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- New Zealand Tanners” Association (Inc) – NZTA.
- New Zealand Meat Industry Association (Inc) – MIA.
- New Zealand Leather and Shoe Research Association (Inc) – LASRA.
- Nimmo-Bell & Company Ltd.

Executive Summary

The leather industry includes three main sectors, bovine, ovine ¹ and wool skin. These sectors cover a wide range of raw materials over which industry interests extend. The combined exports of these sectors make up New Zealand's eighth largest export sector with total exports for the year ended June 2001 of \$926.8m. The leather sector is making the transition from exporting raw and semi processed hides and skins, to exporting increasing volumes of further processed products including wool skins.

In most other countries tanners purchase raw skins and hides from abattoirs and process them to finished leather. In New Zealand, however, most primary stage processing, that is, ovine from raw skin to pickled pelt, and bovine, from raw hide to wet blue leather, is done by meat processors. Tanners compete strongly for raw stock supply from meat companies and abattoirs at prices set by international markets.

There is strong potential to add more value to ovine raw skin exports by further processing. This will require significant investment in resources. Processing capacity exists to increase further processed bovine exports. TRADENZ recognised the industry's potential and have provided strong support through the leather industry Joint Action Group. The New Zealand tanning industry continues to focus on the following without further TRADENZ support:

- Improved quality by preventative management practices and techniques, both on and off the farm.
- Develop a cost-effective process to reward farmers producing premium quality.
- Rationalise practices and increase uptake of new technology.
- Export a greater proportion of hides and skins as further processed leather and seek niche market opportunities.
- Develop closer strategic and operating links between the associations servicing the industry.
- Achieve stronger industry coordination and management of R&D through continued support of the Leather and Shoe Research Association (LASRA).
- Recognition of the importance of training through support for the Leather Industry Training Organisation (Leather ITO) and LASRA's additional function as a Private Training Establishment (LASRA PTE).
- Support quality improvement with target marketing development and promotion.

¹ *Cattle produce bovine leather and sheep produce ovine leather.*

The New Zealand Tanners' Association had developed a strategic plan defining an industry vision and goal of \$1 billion in exports by the year 2000. This was almost achieved with export turnover of almost \$930 million in 2001. However key issues have been identified and the industry is continuing to address these.

NZTA continues to support and further the agreed strategic approach to research and development that was endorsed by a major industry seminar in Palmerston North in May 1994. Following this, the R&D Strategy was developed. It has the endorsement and support of both meat and leather industries and is reviewed annually by the NZTA.

Industry's aim is to communicate the R&D strategy widely to ensure that:

- organisations involved in supporting and funding research will understand the size, potential, and unique features of this industry and its significance in New Zealand.
- future R&D proposals and research programmes will be relevant to the industry strategy;
- science providers and funders will recognise the importance the industry places on R&D in its drive to reach its full potential; and
- science funders will be able to assess individual funding applications against the industry R&D strategy.

Individual companies have their own in-house R&D programmes complimenting the work undertaken by LASRA. Total industry funded R&D is approximately \$3.4m per annum. (LASRA Survey)

The R&D Strategy encompasses six key research and development themes.

1. Improving the quality of the raw stock base:
 - genetic improvement in sheep and cattle to enhance leather qualities in skins and hides.
2. Faults eradication in raw stock:
 - obtaining improved quality raw skins and hides off farms.
3. Leather science and objective measurement of process and product:
 - ensuring underpinning leather science is focused on the specifics of the New Zealand industry.
4. Environmental impact minimisation through clean technology and waste utilisation.
5. Developing differentiated part processed and finished leathers with enhanced properties to increase market premiums.
6. Developing automation and machinery modifications - innovation to provide more consistency to market requirements, at competitive cost structures.

Research & Development Strategy

The New Zealand Leather Industry

1.0 Introduction

1.1 Industry Definition

In this document the definition of the leather industry includes early-stage treated hides/skins, processed and semi processed leather, finished leather and wool-on tanned sheepskins. The term “skin” is used for skins of small animals (e.g. sheep) whereas the skins of larger animals are called hides (e.g. cattle).

1.2 The Leathermaking Process

tanning is an intricate process

Leathermaking, or tanning is an intricate process involving both chemical and mechanical procedures. Many types of leather are produced from different hides and skins. Basic principles may remain constant, but the variations in procedures are endless.

By definition, tanning is the treatment of skin protein in such a way that the resulting leather will resist putrefaction, fill the required function of the leather and be pleasing to the hand and eye. Hides and skins are the raw material of the tanning industry.

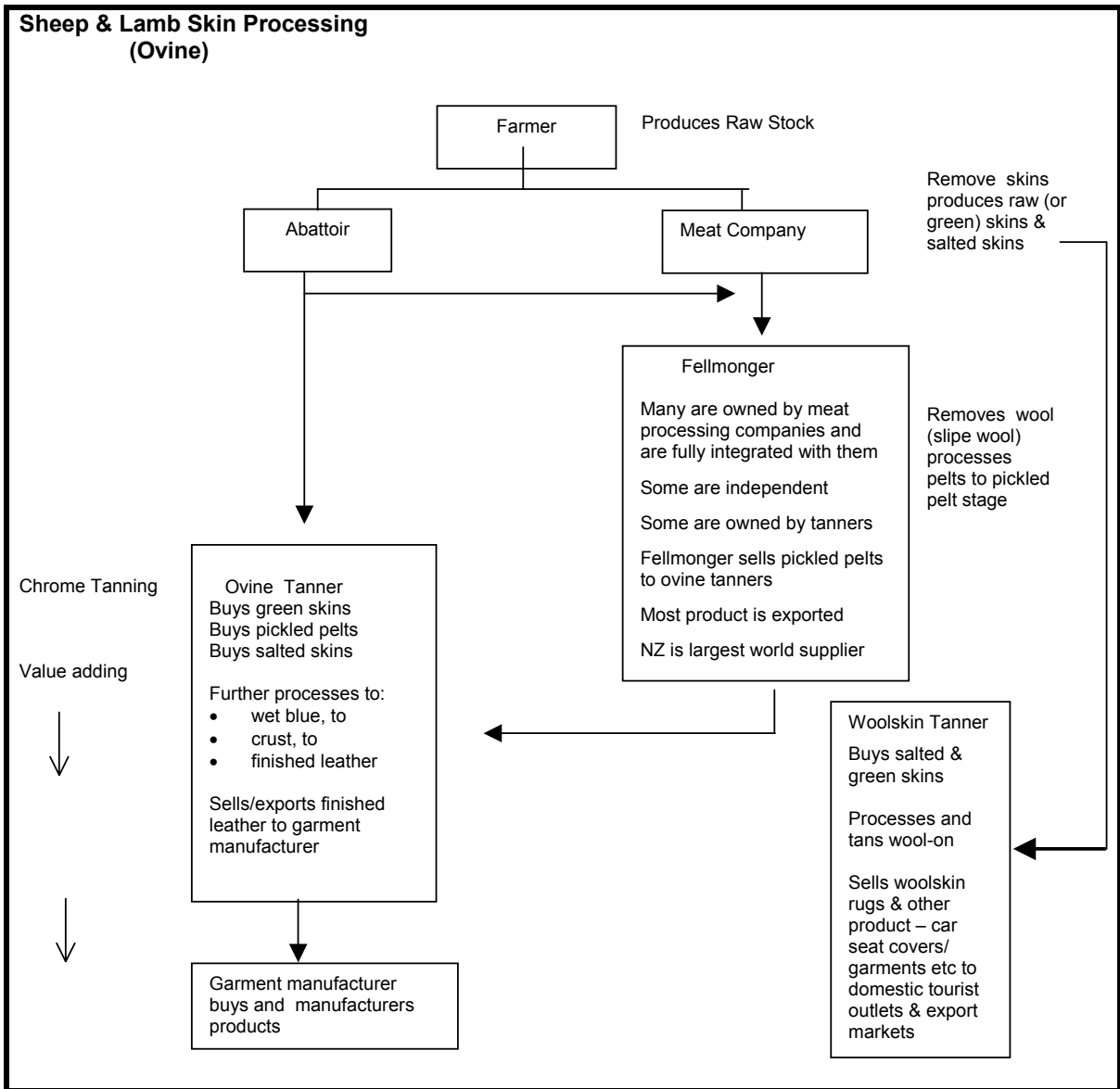
In some cases tanning does not commence immediately after the removal of the hide. Preservation for various periods of time is achieved by using salting mixtures, biocides or cooling. Hides cured with salt can be stored for long periods.

