Viability of establishing a sheep dairy platform on North Canterbury dry land.

Kate Boyd

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Executive Summary

Is now the time for bovine dominance in the milk market to be challenged? There are variable and questionable milk alternatives more readily available both locally and abroad and our New Zealand sheep dairy history would suggest the current spike in popularity will be short-lived. I disagree. In my opinion New Zealand is the ideal location to develop this budding industry. We have the operational know-how, the geography and access to reliable water sources, a tourism market that opens our primary sector to the world, a developing pool of ovine milking genetics suitable to the New Zealand environment, capacity for diversification as we investigate change in land use opportunities and a hunger to pursue an alternative farming vision with learned failures of other ventures a source of inspiration.

"*We believe that strong science, a supportive Government and industry solidarity are essential for the future success of sheep dairying in New Zealand" (*Blue River Dairy)

Sheep Dairy is an industry that has experienced two substantial 'false starts', in both the 1970's and 1990's. One overarching factor was market fragility which proved too challenging and the detriment of the industry at the time. What can we learn from our chequered history? To determine a sound market before we establish supply, mitigate financial risk with comprehensive process of due diligence, a slow and steady approach to ensure long term viability and fundamental is collaboration within the sheep dairy community.

The aim of this project was to investigate viability of establishing a sheep dairy platform on North Canterbury dry land as a profitable land use alternative.

Key findings as a result of this research are that alignment of the sheep dairy community is critical to our success long term, honesty with information is vital and that although dry land sheep dairy in North Canterbury may be ambitious – nothing is impossible!

Acknowledgements: During the 1990's, Jock Alison's East Friesian sheep, together with the promise of ovine dairy, caught my parents' attention and my fascination in milking sheep was ignited. Thank you Mum and Dad for your pioneering intuition and willingness to explore alternative land use systems.

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Yes, sheep dairy brings with it challenges but nothing is impossible and if anything, insight gained throughout this investigation has proven the opposite. We can do this!

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This Report is the result of initial investigation in to sheep dairy as a viable land use change option. It is intended as a foundation document to form the basis of further planning and gaining deeper insight.

Introduction:

When my parents investigated the potential of sheep dairy for our North Canterbury farm in the 1990's challenges such as lack of a local market and developing genetic profile of the New Zealand milking ewe were identified and proved detrimental to the success of the proposed operation.

Now some 25 years later we are investigating options to make our small block of land in North Canterbury more economically viable as the current model is not sustainable long term. Reliance on bovine dairy support has meant we are susceptible to changing demands for supplement feeds, grazing and market pressure resulting in price fluctuations. Our soil type is heavy and cattle can cause significant damage to the soil structure, especially if grazing during a wet winter and therefore sheep are a more environmentally friendly option for our location.

It is an exciting time to be involved in the New Zealand sheep dairy sector and with growing interest from potential new entrants, continued research, Government support through investment into the Primary Growth Partnership, rapidly evolving food innovation and developing industry collaboration this could be third time lucky.

Currently there is no established sheep dairy group or support network in Canterbury and with interest growing I believe there is potential to form a collective of some description. Large scale operations are located in Southland and Taupo and this impacts local market awareness, sound knowledge of large scale ewe milk operations and support for those looking to get established.

Two outcomes of this project are:

1. To develop the foundations for a template for other dry land farmers to utilise in determining viability of sheep dairy.
2. Establish a Canterbury Sheep Dairy Collective as means of support for existing and new entrants to this exciting agricultural pathway.

Literature Review

Sheep dairy farming is a class of agriculture for long-term production of milk from sheep, which is processed (either on the farm or at a dairy plant) for eventual sale of a dairy product.

The history of sheep dairy:

Sheep milking is arguably the oldest form of dairy in the world (Griffiths, 2015). Dairy sheep have been milked for thousands of years in Europe and the Middle East and sheep milk is the foundation for some of our most popular cheeses worldwide, such as Haloumi, Feta, Pecorino and Manchego.

"Sheep milk…has been used in Europe for centuries as a gastronomic indulgence, renowned for quality cheeses and is now a rapidly growing category worldwide" (Chapman, 2016).

Industry

Current shape of the New Zealand sheep dairy sector:

Sheep dairy appeal is attributed to varying factors: agricultural diversification, high value end product, increase in income earned/hectare compared to traditional sheep/beef scenario, provision of stability in farm-gate returns and environmental appeal (Gatley, 2016). Currently there are 13 sheep dairy farms in New Zealand and of those, three large-scale sheep milking operations (Antara Ag/Blue River, Waituhi Kuratau Trust and Landcorp-Spring Sheep Dairy) comprising of approximately 22000 milking ewes. We also have several smaller ventures supplying the domestic market with a range of products (notably there were 4 new producers established in 2015 bringing 3000 milking ewes to the tally) (Hutching, 2016).

Scale: Commercial or Cottage: Does it matter?

If comparing the current New Zealand sheep milking industry to bovine – then yes, we are still a Cottage Industry. However, the three commercial farms currently operating in Southland and Taupo have achieved scale in a global sense, with Blue River farming the largest sheep dairy flock in the world. However, by global standards our annual production is low and not helped with a relatively small gene pool.

Isobel Lees succinctly sums this up with her view that:

> . . .deficiency in critical mass is preventing New Zealand from turning its sheep dairy industry into a thriving industry, predominantly due to the lack of sheer volume to compete effectively in the world marketplace and an insufficient volume needed for effective marketing (2016, p. 2, para. 4).

However, of those supplying the regional customer it is debatable whether this deficiency in critical mass is holding them back. In my opinion they are stewards of this exciting sector, each able to boast unique points of difference and distinct attributes of their District in their produce.

Geographic isolation: similarities between North Canterbury and New Zealand:

International demand for our sheep milk already exceeds what we are currently able to produce. New Zealand has the capacity to market quality, pasture-based dairy products to a local market of approx. 4.7million people. However, we need to avoid the risk associated with becoming reliant on one small market as this is not economically viable for large-scale producers long-term. In order to satisfy financial requirements and mitigate the risk that comes with covering substantial capital investment with establishing an operation, high value products need to be marketed and ensure that maximum profits yielded (Gatley, 2016). To ensure maximum profits and farm gate returns, we need to capitalise on international market opportunities. However, this is a challenge due to our location and geographic isolation from those markets and dictates the wider Asia-Pacific region as a hot-spot for targeting consumers prepared to pay a premium for quality (Neylon, 2016). An example of this is Spring Sheep Dairy targeting markets in Asia with luxury, high-value sheep dairy foods, such as gelato (Peterson & Prichard, 2015).

Viable option as a pathway to succession:

Those involved in farm succession discussions have addressed many questions, one of which how to best utilise this parcel of land in order to provide for generations to come, in a fair and equitable manner? Sheep dairy offers the ability to provide a long-term, environmentally sustainable, profitable land use option on land that is not ideally suited to, for example, bovine dairy. With the ability to increase financial return/hectare and provide employment as a result of a more labour intensive operation than traditional sheep/beef systems, this is relevant for families looking to future-proof the farm asset for generations to come (McCallum, 2016). In my opinion sheep dairy challenges the historical model, where size dependant, the parcel of land can dictate difficulty in the viability of providing a farming pathway to more than one sibling.

Long Term Prospects:

A common theme in the available literature is that a slow and steady approach is needed to prevent a collapse of this emerging sector (Piddock, 2016). What needs to be avoided is reliance on commodity markets and a continued focus on creating high-value, well-marketed products to consumers looking for food that tastes great and offers superior nutritional benefits (Carden, 2016).

