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GROWERS FEELING FLEECE

**How might the market price
improve for strong wool growers?**

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Executive Summary

Background

New Zealand farming is synonymous with sheep. Their naturally grown fleece has many unique attributes that make it a "super-fibre", but competition from synthetic fibres has seen a decline in the popularity of wool over the last fifty years, as synthetics are cheaper to produce and consistently perform well in manufacturing. Wool used to be the main income stream for sheep and beef farmers and strong wool now is currently a net loss for growers. Sheep still need to be shorn for the health of the animal but considering all the additional costs of doing business these days, removing wool from their business is a choice many are considering. For generations, New Zealand growers have developed sheep genetics that yield a high quality and quantity of wool and this report highlights the opportunities and markets that still exist and are developing that need their wool clip.

Purpose of report

The purpose of this report is to understand the structure of the New Zealand strong wool industry. To understand how the market price is determined for strong wool, an industry analysis is conducted, the driving forces influencing the wool market pricing are identified and the opportunities and challenges facing the industry are discussed with a focus on the grower. This report is aimed at the next generation of decision-makers on sheep and beef farms to inform them of the market opportunities that exist for strong wool and recommend how might the market price improve for strong wool.

Methodology

A mixed qualitative research approach is used including Content analysis, through a literature review, Semi-structured interviews with fifteen industry stakeholders, and Thematic analysis used to evaluate insights from the interviews. Discussion of the profitability and competitiveness of the New Zealand strong wool industry is completed using Porter's Five Forces and PESTEL model.

Analysis and Discussion

Analysis of the themes from interviews and literature found prioritizing quality, collaboration, promotion, environmental sustainability, and global market engagement will pave the way for improved market prices.

- There is a consumer trend towards natural fibre solutions over plastics and synthetics.
- There is a demand for quality New Zealand strong wool, and it is well-suited for carpet manufacturing.
- Competitive rivalry is high within the strong wool industry and profitability is low.
- There are many other uses for strong wool, and these are increasing as growers and businesses innovate by solving problems with natural fibres, none of which are currently consuming a significant volume to influence the market demand.
- Quality strong wool will sell well, but to what degree? that is influenced by the additional value created through collaboration with businesses well connected to the consumer.

Recommendations

1. Growers to ensure a quality clip is produced and well prepared for sale.
2. Growers to collaborate with other wool suppliers and supply chain partners. This is key to creating additional value and a unique value proposition with their strong wool clip.
3. All stakeholders are responsible for promoting wool and its advantages to consumers.

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For the project, I would like to thank all the people I interviewed or talked to, who were very engaged and open and shared their valuable time and insights with me. It was a pleasure to meet you all and understand your perspective on the New Zealand strong wool industry.

AI was used to help analyse the interview transcriptions as a second review to ensure key themes ideas from the notes were not missed, further discussed in the methodology how Chat GPT was used.

To the passionate sheep farmers, taking pride in the production and processing of your strong wool clip, Kudos to you, this report is to provide validation and evidence that quality strong wool is demanded in the market and how might the price of wool will improve.

To the businesses and brands already supporting 100% New Zealand wool products and bringing new products to market. Thank you for supporting the wool industry and providing an avenue for the strong wool to be promoted to consumers. The intended outcome for the readers of this report is to be optimistic about the future of the New Zealand strong wool industry.

Lastly, I would also like to thank the constant support of my family and friends throughout the programme.

1. Introduction

The New Zealand farming landscape is synonymous with sheep farming and wool production. Strong wool- also known as 'cross-bred' or 'coarse' wool- production and price has been declining since 1982. Demand for natural fibres has reduced, as fossil fuel-derived synthetics have become the preferred fibre making up 64% of the global fibre market (Textile Exchange, 2023).

Wool is natural and sustainable with many unique attributes making it functional for a multitude of uses. Strong wool's largest product category is traditional carpeting. Hard floor coverings have increased in popularity and synthetic fibres dominate the textile market. But the markets are on the cusp of a natural fibre renaissance led by conscious consumers. These evolving consumer demands focused on sustainability and renewable products are part of the opportunity for the strong wool industry to embrace (Wool Industry Project Action Group, 2020).

Sheep farmers, producing strong wool who are referred to as 'growers' in this report are harvesting and selling wool at a net loss with the cost of shearing exceeding earnings from wool (Bezuidenhout, 2021) and shearing an animal health cost rather than a return on investment. The future of the fibre is being debated by the grower group against the backdrop of very low market prices (Williams, 2017). Many strong wool growers have spent years breeding sheep to produce good quality wool and are having to rely on meat as their only sheep revenue. Supply of wool is currently exceeding demand, by approximately 45,000-50,000 bales (Argent, 2023). Wool is mainly traded as a commodity through auction, where pricing is determined on the day depending on the buyers willingness and sellers product is indistinguishable once sold.

Grower's are challenged with increasing business costs as interest rates, fuel, labour and regulation affect their business. In addition, volatile export markets for meat and wool are challenging the profitability. Over the last 30 years improvements in sheep have been in meat productivity (MPI, 2019). Sheep numbers have held up in New Zealand because strong wool sheep breeds yield well for meat, treated as dual-purpose animals. A change away from wool would significantly change a farming system. Farming sheep and the fundamental activities of sheep farming are embedded in the farmer's way of working and are not given up lightly. Many sheep farmers have hand-selected sheep genetics over years and years to perform within the conditions of their environment and shearing for example supports the communities and districts they live in by providing employment. The skilled workforce needs to be supported to ensure they are to support the industry in the future.

New Zealand's strong wool is renowned for good colour and sound length. Attributes which make the product favourable over other countries exporting wool. The value of wool is measured in many ways, testing of wool, performance from production and end use, provenance, environmental and animal welfare standards as well as the all-encompassing lifecycle assessment (LCA). The LCA incorporates the cradle-to-grave footprint of the product (IWTO, n.d.).

The complex supply chain of wool is a challenge, with several toll processes to go through to be manufactured into a finished product. Because of the variability of natural fibres, the quality of the wool fibre is the most important aspect to the manufacturers. Good quality wool is achieved by sheep genetics, the climate of the environment the sheep live in, sheep health and farming practices and most importantly how well the wool is prepared for sale when shorn. Supply chain complexities can be simplified by growers connecting with brands who are visible to the consumer and working with them develop a supply chain that is fit for purpose and maximizes value creation throughout the process for a win-win outcome for grower and owner of the finished good.

Growers producing strong wool need the market price to improve to make sheep farming viable (Faulkner, 2011). The wool taskforce reported in 2010 “there is no silver bullet for restoring profitability to the strong wool sector” (Ministry of Agriculture and Forestry, 2010). It will take a concerted effort in a variety of ways for the wool industry to improve the strong wool market price. The value of strong wool needs to be recognised by the consumer, and awareness of its advantages over synthetics need to be promoted to consumers who are increasingly switching to natural and sustainable products.

2. Purpose

The purpose of this report is to discuss the structure of New Zealand's strong wool industry. By understanding the driving forces that influence the wool market price and how value can be added to create a differentiated product in the global marketplace. Strong wool growers need to know where the opportunities are to create value and areas to invest in their business that will support profitability.

The focus is from the grower's perspective, the target audience of this report is the next generation of decision-makers on sheep and beef farms. By researching the complex structure of the industry including the wool supply chain and sheep farming, challenges and opportunities for the industry and how additional value can be created for the natural super-fibre they can produce.

how might the market price improve for strong wool growers?

The report consists of three components: a literature review, semi-structured interviews, and thematic analysis which forms the basis of the discussion and conclusions considering the research question:

3. Methodology

A mixed qualitative research approach including Content analysis, Semi-structured interviews and Thematic analysis. Content information was acquired through reading a variety of literature. Semi-structured interviews were conducted with fifteen industry stakeholders including sheep farmers, industry leaders, science and academic community and international representatives. Thematic analysis was used to interpret and analyse patterns in the content and interviewee responses.

The literature review explored broad research questions that analysed the industry structure. News articles, journal articles, industry reports, and websites were researched. Porter's five forces framework is used to understand the industry structure, the profitability, and the degree of the competitive rivalry of the New Zealand strong wool industry from the micro perspective and the PESTEL model is used to analyse the macro factors influencing the strong wool industry from the outside.

The semi-structured interview questions were formed to gain perspectives on the condition, structure, and future of the strong wool industry. The anonymity of interviewees has been

protected, discussions were conducted in confidence and the semi-formal approach encouraged open dialogue. Thematic analysis was used to bring the two research components together.

The Appendix has the interview questions and completed templates for Porter's Five Forces analysis for the New Zealand Strong wool industry.

3.1 Porter's Five Forces

Porter's Five Forces Model, 1980 is used as a framework to understand the industry structure, Michael Porter wrote in the Harvard Business Review journal that industry structure drives competition and profitability, which is why this model was selected for this research project (Porter M. , 2008).

Figure I Forces Driving Industry Competition

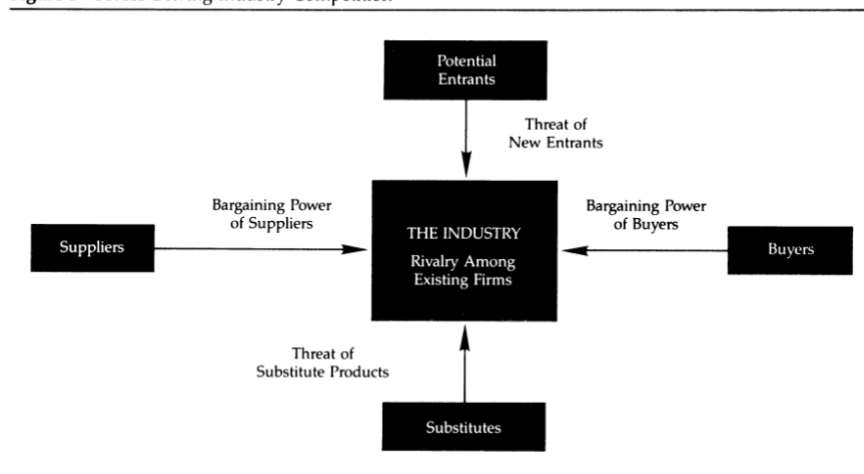


Figure 1 Porter's Five Forces, Financial Analysts Journal from (Porter M. , 1980)

Industry structure drives competition and profitability, not whether a product or service is produced or the maturity of the market or regulation. In the short term, there may be shocks to the industry which will certainly impact the profitability including weather, economic climate, and global pandemic but the longer term profitability is influenced by the structure of the forces and degree of threat of the components (Porter M. , 2008).

Porter's five forces analyses the competitive forces that shape an industry and help determine the weaknesses and strengths of each force. In a larger industry like textiles, Porter's suggests where the forces are intense, almost no company earns attractive returns on investment, then there are some industries where the forces are benign, and many companies are profitable such as soft drinks (Porter M. , 2008).

In 2014, Dobbs published a template framework to use to understand the strategic implications for individual firms within an industry, this will aid a clearer analysis of the five forces because of the structure and drawing actionable conclusions (Dobbs, 2014). Refer to the completed templates for the New Zealand Strong Wool Industry in Appendix 2.

3.2 PESTEL analysis

PESTEL analysis was developed by Aguilar in 1967 (Frue, 2017), it is an environmental scanning tool to help stakeholders understand the macro-economic forces impacting your business or industry. These are: Political, Economic, Sociological, Technological, Legal, and Environmental (PESTEL). The wider context that the industry operates in plays a pivotal role in the business's

performance. These external factors often are not able to be influenced or controlled by the industry stakeholders. It is important to be aware of these macro factors when analysing New Zealand strong wool industry. Porter's Five Forces Model then looks at the micro factors influencing the industry.

3.3 Thematic analysis

The interview data was transcribed, coded, and subjected to thematic analysis. Thematic analysis seeks to describe and report patterns across qualitative data (Clarke, 2006) and then unravel the surface of the "reality". Thematic analysis is useful for summarizing key features from a large body of data and can highlight similarities and differences (Clarke, 2006). Using the thematic analysis meanings from the data were examined, interpreted, and presented through a mind map in the analysis section see Figure 14. This was created using a brainstorming diagram from Microsoft Visio.

3.4 Limitations

Through undertaking the research, it was a challenge to ascertain accurate current aggregated market pricing, wool volumes, and profitability data. As there is no industry-wide sales and benchmarking data. This was acknowledged as a significant gap in the Wool industry project action group report (Wool Industry Project Action Group, 2020) and shared view of many of the interviewees.

Roger's (1962) Diffusion of innovation theory was considered for the research, there are five adopter categories when promoting innovation, the different adopter categories need to be appealed to in different ways (LaMorte, 2022) . As consumers' ability to consider wool as a preferred product and industry's ability to adapt and evolve over the last fifty years was perceived originally to be connected to behaviours but the industry structure and competitive rivalry are more influential to the outcomes for growers and market price, therefore, Porter's model was selected.

There are a few limitations of Porter's five force framework: (Porter, Michael E., 2006) Defining the industry too broadly, Listing too many surface ideas, rather than vigorously analysing the most influential drivers, Confusing effect with cause (e.g. price sensitivity with buyer economics) and completing with a lack of strategic insight.

Through the transcription process post conducting the interviews, sub-themes from the interviews were captured with a descriptive focus. The length of the interviewee and recording approach impeded how the information data set was able to be collated and because transcriptions were mainly manually captured there was a risk favoured insights were recorded better than other ideas. To validate that no key ideas were missed from the manual transcription and view another way of describing the ideas, chat GPT was used to summarise the key ideas of the transcript summary and compared against analyst own ideas generated.