there are several distinct steps which can be integrated at one plant, or spread over time at several plants

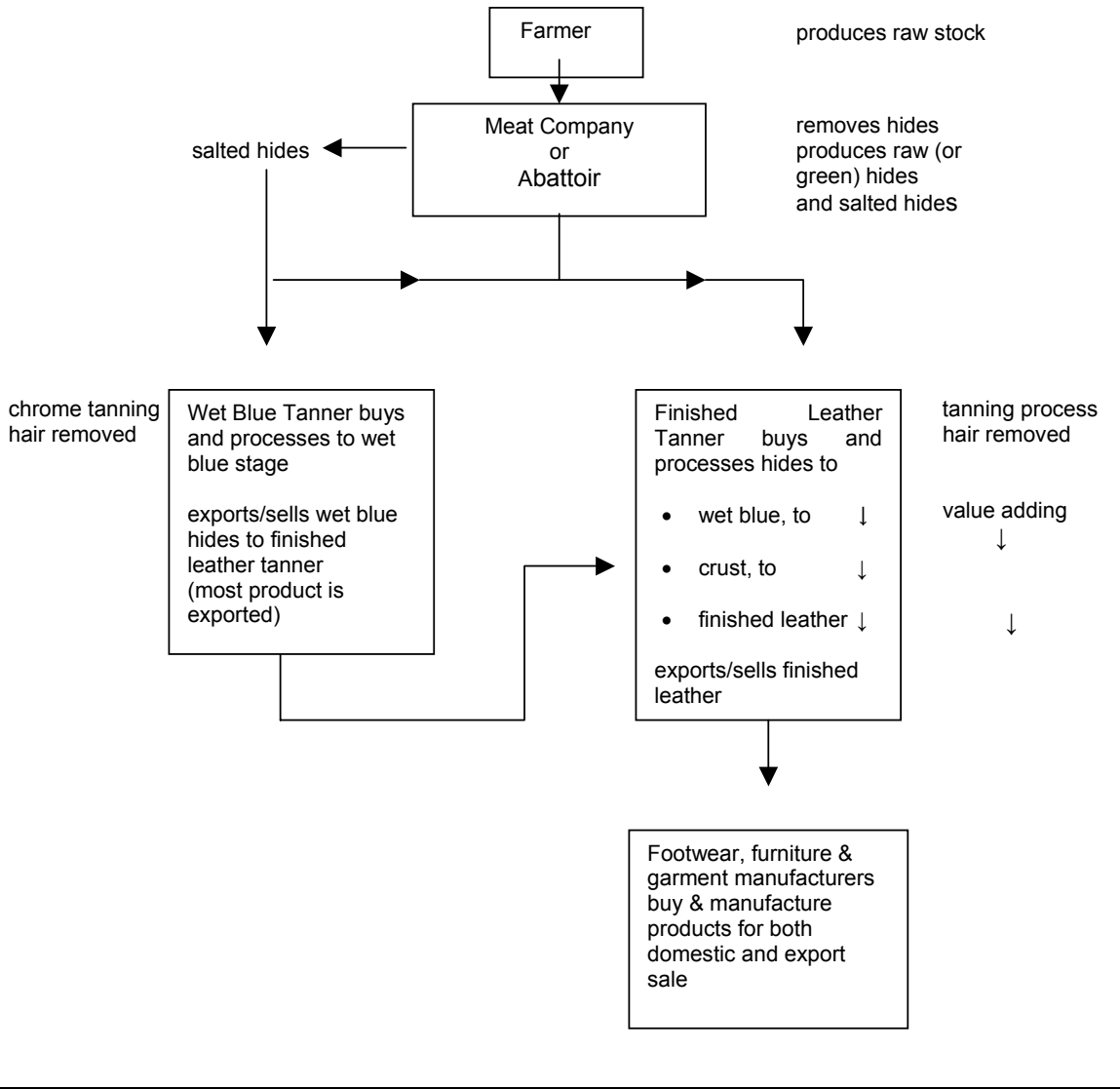
The tanning process can commence immediately after the removal of the raw hide from an animal or from a salted hide. The process includes a number of distinct steps in which the hide is processed for tanning. Processes vary according to final uses. For example, hides for shoe upper leather are tanned with chromium salts, and hides for sole leather, shoe linings and belting leather, are tanned with various vegetable extracts.

the tanning process

The chrome tanning process is applied to both cattle hides and sheep and lamb skins. After initial processing to remove wool, sheep and lamb skins are called pelts. There are a number of stages in the processes with each representing further value added. The main stages are illustrated in the flow charts below, and will be referred to repeatedly in this document. Note that current technology relies heavily on chrome tanning. There is global movement towards non-chrome leather and niche opportunities associated with this movement.



Cattle Hide Processing (bovine)



1.3 The Main Players

Four different organisations with different memberships and focuses service the leather processing and production sector.

- Meat Industry Association (NZMIA)
- Tanners' Association (NZTA)
- ABEA (Animal By-Products Exporters Association)
- LASRA (Leather and Shoe Research Association)

The Meat Industry Association has 35 members, many of whom having direct tannery / fellmongery ownership. Most produced pickled and wet blue product, i.e. semi-processed.

Tanners' Association membership covers a diverse range of product

The Tanners' Association represents the wide diversity of activities that characterise the New Zealand tanning industry.

Members represent:

from primary processing to semi processed to finished leather production

- Bovine finished leather tanners.
- Bovine wet blue tanners.
- Woolskin tanners.
- Ovine finished leather tanners.
- Ovine wet blue tanners.

ABEA relates more to primary processing and trading

ABEA membership is wide and includes meat companies, fellmongers, hide and skin processors, and merchants and traders of animal by-products. ABEA services its members' requirements in terms and conditions for international trading contracts, and shipping negotiations.

LASRA is the research and technical arm of the leather industry, and the training resource base. LASRA's role is detailed in Section 2.8.1.

Tanners Association's strategic goal is to further develop the six key research & development themes

Issues which are key to the achievement of this goal have been identified and the industry continue to address these.

