease, hail, rain can be problems.	Local should provide reasonable opportunity – 500t
Hops	Long day length, winter chilling. Deep free draining soils	Number of varieties Tall and dwarf	Irrigation is essential.	Hail and wind can both be problems. Few diseases or pests. Some labour required. Local hops with unique characters.	Local breweries, domestic.

Appendix 6: Sustainability Evaluation

Potential environmental impact of preferred pulses and grains

Crop	Nutrient leaching	Sedimentation	Agrichemical risk	Poor water utilisation	Emissions
Quinoa	Low N input, low loss	Small seed, cultivated sloping land, high risk	Nil input after establishment, low risk	High water use efficiency	Medium per unit of land medium per unit of product
Hemp	Low N input, low loss	Small seed, cultivated, flat and sloping land, medium risk	Low input after establishment, low risk	Medium water use efficiency	Medium per unit of land high per unit of seed product
Buckwheat	Low N input, low loss	Flat land, minimum tillage, sown in early summer when rainfall risk is low. Low risk	Nil input after establishment, low risk	Low water use efficiency	Low per unit of land, low per unit of product
Soybean	N fixing	Mostly cultivated rolling land, high rain risk, Medium risk	Potentially high inputs after establishment, high risk	Medium water use efficiency	Medium per unit of land mediums per unit of product
Chickpea	N fixing	Mostly cultivated flat land, low risk	High inputs after establishment, high risk	Medium water use efficiency	Medium per unit of land medium per unit of product
Peas	N fixing	Can be direct drilled or minimum cultivation. Low risk.	Low input after establishment. Low risk	Medium water use efficiency.	Medium per unit of land, low per unit of product
Wheat	High N input, low loss	Can be direct drilled or minimum cultivation. Low risk	Medium inputs after establishment, medium risk	High water use efficiency.	Medium per unit of land, low per unit of product
Vegetables	Can be high input and high loss depending on the crop	Some require fine seed beds so there is a risk of sediment loss	Variable depending on the species. Some have high agrichemical inputs.	Variable	Medium per unit of land medium per unit of product
Perennial crops	Generally low and low risk of leaching	Low - perennial crop with permanent ground cover	Variable some have relatively high agrichemical inputs.	Variable some eg grapes high water use efficiency	Low per unit of land, low per unit of product

Any of these crops could be grown in New Zealand with a minimal environmental footprint and would have the potential to be part of an integrated sustainable farm system.

Appendix 7: New Zealand Grown Opportunities (import replacement)

Commodity (not for sowing)	Year	Quantity	Value for Duty (excl insurances)	Price/ton	Estimated Hectares required to produce	Approx. tonnes grown in New Zealand	Can be grown in New Zealand? Yes/No
Quinoa	2017	400t	$1,587,605	$3,969	100	100t	Yes
	2018	346t	$1,402,909	$4,054	86		
Lentils (shelled)	2017	1,586t	$2,751,726	$1,735	500	Small, unable to estimate	Yes
	2018	1732t	2,260,995	$1,305	577		
Chickpeas	2017	1,985t	$4,109,335	$2,070	570	nil	Yes
	2018	2188t	4,261,883	$1,948	625		
Soybeans	2017	1,903t	2,250,891	$1,183	500	nil	Yes
	2018	1,921t	2,492,098	$1,297	500		
Kidney beans (inc. white)	2017	6,637t	$8,044,990	$1,212	2500	nil	Yes
	2018	7,003t	7,788,699	$1,112	2800		
Buckwheat	2017	250t	433,760	$1,735	70	40t	Yes
	2018	201t	364,403	$1,813	57		
Sunflower	2017	1,950t	$2,967,646	$1,522	350	150t	Yes
	2018	1,570t	$2,389,337	$1,522	285		
Hemp	No data	-	-	-	-	100-200t	Yes
Spelt	No Data	-	-	-	-	5t	Yes
Rye	No Data	-	-	-	-	2000t	Yes
Olive oil		4.05M l	$35,000,000	$8.64/l		450,000l	Yes
Olives -prepared or preserved	2017	1,529	7,745,870	$5065		7.5t	Yes
	2018	1,576	8,251,845	$5235			
	2019	1,707	8,697,441	$5,095			
Walnuts (shelled)	2017	995	10,490,422	$10.54/kg		Unable to estimate	Yes
	2018	956	10,492,626	$10,97/kg			
	2019	995	8,775,149	$8.82/kg			

StatsNZ Grain & Pulse, Olives, Walnuts Imports 2017 – 2019

Appendix 8: - Four Phased Value Capture Strategy