With growing interest in this exciting sector, comes the risk for people to jump in without having completed thorough due diligence, lack of experience and an assumption that to milk sheep is the same as farming sheep in a traditional sense (Gatley, 2016). Dairy sheep are different, with different nutritional and handling requirements, different characteristics and an intelligence previously overlooked. A dairy mind-set is required to farm these animals successfully (Neylon, 2016). In my opinion this industry needs quality people with a vested interest in ensuring the success of sheep dairy long-term.

Landcorp are an organisation who utilise quality people in a bid to future proof their venture and adopted expertise in the form of John Ryrie, who has 20 years sheep milking experience in Scotland. Landcorp entered into sheep dairy with concise non-negotiables such as seeking markets outside of China and avoiding spaces where increasing commoditisation is apparent, such as infant formula and cheese (Oram, 2016). They focus on smaller markets and create high-value food products, including probiotic milk powders and award winning gelato (Oram, 2016).

Challenges currently faced in commercial sized operations are inadequate productive performance of the New Zealand dairy ewe, high, fixed on-farm costs, labour intensive and absence of a robust financial modelling tool (Griffiths, 2015).

The recent Primary Growth Partnership announcement (PGP) will provide some comfort in the knowledge that industry is partnering with Government to provide security long term, through Research & Development, exploration of consumer and market insights and development of products fit for purpose (Oram, 2016).

The New Zealand milking ewe

Genetics and nutrition are key aspects in the success (or failure) of the New Zealand milking sheep and the two go hand in hand (Tipa, 2016). The difficulty in forming a picture of the ideal New Zealand milking ewe is that much of the information available is specific to sheep in other countries, such as the Awassi in the Middle East and the Lacaune in France. Therefore until the sheep are run in the local environment, their performance in or suitability to New Zealand conditions is an unknown. New Zealand now has its first registered milking breed in the newly recognised Dairymeade, a result of 20 years selective breeding by Miles and Janet King of Kingsmeade Artisan Cheese Company (New Zealand Farmer, 2016).

Dietary requirements of the milking ewe:

Nutritional requirements of the dairy ewe can largely be underestimated and Sam Peterson states that lactating dairy ewes require five times more energy than a dry ewe (Peterson, 2016). The ewe needs ability to consume enough feed, to avoid inhibiting production and therefore foods with high energy concentration such as clovers, chicory and plantain are required to achieve maximum milk yields (Peterson, 2016).

Productive potential (or lack of) on dry land.

There is a gap in information available regarding actual productive capacity (litres produced per ewe per day) and there are varying levels of clarity on lactation length of the New Zealand milking ewe. Of the minimal literature available 'optimal' lactation length was discussed, again based on what is achieved overseas. Traditionally New Zealand sheep are bred to milk well, enabling them to finish lambs efficiently and quickly. Due to this we typically see shortened lactation length and the necessity to 'breed in' genetics that allow for increase in lactation. With limited literature available to what is realistic for New Zealand systems, let alone North Canterbury sheep milking ventures this can have a drastic impact on variables taken into account during risk analysis (Appendix 1).

Suitability to North Canterbury:

Large-scale sheep milking operations in New Zealand are located in Southland and Taupo where climatic conditions and pasture growth vary in comparison to North Canterbury. The impact of climatic stress on a milking ewe is an unknown for this area. It is relatively difficult to ascertain what production is realistically achievable due to much of the information available being assumptive or anecdotal.

What does the New Zealand milking ewe currently look like?

There are a variety of breeds represented in the 'typical' New Zealand dairy ewe and the predominant element identified in all crosses is the East Friesian influence. Crucial to the success of a milking venture are the animals and because we are breeding to harvest the milk, it is vital to select sheep specifically designed as dairy animals.

Considerations when selecting sheep for milking performance are:

- Ability to forage
- Ability to convert feed to milk
- Quality and quantity of milk produced over a 150-200 day lactation
- Milk let down time
- Udder conformation
- Incidence of disease
- Animal health issues such as mastitis.
- Fertility and ability to produce lambs with good growth rates
- Ability to transit to and from the milking parlour (soundness of feet)
- Suitability to local conditions

Characteristics of milking sheep breeds:

The following are some breeds found in small and large scale New Zealand sheep milking systems and characteristics of each.

Dairymeade

- NZ Dairy Sheep Breed
- EF X Coopworth X Border Leicester
- Improved milk yield
- Lactation length
- Proven in NZ conditions
- High fecundity
- Colour bred in to reduce photosensitivity
- Multiple lambs
- Robust
- Improved surviveability

Awassi

- Originated approximately 5000 years ago in the Middle East
- Highest milk producer in Middle East
- Average 300L/210 day lactation
- Hardy
- Drought tolerant
- Tolerant to cold
- Variable udder conformation
- Good growth rates in lambs
- Quick milk letdown
- Lower lambing of approximately 120-130%

Assaf

- Developed in 1950's in Israel
- Cross of EF and Awassi
- Dual purpose (milk & meat)
- 3 lambings in 2 years (Israel)
- Annual milk yield (650L in Israel)

East Friesian	Lacaune	Poll Dorset
•Originated Germany - derived from the Friesian Sheep from the Friesland region •High milk producers : 450-500L/220-240 day lactation (off shore) •Lower fat and protein in milk •High fertility - average 230% in mature ewes •Good lamb growth rates •Lean carcase •Fragile •Pale feet •Susceptible to foot issues	•France: ancestors date back 4000-6000 years ago. •Hardy •Good udder health •Higher total solids produced than East Friesians •Slightly less volume than EF •Tolerate temperature swings •Fast milk let down •Average 170-180% lambing •Adaptable to range of conditions	•Originated in Australia and NZ breed founded in 1959 •Proven in NZ conditions as a meat breed •Hardy •High growth rates •Lean carcase •Capable of thriving in hot and dry conditions •High lambing percentages •Exceptional milking ability

Market Opportunities

Local Market Opportunities:

Throughout the literature there is consistent mention of the need to establish market first and work backwards, ascertain supply required and how to achieve that (Peterson & Prichard, 2016). For seventeen years Kingsmead Artisan Cheese have maintained a strong presence through their stoic, proactive and relentless efforts to get in front of the consumer/chef/market to showcase their tasty, nutritious and locally produced goods. However, the New Zealand consumer appears relatively naive to the qualities and health benefits sheep milk holds, let alone the great taste. Much of the literature available that addresses market opportunities and exploration tends to focus on the International space, yet there is plenty happening at a regional level. However, not so much in North Canterbury – there's an opening and one with great potential.

In order to avoid commodity price fluctuations seen in other dairy markets, we can learn from the approach of the New Zealand Dairy Goat Cooperative. This group manage supply/demand, hence avoid flooding of the market, achieve price protection for members and as a result do not see pressure and influence of global pricing trends and the impact that has on farm gate price for their suppliers (Gatley, 2016).

International:

While our large sheep milk producers focus on international market potential it would appear they are not targeting the same markets, or same product lines, they each carry a unique point of difference, which in my opinion is critical to their success. New Zealand's small population by global standards and geographic isolation from its markets requires success in our target markets to ensure long term viability. Steve Carden admits it is difficult to place a value on the potential value of sheep milk in export markets, because this is an industry in its infancy (2015).

Maui Milk have established strong connections to their market in Shanghai and advocate the importance of 1:1 contact with their customer, to build a brand and ensure success in sale of their product. Why have they targeted Shanghai? It is regarded as one of the most competitive markets in the world, with high-end supermarkets, full of international products and with premium prices attainable (Dang, 2016).