1.4 Background to the R&D Strategy

the Porter team analysed export industries In 1990 the Porter Project team sponsored by TRADENZ, analysed the competitive advantage of a cross section of New Zealand's export industries.

Caughey O'Boyle reviewed the leather industry As a follow up, TRADENZ commissioned "Porter Project" consultants Caughey O'Boyle to do a strategic review of the hide, skin, and leather processing industry. Completed on 10 April 1991 and titled "Sources of Competitive Advantage of the New Zealand Industry" this review found considerable potential to increase export earnings.

The review identified the following key features:

strategic review found world production is mainly bovine

- World leather production is Bovine (cattle) dominated.

most manufacturing is done in low cost countries

- There are large herds in developing countries but hides and skins are not exported from them.
- Most leather products are made in low cost countries or traditional manufacturing countries such as Italy, and the trend to manufacture in low cost countries is accelerating.

this trend is accelerating

- Most leather is made in countries:
 - of raw material supply, and
 - of leather product manufacturers.

New Zealand is strong in ovine raw material supply

- Consumer countries of leather products have high imports.
- New Zealand has a significant world position in sheep skins and lamb pelts (ovine products).

deteriorating quality

- This position is in raw material supply, not in value adding.

ovine pelt world leadership not being exploited

- Far from helping to upgrade leather products, raw material quality has deteriorated and an urgent programme to upgrade product quality was required.

immediate steps were taken to address quality

- New Zealand was not exploiting its world leadership position in ovine pelts to maximise returns.

The industry took immediate steps to address the quality issues. A comprehensive quality enhancement

<i>issues</i>	programme commenced which was built on the 1987 strategy developed by LASRA.
	This programme, funded jointly by the Tanners Association, TRADENZ and the Meat Industry Association, addressed quality issues on farms and during processing. This programme was coordinated by Nimmo-Bell and Company Ltd.
<i>leather 2000 expanded on the vision and goal</i>	In August 1992, TRADENZ commissioned a further study by Caughey O'Boyle titled "Leather 2000".
	Leather 2000 expanded on the industry vision and a goal to have export sales of \$1 billion by the year 2000 and highlighted two more changes in the pattern of world trade:
<i>growth in exports to Korea and China</i>	<ul style="list-style-type: none"> • the increase by Korea as an importer of hides and skins, surpassing Italy as the largest world importer; and • the increase of Hong Kong/China as an importer of leather and an exporter of leather clothing.
<i>directions for the year 2000 detailed action plans</i>	In November 1992 TRADENZ sponsored Caughey O'Boyle to produce "Directions for the Year 2000". This document detailed action plans to achieve the vision.
<i>TRADENZ recognises the industry's potential</i>	TRADENZ provided strong support through the industry Joint Action Group, with the New Zealand Tanners' Association, and has encouraged the industry to:
<i>TRADENZ actively supported quality improvement and closer industry cohesion</i>	<ul style="list-style-type: none"> • improve quality by preventative management practices and techniques, both on and off the farm; • develop a cost-effective process to reward farmers producing premium quality; • rationalise practices and increase uptake of new technology; • export a greater proportion of hides and skins as finished leather; • develop closer strategic and operating links between the three trade associations servicing the industry; • achieve stronger industry coordination and management of R & D; • established an industry training organisation;

- develop a closer customer focus; and
- support quality improvement with target market development and promotion, building on the Brand New Zealand programme.

TRADENZ funded and supported many initiatives

To assist the leather industry to stretch for growth, TRADENZ:

- supported the development of the leather industry R & D Strategy;
- worked to gather market information;
- supported the International Council of Tanners conference, Auckland, April 1994;
- supported industry promotional programmes through Brand New Zealand; and
- supported participation by New Zealand companies in international trade fairs including India Leather Fair, Hong Kong Leather Fair, INTERSIC (Paris) and Semaine du Cuir.

aim of this document is to communicate the strategy

The aim of this document is to communicate the R & D strategy to ensure that:

- organisations involved in supporting and funding research will understand the size, potential and unique features of this industry;
- future R & D projects will be relevant to the industry strategy;

R & D must be relevant and given priority

- science providers and funders will recognise the importance the industry places on R & D in its drive to reach its full potential; and
- science funders will be able to assess individual funding applications against the industry R & D strategy.

2.0 Industry Background

2.1 Comparative Size

three main leather sectors: bovine, ovine and woolskin

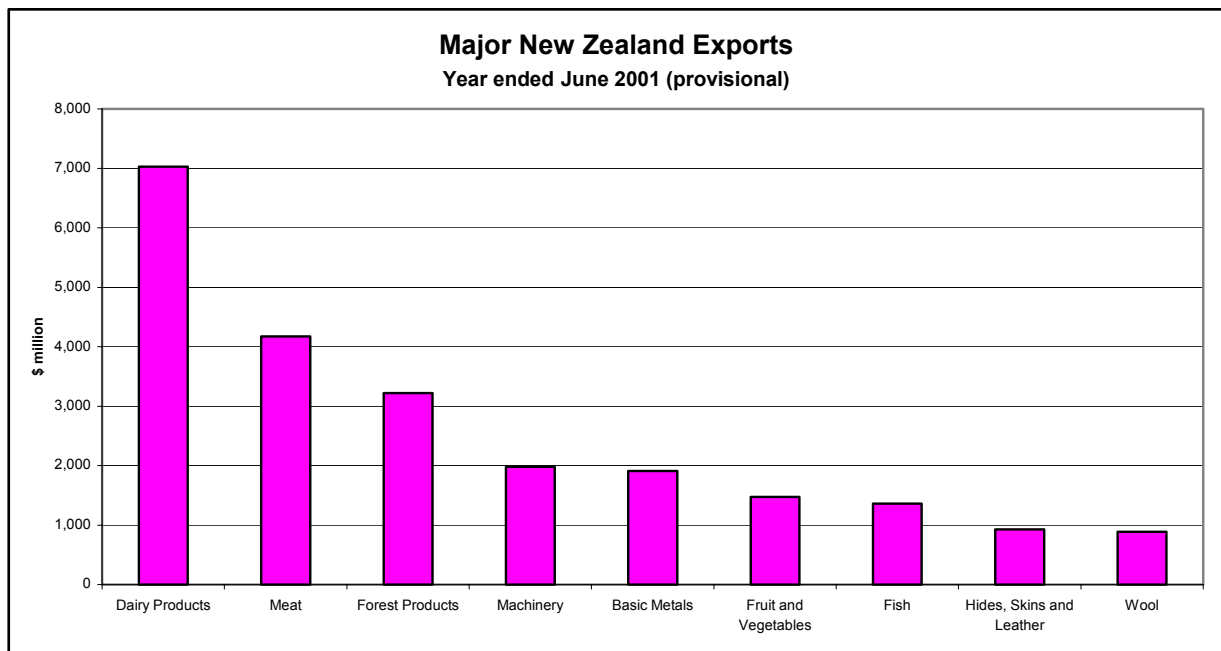
The leather industry includes three main sectors; bovine, ovine and woolskin. These sectors cover a wide diversity and range of raw materials over which industry interests extend.