4. Literature Review

4.1 Why Wool?

Wool's primary advantage is the 'naturalness', wool is a renewable resource, unlike the petrochemicals that are used to produce synthetic fibres (Mckinsey & Company, 2000, p. 32).

Wool is a “super-fibre” with a complex structure, the fibre delivers exceptional functional and technical performance in a variety of uses and the temperate climate in New Zealand is well suited to the production of strong wool breeds that yield high-quality wool and meat (Campaign for Wool, 2023).

Figure 2, lists some of the attributes that make a wool product safe and sustainable to use as knitted, woven, and non-woven manufacturing. Wool is composed of a diverse range of proteins and lipids which imparts a unique set of properties (McNeil, 2015).

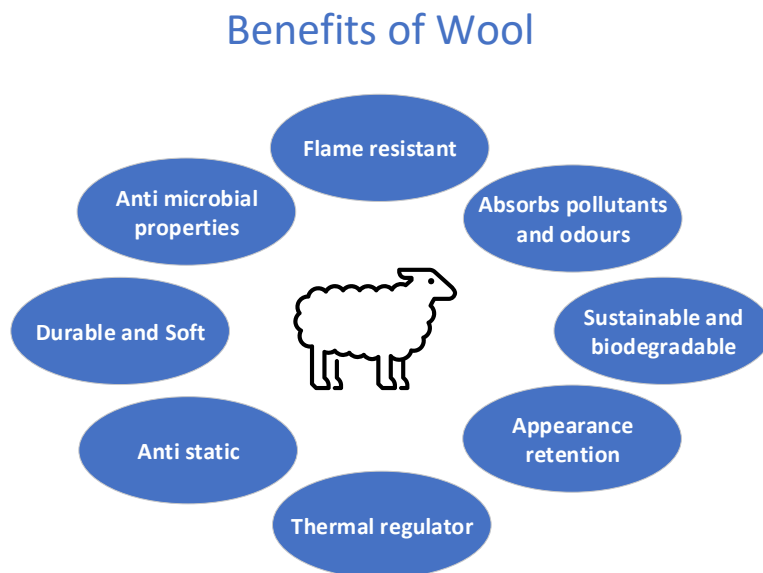


Figure 2 Benefits of Wool Attributes selected from (Johnson et al., 2003) (Berg et al., 2023)

- Sound and moisture absorption, wool can absorb about one-third of its weight in moisture and still not feel damp (Faulkner, 2011).
- Wool can absorb indoor air pollutants; wool carpets are likely to be able to purify indoor air for up to 30 years (McNeil, 2015).
- Wool is a flame retardant, with substantially lower smoke emission and flame spread than nylon carpets (Ingham et al., 2016)
- It is also non-allergenic, biodegradable, has excellent acoustic properties, and thermal insulation (McNeil, 2015).
- The fibrous and flexible protein within wool, Keratin also gives the functional fibre it's elasticity, strength, and ability to withstand repeated bending and stretching (IWTO, 2023), up to over 30% and it will recover to original shape.

4.1.1 Fibre Fineness - Micron

The fibre fineness is the most important parameter of the wool fibre, it determines how the fibre will be used. The measurement unit of fineness is micrometre, commonly referred to as Micron and are grouped based on average diameter as either fine, mid, or strong wool. The price is differentiated based on fibre diameter. Typically, the price increases as the diameter decreases (NZWTA, 2022). Yarn and fabric construction, and finish of the processed product is directly impacted by the quality and specification of raw fibre used (Baxter, 2015). Figure 3 shows the diameter grouping and popular uses for each micron type.

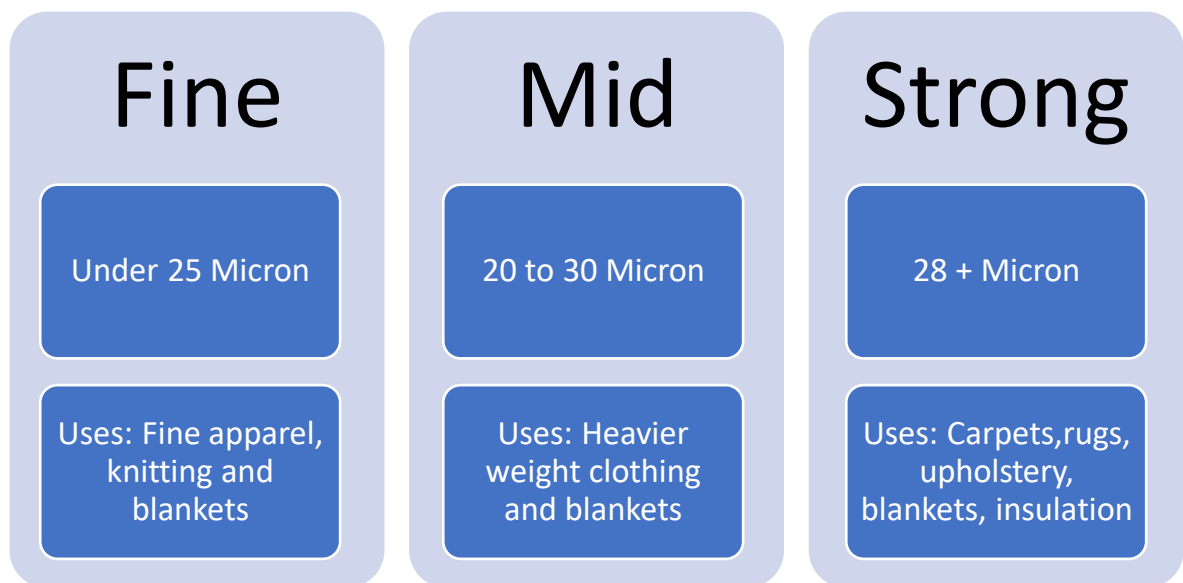


Figure 3 Micron diameters defined from (Campaign for wool, 2023) and (Johnson et al., 2003)

The genetics will bring about specific wool properties. Figure 4 shows the micron variety between the most popular and well-known breeds of sheep farmed in New Zealand, Romney, and Merino. (NZWTA, 2022) There is a complex interaction between genetics and environment that determines the fibre's staple length and strength (Wear, 2021). The interconnection between the seasonal effect of the climate, how the sheep are farmed, their age, health and genetic composition of sheep will influence the fibre length and strength which tested measurement.

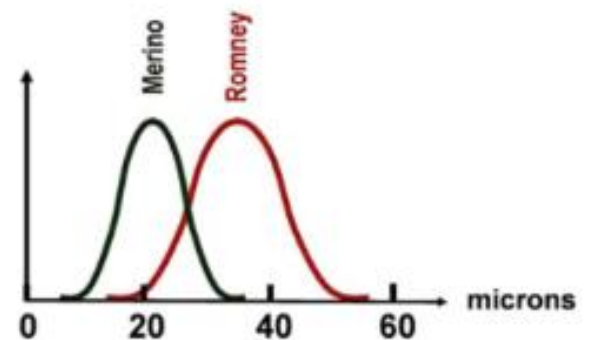


Figure 4: Sourced from (NZWTA, 2022)

4.1.2 Importance of Shearing

Regular shearing, a minimum of once a year is important for maintaining the good health of the sheep (Campaign for Wool New Zealand, 2022). It is an important aspect of animal husbandry that promotes improved health and productivity of the flock (The Sheep Shearer, 2023).

Seven reasons for shearing sheep from the Sheep Shearers website (The Sheep Shearer, 2023)

1. Shearing regularly prevents skin infections and parasite infections, such as flystrike and ticks.
2. Reduces the risk of heat stress in warmer months.
3. Improved weight gain, sheep gain weight after shearing as they become more active with the reduced weight of the fleece, and they graze more often.
4. Improved reproductive performance, they are more comfortable during breeding season and less wool makes it easier for sheep to mate.
5. Improved lambing success, a shorn ewe whilst lambing is more likely to shelter appropriately with a shorter coat of wool and therefore improves the survival rate of a

newborn lamb. Lambs can also find the teat for feeding with ease if there is no long fleece.

6. Better wool quality, shearing removes old wool and allows new, higher quality wool to grow.
7. Increase lifespan as shearing reduces the risk of health issues which improves overall health of sheep.



Shearer manoeuvres sheep and handpiece



Wool handler "Rousie" sorting fleece as shorn

Once the sheep are shorn by the shearer, the fleece is prepared by the wool handler and placed in a wool press which compacts the wool into a "bale." The average bale weighs 161kg with greasy wool, individual farm lots vary from a single bale up to approximately eighty bales which is around 13 Tonnes of wool (Wear, 2021). Volume and quality will vary between growers depending on the farmer's management of the flock and preparation done in the woolshed at the time of shearing. Quality preparation in the woolshed is important, as this process prepares the farmer's wool for the best possible outcome in the marketplace. Decent quality wool has improved options for end use and preferential sale options (Scott, 2023).

Typically, New Zealand's strong wool has exceptionally low levels of vegetable matter (VM) which if not removed through wool harvesting process or scour can cause complications in the manufacturing process (Wear, 2021). There is a commercial consequence for the grower as well as wider industry reputation if poorly prepared and contaminated wool is sold to manufacturers. Nigel Hales Woolworks president has recently returned from China and reported to farmer's weekly that "the Chinese openly stated that they are prepared to pay more for NZ wool, but not until it is handled correctly at the source." Manufacturers and scourers are finding medullated fibre, yellow fribs, poor length and other general contamination, all of which primarily should be addressed in the wool harvesting process (Scott, 2023). The rest of the market feedback from buyers was positive as with sound genetics, quality characteristics and specialised facilities, best fits their requirement. New Zealand will not be able to fulfill market potential at higher price point with poor shed preparation" (Scott, 2023).

4.2 Overview of the New Zealand strong wool industry

New Zealand's wool sector is an iconic part of the country's rural identity. New Zealand exports more strong wool than any other nation to textile manufacturers (Wool Industry Project Action Group, 2020). Traditionally strong wool fibre is used in carpets and upholstery and most of the wool is traded as an undifferentiated raw material (Ministry of Agriculture and Forestry, 2010). Wool was the country's single most valuable export for 89 years between 1856 and 1967. Demand for wool then was high as competition from alternatives was low (Ministry of Agriculture and

Significance of New Zealand strong wool production to the wider industry:

- 23,400 Sheep and Beef farmers, covering 45% of New Zealand's agricultural area (Te Puni Kōkiri, 2023)
- 25 million Sheep in New Zealand, producing around 133,100 greasy tonnes of Wool (IWTO Market Information, 2022)
- 89% of the New Zealand clip is strong wool, 4% medium and 5% fine wool (Ministry of Agriculture and Forestry, 2010)
- New Zealand is the third largest producer of wool in the world behind Australia and China (Wool, 2021)
- New Zealand contributes to 7% of the global wool production (IWTO Market Information, 2022)
- NZ value of raw wool exports is 434 million (Beef + Lamb NZ, 2023)
- 92% of New Zealand wool clip is exported (MPI, 2019)

Forestry, 2010). Today, the national sheep flock is less than half the peak of approximately 70.3 million in 1982 (Peden & Stringleman, 2009). Figure 5 shows the decline in sheep numbers and subsequent wool production since the 1990s. Strong wool is traded in a competitive market with other fibres and synthetics offering preferable technical attribute (Ministry of Agriculture and Forestry, 2010). Sheep farming complements other growing systems such as arable, beef and grape growing in New Zealand. 30 years ago, 30% of Sheep and beef total farm income came from the wool cheque, now it is under seven% (MPI, 2019).

Figure 6 represents an average all New Zealand real wool revenue and shows the decline since the 1990s. This is for several reasons including increasing costs of shearing, reduced market price of wool because of deflated demand.

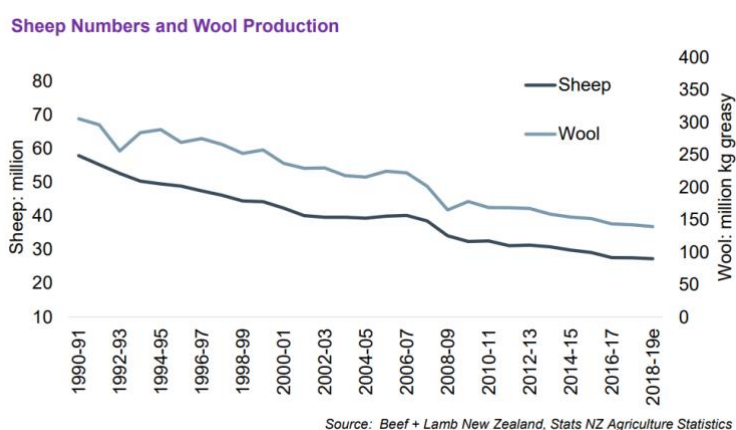


Figure 5 Beef + Lamb New Zealand sheep numbers as cited from Wool Databook (MPI, 2019)

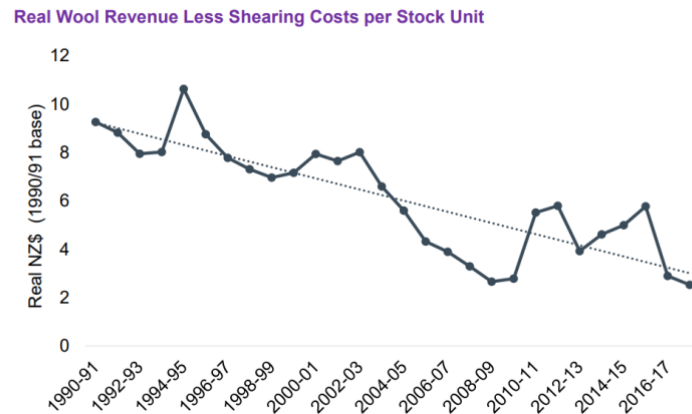


Figure 6 Real Wool Revenue less shearing costs per SU from Wool Databook (MPI, 2019)

Over the past 20 years the loss of core sector capability and coordination of investment has resulted in many of the industry development capabilities to decline (Wool Industry Project Action Group, 2020). There has been a lack of differentiation and the industry has competed fiercely on price to sell New Zealand strong wool (Faulkner, 2011). The wool board was formed in 1944 and dissolved in 2002 as voted by growers through a referendum, with the wool levy ending funding for industry research, marketing, and economic services also diminished.