Landcorp are exploring a range of options in Asian markets with particular focus on Taiwan and Korea. Their rationale, that these are markets that appreciate "quality, [understand] food and had a long partnership with New Zealand" (Chapman, 2015, p. 3). When asked why they are not targeting China, as Blue River and Maui Milk are, they attribute this to their key objectives which do not include moving in the ingredients or cheese space. Landcorp attribute their rationale to the latter being largely dominated by Europe and commoditisation increasingly evident in the ingredients market (Chapman, 2016).

As reported by Blue River at the 2016 Sheep Milk Conference, pollution in China is detrimental to their agricultural industry. New Zealand with our clean, natural, green reputation appeals to the Chinese consumer, along with our strict export quality guidelines, safety, and skills of our primary producers (Chen, 2016).

As a snapshot into the potential of the Infant Formula market, in "2014 NZ exported around $357 million of retail ready infant formula worldwide, or which around $106 million was to China" (Pickett, 2014, p. 1). The infant formula market in China has grown 10% year on year for the last 10 years (Chen, 2016). Blue River export approximately 80% of its sheep milk powder and have undertaken significant investment in a milk powder canning plant at their Invercargill base. They have the flexibility to produce Infant Formula and have added this to their high-value product portfolio sold to Asian markets (Devlin, 2016).

Value creation:

Maui Milk utilise positioning strategies to support value proposition of their product in Shanghai, where product can be differentiated by location in health food category, instead of the dairy aisle (MacGregor, 2016). Natalie Dang of Maui Milk discussed value proposition at the 2016 Sheep Milk Conference in Palmerston North. She identified 2 key principles when assessing the value, before communicating it with the target customer.

1. Need to understand the nutritional value of sheep milk compared to cow milk.
2. Crucial to identify why sheep milk is so special.

How do we anticipate what the consumer may consider valuable? Consumer insight is critical and our successful sheep milk producers have a good grasp of value sought by the consumer. Landcorp identified Taiwan as an ideal market for the value Spring Sheep offer in their products " . . .a sophisticated consumer who appreciates quality, and with our products alternative dairy globally is going really, really well and we wanted to choose a market that understood value and the value of New Zealand" (Chapman, 2016, Radio NZ).

A recent article in Harvard Business Review suggests that the ability to capture value increases, the closer we are with our consumer and critical to the element of value perceived in a product, is governed by the consumer themselves (Almquist, Senior & Bloch, 2016). However, fundamental is creation of the value from the producer perspective and hence belief in our unique selling points is paramount. It is one thing to create the value, but communicating it effectively to consumers is another and Spring Sheep do this well. They utilise pharmaceutical connections and leverage access to drug stores with their branded products and view this as a fantastic way to directly connect with customers (Chapman, 2016).

Jamie Gray identified the growth of alternative dairy categories visible in our supermarkets and explored the idea that consumers are open to alternatives to the traditional foods they have known (2016). Gray is not the

first to attribute Landcorps' market success and diversification due to their ability to get close with their customers. Establishment of the Pamu Brand is an example of how Landcorp have capitalised on their consumer insight and adapted various products to reflect increased consumer demand for value (Gray, 2016).

Nutritional trend factor.

The consumer is more nutritionally savvy than they once were, with a discerning taste and appetite for new food experiences, seeking delivery of human health benefits from their food source. New Zealand farmers need to embrace food cultures and "become foodies if they are to reach high end consumers" (McVinnie, 2016, para. 2). This includes a thorough understanding of what their produce becomes, how it should taste, what it should be used for and how to cook it (Piddock, 2016).

Why is sheep milk so good? Kingsmead Artisan Cheese proudly claims on their website that:

Two cups of sheep milk, or 93g of sheep cheese, provides the daily human requirement of calcium, riboflavin, and five of the 10 essential amino acids. One litre of sheep milk would provide the daily human requirements of protein, eight of the essential vitamins, calcium, phosphorus and several other essential minerals (Kingsmead, 2016, para.5).

Knowledge of the nutritional profile of sheep milk continues to evolve. The following characteristics are a snapshot of common characteristics identified across a range of literature (Kingsmead, 2016. The Sheep Site, 2016. Quiet Corner, 2016. Chapman, 2016).

- Fantastic taste!
- Lactose levels similar to those found in other ruminant milk
- Contains sought after A2 protein
- 18-19% milk solids, compared to dairy cows 10-12%
- Twice the 'healthy fats', including Omega 3 and 6 (the body needs these for many functions, including the absorption of Vitamins)
- Creamier texture than cow milk
- High calcium content (ideal for the elderly market)
- Twice the protein than cow or goat milk
- Rich source of Zinc, Iron, Magnesium and Phosphorus
- Lower in Sodium than cow and goat milk
- Rich source of Vitamins (A, D, E, Folic Acid and B12)
- Smaller fat globules than in cow or goat milk which improve digestibility and less likely to result in high cholesterol (improved digestibility make it suitable in elderly and infant markets).
- Rich in medium chain fatty acids (can benefit weight control, through 'fullness', consequently reducing fat deposits and increasing energy and more easily metabolised)
- One third more energy than cow or goat milk (well suited to high performance athletes)

Our New Zealand sheep dairy story

The importance of Science.

Importance of research to support nutritional claims of sheep milk is a common discussion point and Natalie Dang raised this in her presentation at the Sheep Milk Conference in Palmerston North. She commented that the health benefits of sheep milk are recognised by some consumers, but the science behind those isn't as strong and that more research would be an advantage (2016).

Research is continuing into diverse areas of interest such as skin allergies, blood pressure and repair of damaged cells. AgResearch are clear in their intention to support claims around the nutritional benefits offered in sheep milk and are part-way through a $6 million MBIE-funded programme. They cite a lack of New Zealand data, though developing and one aspect of their research investigates composition of sheep milk, in order to provide solid support to claims around health benefits (AgResearch, 2016).

One interesting investigation conducted by AgResearch was around the difference in effect of sheep and cow milk on gastrointestinal physiology in rats. They found that sheep and cow milk cause different effects and that rats fed sheep milk required less solid food than the rats fed cow milk (to maintain same growth rates) and supports the view that sheep milk is an excellent source of nutrition (Young & Samuelsson, 2016).

Environmental Stewardship:

The need to farm with care for the environment to ensure sustainability long term is front of mind for the majority of primary producers. Sheep dairy uses less water and creates less nutrient run-off than bovine dairy and as a result is viewed as more environmentally friendly. Kate Downie-Melrose addresses the environmental impact of bovine dairy in Canterbury with regard to water quality, effluent management and nitrate leaching (2014). She concluded that one of the primary concerns for farmers in the region is the high environmental footprint of cows, particularly with high Nitrogen concentration in urine patches on the pasture, which have the ability to leach into ground water systems. She identified sheep milking as an option for farmers looking to upscale and increase profitability in the face of increasing land prices while keeping within environmental constraints (Downie-Melrose, 2014).

What is the story about?

Over time the New Zealand primary sector has created a variety of adaptations to the 'Pasture to Plate' story and with varying levels of success. In the literature available, the sheep dairy community diligently share information about the environmental benefits of sheep dairy systems, operational considerations, target market information, suggestions that global demand for sheep milk exceeds supply, plans for expansion while avoiding commoditisation, with constant reminders that this is an industry in its infancy requiring a careful approach from potential new entrants and concerted effort to protect its future (Brackebush, 2016). That said, at times the information reveals gaps and in my opinion a particularly notable one is the absence of precise dairy sheep performance data.

How well is the story currently being told?

Kingsmead Artisan Cheese are effectively telling a compelling story of their sheep milk product pathway and utilise their website, to create an overall experience. They take the consumer on a virtual journey of their farm system, introduce the flock, acknowledge the contribution of their sheep, discuss the nutritional merits of the product they produce and explain the process involved in putting product in front of the consumer. Critical to the success of this particular story, is that they use language to their advantage and reassure the customer, with mention to the holistic and ethical farm processes involved at Kingsmead.