Footwear, upholstery and some accessories are made from cattle hides, clothing leathers from lamb pelts, and woolskins are made into floor rugs, seat covers and garments.

in total, eighth largest export sector

The total exports of these sectors make up New Zealand's eighth largest export sector. Figure 1 compares total exports for the year ended June 2001 of \$926.8m with other major sectors. Total exports include treated hides and skins, semi-processed and finished leathers.

Figure 1



2.2 Export Trend Comparisons

Figure 1 shows export trends for the nine largest export sectors over the past eight years.

Total leather sector exports increased 42% from 1993 to 2001.

The total sector is a large employer with a skilled and experienced workforce of over 3,000 staff.

sector is increasing further processed leather exports

New Zealand contributes 30% of the world's trade in ovine leather goods.

2.3 Raw Material Supply

Figure 2 illustrates lamb, sheep and cattle slaughtering from 1989 to 2001. In 1989 companies processed nearly 40 million lamb pelts compared with 32 million today.

from 1989 to 2001 lamb pelt supply fell 16%

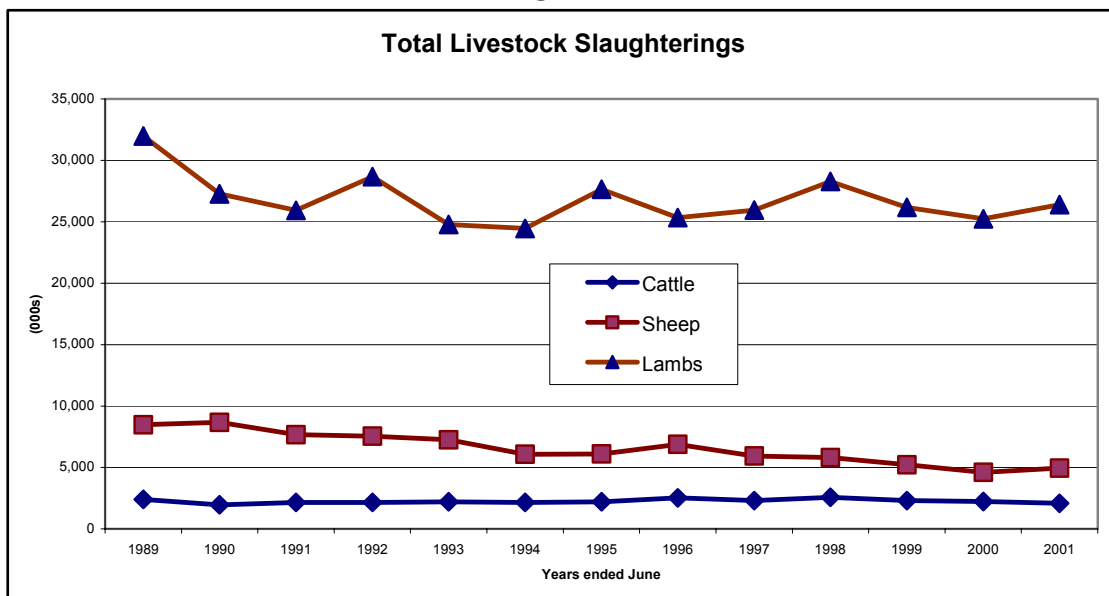
Likewise, sheep slaughtering fell from 9 million to an estimated 5 million.

The declining sheep and lamb kill emphasises the need to promote increased net values as a strategic approach to improving export receipts.

cattle slaughtering stable

Cattle slaughtering are relatively stable at about 2 million.

Figure 2



Further processing of the national pelt resource will be

encouraged by the development of new technology to produce high tech, differentiated product under environmentally friendly systems of production.

meat companies play a major role in primary processing

In most other countries, tanners purchase raw skins and hides from abattoirs and process them to finished leather. In New Zealand, however, most primary stage processing, that is, ovine from raw skin to pickled pelt and bovine, from raw hide to wet blue, is done by meat processors. Wet blue processing, particularly of lamb pelts, by meat companies is increasing.

strong competition for raw materials

Tanners compete strongly for raw stock supply from meat companies and abattoirs at prices set by international markets.

2.4 Sector Value Adding

bovine leads in value adding

Volumes have increased since the cessation of the Australian Export Incentive Scheme in June 2000. The annual volumes have been impacted by the closure of one of the Ovine tanners.

large potential in ovine is clear

The potential to add value to ovine in product is clear with raw skin export value¹ greatly exceeding finished leather. Conversely, finished woolskins greatly exceed exports of raw (wool on) skins. Bovine exports of finished leather are approximately 52% of the value of raw hide exports.

2.5 Total Industry Value Added Trends

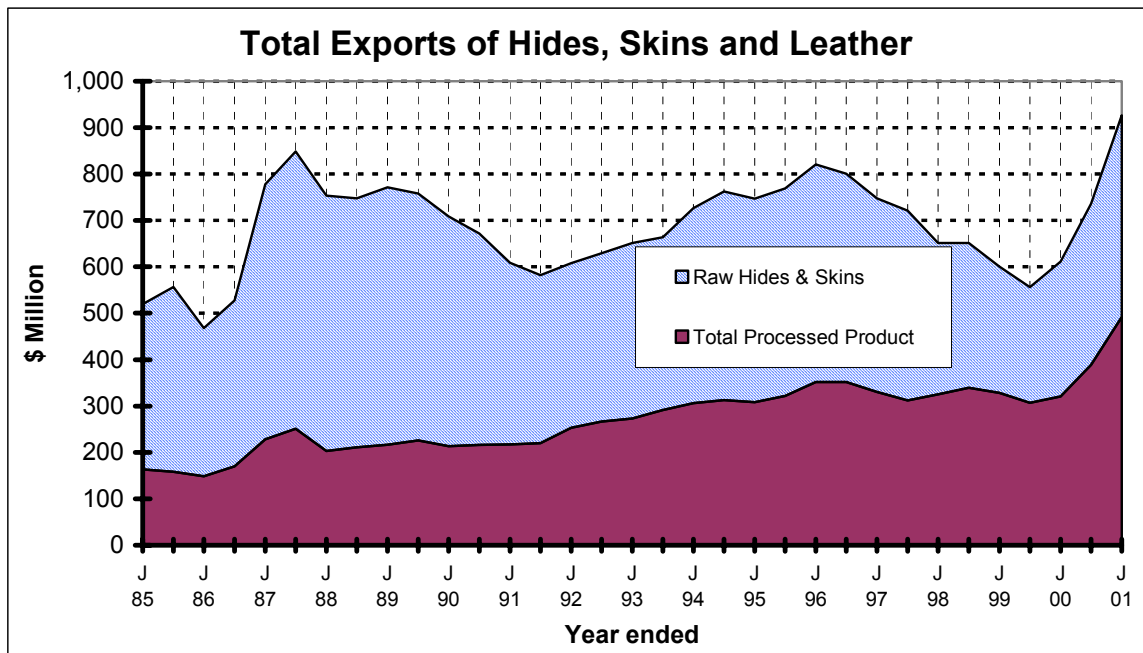
further processed component is increasing

Figure 3 shows that in value, the raw hide and skins component of total sector exports has declined since 1989. Conversely, the further processed and finished leather components nearly all show increases.

The net effect is a steady increase in total export receipts since June 1991 in spite of a 30 percent reduction in sheep numbers.