The New Zealand government introduced a supplementary pricing in 1952, this set the floor price for wool in auction but did not help lift the market price for wool. In the 1970s, Britain joined the European Economic Community and the first 'oil shock' occurred, raising costs of transport and production as highlighted in Figure 11 below. Wool prices fell further because of competition from synthetics and changes in fashion (Peden & Stringleman, 2009). Supplementary pricing ceased in 1991 (Carter & Macgibbon, 2003) and the price of wool continued to decline through to present time.

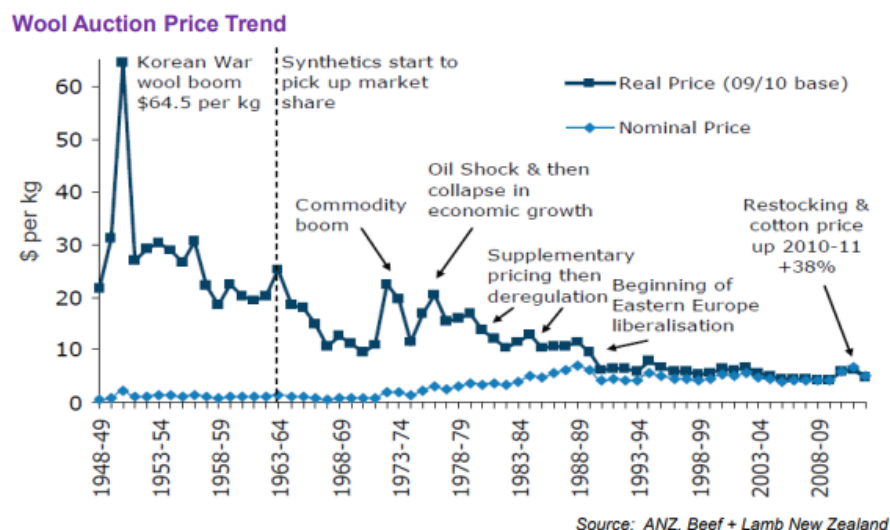


Figure 6 Wool Auction Price Trend from Wool databook (MPI, 2019)

In July 2023 stuff quoted Wools of New Zealand CEO John McWhirter “the wool industry has been largely asleep through the rise of synthetics” (Uys, 2023), the decline in export volumes and prices, and costs have increased, the reality is now growers wool production is now a net cost from the production of meat (Ministry of Agriculture and Forestry, 2010). Sheep productivity growth over last 30 years has been primarily a result of improvements in meat productivity characteristics. Meat yields are more attractive relative to wool yields (MPI, 2019).

4.3 What is the structure of the New Zealand Strong Wool industry?

4.3.1 Wool harvesting Process

The wool harvesting process involves several skilled roles, including shearers, wool handlers, wool classers, and farmers. The future of the industry and supply of wool to market is dependent on the skilled workforce. Majority of farmers cannot efficiently shear all the sheep themselves so employee contractors, they command a reasonable wage for the physically demanding and skilled work.

It is estimated that there is around 4,350 employees in 2022 in the New Zealand shearing industry (Stats NZ, 2023), this number has declined since 2006 when Barry Pullin quoted around 7,500 (Pullin, 2006). There have been many attempts at researching alternative ways to manual shearing such as "chemical shearing" and robotic shearing, but none have come close to being as efficient as traditional machine shearers. The efficiency of de-fleecing a sheep depends on the engineering of the handpiece, gear, and skill of the shearer (Pullin, 2006).

The wool industry must ensure that they have the education and training available that caters to the workforce needs. Muka Tangata, the Workforce Development Council is currently working with the industry to develop four micro-credentials to recognise the skills of shearers and wool handlers (Staff Reporter, 2023). The wool industry is unique, and the people have unique skills, as such training needs to be skills-based and support the seasonal nature of the industry (Staff Reporter, 2023).

New Zealand wool is recognised for its high-quality wool, and marketing the wool story relies on how well we manage the sheep and handle the wool (Wool Industry Project Action Group, 2020). There is a need to increase the availability and accessibility of wool harvesting training to grow our workforce and improve capability (Staff Reporter, 2023).

4.3.2 Outside the Farm gate

The production chain for wool is much more complex and longer than most agricultural products, and many groups participate in the industry via a silo fashion equating to many vested interests that are difficult to satisfy collectively.

Below is a traditional supply chain map of the key process owners involved in the strong wool production chain. Between each component, there are service providers such as freight and storage providers who are an integral part of the chain.

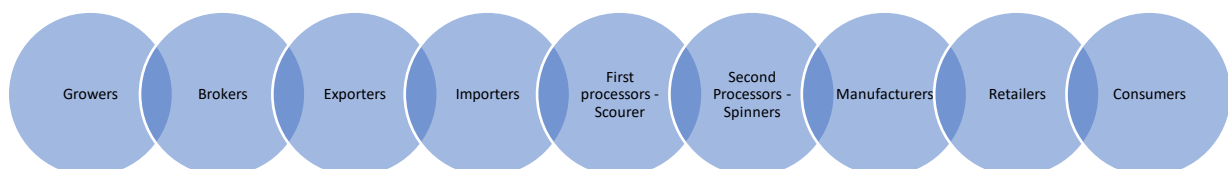


Figure 7 Traditional strong wool supply chain, cross over of circles indicates a transaction occurring modified New Zealand wool value chain diagram from (Wool Industry Project Action Group, 2020) .

The complex supply chain poses challenges for collaboration and efficiency. The traditional strong wool industry has not changed the route to market and has been further challenged by low demand, rising production cost and disruptions in the supply chain. Adverse weather events frequently effect quality of wool and production. For instance, Cyclone Gabrielle, early 2023 led to the closure of the only north island wool scourer due to flooding resulting in limited domestic scouring capacity. The South Island plant has been operating 24/7 to keep up with demand. Sixty-one percent of total New Zealand's wool clip is scoured on-shore before export (MPI, 2019).

This closure has caused a disparity between North and South Island auctions due to the higher transport fees. (Fusca Limited, 2023). In 1995 there were fifteen active scours (Wear, 2021), this reduction of scouring facilities in New Zealand reflects the decline in wool production. This consolidation is reflective of the limited manufacturing capacity New Zealand has and negatively impacts the industry when there are local supply chain disruptions.

The global wool supply chain was heavily impacted by Covid 19, with reduced overseas demand, manufacturing stoppages, and extended freight lead times. China's strong response to the pandemic significantly affected New Zealand's wool industry as it constitutes 44% of the strong wool total exports (MPI, 2019) primarily used in textile manufacturing.

4.3.3 Selling of Wool

Historically 50-60% of wool has been sold via auction (the first transaction between growers and brokers, see Figure 7) with the remainder sold privately (Beef + Lamb NZ, 2020). For auction, wool samples are tested, then physically displayed at selling centres and appraised by eye, little wool is sold electronically, or forward sell (Australia Wool Innovation Limited, 2015). Broker's, private buyers, and exporters are responsible for selling grower's wool to overseas markets. There is no feedback between processors and growers, when product is sold in auction (Baxter & Cottle, 2015). The wool selling system does restrict the pace of change in the industry by operating very conservatively and traditional way (Australia Wool Innovation Limited, 2015).

Greater flexibility and transparency in the selling system would build equitable outcomes for growers and buyers. Alternatives to auctions could provide benefit to the growers, opportunity to commit to pricing earlier, greater certainty in the price and may build new and mutually beneficial buyer-seller relationships which could lead to innovation in the way wool is grown and marketed (Australia Wool Innovation Limited, 2015) .

NZ Merino has been working on arranging strong wool contracts with brands for growers over the last few years through their ZQ programme (NZMC, 2022) and Bremworth recently has offered 10 year supply contracts to a select number of farms, co-creating a woolgrowers club to secure the volume and specifications for the buyer. This gives the certainty of income and supply for a reasonable period for meeting quality specifications (Scott, 2023). Quality specifications can be permitted through assurance programmes such as the New Zealand farm assurance programme (NZFAP) or Responsible Wool Standards (RWS), New Zealand Merino assurance programmes, ZQ and ZQRX. Like standard practice in the meat and dairy industry, contracts are one of the only ways to get surety of supply for the growers if there is commitment of volume by the consumer.

4.3.4 Processing stages

There are number of processing stages the fibre goes through before it is a finished product (Mckinsey & Company, 2000, p. 19) , see Figure 8 for the New Zealand strong wool value chain, further enhanced than Figure 7, to reflect the possible relationships and transactions between supply chain partners. Defined by Michael Porter's as "a value chain is a set of activities. Products pass through all activities of the chain in order and at each activity generates some value. The chain of activities gives the products more added value than the sum of added values of all activities" (Porter M. E., 1985)

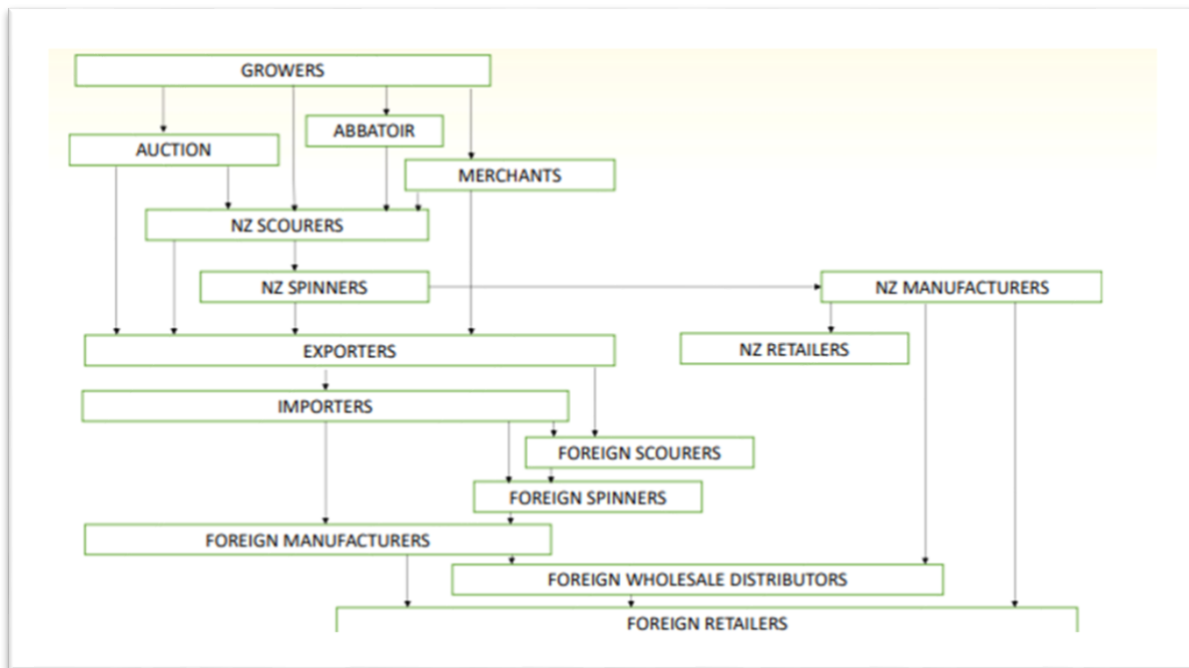


Figure 8 Diagram of the New Zealand Strong Wool Value Chain from (Conforte et al.,2011)

Within this complicated and transactional supply chain wool makes up a low portion of the finished product value. Strong wool return only 5% of the retail price or value of a typical tufted carpet. Manufacturing and spinning processes are both capital intensive. Manufacturers buy the yarn from the spinner to create the finished product, distributors store and wholesale to retailers. The costs incurred by the spinners and manufacturers are much lower than the cost of wool. Manufacturers and retailers capture more than 75% and Spinners capture about 15% of the final product value. The manufacturers compete in competitive environment and incur costs in production and overheads. Very little of the final value accrues to brokers, scourers and exporters, too aggregate, clean and scour and transport the wool, earns only 2% of the retail price (Mckinsey & Company, 2000, pp. 18,19).

New Zealand strong wool is differentiated in the export market, with 90% of New Zealand's exports traded as "clean" wool, opposed to "greasy" wool. Clean wool is scoured, and greasy wool is raw state as baled in the woolshed. Scouring is the first mechanical process that wool goes through which in simple terms is the washing and drying of wool (Wood, 2012) , Once scoured the wool clip would typically go to the Spinners, who create yarn for knitting, weaving or tufting processes.

4.3.5 Transactional vs Transformational Supply chains

Transformational supply chain leadership is when leaders encourage others and create relationships that motivate all stakeholders in the end-to-end process. Supply chain participants possess many different skills and will have different organisational goals,

transformational leaders will understand the different perspectives and can influence desirable outcomes for overall improvement. Transactional supply chain leadership, is task and result driven, made up of many autonomous entities (Bezuidenhout et al.,2021) Within the wool industry, there is a need for improving collaboration and communication between supply chain components. Transformational leadership adopted by industry and business leaders would help develop value chains and positively impact outcomes for growers. There are several possible reasons why transactional leadership dominates the wool supply chain, the traditional transactional way of commodity business being one of them and fear of change for loss of control and margin would be the second, as many stakeholders in the industry have vested interests (Bezuidenhout et al.,2021).