The flock of 200 are very used to the routine and really do skip to get their treats each day. They are each given a cup full of specially formulated dry food which supplements their green pasture diet, and helps to naturally enrich the milk and good health of the animals (Kingsmead Artisan Cheese, 2016, p. 1).

Miles and Janet King go on to say how friendly the sheep are, how well they're cared for and as a result how happy and content the ewes are (2016). Maui Milk discovered that the happiness of the sheep is important to their Chinese consumers and communicating that effectively adds to their success in that market (Dang, 2016)

Who is telling the story?

Each producer of sheep milk is telling their story in some capacity. Stories can be heard, read and watched across a variety of media formats, some producers utilise their own websites or social media to engage with the consumer directly, some are regularly found at their local farmers markets and restaurants, developing the personal product pathway story. Fundamental to the success of the sheep dairy story, be it at district level or internationally, is that we all have the ability to use country positive reputation to our advantage.

Who is the story being told to?

The sheep dairy story, in broad terms, is available and delivered to anyone interested. Be that potential new entrants, industry partners, government, research agencies, other sheep dairy producers, possible customers, economic analysts and the list continues. In my opinion the story is being told to the right people at the moment. However, we need to be mindful that to educate the New Zealand consumer on the benefits of this terrific product and positive agricultural avenue, we need to maintain a presence across a variety of channels. I believe we could be doing more to educate our domestic consumer on the nutritional merits of our products, the environmental advantages sheep dairy systems offer and provide the food experience for our customers to buy in to.

Who is the target consumer?

Information on the nutritional benefits of sheep milk continues to evolve. There is plenty of anecdotal information available regarding its merits, although there are plenty of gaps where proof points would add substance to the claims. For example, at times language used in articles claiming this product is ideal for those lactose intolerant, would suggest it doesn't contain lactose (when in fact it contains lactose levels similar to other ruminant milks (Broadhurst, Bekhit, Vyssotski, Samuelsson & Day, 2016). Clear explanations of health benefits of this product and provision of concise information would avoid misinterpretation from consumer level. For example, explain in simple terms why it is digested faster and why its composition makes it suitable for those with high cholesterol or skin allergies. As found in Miles and Janet Kings information, make the claims precise and compare to something the consumer has knowledge of, such as cow or goat milk (2016).

The constant referral to the 'high-end consumer' may give an impression that sheep milk is an unaffordable luxury for some consumers, or that these high end consumers cannot be found domestically. When in fact the high end consumers are found to be more densely populated in areas such as Hong Kong and Taiwan, hence Spring Sheeps' focus ticking the box for both achieving scale and identifying target consumer with their luxury products off shore (Carden, 2016). In my opinion we need to provide balanced information to ensure New Zealand consumers that are willing to pay a premium for this wonderful product, know they too can source quality product locally.

The subtlety of Language:

Much of the information available refers to our three large scale sheep milk entities – Blue River Dairy in Southland, Maui Milk and Spring Sheep/Landcorp in the North Island. Maui Milk has a good grasp of the importance of language, through their market success in Shanghai and have identified that a common misperception of the Chinese consumer is that sheep and goats are connected. Therefore they have been strategic with placement of the product, away from the cow and goat goods, avoiding the risk of confusion and clarity it is indeed sheep milk product (MacGregor, 2016). An example of why it is critical to understand the language of export markets was discussed at the Sheep Milk Conference. One company (who shall remain anonymous) export large quantities of lamb to China and discovered, that to their detriment, with regional language differences they were in fact marketing 'Highland Goat' as opposed to 'NZ Hill Country Lamb'. There is common confusion to the Chinese consumer between goat and sheep hence it is critical to clarify the animal source of your produce (MacGregor, 2016).

Summary of Literature Review:

In my opinion the literature available regarding performance of the milking ewe is still heavily weighted to overseas data and the New Zealand picture still emergent. It is very much a story of potential versus actual and this makes building a compelling, concise and intelligent case for sheep dairy, of any scale, difficult. Lack of information regarding sheep dairy on dry land similar to North Canterbury, places our plans in the pioneering quartile. Our production potential, capacity of a New Zealand milking ewe in this environment is an unknown and in order to progress the case needs strengthening through local evidence, supporting information and fundamental will be learning through doing.

Findings and Discussion

Market situation:

- The new nature of this industry sees a constant state of positive change in the market.
- Protection of returns this unique product earns and avoiding price swings seen in other markets is critical to its success long term.
- Industry initial discussions, some with fellow emerging producers, have been positive.
- Our customers buy an experience and food integrity and safety is fundamental to our success.

Market isolation:

- When investigating the viability of a Sheep Dairy operation in North Canterbury geographic isolation can be a hurdle to overcome. How do we blaze a trail with isolation a factor in seeking operational support, pitching for investment in new enterprise and establishing market security. Similar to New Zealand's distance from target markets, we face similar constraints in terms of freight costs, market development, distance from processors and lack of critical mass with no established 'collective' of other operations in close proximity.
- It is critical that entry to this industry is approached with a long term view, if we are not thinking ten years out (or more) we will miss some tricks. However, good things take time.

Collaboration with room for improvement:

- Collaboration can be a challenge and is not unique to sheep dairy. I challenge the notion from some in the industry that argue that we've missed the opportunity for producers in the sector to work more closely. Thanks must go to Craig Prichard for modelling industry collaboration as he works to bring existing and new players of the industry together through an open forum for discussion held each month via WebEx .

The sheep:

- One disadvantage in building a picture of what constitutes the New Zealand milking ewe is a lack in locally specific information on large-scale operations. A lot has been extrapolated from overseas to build a 'maybe' and 'what if' story applied to potential for sheep dairy in New Zealand. That is continuing to evolve, develop and gain traction as we fine tune and share learnings. There are evident gaps in the data available and some way to go before we can build a clear picture for true expectations for productive capacity. With the absence of milk metering in some operations it is difficult to ascertain accurate estimate for volume produced by the milking flock without concise data on current outputs.
- Perception of some sheep dairy operators is that New Zealand milking ewes are not producing enough volume, for long enough, production information is variable and there is significant protection of genetic intellectual property from our large-scale operators. This is understandable and can be a hurdle for new entrants trying to build a picture for the viability of this as a farming venture.

- Key nutritional consideration for the dairy ewe is daily food consumption and forage quality *(Nutrition and management of lactating ewes in NZ)* and a determining factor in ensuring feed quality is availability of water.
- Sheep milking operations see a 30% lower nutrient impact than bovine milking.

Thematic Analysis of Interviews:

See Appendix 1 – Interview Questions

Method:

Qualitative information was collected through reading media releases, industry reports, discussions with other sheep dairy producers and ten phone interviews were conducted with a variety of candidates. Selection was based on the candidates' involvement in and knowledge of the New Zealand sheep dairy sector, representatives from primary industry organisations and innovative local farmers from the North Canterbury area. The objective was to gain insight into operational, industry, new entrants and science to ensure a range of perspectives was obtained.

Market:

Similar perceptions to those apparent in the literature were discussed from majority of candidates with particular reference to the size of our domestic market. It was noted that global demand in densely populated areas is high and questionable if there is enough high-end market potential locally to sustain large scale sheep dairy growth. General consensus was that the New Zealand market will never be exhausted by supply and that our population size dictates export for sheep dairy produce as the priority.

Scale of the sheep dairy sector in New Zealand:

If comparing to bovine dairy our emerging sheep dairy sector is seen as boutique, with the theory that if done well this is a success. The majority of those interviewed mirrored opinion found throughout the literature that we need to be mindful to focus on a variety of markets, to avoid over supply and price fluctuations that come with commoditisation. Location was not viewed as a disadvantage and because people like to see a variation in land use types we could use this to our advantage, especially with district branding of our product.