¹ Raw skin classification includes pickled pelts

Figure 3



2.6 Major Market Trends

markets shifting from Europe to Asia

In 1995 the UK, France and USA accounted for 30 percent of our exports and in 2000 this was down to 4 percent. In contrast, China, Hong Kong and Korea accounted for 10 percent in 1995, and 46 percent by 2000.

Korea and Italy are key markets

Italy and Korea are key markets for ovine pickled pelt and wet blue, and together now account for 44 percent of total exports.

The rapidly developing Asian economies (India, Thailand, and China in particular) are manufacturing markets for the major consuming nations in Europe, the US and Japan.

2.7 Potential for Increased Export Earnings

The average annual increase in total export value of processed product from 1985 to 2001 was 12.5 percent. The corresponding annual increase in raw hides and skins export value was 1.4 percent.

finished ovine market is fashion sensitive

The ovine finished leather market is extremely fashion sensitive. Fashion is affected by economic conditions and this can have a significant impact on performance.

leather export growth has tremendous potential

Capacity exists to increase bovine further processed leather exports but the tremendous potential to increase

further processed and finished ovine exports will require considerable investment in resources.

2.8 Industry Research & Development

2.8.1. R & D PROVIDERS TO THE INDUSTRY INCLUDE:

- LASRA, the industry's primary research provider
- AgResearch
- Industrial Research Ltd
- WRONZ (Wool Research Organisation of NZ)

LASRA has a diverse membership base

LASRA was established to organise and service the industry's research, technical, training, and information requirements. LASRA has a diverse membership including bovine and ovine tanners, fellmongers, hide processors, woolskin tanners, footwear manufacturers and ancillary members in related servicing industries.

LASRA outputs are geared to industry needs

LASRA's industry links ensure its outputs are directly geared to the industry's long and short term needs.

works closely with other research providers

LASRA's strategy is aimed at encouraging input from other science sectors. LASRA works with AgResearch partners on raw material quality research, Industrial Research Limited on automation, and Massey University on underpinning science –

Industry funding for LASRA is voluntary and drawn from a diverse membership. FRST funding underpins far horizon research with its greater order of risk and is an essential complement to the targeted research carried out for and approved by industry.

industry and FRST complementarity

LASRA's key role is to promote the well-being and development of the leather and leather related industries in New Zealand by:

- applying science and technology to the understanding of New Zealand's hide and skin resources;
 - advancing leather science; and
 - promoting the application of science, technology and training to the production of leather and leather goods in New Zealand.
-

3.0 Research & Development Strategy

This plan presents six key research and development themes. These are:

1. Improving the intrinsic leather-making quality of the raw stock base
 - genetic improvement in sheep and cattle to enhance leather qualities in skins and hides.
2. Faults eradication in raw stock
 - obtaining improved quality raw skins and hides off farms.
3. Leather science and objective measurement of process and product
 - ensuring underpinning leather science is focused on the specifics of the New Zealand industry.
4. Environmental impact minimisation through clean technology and waste utilisation
5. Developing differentiated part processed and finished leathers with enhanced properties to increase market premiums and niche opportunities.
6. Developing automation and new technology applications to provide more consistency and competitiveness linked to market requirements and novel opportunities.

Detailed discussion on each theme follows.

3.1 Improving the Intrinsic Leather-making Quality of the Raw Stock Base

world leader in pelt supply but numerical superiority not matched by intrinsic quality

New Zealand's ovine raw stock base comprises 6 million sheep skins and 25 million lamb skins. The volume of lamb skins produced underpins New Zealand's position as a leading supplier of ovine leather material to the international garment leather trade.

However, this numerical superiority is not matched by the intrinsic quality of the pelts, irrespective of levels of preventable damage induced on the farm.

sheep breeds have different skins

It is well known in the leather industry that breeds with premium wool like Merinos produce inferior pelts and the best skins for garment leather making come from hair sheep where the fibre is almost valueless.

Other New Zealand sheep breeds farmed under our warm temperate conditions for wool and meat, suffer from particular character defects that significantly and adversely affect their usability.

pelts have important adverse characteristics which effect their usability

The particular adverse characteristics that reflect in the New Zealand lamb pelt are:

- an open textured fibrous structure;
- high levels of natural grease;
- natural grease concentration at the grain/corium boundary (i.e. point of natural weakness);
- a tendency to delaminate at the grain/corium boundary;
- the pinhole defect;
- ribbiness;
- open curly wool;
- small square skin pattern; and
- bacterial/fungal staining in the wool.

Research aimed at altering the character of the national sheep flock must recognise these features of the skin that influence its appeal for leather manufacturing.

animal welfare and organic farming offer spin-off opportunities

The acceptability of leather, particularly in high value sophisticated markets may increasingly be dependent on matters of animal welfare and product safety.

It is in the industry's interests therefore to capitalise on and promote New Zealand's humane treatment of animals on farm and in meat plants, to support the removal of chemical residues (pesticides and the like) and to encourage the organic farming of raw stock for niche marketing.

meat and wool research must link with skin/leather needs

There is a need to ensure that leather industry needs are not prejudiced by research that focuses only on meat and/or wool.

Selective breeding, the introduction of novel breeds, dietary manipulation, growth regulation and genetic manipulation are possible as ways of exploring how to improve ovine skin characteristics.

sheep research considerations must be balanced

But funders need to ensure that a balanced mix of considerations is built into programmes that could conceivably change skin characteristics.

New Zealand hides are highly regarded

It is generally held that New Zealand hides, notwithstanding their farm faults, are highly regarded for their quality in most world markets.

There is, however, a moderate to small incidence of the genetic defect known as “vertical fibre”. This defect is characterised by lack of fibre interweaving and the vertical orientation of fibre bundles relative to the plane of the leather which results in weakness.

Theme Strategy

- Ensure that animal research proposals are evaluated by funders to confirm that potential effects on leather are identified and addressed.
- Investigate breed and dietary effects that could provide improved leather-making and woolskin making characteristics.
- Investigate how genetic manipulation could resolve adverse skin characteristics.
- Provide improved scientific understanding of the causes of open texture, high and localised grease content, delamination, pinhole and ribbiness in New Zealand lamb skins.
- Investigate means of eradicating the above-listed defects from New Zealand lamb pelts to increase their usability and versatility for fashion garment leathers and for woolskin products.
- Develop breeds that will provide straighter, denser wool without the problems of delamination and ribbiness.
- Develop breeds that which have a larger, longer body frame.

- Seek leather sector involvement in research into animal welfare ,animal treatments, organic or low-chemical farming
- Address the vertical fibre defect in cattle hide.
- Develop strong working relationships via LASRA with tertiary educational facilities and research and development providers.
- Initiate analysis on the effects of breed changes on the resultant leathers.