Negotiation is a large part of any supply chain business, there can be different negotiation approaches. In distributive negotiation, when bargaining resource is limited, no relationship, and a strong bargaining position is held. Integrative approach, the bargaining resource is unlimited, the weaker bargaining position still wishes to gain some value from the dealing, and a good relationship is maintained (Bezuidenhout et al.,2021). Distributive negotiation is common in the transactional supply chain, most common in the traditional wool supply chain. There is little coordination and very de-centralized supply chain mechanisms (Bezuidenhout et al.,2021). O'Keeffe,1998 discusses within an supply chain management article four characteristics relating to the Australian agribusiness that hinder trust and cooperation in agricultural supply chains.

1. In commodity markets the sum of value created is fixed and the major issue is how it is divided among channel participants. This is a win-lose game and leads to adversarial relationships.
2. Auction systems and regulated markets isolate farmers from the rest of the food system and farmers do not gain any insight into their customers, Likewise, processors have not needed to, or had the opportunity to, develop relationships with growers.
3. Supply chain management does not remove the volatile nature of prices and supply - both quantity and quality - characteristic of agriculture. Price volatility puts pressure on relationships.
4. Interdependence is difficult to achieve owing to the size imbalance between processors and farmers. (O'Keeffe, 1998)

James Parsons 2009 Nuffield Scholar, drew parallels with the New Zealand agribusiness context in his report "supply chain relationships and value chain design". Which is still relevant to the 2023 New Zealand Strong wool industry, as we consider all four as current challenges for the wool grower and influence on market price. The win-lose game is considered when one participant gets more than the other parties involved (Bezuidenhout et al.,2021), When wool is sold via auction, the win-lose game is played first in auction and then between the wool exporter and first processors. The win-lose game enables a 'buy low, sell high,' Parsons discusses that the 'buy low, sell high' approach breeds poor communication and mistrust between chain partners (Parsons, 2009). It disincentivises information sharing a great example of this are auctions where there is a temporal relationship that voids communication between seller and buyer.

Supply chain collaboration can be defined as two or more independent firms jointly working to align their supply chain processes to create value to end customers and stakeholders with greater success than acting alone (T.M Simatupang, 2004) . Quality collaborative relationships between supply partners are crucial, fairness and trust are also important attributes when collaborating. Parson's report explains what the difference is between a value chain and supply chain is and how efficiency and economic gains can be produced through chain efficiency which a culture of collaboration is required and trust (Parsons, 2009). Information sharing is paramount to collaboration between supply chain facilities, visibility of customer demand and supplier performance can help improve the collaborative benefits

(Bezuidenhout et al., 2021). The later approach to supply chain collaboration supports a transformational supply chain.

4.4 PESTLE analysis of the external environment

PESTLE analysis is a model used to examine an industry's macro environment, these external factors are not able to be controlled by the industry stakeholders (Frue, 2017). But they directly influence all the supply chain components therefore important to discuss when analysing the strong wool industry structure.

PESTLE factors:

- Political
- Economic
- Social
- Technology
- Legal
- Environment



Figure 9 PESTLE Analysis of the macro-environmental factors influencing the New Zealand Strong wool industry adapted from Aguliar (1967)

The global conditions heavily influence the predominant export trade industry, wool being one of them (MPI, 2020). The political and economic situation of our main trading partners, China, India and the United Kingdom directly affect the market prices of strong wool (Beef + Lamb NZ, 2023).

A John F Kennedy quote was shared from an interviewee "For the farmer, is the only man in our economy who has to buy everything he buys at retail - sell everything he sells at wholesale - and pay the freight both ways." This is telling of the situation growers are in, fully impacted by the costs and market prices influenced by the global and domestic economic climate.

Cost of doing business and availability of labour are two important aspects that influenced by political, legal, economic, and social factors combined.

Technology is an enabler to conducting business, leveraging information sharing effectively around the globe (Parsons, 2009). Technology is an integral part of innovation and research in the science, marketing and manufacturing areas which broadly together cover all aspects of the supply chain. Technology can drive efficiency gains and give industry's a competitive advantage, through increasing productivity and creating differentiation.

Climate change which has come around largely due to the excessive burning of carbon stored in fossil fuels over the last 250 years has changed the natural balance in the carbon cycle (IWTO, n.d.) How countries are responding these situations with mandates or policy changes shows how environment and societal norms can influence an industry's performance. For the wool industry, New Zealand has a unique farming system and wool qualities associated to naturalness and sustainability gives the strong wool industry a significant opportunity to leverage the environment and societal concerns where wool can suit the consumer's demands (Wool Industry Project Action Group, 2020). This can be done by understanding the economic, legal, and social factors driving market behaviours and can be assisted by understanding the technology requirements and capabilities.

4.5 Porter's five forces analysis of the New Zealand strong wool industry

The Porter's five forces model was used as a framework to understand the industry structure, Porters suggests that industry structure drives competition and profitability (Porter M. , 2008) profitability of the industry directly implicates the grower's return and the companies within the industry can influence the five forces (Porter M. E., 1999) For each of the five forces there are components, that for every industry that may vary depending on the setup. The threat of each component in relation to the strong wool industry has an indicative threat level score from higher to lower, this considers the value or measure of the threat source (Dobbs, 2014).

Porters five forces

1. Rivalry among existing firms in the industry (high)
2. Bargaining power of buyers (high)
3. Bargaining power of suppliers (low)
4. Threat of substitute products (high)
5. Threat of new entrants (low)

The strength of the five competitive forces affects, prices, costs and investment required to compete within the industry structure (Porter M. , 2008). The macro environment factors previously discussed in the PESTEL analysis also influences the profitability of the industry.

Figure 10 lists the participants within each force and lists the highest threats of each force for the New Zealand strong wool industry. Discussion follows with an overview of each force. See Appendix 2 for complete five forces analysis with driving forces highlighted and threats and opportunities summarised, Linking the five forces assessment to opportunities and challenges the industry faces can help strategic think and develop meaningful responses to industry pressures to improve competitiveness and profitability (Dobbs, 2014).

Porter's five forces of the New Zealand strong wool industry

| Rivalry among firms | Bargaining Power of Buyers | Bargaining Power of Suppliers | Threat of substitutes | Threat of new entrants |
|--|---|--|--|--|
| <ul style="list-style-type: none"> •Threat level: High •Who: All suppliers and buyers •Driving factors: <ul style="list-style-type: none"> •Slow industry growth •Little product differentiation | <ul style="list-style-type: none"> •Threat level: High •Who: Wool brokers and traders, exporters •Driving factors: <ul style="list-style-type: none"> •Buyers orders based on high volume, low margin •Backward intergration not feasible | <ul style="list-style-type: none"> •Threat level: Low •Who: Growers and Meat works •Driving factors: <ul style="list-style-type: none"> •Many suppliers, low volume and low profit •Standardised product when sold •Suppliers have multiple options of buyers | <ul style="list-style-type: none"> •Threat level: High •Who: Synthetics & other wool producing countries •Driving factors <ul style="list-style-type: none"> •Buyers are price sensitive •Performance is important and synthetics are easier to use in standard application. | <ul style="list-style-type: none"> •Threat level:Low •Who: New players •Driving factors: <ul style="list-style-type: none"> •high captial requirements •low profitability makes it an unattractive option •Supply side economies of scale required to compete |

Figure 10 Porters Five forces of the New Zealand strong wool industry- Adapted from (Porter, 2008)

The bargaining power of buyers is important to understand and highly regarded as a driving force contributing to the rivalry among firms within the strong wool industry. The buyers forward buy for volume commitments, so if the retailers and manufacturers are demanding the strong wool the competition is positive for the growers. Wool traders in an auction have a degree of coercive and expert power over the suppliers. China has a significant coercive power of the buyers of New Zealand strong wool industry due to the volume they purchase (Bezuidenhout et al.,2021). The Rivalry among firms is high as low demand increases competition for the existing supply. The wool trade is competitive, with a few large exporters having a considerable influence on the New Zealand auction outcomes.

The bargaining power of suppliers is low within the strong wool industry and driving force is weaker comparative to the bargaining power of buyers. Growers prepare their wool for market, and majority of wool is sold by auction or through a private negotiation with a wool broker and very little through forward contracts (Australia Wool Innovation Limited, 2015). The negotiating power when demand for wool is low, sits with the buyer as discussed above. Wool is volume-based on kilograms, if growers were to collaborate and increase inventory of a certain specification for market together, this would assist their bargaining power.

The threat of substitutes to the strong wool industry is high. Since the entry of synthetic manufacturers in 1963, they had rapid productivity gains, and the synthetic manufacturers have distinct advantages in production over wool as they can produce standard product. The costs of processing synthetics extend beyond the cost of the raw fibres. Synthetic fibres are not subject to the product variability or contamination that wool can have which hinders production. The opportunity to seize the timely market shift towards natural fibres is here (Wool Industry Project Action Group, 2020) and New Zealand strong wool growers need to ensure quality product is produced, which will encourage manufacturers to buy New Zealand strong wool as it can the best of colour, length, and lustre available globally.

The referent power has been applied by synthetics with manufacturing and consumer fashion to date, but the favourable natural property of wool is where the wool industry needs to focus to combat the threat of synthetics.

There is a low threat of new entrants to the strong wool industry. The pastoral farming area in New Zealand has declined over the last 30 years, farms have consolidated or moved to other land uses such as lifestyle blocks, urban development, forestry, and even some horticulture (Woodford, 2021). For the intensive sheep and beef farms, beef income easily exceeds sheep income, therefore is little incentive for new entrants to join the industry in its current state.

Overall rivalry within the New Zealand strong wool industry is high and the forces are intense with little differentiation and majority of wool clip sold via auction. It is hard for value to be added to the wool clip when the grower is disconnected from the supply chain. The numerous ownership transactions that occur through the wool supply chain and "buy low, sell high" commodity trading means the pricing mechanism is vastly unknown by the grower. Supply is greater than demand so the competition for wool to be sold is high. The amount of competition in the industry increases the incentive to invest in research and development, a medium degree of cooperative orientation results in a low degree of innovativeness (Baxter & Cottle, 2015). The prevailing intense forces such as threat of substitutes, bargaining power of buyers and rivalry among firms, supports Porter's suggestion of high competition and generally low returns which has been supported with the wider literature research of the New Zealand strong wool industry.

To improve industry returns, the bargaining power of supply needs to improve, and new entrants need to be attracted and bargaining power of buyers addressed which is discussed in further detail by the challenges and opportunities for the strong wool industry.

4.6 What are the challenges facing the wool industry?

4.6.1 On Farm pressure

Growers are at the beginning and the end of the supply chain which means trading market conditions implicate their ability to produce and invest in all areas of their business. Farmer sentiment and overall confidence is low this season with a lot of uncertainty and deflating farm gate prices (Beef + Lamb NZ, 2023). On farm inflation is at a high, as of March 2023 it was running at 16.3%. Last time it was comparatively this high was in 1981 when it was 17.1%. (Burke, 2023) Inflation is eroding farm profitability significantly, approx. \$70,600 per farm extra costs incurred (Beef + Lamb NZ, 2023).

If we look at just strong wool the reality in 2022/2023 season auction prices for clean wool were under \$3 a kg, this was up from 2021 season when auction prices were lower than \$2 per kg (Fusca Limited, 2023). Cost of harvesting wool for the 2021/22 season was 150% more than the return from the wool clip for a South Island hill country farm (Barnett, 2023) and north island farmer, Toby Williams, Federated Farmers Meat and Wool Chair reported 25% loss who said it is 10 years since he last made money off wool (Scott, 2023). Farmers are questioning whether they stay producing strong wool or consider changing sheep breeds that don't require the shearing costs. Over 50% of the New Zealand sheep flock is Romney bred (MPI, 2019), if growers are wanting to still produce lamb meat, there are alternative breeds without fleece, most known breed is Wiltshire, they self-shed the fleece. There are new breeds that of hair sheep are beginning to establish a genetic base in New Zealand now such as the Wairere Nudie promoted with "No wool No shearing No shedding" in their 2023 Newsletter (Wairere, 2023).

It is not a simple task to change a sheep breed, It can take 3-5 years to transition breeds and there is lost production and income incurred in that time until new flock is fully integrated into farming system advised by an interviewee who has left the industry (Communication, 2023). If growers change breeds, exiting strong wool industry in the process, the industry will be diluted

of strong wool long term and in the short term will receive with lower quality and quantity being produced as they transition breed.



Romney Sheep



Wiltshire sheep that self sheds

4.6.2 Low demand and excess supply

It is estimated there is an oversupply of 45-50,000 bales of strong wool above market demand (Argent, 2023), international demand has decreased. Hard floor coverings have increased in popularity and wool carpets are now mainly consumed in top-end residential and commercial market segments, fashion and lifecycle costing are important to the consumer (Wool Industry Network, 2006). High inflation worldwide recently has resulted in an increase in interest rates, which has created a cost-of-living crisis in most of our trading nations and the Ukraine war and China's economic challenge has also unsettled the markets for trading (Beef + Lamb NZ, 2023),

Figure 11 shows strong wool lower price base is significantly underneath Fine wool. Fine wool makes up around 12% of New Zealand's wool clip and fetches a significantly higher price in market because of the fineness of the wool and the premium markets will pay for that item.