The sheep:

This formed the basis for what new entrants to sheep dairy primarily seek information on, with the following common areas of interest:

- Availability of good genetics
- Productive capacity
- Temperament
- Somatic Cell Count and susceptibility to disease
- Fertility
- Longevity

- Husbandry
- Lambing ability
- Soundness (particularly mouth/feet/udder)
- Ability to graze
- Ability to transit to and from the milking parlour

Potential new entrants to sheep dairy also identified clarification of the market for produce, profitability, industry support and how enjoyable this farming venture is, as areas they would seek information on before committing to establishing a sheep dairy operation.

Threats to the sheep dairy sector:

Public perception of sheep dairy farming was the greatest risk identified, due to examples seen in the bovine dairy industry, with particular reference to the fall out regarding bobby calves and animal welfare. The next most common risk to sheep dairy was sustainable water use, if farming on irrigated land and provision of shelter for animals susceptible to both cold conditions and photosensitivity.

Challenges to the sheep dairy sector:

Availability of good genetics and maintaining premium price for milk were viewed as the biggest challenges faced by the sheep dairy sector. The absence of a proven profitable farm system model, together with the high cost to get established was discussed and unknown market security as a means to mitigate the cost to set up a sheep dairy operation raised some concern.

The New Zealand primary industry story:

Fundamental to the success of the primary industry story is undoubtedly the ability to market the natural characteristics of the product produced. The ability to gain the trust of the consumer, either through science or emotion is key and it is important that the story is balanced. Those interviewed attributed the following to successful primary industry story telling:

- Safe
- Genuine
- True
- Believable
- Attractive
- Authentic
- Provenance
- Value identified
- Traceability

Who is modelling New Zealand primary industry story success?

- *Merino New Zealand*
- *Zespri*
- The wine industry

- The avocado industry
- Central Otago Pip fruit
- Bluff Oysters
- *Kumanu Lamb*

Engaging the New Zealand primary sector:

With the recent Primary Growth Partnership announcement has come a new wave of confidence that this emerging sector has the support it needs to survive long term. During the interview process science was discussed as the overarching tool for collaboration that particularly large scale sheep milk producers all stand to benefit from. Research initiatives have brought large players together and the Ministry for Business, Innovation and Employment together with AgResearch have shown their commitment to sheep dairy research and development for some time.

Viability for establishing a sheep dairy platform on North Canterbury dry land:

All candidates interviewed and other local farmers that we have discussed the potential of this land use option with have responded with overwhelming positivity. With sheep dairy comes the ability to farm these animals (almost) anywhere and especially beneficial is the avoidance of nutrient issues commonly seen with bovine dairy intensification. The majority of those interviewed identified an element of risk with establishing a sheep dairy platform on North Canterbury dry land but also noted that anything is possible.

Case Study: Developing a Sheep Dairy Platform in North Canterbury:

Option A: Small holding, dry land.

Option B: Larger holding, part irrigated and potential for commercial scale.

Sheep milking has been of interest for some time and with this exciting industry gathering momentum, now is a good time to conduct thorough investigations. With looking at viability of alternative land use options, using sheep dairy as the farming type, it is important to ensure sustainability long term. Our current farming model is flawed, with uncertainty around lamb prices, together with the reliance on dairy support and the impact felt of the dairy down turn, future proofing our parcel of land requires careful thought.

What does sheep dairy offer?

- An emerging, exciting avenue full of potential and promise
- Profitability unseen in traditional sheep farming systems, stability in farm gate returns and consumer appeal.
- With approximately 25000 milking ewes in New Zealand (and growing) this industry is in its infancy.
- Environmental sustainability with nutrient impact 30% lower than dairy cows.
- Nutritionally superior: more easily digestible, with more calcium and a sweeter taste than cow milk.
- 18-19% milk solids and sought after for its health benefits, particularly by the high-end, sophisticated consumer who appreciate high value products.

Key areas to consider:

- Market
    - Who will process the milk?
    - What happens to the milk post-processing?
    - What distance from the farm is the processor?
    - Who is the target market?

- Current shape of the sheep dairy community

- Sheep
    - Genetics
    - Establish flock and time until milking commences
    - Suitability to the local conditions
    - Productive Capacity
    - Animal Health considerations
    - Nutritional requirements
    - Mating
        - AI or Ram
    - Stocking Rate

- Pasture
    - Quality depending on time of year
    - Quantity required for lactating ewes
    - Quantity required for finishing lambs

    - Growth
        - Effect of weather i.e. cold wet winters, windy spring, dry summer or autumn
    - Type
        - Fodder crops to promote high milk volumes
        - Supplementary food required

- Operational
    - Herringbone, Rotary or Movable
    - Size of milking facility required
    - Metering technology
    - Cost
        - To build
        - To operate
    - Labour required
        - Milking
        - General Farm
        - Lamb rearing
    - Effluent management system

- Lambing calendar
    - Planned start of Lambing
    - Planned start of milking
    - Lamb rearing model
    - Finishing vs. Stores
    - Housing and Shelter

- Environmental sustainability
    - Zone
    - Hurunui Water Project on the horizon

- Economic Viability
    - Investment partners required
    - Risk Analysis
    - Sensitivity Analysis

- Compliance and Regulatory requirements

Our process.

During the process several discussions were had with those involved in sheep dairy, both small and large scale and it was confirmed that this farming option, that like any other presents challenges and also great promise. After thorough due diligence, we identified that each option provided potential for a successful sheep dairy operation.

For further information on our investigation process:

Appendix 2: Sales Strategy **Appendix 3: Risk Analysis** **Appendix 4: Nutrient Map**

Figure X: SWOT Analysis for Property A:

Property A: 23ha dry land in North Canterbury. Located in Hurunui Water Project (HWP) catchment with the capacity to irrigate once water is available and currently flexible nutrient limits with existing land use and nutrient allocation for HWP means sheep dairy conversion is feasible. Land use currently split between sheep breeding and dairy support (grass and cereals).

Strengths

Pasture quality

Small distance for sheep commute to milking parlour

Environmentally sustainable

Profitable option to meet irrigation costs when HWP commences

Potential for increase in value earned per hectare compared to current model

Sheep milk sought after and domestic market awareness growing

Market for our lamb

Market for our milk

Support of other local producers in Canterbury is strong

Number of local farmers considering this as a viable land use change option is increasing

Weaknesses

Small area with little opportunity for stock number increase

High capital outlay for building of milking parlour/plant

Capital outlay for housing and shelter development

Development of milking flock would see 2 year window until milking commences

Establishing market is difficult with possiblility of 2 years before milking commences

Absence of a market if milking commences sooner would risk potential sales of milk

Distance from processor

No milk collection

Lack of critical mass locally, with absence of other sheep milk producers in close proximity

Supplement feed may need to be sourced off farm seeing increase in costs

Opportunities

Movable plant an option which would save on capital outlay

Establish Canterbury Collective for other new and existing sheep milk producers

Work with other large scale new entrants to build critical mass for large processor to collect milk

Local Farmers Market

Local Restaurants

Local Supermarkets

Tourism Market

Brand development option with processor

Threats

Weather events (Drought and Wind)

Milking sheep performance unknown

Quantity of milk produced unknown

Quantity max/min able to be processed unknown

Shortened lactation due to weather and pasture available

Animal Health risks

One processor and risk that if contract terminated there would be no pathway for our milk

Milk price uncertainty

Environment dictates pasture growth patterns which directly impacts production/ewe

Figure Y: SWOT Analysis for Property B:

Property B: 227ha located in North Canterbury with 110ha irrigated and the balance rolling, dry land, currently running sheep and dairy support. Amuri Irrigation Scheme (AIC) being modified which will result in more efficient piped water supply, capital cost required to convert border dyke to spray and increase in running costs per year for pumping. Flexible nutrient limits with existing land use and nutrient allocation for AIC means sheep dairy conversion is feasible. Current land use is not economically sustainable due to increase costs associated with irrigation development and with combination of downs and flat, not all land area is suitable or environmentally sustainable to farming dairy cows.