3.2 Faults Eradication in Rawstock

As referred to in the introduction, the 1992 Strategic Review identified deteriorating product quality in international markets. A quality enhancement programme has commenced, which was built on the 1987 strategy developed by LASRA.

quality issues were addressed in four main areas

The programme addresses quality issues in four main areas:

- upgrading the quality of raw materials on farms;
- improving processing techniques to minimise skin and hide damage during processing;
- improving pelt grading standards; and
- developing systems so the quality of raw skins and hides could be recognised in payments to farmers.

quality faults cost \$100m per annum

The programme established that quality faults in lamb pelts, sheep skins and cattle hides cost about \$100m per annum. About half, i.e. \$50m, of the lost revenue is from downgrading for farm faults.

about half of this occurs on the farms

The largest contributors to downgrades in lamb pelts have shear scar, (i.e. cuts to the skin during shearing) and grain damage caused during the removal of pelts from some animals.

common damage is preventable

Common damage such as shearing scar, seed damage, fly strike, yolked wool, inoculation scars, dog bites, claw marks, brand marks and horn rakes can all be prevented by good livestock management.

parasite and disease damage incidence

National survey data (LASRA) has shown that dermatophilosis incidence is decreasing in sheep and holding on cattle. Dermatophilosis prevention and control is now better understood as a result of LASRA research.

Cockle is a significant reason for lamb and sheep pelt downgrading. Research has shown that it is caused by the animal's allergic reaction to louse infestation. Dipping has been shown to be effective in the control of cockle but there are concerns about dependency on organophosphates and the general issue of pesticide residues.

Yolking or canary yellow bacterial/fungal staining is a major defect effecting lambskins and their use for woolskin purposes.

Grain damage in cattle hides is endemic. The worst single fault is healed scar. It is caused by an itchy animal rubbing itself against sharp objects. Itching is usually caused by external parasites such as lice and ticks.

The causes are known and the damage can be prevented. The adoption by farmers of quality management systems to reduce the incidence of external parasites in cattle is the key to progress.

some faults are very difficult to detect until processed to finished leather

Dermatophilosis and dermodex lesions are the other main causes of hide damage. The impact of these faults is heightened by the fact that many of them often cannot be recognised until the hide or skin has been processed to finished leather.

sheep/lamb skin removal often causes grain strain

About \$20m of lost revenue results from grain damage caused at skin removal from the lamb/sheep carcass.

The defect grain strain occurs when sheep and lamb pelts are stretched excessively during skinning operations. Gross strain is easily visible in pickled pelts, but micro strain cannot be detected until final processing to finished leather.

grain strain is a major cause of lamb pelt damage

Micro strain in lamb pelts is a major quality issue. Its influence is huge with up to 60 to 70 percent damage in some lines of finished leather. There are wide ranges in the incidence of grain strain within individual lines of lambs and there are many unanswered questions about its causes and prevention. Its incidence has increased with more mechanised processing.

LASRA's initiative and research into gas depleting has been shown to be capable of dramatically reducing grain strain.

motivating farmers to produce quality hides and skins is a key issue

Means of encouraging farmers to improve hide and skin quality must be found. To date the product/farmer link, that is, linking a skin at the time of grading to an individual farm, has not been solved. Serious consideration should be given to provide incentives to farmers to adapt quality management systems.

ways must be found to link products with farms so payments can reflect quality

The two main options for linking the product with the farmer are:

- develop individual pelt and hide identification systems; and
- develop a farmer accreditation programme as part of a Total Quality management system that will

encourage the implementation of best practice procedures in all facets of animal health management to minimise damage and produce a quality product off the farm.

limitations with pelt ID systems, have stalled progress

The development of pelt identification systems has stalled for two main reasons:

- no commercially viable systems are presently available; and
- some meat companies say that even if suitable technology was available they may have difficulty in justifying the investment from a return on capital viewpoint.

hide ID is available but not widely used

Hide identification based on a tattoo system has operated in two companies. The technology is practical but economic pressures on the meat industry have slowed the take-up of this LASRA devised technology.

Theme Strategy

- Investigate means of establishing a hide/skin quality link with the farm to encourage quality improvement by developing cost-effective identification or practical accreditation options.
- Promote the adoption of practices that reduce the incidence of shearing damage, seed damage, fly strike, inoculation scars and dog bites on lamb skins.
- Develop shearing equipment and/or shearing techniques that minimise skin damage.
- Investigate improved means of ectoparasite control on cattle to reduce direct damage and secondary, scratching damage induced by irritancy.
- Promote the adoption of practices that reduce the incidence of brand marks, horn rakes and yarding damage on cattle hides.
- Investigate improved means of dermatophilosis prevention on lambs and cattle, relevant to practical farm management.
- Investigate improved means of louse control for the effective prevention of cockle on lamb skins, relevant to practical farm management and mindful of market concerns for pesticide residues.

- Investigate the means of control of bacterial/fungal growths in live sheep which give rise to in-vivo staining of the wool.
- Promote improved means of pelt removal from lamb/sheep carcasses using LASRA gas depleting to eradicate gross and micro grain strain damage.

3.3 Leather Science and Objective Measurement of Process and Product

leather making is complex

Leather making involves a complex inter-related series of production steps. The production steps involve chemical, biochemical and physical treatments. Control of physical treatments and the consequent effects on leather properties are generally understood. The same is not true of all chemical/biochemical treatments. The following two examples serve as graphic illustrations:

chrome tannage is the dominant process

1. Chrome tannage is the dominant method of making leather for footwear, upholstery and garment use worldwide. Established principles and practice regard acid treatment prior to tannage as essential. Recent research by LASRA has proved that the established principle does not govern the chrome tannage of ovine skin. This finding is of radical significance and the concept developed by LASRA (the ThruBlu process) has called into question the principles of science assumed to govern the most important stage in the production of tanned ovine leather.

but there may be alternatives which have lower environmental impact

enzymatic usage is established but effects on leather are judged subjectively

2. Enzymatic usage in the production of ovine and bovine leathers is only partially established. The use is, however, empirical. There is no objective control or measurement to define the results of enzymatic treatment. Effects of enzymatic treatment on leather are judged subjectively by organoleptic or tactile methods (by feel) with consequent lack of standardisation or objective definition of the required results.

The advantages gained from enzymatic treatments are often countered by disadvantages. So, for example, the benefit of an improved surface feel is offset by increased degrees of structural looseness.

opportunities to exploit enzyme-based processing

The full extent to which enzyme treatments could replace inorganic processing has not been exploited. The opportunity to use enzyme-based technologies to overcome the polluting effects of existing chemistry and to deliver better processing specificity should be pursued.

improved measuring processes are essential

A scientific understanding of processing stages coupled with means of objectively measuring process control parameters and quality outcomes is essential for:

- consistent control over processing and product;
- the development of differentiated leathers; and
- the development of cleaner technology options.

European research institutes were leaders and the most advanced technically

Much leather science in the past was developed through European based research institutes. These institutes functioned according to the fortunes of the leather industry. The leather industry in the past was predominantly positioned in Europe and European leather producers were the most technically advanced.

the shift in production to Asia has greatly weakened Europe's research capacity

In the last decade, global leather production has been repositioned away from Europe into Asia. There has been a dramatic decline in the fortunes of many of the European leather research groups as a consequence. Many institutes have reduced in size and have repositioned their research effort away from leather science. In some cases the groups have moved away completely, for example EMPA, the Swiss group at St Gallen ceased all leather research in the mid 1990s.

this capacity has not been replicated in Asia

global leather research has therefore reduced

These changes have not been compensated for by any significant or relevant developments in the emerging regions. The net effect has been to reduce global leather research capacity and increase reliance on supply companies to the industry. Reliance on chemical supply companies provides some valuable input but is clearly restricted to product interests and research is carried out only to the extent that it will support product sales.