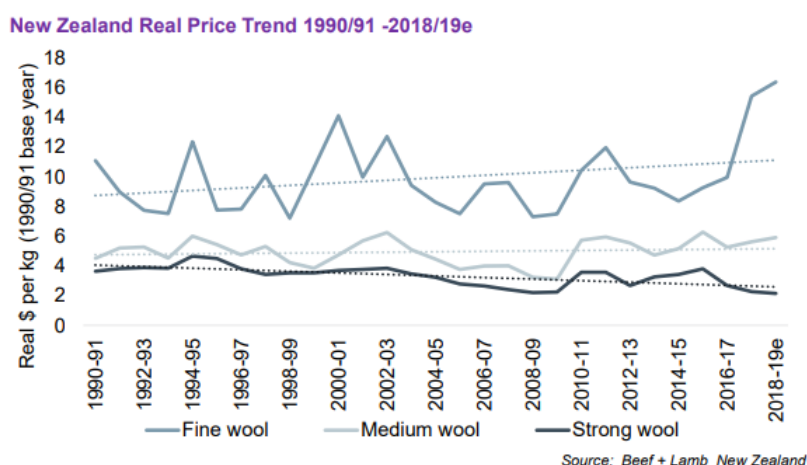


Figure 11 Real Price Trend of different wool types from Wool Databook (MPI, 2019)

ANZ Research Agri focus update October 2023 wool commentary is positive. "Wool prices are still relatively low, but above where they have been for the last two seasons. Current prices are up on 11% on a year ago. Demand from buyers appears to be improving and this is raising prices seen at auction. A depreciating New Zealand Dollar to the United State Dollar and remaining low against our popular trading partners is favourable for exporting sectors such as strong wool" (ANZ, 2023).

It is hard to accurately ascertain the average return for all strong wool sold, due to the variety of channels that wool is sold and only auction results are published from each auction house which represents a portion of the national clip, Ryan Cosgrove is building Fusca, a data exchange platform to help connect the growers and wool traders understand the value of their wool in market and give them full visibility, by re-establishing a strong wool price indicator (Scott, 2023).

4.6.3 Competition from Synthetics

The New Zealand sheep farmers are in a very vulnerable position by the limited use of strong wool in non-carpet end uses (Wickham, 1982). Wool is most important animal fibre used in fashion and textile industry because of its breathability and durability but accounts for only 1% of the global fibre market (Textile Exchange, 2023). Synthetic fibres make up 64% of the global fibre market (Textile Exchange, 2023), 72million tonnes of synthetic fibres were produced in 2021, compared to 1.03million tonnes of clean wool produced in the world (IWTO Market Information, 2022).

Synthetic manufacturers have vested interests with retailers globally, as they offer commission incentives this was validated by interviewee responses. Retailers and sales representatives are inclined to promote the sale of a synthetic carpet over a wool as they are financially rewarded. Which wool manufacturers do not offer as they cannot afford too, based on the smaller volumes transacted and margin limitations.

Synthetics are fossil-fuel derived resources and consumers are becoming increasingly aware and conscious about the plastic pollution and use of harmful chemicals associated with the use of Synthetics (MPI, 2020).

Wool is most important animal fibre used in fashion and textile industry because of its breathability and durability but accounts for only 1% of the global fibre market (Textile Exchange, 2023).

4.7 What are the opportunities for strong wool growers?

4.7.1 Promote wool to consumers and businesses

The advantages of wool need to be better promoted to consumers and businesses. By informing and educating them on how versatile wool is and how it is able to positively be differentiated from synthetic fibres can help inform their purchasing decisions.

Growers can promote wool through engaging with their communities and aligning with wool supply partners that share similar values, like brands and consumers. Campaign For Wool New Zealand (CFWNZ) works as part of a global initiative to enable and advance the education about the natural, renewable, and sustainable properties of wool. CFWNZ aims to shift preferences toward New Zealand wool through education and promotion of wool applications in buildings. They are working around the outside of the supply chain, through expanding the "wool in schools" initiative and promoting "wool in architecture" to designers

and consumers. They also provide communication and advocacy channels for the brand's utilising New Zealand wool (Campaign for Wool New Zealand, 2022). Figure 12 is a snapshot of a dozen New Zealand Wool Brands that have innovated and created a value proposition for market with strong wool, all supporters of CFWNZ. They create a range of products and services using strong wool across construction, retail, engineering, and technology categories.

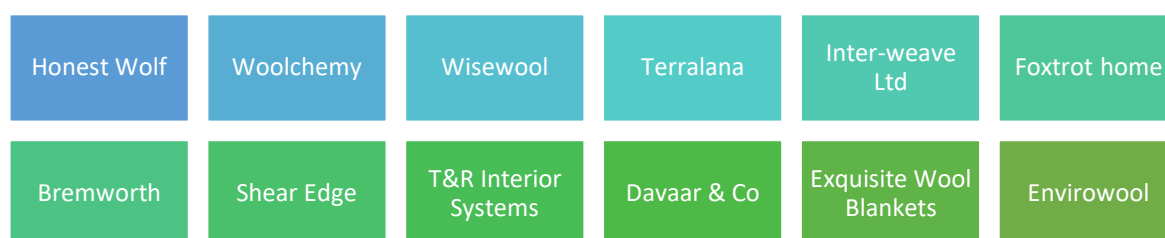


Figure 12 New Zealand strong wool brands, supporters of CFWNZ. Brands selected from (CFWNZ, 2023)

4.7.2 Credence Attributes

Consumers purchasing decisions are based on three different categories of attributes according to (Bezuidenhout, 2021). These are:

1. Search attributes – visible (examples, price and brand)
2. Experience attributes – sensory contact (seeing, hearing or feeling)
3. Credence attributes – features unable to be determined by experience only, usually conveyed on a label or as features (examples, certifiable standards, country of origin)

Developing credence attributes, typically requires improved capability, research and development, accreditation as well as industry coordination (Bezuidenhout, 2021). New Zealand strong wool industry does not promote and endorse the wool attributes well. New Zealand has a unique natural farming system and the additional advantages that wool fibre itself holds regarding fire retardancy and renewable natural fibre. Associated attributes are then promoted as country of origin, provenance story, safety statements, natural ingredients and certification of proper farming and animal practices. These credence attributes favour wool over synthetics and need to be leveraged more by the industry to the consumer (Bezuidenhout et al., 2021). International Wool Textile Organisation (IWTO) invests in research so that wool's environmental credentials can be quantified and communicated. Sheep are part of the natural carbon cycle, 50% of wool weight is pure organic carbon, wool products have long lifespans and required less washing at a cold temperature which has a lower impact on the environment (IWTO, n.d.). New Zealand strong wool industry needs to get better at telling our story (Wool Industry Project Action Group, 2020).

The market share of accredited wool products is on the rise (Textile Exchange Preferred Fibre and Material Market Report, 2022). Responsible Wool standards (RWS) was established by the textile exchange in 2016. RWS requires all sites from growers to the final business to business transaction to be certified. This approach gives the industry a tool to recognize best practices, and that a progressive approach of certified materials is used as the product moves along the supply chain. New Zealand Merino are the largest supplier in the world of RWS. They offer the RWS certification in addition to the ZQ and ZQRS certification (NZMC, 2023). There's greater potential if growers and wool buyers support these preferred wool programs, which certify practices related to environmental responsibility and animal welfare standards. New Zealand Farm Assurance programme (NZFAP) is an inclusive, voluntary national farm assurance

programme that covers authentic origin, traceability, food safety and animal welfare standards across meat and wool production in New Zealand. They also have the NZFAP Plus programme, which is a higher-level sustainability standard with an additional three components to the NZFAP, people, farm and natural resources and biosecurity. Integrated farm planning is designed to protect and enhance all resources and incorporates social responsibility and ethical practices (NZFAP, 2023).

The fine wool industry has demonstrated the success of a consumer-focused business model and advantages of having strong connections between growers and brands (Wool Industry Project Action Group, 2020). The New Zealand strong wool industry needs to collaborate to create a value proposition that does not compete only on price like a commodity product. Icebreaker is a notable example, where New Zealand Merino (NZM) sought to create a value chain through marketing, innovation, and brand relationships. The outcome is a shortened transparent supply chain, developed on close long-term relationships between grower and brand which creates a provenance story and value proposition for both brand and grower (Icebreaker, 2023). Andy Caughey, Wool Impact told farmer's weekly "It is brands and sustained partnerships with their supply chains that could improve wool prices" (Scott, 2023). Growers are price takers at the beginning of the supply chain, so they need to work with other supply chain components to build resilience and brand equity that will set the strong wool clip apart in market.

NZM has a strong record in innovation both in fine and mid micron wool. By adopting a programme for strong wool, it has expanded the opportunity for strong wool growers. ZQ assurance programme is around recognising growers that can produce 'fit for purpose' fibre and recognising certain values and ethical farming systems. ZQ brand partners can take assurance in knowing they are sourcing wool from a highly held and sustainable standard, that will meet production standards, traceability and long-term economic sustainability for them and the growers (NZMC, 2023).

Lake Hayes Station owners, Justine and Jeff Ross illustrate a similar and successful methodology is required in non-farming business, where creating a competitive advantage requires investing in value creation. Creating demand involves identifying customers who value your product and are willing to pay a premium. Today this often hinges on environmental and animal welfare credentials in the wool and meat industries. Lake Hayes station have crafted a brand and a provenance story that is drawing interest from international brands eager to collaborate (Ross, 2023).

4.7.3 Create demand and new relationships

New Zealand businesses have innovated in the non woven fabric categories consuming wool. Terra Lana pioneered making insulation and eco textiles from recycled wool, building on work undertaken by Wool Research Organisation of New Zealand (WRONZ). They were the first New Zealand company with wool based insulation products appraised by Building Research Association of New Zealand (BRANZ) in 2012. They now have three distinct categories of products which utilise the strong wool clip and oddments, insulation, furniture blankets for storage and transport and Dagmat (Terra Lana, 2023). To see an increase in the volume of strong wool being used in other products than textiles requires creating solutions to problems with wool.

Wisewool have re-engineered and created 100% natural and chemical free wool products that are used within upholstery and furniture industry. Retaining wool's natural attributes and creating additional manufacturing capacity here in New Zealand is example of innovation and investment to bring the wool industry "back to its best" (Wisewool, 2023). Wool's attributes

such as the fire retardancy, the biodegradability, antic static and anti-odour attributes are being promoted and incorporated into the story of the brand and product (Wisewool, 2023).

Strengthening relationships with brands and retailers to vertically align on a value proposition and add value for both parties throughout the value chain is beneficial by reducing the toll processing, less money leaks out of the system (Faulkner, 2011). Wool impact formed in 2022 (Scott, 2023) as a three-year joint industry and government programme to 'lift strong wool out of the doldrums'. Wool impact is canvassing local brands and businesses as well as global markets to understand where new opportunities exist for increasing use of strong wool. "If the predictions of brands actively advocating for wool in their product ranges are realised then we will see a significant impact on wool demand and price with the added benefit of reducing our reliance on some of our volatile export markets," Caughey said (Scott, 2023).

Wools of New Zealand is a cooperative model, which acts as a wholesaler, exporter and marketer enabling farmers to participate further down the supply chain. The combined wool volume they procure accounts for over a third of the domestic strong wool clip. The merger of Wools of New Zealand and Primary Wool- co-operatives in July 2021 was a consolidation the grower shareholders supported. The merged organisation strategy is focused on selling consumers branded woollen products rather than selling commodity wool with the aim at improving returns for the grower shareholders (Wools of New Zealand, 2021) They have since launched their own carpet range to market in July 2021 with the brand tag line being "from our farm to your floor". Which is a splendid example of value creation and the primary producers adding value and bringing another wool product to market.

Bremworth, premium carpet manufacturer ceased manufacturing synthetic carpets in May 2021, the company's long-term vision "is to be a global leader in designing and creating desirable, high performing, safe and sustainable interior products" through focusing on natural fibre interiors they endeavour to make a difference to the environment and are only making 100% New Zealand wool fibre carpet and rugs (Bremworth Wool carpets, 2021). Then, as of September, 2023 Bremworth announced they are offering a forward ten year contract to a group of strong-wool suppliers who can meet the quality specifications and NZFAP certification (Scott, 2023). Bremworth's alignment of production to just wool and then offering a commitment through a forward contract to growers, signals commitment to the industry and consumer that they are invested in strong wool and producing high quality products that perform made of 100% New Zealand wool.

The businesses willing to offer forward contracts such as New Zealand Merino company and Bremworth sends positive market signals they are willing to invest in the value chain to secure commitment. The value chain model is collaborative, built on value adding, removing toll processes and focuses on chain efficiency rather than component efficiency (Parsons, 2009).

4.7.4 Research and Innovation

Use of wool in the technical/industrial application has been limited historically because of the cost but with advances in biotechnology and greater understanding of biopolymers there are advances for wool to be potentially used as technical raw material such as acoustic textiles, insulations, medical and cosmetic applications or blended with other fibres (Johnson et al., 2003). New Zealand new market categories are currently in the commercialisation phase include insulation, acoustic tiles, flooring innovations and deconstructed particles (pigments and powders) (Cronshaw, 2023).

WRONZ focuses on funding applied research and development for the New Zealand Wool industry (About Us, 2023). Wool source, established in 2021 focused on commercialising the development of deconstructed fibre products such as particles, powders, and pigments. They

are testing them in a specialized facility and testing with selected market partners to determine commercial viability (Wool Source, 2021). These patented technologies are looking at revolutionizing the use of the strong wool fibre in multiple new uses (Wool Source, 2023). Product categories include filtration, cosmetics, personal care, nutrition, luxury fibres, printing, bedding, fill applications, pigments, pastes, and leather. However, as of 2023 these products are still in pilot stages and have not impacted farm-gate price (Rae, 2023).