Strengths

Irrigation

Environmentally sustainable

Profitable option to meet irrigation costs when development complete

Potential for increase in value earned per hectare compared to current model

Sheep milk sought after and domestic market awareness growing

Market for our lamb

Market for our milk

Support of other local producers in Canterbury is strong

Number of local farmers considering this as a viable land use change option is increasing

Ability to grow all supplement feed required

Ability to finish lambs on property

Ability to run large scale operation of 1200 milking ewes

Weaknesses

High capital outlay for building of milking parlour/plant

Distance for sheep commute to milking parlour

High cost to establish milking flock

Increased annual irrigation cost

Irrigation development cost is high

Price of land is expensive

Labour intensive

Development of milking flock would see 2 year window until milking commences

Establishing market is difficult with possiblility of 2 years before milking commences

Absence of a market if milking commences sooner would risk potential sales of milk

Distance from processor

No milk collection

Lack of critical mass locally, with absence of other sheep milk producers in close proximity

Opportunities

Variety of income avenues possible which reduces risk

Establish Canterbury Collective for other new and existing sheep milk producers

Work with other large scale new entrants to build critical mass for large processor to collect milk

Local Farmers Market

Local Restaurants

Local Supermarkets

Tourism Market

Brand development option with processor

Threats

Milking sheep performance unknown

Quantity of milk produced unknown

Quantity max/min able to be processed unknown

Lactation length unknown

Animal Health risks

One processor and risk that if contract terminated there would be no pathway for our milk

Milk price uncertainty

Property B would be the preferential option to establish a sheep dairy platform:

The value lies in the diversification the property offers, access to reliable irrigation and the ability to operate a mixed venture earning a variety of income streams is critical for future proofing. The cornerstone of our sheep dairy operation is to be pasture based. New Zealand dairy farmers specialise in growing quality pasture, harvesting that quality and turning it into milk. Property B is renowned for its fertile soils and ability to provide quality pasture and nutritional requirements for the lactating dairy ewe. It is an ideal property for conversion to sheep dairy, as one of the few remaining in the area without bovine dairy in operation. Much of the property is tractor country, which is essential for the milking platform and existing shelter in place is a real advantage.

Conclusion:

During consultation with other sheep dairy operators – passion is first and foremost the common vibe. Passion for success of producing a wonderful product, making that available to different markets be that international or domestic, passion about the milking sheep and perhaps most importantly passion about the development of the people involved in this exciting industry. With a network of visionaries, support and positive public perception of this land use alternative then sheep dairy is in good shape with a bright future.

Productive capacity of the New Zealand milking ewe is constantly evolving and with it our knowledge. Advice received from those who have been involved in this industry for some time is to be patient, take the time to ensure the farming system and sheep selected will be able to produce volumes required to maintain economic viability and sustainability long term.

Our emerging sector will benefit substantially from continued investment in research and development. The Primary Growth Partnership and Ministry for Business, Innovation and Employment are leading the charge in terms of collaboration, with research as the overarching umbrella (Griffiths, 2015). Maintenance and stability of a price for our sheep milk is vital and we can learn from other collectives such as the New Zealand Dairy Goat Cooperative to prevent price fluctuations seen in the bovine dairy space (Gatley, 2016).

In planning to establish a large scale operation we found that the absence of ovine milking operations in North Canterbury resulted in lack of benchmarking ability. There is definite interest and willingness from outside parties to invest and with other new ventures established in Canterbury this year, the data set will develop.

Our consumer is seeking delivery of human health benefits from their food source and understanding the value they are looking for is crucial. Sheep milk has a vast range of nutritional benefits to boast and it is the responsibility of all involved in this sector to share that message with accuracy and consistency. Our story is about winning the hearts and minds of our consumer.

We cannot afford to be average as we strive to grow this successful sector. Be that with establishing a possible collective, establishing performance standards for producers, modelling mutually beneficial behaviour both within the sheep dairy community and to those on the periphery. In my opinion we have room for improvement with marketing unique points of difference of sheep milk and leveraging our pasture based story to our customers.

The aim of this project was to investigate the viability of establishing a sheep dairy platform on North Canterbury dry land. Farming a successful sheep dairy venture with optimal lactation length of approximately 200 days and achieving approximately 1.5L/ewe/day requires quantity and quality pasture and in order to sustain the pasture required, water is an obvious advantage. To consider establishing a large scale sheep dairy operation on North Canterbury dry land would be ambitious and in my opinion not sustainable long term.

Recommendations:

- We have identified a local processor for our milk (once in operation) and from there potential markets to sell cheese and yoghurt have become apparent.

- Digital presence (online) will be fundamental to our success. I am investigating ways to improve online connectivity with our consumer and develop our digital capability.

- Sheep milk products are relatively new to our local market. Recipe ideas and creating a sensory experience with our food is a crucial aspect of marketing the potential and great taste of this wonderful product. Look for opportunities to position our products in retail outlets with the chance to promote taste experiences for local consumers.

- Uncertainty regarding distance from processors, identification of target market and clarification of milk price is something other potential new entrants have flagged as a concern and we are focusing on sharing learnings from our process to address those concerns.

- Collaboration – how to get the wider industry and local community to engage in the potential of sheep dairy farming? The majority of sheep dairy farmers are working in isolation and competing for the same market (especially locally). I am enthusiastic about developing a critical mass at district level, strengthening relationships with other sheep dairy farmers and sharing information where possible and practical.

- How do we blaze a trail with North Canterbury geographical isolation a significant hurdle for operational support, investment in new enterprise and market security? Continue to strengthen relationships with other large scale sheep milk producers.

- Leverage our pasture based message.

- Establish what unique fat and protein profile North Canterbury sheep milk offers and share that message with other producers and consumers.

- Sheep dairy is an exciting disruption to the New Zealand primary sector, as a positive land use change option. However, challenges are numerous and this is an industry suited to 'good' farmers to ensure its future viability, success and presence. As a result of this investigation I have the confidence to pursue our vision to establish a large scale sheep dairy platform in North Canterbury.

Appendix 1: Interview Questions

Sheep Dairy:

This is an emerging, exciting sector full of potential and promise. Sheep Dairy offers profitability unseen in traditional sheep farming systems, stability in farm gate returns, environmental advantages over Bovine Dairy and consumer appeal. With approximately 25000 milking ewes in New Zealand (and growing) this industry is in its infancy.

1A: Please explain your understanding of the NZ Sheep Milking sector.

B: In your opinion, is sheep dairy destined for success as a thriving industry with scale, or will it remain a 'Cottage Industry'?

C: Why?

2A: What threatens the bovine dairy industry, that sheep dairy as an emerging industry, should work hard to avoid, in order to ensure it's success?

B: What do you think has damaged the image of the bovine dairy industry in the eye of the consumer?

C: Why?

3A: In your view what are the challenges currently faced by the sheep milking industry?

B: How do we overcome those?

4: SFF market themselves as "100% Made of New Zealand" and tell a story based around history, pride, success and a product "naturally made of our Land and of our People".

A: In your opinion what other primary industry groups have the aspect of storytelling mastered?

B: What makes their story telling successful?

C: How does a good primary industry story look to you?