New Zealand universities are not yet committed to leather science

The leather industry is well aware of the fact that there is no university in New Zealand that has a commitment to leather science. This is despite the size of the industry and its huge significance as eighth largest export earner. The industry does, however, recognise the links established between LASRA and Massey University and the inclusion of some relevant course material in some degree and diploma courses.

The New Zealand industry is aware of the need to ensure:

essential that NZ drives and supports a rigorous research programme

- basic leather research is adequately supported and recognises New Zealand's natural competitive advantage in its ovine resource; and
- that reductions in relevant basic research available from overseas institutions are recognised, particularly with regard to Crown funded research.

Theme Strategy

- Ensure that the need for a viable research base is understood and adequately supported by the PGSF.
- Promote further commitment to leather science, particularly within universities where research leading into education is regarded as of particular importance.
- Encourage the coordination of research activities carried out for the hide skin and leather industry.
- Investigate the principles of key production stages where controls are known to be empirical.
- Investigate key production stages with particular emphasis on ovine leathers where established principles may be challenged.
- Investigate improved means of process control through scientific understanding and objective measurement.

3.4 Clean Technology and Waste Utilisation

the industry supports a greater use of cleaner production technology

The industry supports a focus on the further development and greater utilisation of cleaner production technology with a reducing need to depend on end-of-pipe treatment of tradewastes.

Coupled with this is the recognition that energy and water utilisation needs to be considered in terms of improved efficiency of use and cost reduction.

There is a recognition that much existing technology exists for waste treatment but that there are specific wastes generated from leathermaking that need to be given particular attention.

leathermaking needs more solid waste options so wastes can be used rather than disposed of

As well as waste treatment technology, there is a need for appropriate solid waste options suited to the industry and the special circumstances that prevail in New Zealand. As a matter of principle, the issue of solid wastes from leathermaking should be regarded as a matter of utilisation rather than disposal. The work of LASRA serves to provide an example:

Grease removal from lamb pelts at present generates grease contaminated with biocide and therefore restricted in use. The LASRA proposal on neutral pH degreasing prior to the stage at which biocide would be added, could deliver a recovered by-product of wider usability and appeal.

end user countries are tightening eco requirements

Increasingly, exports of part-processed and finished leathers will have to meet eco-requirements in overseas countries. The triangular trade in leather sees production of leathergoods in countries with particular difficulties of waste disposal; often in regions of water shortage, with leathergoods arriving in western markets where eco-acceptability issues are becoming more evident.

stringent limits on chloride and sulphate already exist

The recent identification by LASRA of potential salt disposal problems in overseas markets would profoundly affect many current exports that are salt laden in terms of chloride and/or sulphate. Stringent limits on chloride and sulphate already exist in countries like Italy and there are many examples of plant close downs caused by excess salt discharge and consequent impositions by the authorities.

*pollution reduction
technology must be
product focused*

It is of concern to the industry that suggestions for pollutant reduction have been made by those with no appreciation of leather science and technology. Tanners are primarily in business to produce leather, the production of environmentally acceptable waste is regarded as a consequence of that. Any research aimed at pollution reduction through the use of alternative technology must be product focused.

*eco labelling will become
more common*

The possibility of overseas regulations governing the eco-characteristics of leather and leathersgoods is evidenced by recent moves to introduce eco-labelling as a means of attaching environmental approval to goods. The Dutch "Miliukeur" and the Austrian Oko-Tex Standard 116" are examples where demanding conditions would be required for product and its means of production. At this stage, there is no indication of how widespread such eco-labelling might become. However, the International Council of Tanners at its meeting in Auckland, accepted the need to assess the technology implications of eco-labelling and has accepted the matter as one requiring active concern.

*move to cleaner
technology will be driven
by overseas market
access requirements and
the Resource
Management Act*

The move towards the development of cleaner technology is clearly driven by the specific pressures outlined above relating to New Zealand's access to overseas markets. There is also a clear drive in New Zealand under the Resource Management Act and the trend by regional and local authorities towards more stringent regimes of control over discharges to natural lands and waters and air emissions.

Theme Strategy

- Evaluate existing production systems for environmental acceptability.
- Investigate overseas technology options for their relevance under New Zealand conditions.
- Study cleaner technology alternatives to counter environmental concerns in New Zealand and relevant concerns overseas.
- Monitor and respond to overseas eco-labelling.
- Respond through appropriate research to environmental concerns according to New Zealand legislated requirements and the particular cultural concerns prevailing in this country.

- Ensure that changes proposed for environmentally sound reasons are investigated with respect to their impact on leather production and product.
- Examine solid waste utilisation with particular reference to the applicability of overseas technology options and relevance in New Zealand.
- Examine solid waste disposal and the use of best overseas and local technology in this area.

3.5 Developing Differentiated Part Processed and Finished Leathers with Enhanced Properties

The New Zealand leather industry has demonstrated the ability to respond to export opportunities.

industry and growth can be significantly enhanced by further processing

Further growth will depend on the production of more finished leather and the further processing of untanned material. Opportunities exist for the conversion of hides beyond the tanned stage and for the conversion of lamb pelts to part processed or finished stages.

The New Zealand leather industry is internationally competitive. Opportunities exist for the further processing of skins imported in raw or partly processed form.

there will be strong demand from China and India for our raw material

New Zealand lamb pelt production will see the greater volume of skins converted beyond the pickled condition. Global demand for raw material from countries like India and China will place pressure on our leather industry to compete for our raw material, and for finished leather market share. Future growth will depend on improved technology for New Zealand finished leather ovine tanners.

The production of differentiated leathers of high quality will be one means of establishing an advantage over bulk producers overseas and targeting niche opportunities.

our leather makers will seek to differentiate product to obtain niche market premiums

To the extent that New Zealand will continue to supply part-processed material to overseas tanners, there is scope for differentiating the part-processed product and moving further up the added value scale. Note is taken of LASRA's suggestions for no salt pickle, degreased pickle and chromium alternatives, all of which would provide tailored options suited to specific niche market needs.

With respect to finished leathers, there is scope for emerging aesthetics with higher orders of technical performance. So for example, improved water resistance and oil repellency, provided touch and softness were retained, would add performance advantages to a fashion item and distinguish such leather from standard bulk product.

opportunities linked to novel or alternative usages

There are opportunities for exploring novel usages, based for example on upholstery use of ovine leathers which have traditionally only been used in clothing.

processing developments and opportunities examples

With respect to bovine leathers in particular, there is scope for the study of leather production techniques that might more readily integrate with modern methods of leather goods fabrication. For example, the footwear manufacturing industry would prefer to use water-based rather than solvent-based adhesives. Reduced use of organic solvents would reduce workplace exposure risks, remove flammability concerns, reduce environmental impact and/or reduce the costs of meeting these risks, concerns and impacts.

Research into leathers particularly suited to bonding with water based adhesives could offer significant advantages to manufacturers.

Theme Strategy

- Development of chrome-free eco-friendly tanning systems.
- Evaluate overseas technologies for their suitability for use on New Zealand hides and skins as means of improving performance in use.
- Investigate means of enhancing the yields of New Zealand hides, pelts and skins.
- Investigate alternative overseas raw materials both of standard and exotic types for use by the New Zealand leather industry, ensuring their compatibility with the agricultural requirements of New Zealand.
- Investigate alternative technologies, particularly biotechnologies, for their ability to achieve differentiated properties in leathers and open up novel applications or usages.