In the construction sector for example, the use of sheep wool's insulation is discussed in the Resources, Conservation and Recycling Journal, 2014. Due the societal concerns about the environmental impact of construction practices and materials used, has increased the demand and use of sustainable and renewable building products (Corcadden et al., 2014). Kibert (2008) suggests the following six areas as measures of sustainable building construction: reducing resource consumption, reusing resources, utilizing recycled materials, conserving the natural environment, removing toxins, ensuring economic efficiency by considering life cycle costs and reinforcing quality. This integration and innovation with wool products may offer small but significant benefit to sheep producers as well as consumers such integration and innovation with wool products may offer small but significant benefit to sheep producers as well as consumers (Corcadden et al., 2014).

Small but significant is a familiar theme when researching literature on new wool uses and commercial endeavours. Any additional volume of strong wool demanded will assist in improve the market price for wool by increasing demand.

5. Analysis and Discussion

5.1 Analysis

The information gathered from the literature and interviewees was retrieved to gain insights to answer to the below five sub research questions.

Why Wool?

What is the structure of the New Zealand strong wool industry?

What are the challenges facing the wool industry?

What are the opportunities for the strong wool growers?

How is demand created for New Zealand Strong wool?

5.2 Interviews

The fifteen interviewee responses came from a variety of perspectives domestically and internationally. Including current strong wool growers, ex-strong wool grower, manufacturers, wool traders, marketers, science, academic and international textile industry representatives. With the semi-structured interviews, questions were asked, and open dialogue recorded that

was relevant to the experiences of the individual with the strong wool industry. There was a large amount of data to read, AI was used as tool to review the responses. ChatGPT was used to help the analyst identify codes and identify themes from the transcript to ensure that the analyst had not missed any significant themes. Themes were selected and named by the analyst based the importance in relation to the research question.

5.3 Thematic analysis

The broad themes from the interviews and literature were consistent. Strong opinions were consistent between the literature news articles and interviewees. Figure 13, mind map shows the overarching themes and sub themes of the interview responses, the sub themes connected off the circles describe the essence of the overarching themes.

For the first phase, transcription process, responses were grouped by interviewee against the research sub questions. Second phase of thematic analysis is coding, features of the data were identified that were of interest to the analyst then codes were generated against the data, to assist the meaningful organising of the responses.

The following post thematic analysis forms the basis of the discussion of how the strong wool market price might improve, by understanding the strong wool's industry structure and profitability through literature review and semi-structured interview discussions.

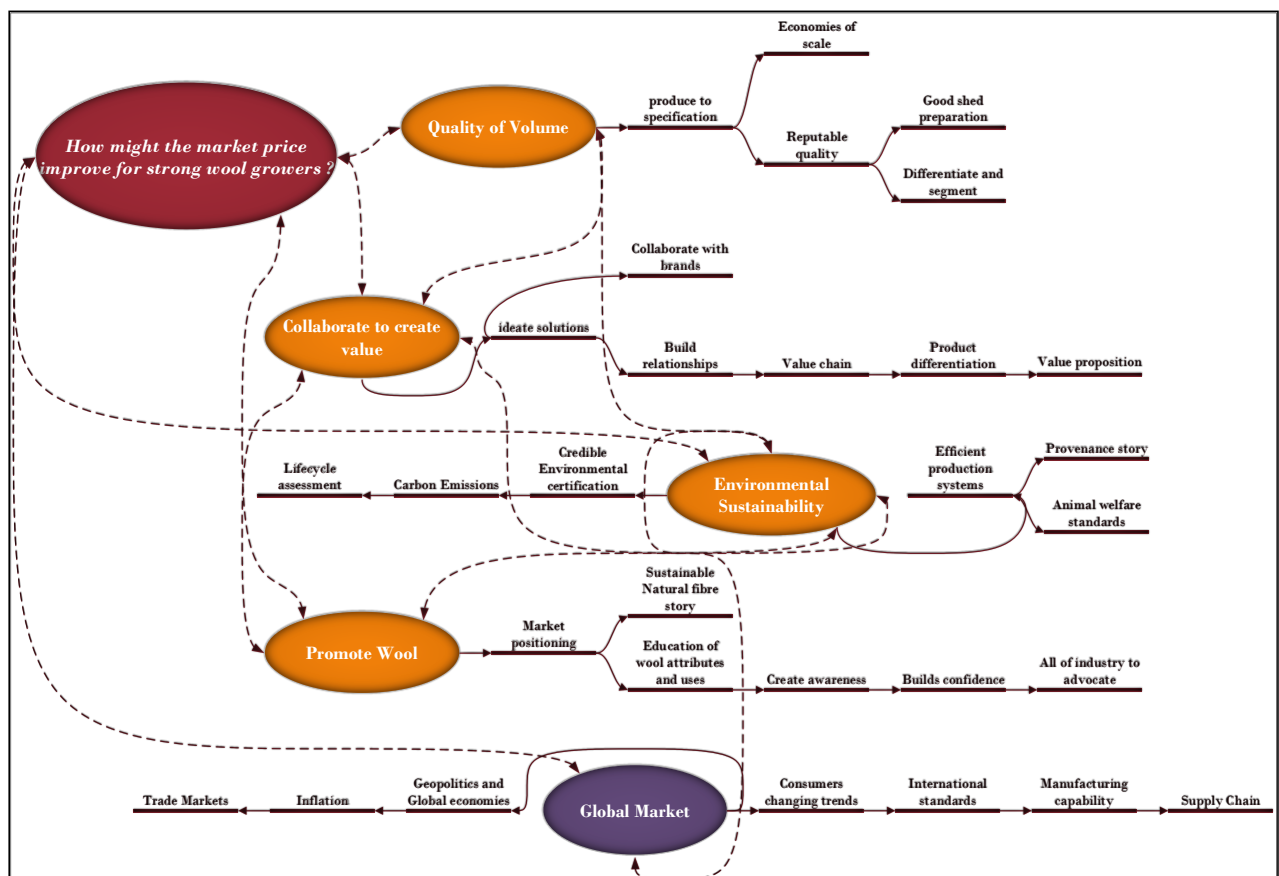


Figure 13 Thematic analysis – interpretation of themes in form of mind map, adapted from (Braun & Clarke, 2006)

5.4 Quality of Volume

Throughout the literature and interview responses there was a strong focus on superior quality the strong wool produced in New Zealand and how well suited it is for carpet manufacturing. It was mentioned multiple times by manufacturers and resellers of wool that the low VM and good white bright wool of decent length performs well under the production pressure and is receptive to dying and performing well as a finished product.

Wool is needed in volume to be used in large scale production processes, the grower needs to invest and maintain good production systems and wool preparation standards to ensure a decent clip is harvested. Collaborating through grower groups to produce wool to a certain specification is a way grower's than increase the influence of their supply to market by aggregating a consistent volume of wool to market as one bundle. For the wool to be worth more than the "bargain bin" value of the auction room, which was a phrase termed by an interviewee when describing the strong wool pricing indicator from auctions. If a grower is willing to invest in the time to understand the market and meet the market with their requirements there is an opportunity to receive a higher market price, to gain volume and economies of scale to have leverage in negotiation collaboration is a necessity for growers. That could be achieved to supporting a co-operative model such as Wools of New Zealand or forming a unique grower group to consolidate volume and quality for market. Commercialisation of these groups is important for the ability to operate within a free market, when asked interviewees about industry structure, it was clear that commercially viable business entities was an important foundation for transacting business upon rather than industry and government elected working groups.

There are advantages to having a competitive rivalry between buyers and sellers that influences the overall industry profitability. And through the suppliers (growers) consolidating their offer to market, with excess supply gives the suppliers more ability to hold the buyers to account. This does require investment of capital and a degree of risk, with risk comes with reward. If market research has been completed, value propositioned identified and relationships established the investment opportunity will be well understood. Taking a chance and trying something different is important when endeavouring to seek different outcomes for the strong wool industry.

The weather plays an integral part in the quality of the wool clip which the grower cannot influence but they can influence and control the sheep genetics they use and the woolshed preparation. For example New Zealand is currently experiencing El Niño which is a warmer weather pattern which could deliver some difficult feed conditions, but the warm, dry and windy conditions, will assist the wool clip being cleaner and drier which will work in grower's favour when wool is sold (Hilhorst, 2023).



El Nino Summer (in drought)
Banks Peninsula, NZ April 2021



Post El Nino Summer (post 3 year
drought), Banks Peninsula, NZ
December 2022

Figure 14 and 15 demonstrates how the limited New Zealand infrastructure is also exposed by natural weather events and the last three season's pricing trends for each island. As of 12th October, South Island PGG auction prices for strong wool were "breaking fresh ground" with good length and good colour scoured wool selling well. The best styles fetching the price of \$4.05 kg clean, while poor style remained low at \$2.60. This validates that the grower producing a quality clip are receiving more than the low-quality wool, 150% more in fact (PGG Wrightson Wool, 2023). Currently South Island wool is selling exceptionally well compared to North Island wool. Good-coloured fleeces, exchange rate and renewed interest from overseas has been adding competition in the auction (Hilhorst, 2023) .

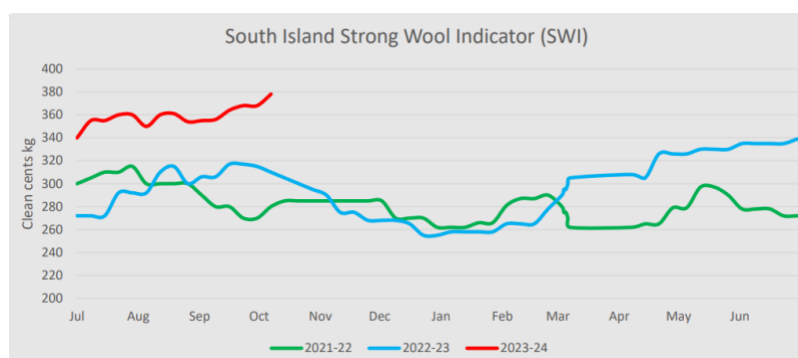


Figure 14 PGG Wool South Island Strong wool indicator October 12, 2023, From: (PGG Wrightson Wool, 2023)

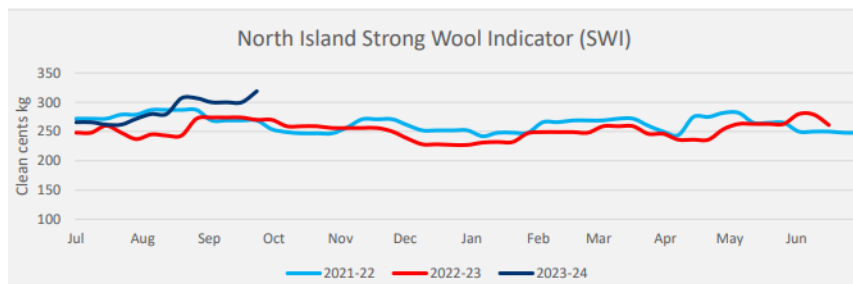


Figure 15 PGG Wool North Island Strong wool indicator October 5th, 2023, (PGG Wrightson Wool, 2023)

The limited amount of scoured good quality wool coming out of the North Island with the scour closure is keeping North Island prices flatter. Market wool prices usually settle from around December onwards as the below graphs of previous seasons reflect as summer shearing lifts the volume available to market (Hilhorst, 2023). The PGG wool island reports shows the variable pricing within the one New Zealand market, quality and volume are the driving factors of the pricing variability. Fusca, a New Zealand data platform, models a national strong wool price indicator, which analyses national auction wool sales retrospectively to give a national pricing trend, but unable to see the impact of island variances, figure 16.

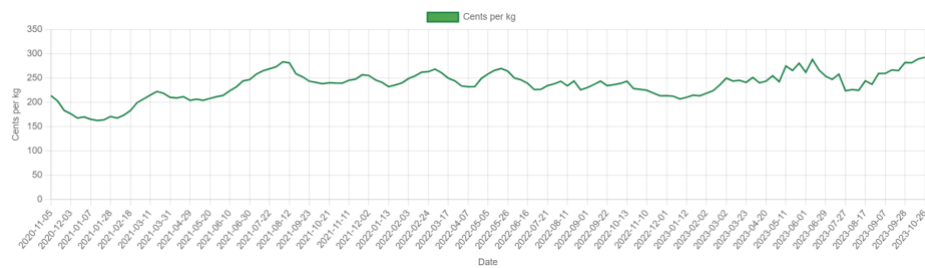


Figure 16 Fusca National Strong Wool Indicator per kg price for New Zealand wool for last 3 years from (Fusca Limited, 2023)

5.5 Collaborate to create value

To close the gap between supply and demand, New Zealand strong wool must endeavour to develop collaborative value chains within the textile industry as New Zealand's strong wool is ideal for carpet manufacturing, and it consumes a large volume of wool therefore will likely remain the largest product category for strong wool.

The collaborative value chain philosophy is how we can grow and develop the business to benefit all partners throughout the supply chain (Parsons, 2009). Compared to the transactional supply chain philosophy which sole focus is on the outcomes of the single component that business competes in and not improving the business outcomes for the other supply chain components (Parsons, 2009). Collaboration can take shape in many ways, strategic partnerships, streamlining business activities or consolidation of business processes.

A few of the interviewees commented on the number of players in the New Zealand strong wool industry, that there are too many wool buyers with vested interests. The buyer power was indicated as a high threat level with Porter's five forces analysis. This will likely remain until the supply is constrained if supply was limited that would directly influence the buyer's behaviour as they would need to pay more to secure inventory. The degree of competition, based on excess supply of strong wool is having a negative influence on profitability for growers.