D: Are we doing enough in NZ as primary producers to tell 'our' story?

E: How could we improve?

5A: Using the example of Sheep Dairy, the majority of the market for product, primarily milk powder and infant formula, is sought in Asia. In your opinion, are primary producers focusing too much on international market potential?

B: What could be done to capitalise on local market opportunities first?

6A: Emotive appeal over Scientific Evidence – in your view which is more important to the consumer?

B: Why?

7A: You are venturing into sheep milking. What are the 3 most important aspects you would want to know before you start?

1.

2.

3.

8A: What in your view are the characteristics of a resilient NZ Milking Sheep?

B: In your opinion what are the characteristics of a sustainably bred NZ Milking Sheep?

C: How far away are we from achieving that?

9A: In many parts of NZ Bovine Dairy relies heavily on irrigation to sustain pasture, resulting in consistency of milk production throughout the milking season. Is ovine dairy as susceptible to pressures of NZ weather?

B: Is Sheep Dairy less reliant on irrigation than Bovine Dairy?

C: What are the potential risks for sheep dairy on Dry Land?

D: In your opinion, is Sheep Dairy an economically viable option for Dry Land farmers?

10: I've been told that "Industry good organisations are too tightly defined and don't create opportunity for different land use systems".

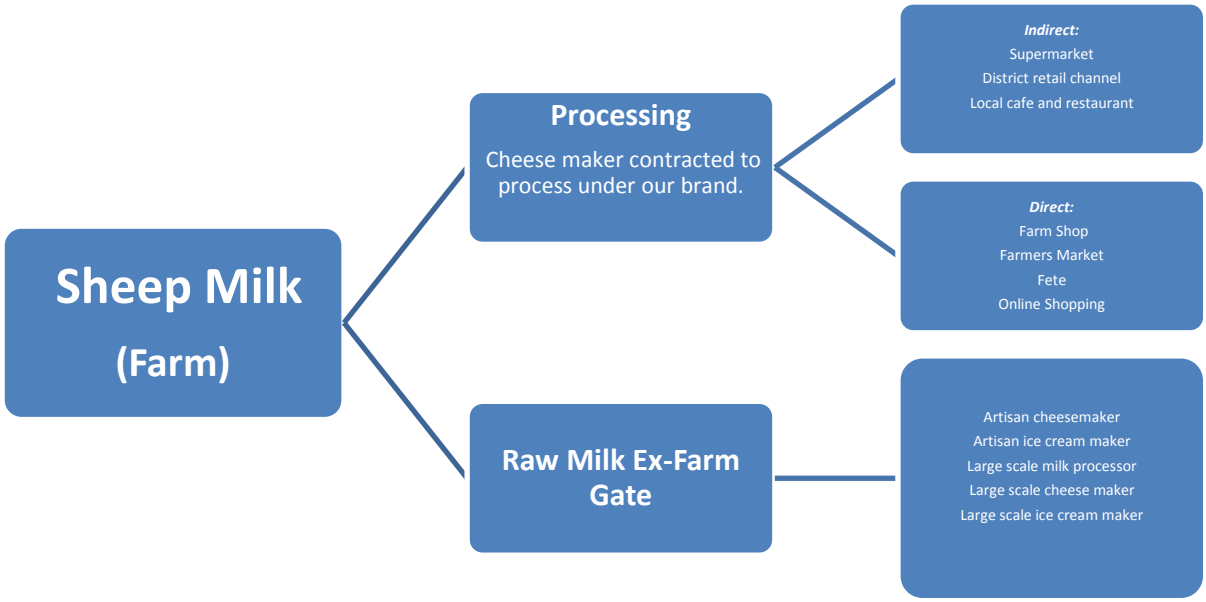
A: How could Sheep Dairy better engage the primary sector in the potential of the sheep dairy industry?

B: How can Sheep Dairy foster collaboration to build a sustainable and world renowned sheep dairy industry in NZ?

C: In your view what can Sheep Dairy learn from other sectors in terms of production?

D: In your view what can Sheep Dairy learn from other sectors in terms of performance standards?

Appendix 2: Sheep milk sales strategy



Overarching Sales Strategy: To identify market opportunities for our quality, refined, sought after sheep milk product. We will utilise the expertise of those invested in our venture to ensure success of our brand and sustainable growth in those markets.

There are two potential paths for our milk once produced. To be a profitable, agile business it is important to continually be in touch and open minded about adapting the paths, relative to market situations and opportunities.

Processing Path

- This takes us direct to the end user and with retail allows maximum margin.
- An artisan cheese maker has expressed interest in processing the milk for us so we can then sell it under our own brand.

Indirect Sales: As per diagram

Direct Sales: As per diagram

Raw Milk Sold Ex Farm Gate

- The diagram indicates alternative options for sale of our product under our own brand. Our initial plan is to sell raw milk to a processor. Avenues for supply of raw milk vary and ranges from Yoghurt/Cheese/Ice Cream production, through to Powder/Formula for the Export Market. Opportunity to provide raw milk to other large players outside the region is something we are exploring further.
- Viability investigation based on raw milk sold ex-farm gate for Option A and B.

Appendix 3: Risk Analysis

Trivial:

Lambs don't finish: sell as store: This results in reduced income from lamb crop. To overcome, lambs may be required to graze longer to achieve target weights. However, this may result in reduced area available to sell as grass/silage if needed to graze lambs.

Time to train ewes longer than anticipated: Time is the cost. Can be overcome by being well planned and ensuring ewes trained before milking season commences.

Weather events threaten lamb crop: Varying degrees of severity. Snow could be catastrophic depending on time of season. Risk can be mitigated with providing shelter and prepared for worst case weather scenario.

Power outage: Unable to run milking plant: A delay in milking and can be overcome with having access to alternative power source to prevent this happening.

Irrigation restrictions outside lactation: This is more likely to happen once ewes are dried off and so unlikely to impact volume harvested. It may impact grass growth on area set aside for post-lactation silage and reduce crop yield.

Minor:

Demand for milk greater than Supply: Missed opportunity for revenue from milk sales. Possibility of unsatisfied customers. Can be overcome with clear expectation set with customers at time supply contracts negotiated.

Demand for livestock greater than Supply: Missed opportunity for revenue from livestock sales. Risk losing market, to larger producers who can meet demand. Key is being well-planned and understanding the market for milking progeny.

Animal Health Issues: Outside lactation: Cost of treatment and time to do so. Risk reduced by regularly checking on stock during Dry period, intervention when required and ensuring grazing areas aren't increasing risk for issues. For example: To reduce foot related problems, keep stock on dry areas when possible.

Purchaser can't take volume produced: Result could be wasted milk and lost sales opportunity. Can be overcome by spreading the risk and having more than one path to supply.

Other new ventures threaten our market: This can be overcome by forming sound, professional, long-term relationships with customers.

Significant:

Drought effecting dry land: Risk to crop yield on Dry Land and ability to finish replacement stock. This may see an increase in costs associated with extra supplement feed required and decrease in income from reduced crop sales. This can be overcome by being well-planned. For example: Ensuring supplement feed is available when required.

Milk Price: Drop of 10% or <: This would have a major impact on income. As with price fluctuations, the risk could be reduced by solid contracts agreed upon before season commences. Wider industry collaboration could also assist, with the establishment of similar sector Group, to the Dairy Goat Co-op.

Global Crisis: This risks export market opportunities. Pursue local market opportunities, with aim to form long-term professional relationships. Ability to adapt if required and openness to other opportunities will reduce risk. Less of a reliance on export could help protect our income stream in the event of a Global Crisis.