3.6 Developing Automation and Improved Production Control Technology

greater use of electronics will enhance production and inspection

Leather production involves stages of chemical treatment, physical manipulation and quality inspection. There is scope for improvement to methods of production and inspection through greater use of electronics and automation.

work done overseas often doesn't match New Zealand's needs

The sources of such improvements have invariably been overseas and carried out by companies servicing their own domestic industries. Often this has led to the development of equipment that does not match the specific needs of New Zealand industry. The classic example in recent years has been the lamb skin preflesher. European developed through feed prefleshing machines have embodied the critical principles needed by New Zealand producers but have lacked the operational detail needed here.

There is a need for some funding facility that could encourage the specific development of modern processing equipment to suit this country's requirements. This would require some means of ensuring delivery of results in the broadest industry interest. It is suggested that a model operation could be set up for general benefit.

improved inspection technology will improve grading standards and reduce production waste

Leather production involves many quality inspection stages. Some stages of inspection are plagued by the fact that crucial defects that will downgrade the finished leather are not readily visible at early inspection stages. The consequences of this can be serious. Tanners will commit a line of production on the basis of the earlier inspection and such a commitment will invariably be non-reversible. If the final leather turns out to be sub-standard once defects are revealed, significant losses can be incurred.

There is a need for improved methods of inspection that will allow graders to better allocate hides and skins to appropriate lines of production and provide more consistent gradings for market requirements. The options here would seem to revolve around means of enhancing faults for easier inspection and/or machine vision systems capable of analysing faults and determining grade or usability.

Theme Strategy

- Develop means of evaluating novel machinery under New Zealand conditions and encouraging developments suited to New Zealand's needs.
- Develop systems suited to New Zealand requirements for the purposes of easing faults identification and improving the consistency of grading.
- Develop systems suitable for New Zealand conditions for handling hides, skins and chemicals.
- Grading technology applications such as substance and area grading.
- Effluent systems design and control.

APPENDIX A

FOB VALUE OF NEW ZEALAND EXPORTS

Year ended	Dairy Products	Meat	Forest Products	Machinery	Basic Metals	Fruit and Vegetables	Fish	Hides, Skins and Leather	Wool	Other Exports	Total Exports
1993	3,180	3,057	2,278	832	1,255	991	1,073	652	901	4,025	18,242
1994	3,379	2,874	2,428	1,028	1,315	1,076	1,113	727	1,054	4,170	19,164
1995	3,257	2,613	2,576	1,139	1,499	1,061	1,118	747	1,253	4,803	20,065
1996	3,540	2,655	2,531	1,179	1,472	1,108	1,147	821	1,034	4,471	19,960
1997	4,085	2,730	2,332	1,274	1,400	1,050	1,026	748	947	4,815	20,406
1998	4,375	2,903	2,281	1,485	1,545	1,229	1,026	651	911	5,083	21,490
1999	4,625	2,828	2,392	1,475	1,464	1,451	1,168	600	741	5,034	21,777
2000	4,781	3,376	3,191	1,697	1,707	1,340	1,223	611	801	6,018	24,746
2001 p	7,025	4,173	3,222	1,980	1,907	1,473	1,362	927	884	7,838	30,793

Source: Business NZ / Statistics NZ

APPENDIX B

Summary of Hide, Skins and Leather Export Product Mix	
(\$ million fob)	
Years ended June	2001
Raw Hides and Skins	
Bovine, Equine	94
¹ Sheep and Lambskins	330
Deer	8
Other	2
Total	434
¹ Sheep and Lambskins include:	
Wool on	1
Pickled	329
Other	0
Bovine and Equine Leather	
Wet Blue	190
Finished	53
Other	11
Total	253
Sheep and Lambskin Leather	
Wet Blue	107
Finished	27
Other	1
Total	135
Deer Leather	8
Other Leather	5
Total	12
Tanned Woolskins & Woolskin Products	
Woolskins	46
Woolskin Products	42
Other	4
Total	92
Summary	
Raw Hides and Skins	435
Wet blue, Crust , Other	317
Finished Leather	87
Woolskins	88
Total Exports	927

Source: NZ Department of Statistics
 NZ Tanners Association

APPENDIX C

Summary of Annual Cost of All Quality Faults (based on year ending 30/6/1992)			
(\$ million)			
	Sheep	Cattle	Total
Farm Faults			
• Sheep	30		30
• Cattle		20	20
<i>Sub total</i>			50
Processing Faults			
Direct costs			
• Sheep	16		16
• Cattle		2	2
<i>Sub total</i>			18
Indirect discount for micro strain	30		30
Total Annual Costs	76	22	98
Rounded to	77	23	100

Source: Nimmo-Bell & Company Ltd
LASRA

APPENDIX C

Annual Variation in Export Receipts

Years ended	Total Processed Product	% annual increase	Raw Hides & Skins	% annual increase	Total Exports of Hides, Skins and Leather
	(\$ million)		(\$ million)		(\$ million)
J 85	163.7		356.3		520.0
	158.4		398.5		556.9
J 86	148.5	-9.3%	319.5	-10.3%	467.9
	170.0	7.3%	357.8	-10.2%	527.9
J 87	228.2	53.7%	549.6	72.0%	778.3
	250.9	47.6%	597.6	67.0%	849.0
J 88	202.9	-11.1%	550.4	0.1%	753.2
	211.1	-15.9%	536.4	-10.2%	747.3
J 89	216.5	6.7%	555.4	0.9%	772.0
	226.1	7.1%	531.9	-0.8%	758.1
J 90	213.6	-1.3%	494.9	-10.9%	708.5
	216.4	-4.3%	455.5	-14.4%	671.9
J 91	217.7	1.9%	391.2	-21.0%	608.9
	219.8	1.6%	362.6	-20.4%	582.4
J 92	253.1	16.3%	355.1	-9.2%	608.4
	266.4	21.2%	363.1	0.1%	629.7
J 93	273.2	7.9%	378.3	6.5%	651.6
	291.5	9.4%	372.4	2.6%	664.0
J 94	306.1	12.0%	420.8	11.2%	727.0
	313.1	7.4%	449.6	20.7%	762.8
J 95	308.0	0.6%	438.6	4.2%	746.6
	321.8	2.8%	447.5	-0.5%	769.3
J 96	351.4	14.1%	469.6	7.1%	821.1
	352.0	9.4%	448.6	0.2%	800.7
J 97	330.1	-6.1%	417.5	-11.1%	747.5
	312.2	-11.3%	408.7	-8.9%	720.8
J 98	325.4	-1.4%	326.0	-21.9%	651.4
	339.2	8.6%	312.3	-23.6%	651.6
J 99	328.4	0.9%	271.6	-16.7%	600.0
	307.2	-9.4%	249.2	-20.2%	556.3
J 00	320.4	-2.4%	291.0	7.1%	611.4
	388.7	26.5%	347.5	39.4%	736.5
J 01	492.2	53.6%	434.6	49.3%	927.3
Average Percentage Increase		12.5%		1.4%	