Half of the interviewees spoke strongly about the requirement to consolidate supply chains and the opportunity to connect growers with businesses that have a direct relationship with brands. Collaboration starts with growers understanding the value and quality of the product

they are supplying to market and understand what the market is demanding, this involves communication. Growers should be able to understand how the pricing is derived and what the wool fibre is being used for and to connect with other growers in the community to understand what they are doing. At the other end, the consumers are asking retailers and brands for what they want in a product. Brands are deciding where they invest in product development and how they can optimise value and solve problems for the consumer.

Owning the product throughout the supply chain does incur extra inventory costs and has associated risk but offers improved alignment. Stronger relationships can also be developed better with a shortened supply chain, efficiencies can be obtained by producing for specification, reducing toll processing which erodes margin as when the product changes ownership when value is added iteratively, and margins applied by several different entities throughout the supply chain. If growers relate to brands directly who are selling to customer. This can capture additional value through improved information sharing and commitment to product which is a win-win for grower and brand.

Outside the textile industry, wool producers and traders need to engage with brands to help them find solutions to problems with wool. Multiple interviewees discussed that connecting and collaborating with brands is important, and through solving problems and creating solutions together can the form the basis of a working and collaborative relationship. A collaborative relationship allows improved value chain efficiency in sales, inventory, and processing when all supply chain is working in a value-add way. The brand is the physically seen in the marketplace and already connected with their consumers. It is of value to brands to have a strengthened supply chain that offers additional value, such as commitment of product of a certain specification, a certain provenance story, an integrated business approach can be a win-win approach.

There should be a continued focus on developing relationships with textile brands and manufacturers as well as finding new uses for wool fibre outside the textile industry. Non-woven products including and certainly not limited too; insulation, acoustic tiles, pigments, and powders that will consume an additional portion of wool in the future.

From the interview's conducted, there was no favouring towards a revitalised wool board, but ideas were suggested that existing sheep and meat industry bodies could support an industry representation such as beef and lamb New Zealand, or a voluntary industry body could be created that promoted the collaboration of growers and wool entities. It was validated by many interviewees that there are currently many players in the industry with vested interests which slows progression as an industry body. Also validated by Toby Williams, Federated Farmers Meat and Wool chair telling Farmer's weekly "It is the sector's responsibility to get its house in order in terms of a workable single body and leadership structure before it looks to government for more investment" (Scott, 'Feds could lead the way on wool', 2023). An industry body group would be advantageous when promoting New Zealand wool internationally and encouraging information sharing such as the exchange of market data and organising wool industry networking events, but what that looks like is up to the industry to decide. Grower's make up the largest number of individual contributors to the industry, but wool traders as well as the overseas buyers hold a lot of the power over the whole industry which improved grower representation with industry could help progress industry discussion.

When the tide rises all lifts, is a nice analogy an interviewee used to describe the greater outcomes for the industry can be improved by individual efforts. The focus on greater good for the industry to improve and prosper should be kept front of mind when innovators and early adaptors are trying something new. The first to market will receive a larger market share and give them an edge of competitive advantage which is the reward for the risk they have taken upfront.

5.6 Promote Wool

Wool has a unique value proposition, a sustainable and naturally produced fibre which many of the credence attributes need to be effectively promoted to be known. Majority of the interviewees passionately believe in strong wool production and its value and that the story of “why wool” can be told better. Positive storytelling and marketing of wool in general will be of benefit to encouraging the consumers to consider purchasing wool over synthetics. CWFNZ “Wool in Schools” programme is targeting primary and intermediate school children with the “wonders of wool”, with a plan to extend to New Zealand secondary schools in 2024 (Campaign for Wool, 2023).

Wool cannot compete in the retail space with synthetic companies who offer sales incentives, or purely on price as wool has a long production process and is more expensive to produce. But wool does have natural attributes making it a more sustainable, environmentally friendly, and safer product for use than synthetics. In the New Zealand and Australia retail markets there were examples of interviewees having experiences with sales staff on the retail floor being advised that wool was not suitable or preferred option for their intended flooring use, and where an insurance company would not insure a new build if wool insulation product were used. Advantages of wool needs to be validated by first class science and be promoted through all parts of the supply chain and in the marketplace.

The wool sector needs to respond to the consumer's needs (Wool Industry Project Action Group, 2020), improved story telling of New Zealand wool was mentioned multiple times throughout the interviews. In the digital age of 2023, connecting with consumers, retailers and brands does not require having teams of sales representatives contracted around the globe to sell the product. The person-to-person aspect is certainly still important but can be conducted through the internet. Connectivity for New Zealand rural communities is also improving so the ability to conduct business wider than ever before. Connecting and sharing information and ideas with brands and educating “followers” as potential consumers with the provenance story of wool and advantages of wool over synthetics is actionable by growers. Growers and the wool sector must communicate clearly about the values and systems that they produce within (Wool Industry Project Action Group, 2020).

5.7 Environmental Sustainability

Growers can leverage the natural carbon cycle influencing and measuring the amount of carbon stores in plant and soil and through animal management. Carbon produced from wool and sheep is part of the natural cycle derived from living matter that absorbs carbon through its life, 50% of the weight of clean wool is pure biogenic carbon in contrast emissions from fossil fuel derived fibres, that fossilised carbon has been stored below ground and kept out of the atmosphere until it is released through use above land (IWTO, n.d.).

The most widely accepted tool for evaluating the environmental impacts of a product is the Life Cycle Assessment (LCA). It considers all stages of a product's life from cradle-to-grave and evaluating all categories of environmental impact relating to resource use and emissions to air, water, and land. Impact categories for textiles include climate change, fossil energy use, water use, land use, eutrophication, eco toxicity and human toxicity. Wool LCA can help all in the value chain understand their impacts on the environment, as well as help inform the consumer about the environmental performance of the product (IWTO, n.d.).

Sheep farming commonly produces wool and meat, where multiple products share the same process, a challenge for wool is the allocation method of methane emissions, considering the

dual products produced from strong wool sheep fairly (IWTO, n.d.) In support of brands, Wool Impact in partnership with AgResearch are undertaking the carbon footprint for New Zealand strong wool that will consider emissions using the LCA methodology (Wool Impact Ltd, 2023). A recent industry example in this area was the "outdated carbon footprint information" submitted as part of the tender process to the Ministry of Education from Wools of New Zealand for a carpeting contract in New Zealand schools and the contract was awarded to a United States synthetic manufacturer. The tenders were assessed on a variety of measures such as performance, safety, contributing to a healthy internal environment, durability, moisture retention, environmental impact, ongoing maintenance, and sustainability. The successful tenderers were proven recyclable, longer lasting, and smaller environmental impact based on the information submitted (Wallace, 2023).

Majority of interviewees mentioned that the strong wool industry needs to ascertain the carbon footprint and lifecycle assessment of wool which should be validated by science and reputable industry organisations such as the textile fibre exchange was mentioned. If the New Zealand strong wool industry can work with credible industry bodies such as the IWTO and Textile exchange that would advance New Zealand's strong wool industry to compete with synthetics where environmental footprint is concerned.

5.8 Global markets

The PESTEL analysis discussed the ways in which macro environment factors influence the strong wool industry and interviewees spoke about the importance of having international relationships will help navigate these factors when the industry is challenged. Growers are very resilient people; adverse weather events effect their businesses frequently. The adverse global events also impact heavily reliant export markets, which is wool is. Often the New Zealand strong wool supply chain spans the across multiple continents such as Asia, Europe, United States. Growers should be informed on the macro factors impacting the global markets as it impacts multiple revenue streams such as meat, dairy, horticulture and forestry. The inflation rate and associated cost of labour and production in New Zealand, are required to pay and invest as skilled labour and finance facilities are critical to business operation.

Through diversification of trade markets, commercialised entities with committed manufacturing and wholesale arrangements could prepare the wool industry in a better position to face challenges. Interviewees mentioned that New Zealand Wool industry must being involved with international discussions with global industry groups such as IWTO and the Textile Fibre Exchange and science communities of our trading partners as they play an influential role to advocacy and supporting global standards and innovations with use of wool in various ways.

Having collaborative relationships with supply chain partners and having a trusted team network surrounding the business who can inform and advise on possible market headwinds can help prepare the grower and supply chain partners to be more resilient to global shocks and domestic market business conditions.

6. Conclusions

Growers are essential to the success of the New Zealand strong wool industry. It would not exist without them. It will not prosper if the number of consumers wanting to buy products made with wool does not increase. It demands a concerted effort from growers and businesses working with the New Zealand strong wool industry, to produce a product fit for purpose that meets and exceeds customers demands.

Distinguishing points of difference and streamlining supply chains will give grower's more influence within the supply chain and ability to capture additional value. New Zealand strong wool growers have advantages over other wool growing countries, well developed genetics, and efficient farming systems on a larger scale, with multiple revenue streams. Operating without subsidies, they navigate a genuine trading environment and are a key player in the global wool market. Now is time to act, seize the opportunity as consumers transition away from the use of plastics and fibres that negatively impact on the environment.

New Zealand land lends itself to an efficient agricultural environment for growing sheep wool and meat, with temperate weather and moderate rainfall allowing for natural grazing systems and good-coloured fleeces to be grown. The New Zealand wool industry needs to invest in certifying the wool lifecycle assessment with first class science so that the industry can withstand scrutiny from synthetic competition and focus on improved marketing of the natural and social story associated with wool. There is the ongoing development of new applications for wool outside of traditional categories. Scientists and product markets are exploring different solutions with wool which might result increased usage of New Zealand strong wool if solutions can be commercialised and scaled. The industry needs to have strong commercial entities and the industry groups should be able to work together to draw on government's support when needed.

New Zealand's strong wool grower's ability to produce superior-quality wool for carpet manufacturing is a strategic asset. While weather conditions and global politics remain beyond grower control, choice of sheep genetics and standards for wool preparation are within the grower's control. Collaboration through grower groups and co-operative models amplifies market influence, while aligning wool specifications and streamlining supply chains collectively captures value.

Growers that can consistently produce a high-quality clip will be rewarded more than with poorly prepared wool. To what degree? is determined by the perceived value of the product which is set by the buyer's willingness. If grower's can collaborate with the buyers through forward integration, developing value chains and engaging with brands that may improve their position to have improved pricing and sale opportunities from producing for buyer's specifications.

The journey to a more economically sustainable industry requires collective action and a forward-thinking mindset, with growers playing a pivotal role in shaping the industry's future.

7. Recommendations

- Growers to maintain a reputable quality clip that you are proud to produce and understand where it is going, while seeking feedback on product performance.
- All stakeholders to the strong wool industry to advocate for wool, promote the sustainable/natural story about wool and its advantages to encourage increased purchasing of wool products.
- Suppliers and buyers to collaborate rather than compete. Wool trading for manufacturing will always be transacted based on volume, so if growers have economies of scale, they will have stronger influence on market.

- Growers and wool buyers to build trusted relationships, align with businesses and brands that have similar value-sets and create solutions to problems with wool together.
- Shorten the supply chain. Growers must consider forward integration and investing in creating a value chain with other businesses invested in similar outcomes.
- Supply chain partners to utilise science and collaborate to validate Lifecycle assessment and certification of wool products that are fit for use including grower's assurance programmes.

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Appendix

Appendix 1: Semi-structured interview Questions

For Domestic Interviewees

1. What is your current role within the strong wool industry?
2. How long have you been in the strong wool industry for?
3. How would you describe that state of the current strong wool industry in NZ?
4. What are the biggest opportunities for the strong wool industry?
5. What are the main challenges for the industry to overcome?
6. How would you describe the current structure of the supply chain?
7. Who should our target consumer and trade markets be?
8. Are there any other countries or industries that you think are leading way we should aspire too?
9. What do you think the future of the NZ strong wool industry will look like?

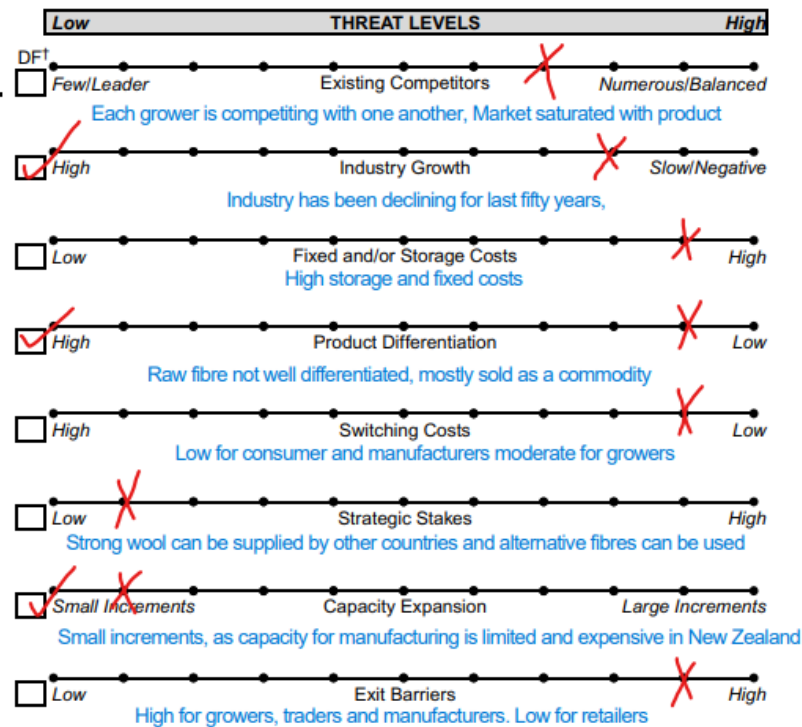
For international interviewees:

1. How would you describe the state of the current strong wool industry/ natural fibre textiles market in your country?
2. How would you describe the current structure of the supply chain?
3. Where do you think that there is room for economic and efficiency gains with the supply chain?
4. What are the main challenges to overcome?
5. Who is your target consumer and future trade markets?
6. What is your perspective on the global trade headwinds for heavily export focused economies?
7. What are the biggest opportunities for the global strong wool industry?