Irrigation restrictions during lactation: This could see short-term reduction in feed available to milking flock and cause a reduction in milk yield, seeing a reduction in volume available to sell and as a result reduced income from milk sales. Use of supplement feed when required will help overcome this risk.

Farm Accident: Varying severity: Depending on how serious, this could see minimal impact to catastrophic. Reduced labour, increased pressure on other staff to fill the gap and depends on time of season as to how much of an impact this would have. Ensuring H & S Plan up to date, raising awareness of hazards, providing safety equipment when necessary, training and supervision of less-experienced staff in certain tasks may reduce risks. For example: Training for using a chainsaw, training for safe operation of motorbike on hills and how to correctly assemble a hand piece.

Major:

Unable to produce 1.5L/ewe/day: Indication from NZ farms milking on commercial scale, is that yield currently sits between 1.4-1.8L/ewe/day. We have been conservative in our estimate on production/ewe in the first season. Less than 1.5L/ewe/day would have a significant impact on revenue from milk sales. With the adoption of improved 'dairy sheep' genetics in our breeding programme this can be overcome, by ensuring breed selected for milking flock have trait for sufficient volume.

Unreliable market: Price fluctuations: This can impact profit margin. Risk reduced through sound supply contracts and price expectation clearly stipulated/agreed on by all parties before milking commences. Over 12 months we plan to firm up market access and agreements before building the farm dairy.

NZ Goes into Major Recession: If reliant on the NZ market this would impact local sales. However, generally recession brings lower interest rates and reduced on farm costs, which would help mitigate risk associated with a NZ recession.

Increase in interest rates of 5% or <: This would put increased pressure on the bottom line profit. This can be mitigated by calculated on farm expenditure that does not adversely impact production. It is critical to have strong relationships with financers and ensure that any debt is the most cost effective / best value.

Animal Welfare: Staff mistreating animals: A significant impact on public perception of Sheep Milking, similar to that seen in Bobby Calf/Dirty Dairy scenario. Can be overcome by training staff adequately, selecting staff with good stock sense and work ethic, addressing concerns if they arise. Telling a good story following 'happy sheep from pasture to production' will help sell the 'how' and 'why' to consumers.

Catastrophic:

Milk Production: Drop of 10% or <: This would have a significant impact on revenue from milk sales. Can be overcome by ensuring consistency of feed quality/supply on milking platform, minimal walking distance to and from dairy and BCS of milking flock closely monitored throughout lactation.

Supply Contract terminated: Ability to adapt if required and openness to other opportunities will reduce risk. If we have more than 1 avenue for stock/milk sales we will be less-likely to see a major impact, unless all supply contracts are terminated.

Major animal health incursion: Foot and Mouth: This would have the potential to wipe out milking flock and all stock/milk related income. Results would be catastrophic.

Operational Inefficiencies: This can impact profit margin, through increased farm working expenses, if not operating at optimum efficiency. We have allowed 12 months to engage, continue due diligence, extend our knowledge through research and become involved with others in the industry to learn more about management of well-run operations. An example of this is our participation in the monthly conference calls with other farmers/corporates involved in NZ Sheep Milking.

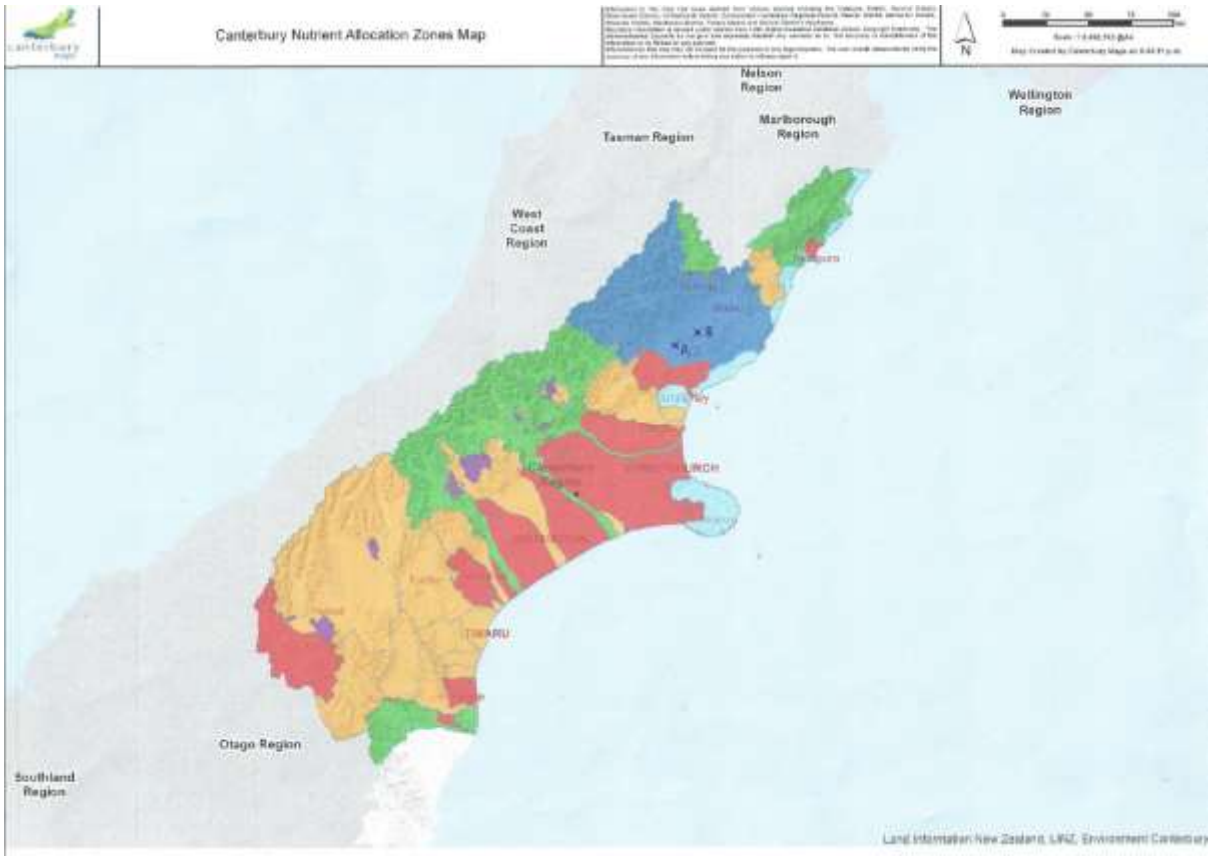
Sheep Milk proven to be detrimental to human health: The risk would be losing the market for our product, loss of income from our milk. This risk can be reduced by having other streams of income for the operation. For example, livestock and crop sales.

	Trivial	Minor	Significant	Major	Catastrophic
Highly Likely	Lambs don't finish: sell Store.	Supply < Demand Milk	Drought effecting Dry Land	Unable to produce 1.5L/ewe/day	Milk production: Drop of 10% <
Likely	Time to train ewes longer than anticipated	Supply < Demand Stock	Milk Price: Drop of 10% or <	Unreliable Market: Price Fluctuations	Supply contract terminated
Quite Possible	Weather event threatens lamb crop	Animal Health Issues: Outside lactation	Global Crisis	NZ goes into major recession	Major animal health incursion: Foot and Mouth
Possible	Power outage: Unable to run milking plant	Purchaser can't take volume produced	Irrigation restrictions during lactation	Increase in interest rates of 5% or <	Operational Inefficiencies
Unlikely	Irrigation restrictions outside lactation	Other new ventures threaten our market	Farm Accident: Varying severity	Animal Welfare: Staff mistreating animals	Sheep milk proven to be bad for human health

Impact

Appendix 4: Regional Nutrient Allocation Zones Map

Retrieved from Environment Canterbury website



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