Appendix 2: Porter's Five Forces Templates

Templates completed for the New Zealand strong wool industry were modified provided by Michael Dobbs, 2014 in the Competitiveness Review Journal (Dobbs, 2014).

These were used in the research approach to understand the forces and to what degree they were shaping the competitive rivalry and profitability of the New Zealand strong wool industry.

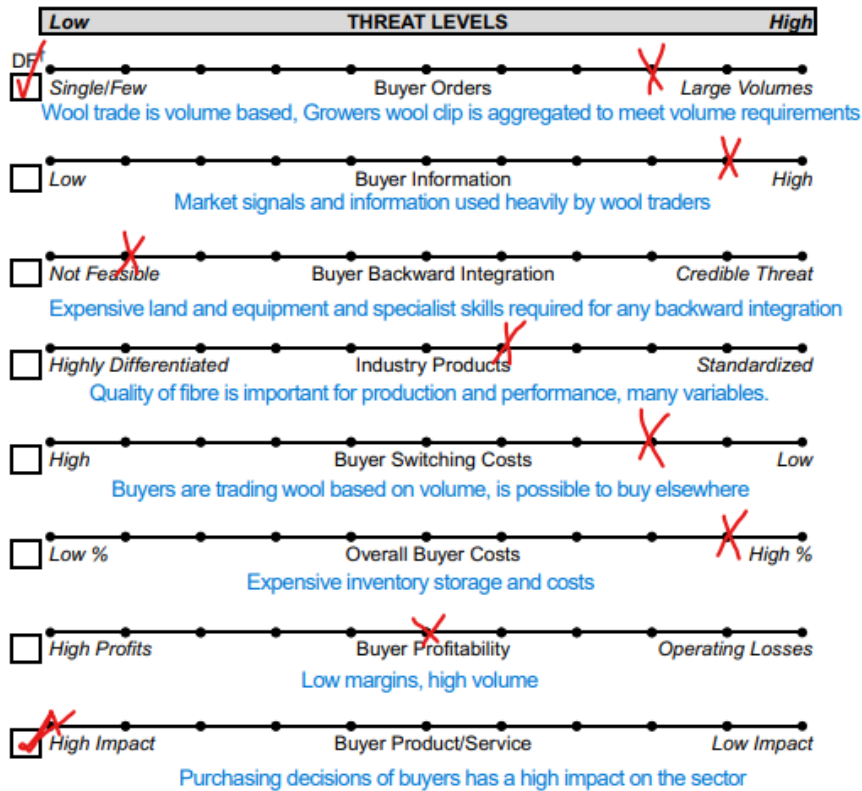
Threat of Competitive Rivalry***For New Zealand Strong Wool Industry**

| THREATS | |
|---------------|--|
| 1. | Capital invested in old infrastructure. |
| 2. | High capital requirements to invest in new technology. |
| OPPORTUNITIES | |
| 1. | Developing new uses for strong wool |
| 2. | Supply chain component efficiency |

(continued)

Notes: *Rivalry necessitates price cuts, new product development, advertising campaigns, service improvements depending on the intensity and basis of competition between rival organizations; †DF – driving factors of industry dynamics to be indicated with check marks

Threat of Buyers/Buying Groups* (New Zealand Strong wool)



| THREATS |
|--|
| 1. Buyers have plenty of choice |
| 2. Buyers hold the bargaining power |
| OPPORTUNITIES |
| 1. Buyers and manufacturers commit to large volumes |
| 2. Buyers social responsibility will be challenged by the brands and consumers |

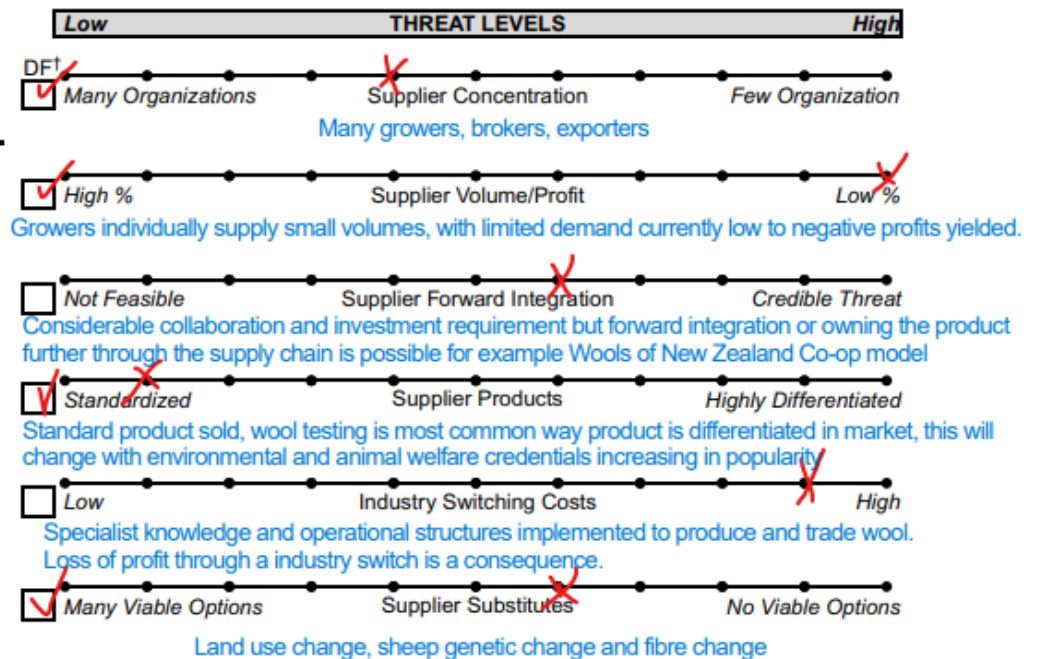
(continued)

Porter's five
forces
framework

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Notes: *Powerful buyers (the first five) and/or price sensitive buyers (the last three) force down prices, demand better quality/service, and play competitors off one another;
†DF – driving factors of industry dynamics to be indicated with check marks

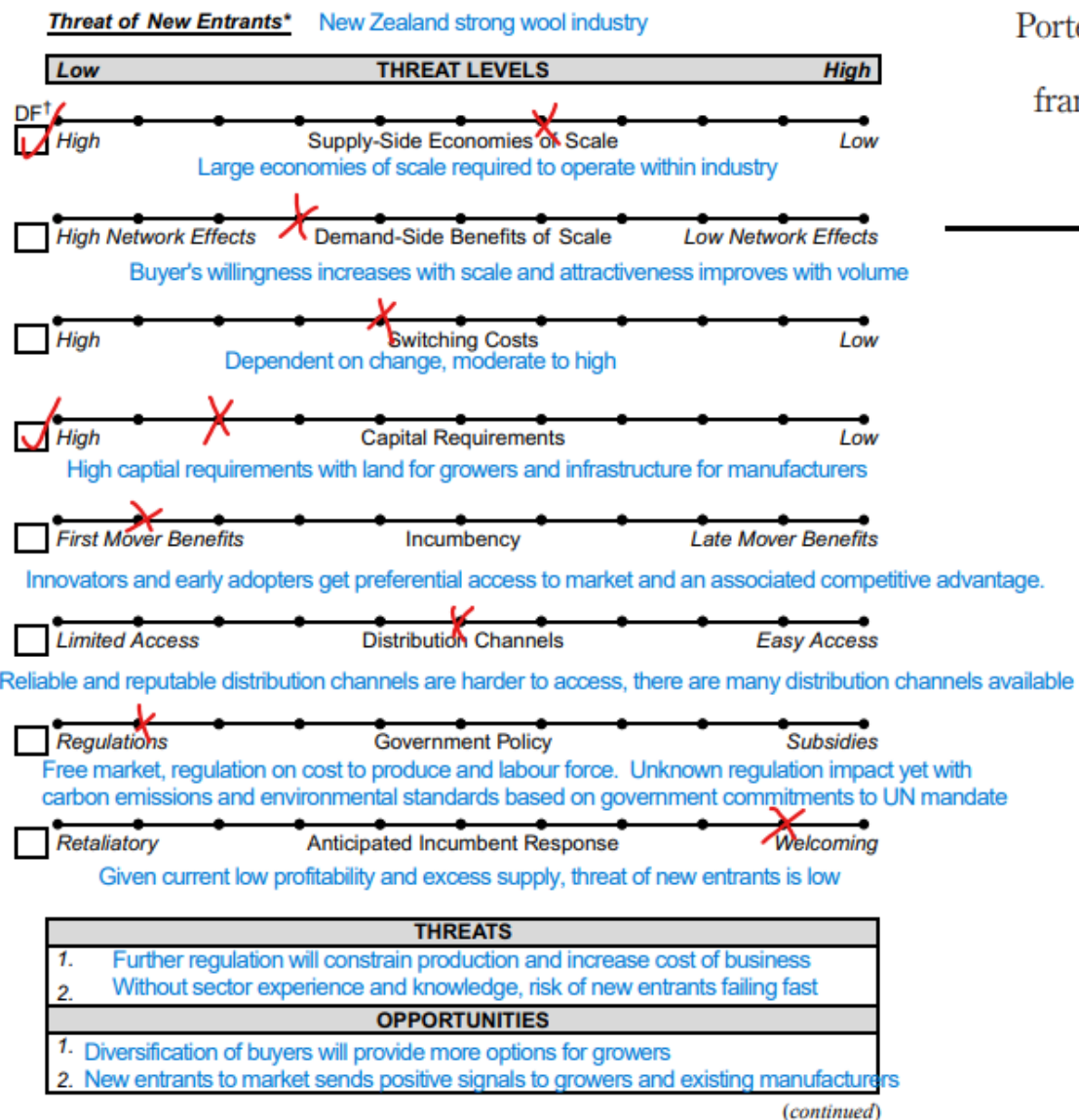
Threat of Suppliers/Supplier Groups* (Of New Zealand Strong wool)



| THREATS |
|--|
| 1. Volume and profit is interdependent whilst wool is sold as an undifferentiated product |
| 2. supplier concentration constrains grower's returns when supply is surplus |
| OPPORTUNITIES |
| 1. Growers forward integrating or owning the product further through the supply chain |
| 2. If growers leave the industry because of the unsustainable returns, that will reduce supply which not negatively impact remaining growers |

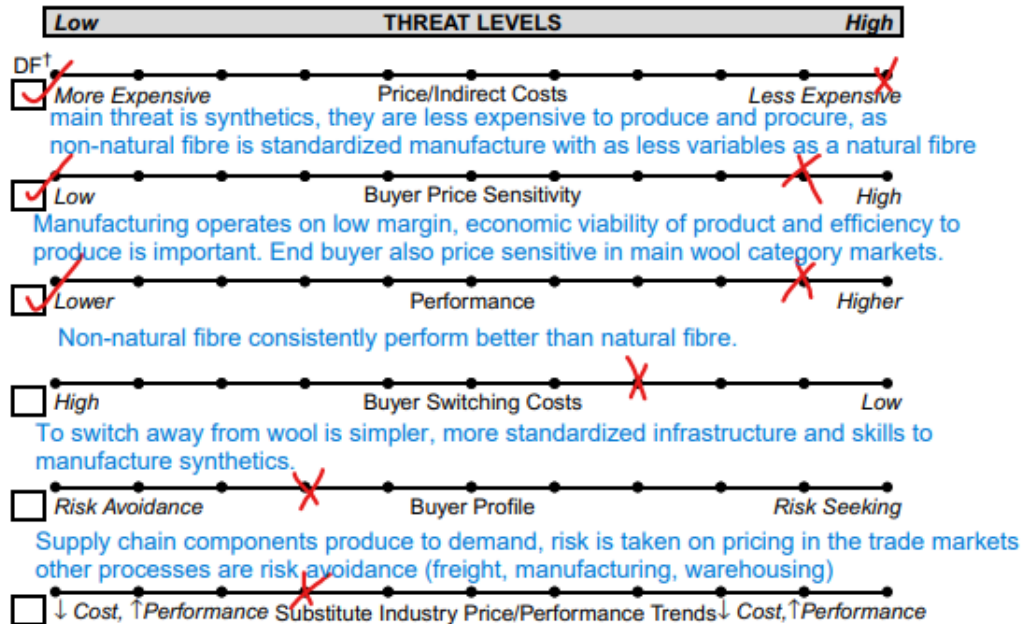
(continued)

Notes: *Powerful suppliers charge higher prices, limit product/service features/quality, and/or shift costs to other industry players; †DF – driving factors of industry dynamics to be indicated with check marks



Notes: *The threat of new entry puts downward pressure on prices, and upward pressure on costs/rate of investment necessary to keep new entrants out of the industry;
[†]DF – driving factors of industry dynamics to be indicated with check marks

Threat of Substitutes* (New Zealand Strong Wool)



| THREATS | |
|---------------|--|
| 1. | Synthetics continue to out market wool |
| 2. | Synthetic brands, sell the environmental and lifecycle assessment better than wool |
| OPPORTUNITIES | |
| 1. | R&D working on developing wool fibre to better compete in |
| 2. | manufacturing and end use, maintain quality of fibre important. |

(continued)

Notes: *Substitutes perform the same/similar function as products of the industry but by different means. Viable substitutes place a ceiling on prices and drive up costs related to product performance, marketing, service, and R&D; †DF – driving factors of industry dynamics to be indicated with check marks

