

New Zealand Society of Animal Production online archive

This paper is from the New Zealand Society for Animal Production online archive. NZSAP holds a regular annual conference in June or July each year for the presentation of technical and applied topics in animal production. NZSAP plays an important role as a forum fostering research in all areas of animal production including production systems, nutrition, meat science, animal welfare, wool science, animal breeding and genetics.

An invitation is extended to all those involved in the field of animal production to apply for membership of the New Zealand Society of Animal Production at our website www.nzsap.org.nz

[View All Proceedings](#)

[Next Conference](#)

[Join NZSAP](#)

The New Zealand Society of Animal Production in publishing the conference proceedings is engaged in disseminating information, not rendering professional advice or services. The views expressed herein do not necessarily represent the views of the New Zealand Society of Animal Production and the New Zealand Society of Animal Production expressly disclaims any form of liability with respect to anything done or omitted to be done in reliance upon the contents of these proceedings.

This work is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](http://creativecommons.org/licenses/by-nc-nd/4.0/).



You are free to:

Share— copy and redistribute the material in any medium or format

Under the following terms:

Attribution — You must give [appropriate credit](#), provide a link to the license, and [indicate if changes were made](#). You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

NonCommercial — You may not use the material for [commercial purposes](#).

NoDerivatives — If you [remix, transform, or build upon](#) the material, you may not distribute the modified material.

<http://creativecommons.org.nz/licences/licences-explained/>

Recent and potential changes in meat processing and their implications for producers

B. B. CHRYSTALL

Meat Industry Research Institute of New Zealand (Inc.) Hamilton

ABSTRACT

Changes in meat processing to comply with overseas and domestic hygiene requirements or to reduce costs and improve product quality are almost continuous. Electrical stunning, mechanical dressing, accelerated conditioning, shrink wrapping and further processing are discussed in relation to their impact for producers. Major meat processing changes that could affect either processing costs or increase the gross return for the products and thereby affect the return to producers are considered. Some of these changes require producers to modify their management practices to get the increased returns.

All changes in meat processing have financial implications for the producer. These are easy to see if they affect his financial return. The effects may be less obvious in the case of changes introduced to satisfy market requirements or to improve product quality in order to retain a market or open up new ones.

Increased processing costs are often considered to be the cause of reduced returns to the producer. However, a breakdown of the retail returns for a lamb on the United Kingdom market shows that processing costs (of which 60% is labour) account for only 15.7% of the gross return. Other costs, beyond meat industry control have more significant effects on reducing the 24% 'residue' available for payment to the producer.

Many of the changes in meat processing over recent years have been introduced to satisfy hygiene requirements stemming from the U.S. Wholesome Meat Act 1967 and the EEC Council Directive 1972-3 CVD which have been incorporated into N.Z. Meat Hygiene Regulations 1969 and MAF manuals. Overseas hygiene requirements have been concerned largely with standards for inspection procedures, buildings, plant and operational hygiene. The implications are obvious when it is realized that in the last 10 years dressing chain manning has doubled, the number of meat inspectors has increased fourfold and there has been a considerable increase in the number of works veterinarians. The cost of improvements to satisfy hygiene in the 1971 to 1980 period was about \$650 million. Increased killing charges have been the inevitable result.

The producer pays for the changes to meet hygiene requirements, but it is the producer who benefits in the long term. If many of the changes had not been introduced we would not now be selling meat to the United States, a market which last year earned N.Z.

\$402 million, nor to the EEC and UK, which returned \$421 million.

Not all changes have been related to hygiene; some have been made to improve efficiency, some to present new products to markets and some to improve the quality of existing products.

The lamb and mutton processing chain shows many important changes. Covered yards with grating floors to hold stock for specified times, washing of an increased proportion of lambs before slaughter and separation of yards from the slaughter board were all introduced in the past 10 years to satisfy hygiene requirements. Some of the stock-holding requirements stem from the apparent inability of farmers to ensure that stock are emptied out before transport to the works.

Changes have taken place also in the slaughter and dressing area. These include electrical stunning, mechanical pelting, automatic weighing, accelerated conditioning and shrink wrapping.

Electrical Stunning

In the past lambs were tipped on to their sides from a knocking box, their throats were cut and necks broken before the legs were shackled and carcasses sent swinging and bleeding up to the dressing floor. It was a noisy, bloody scene.

Lambs are now conveyed from the yards in a V-restrainer which also holds them as they are electrically stunned. Various stunning procedures are used to satisfy different market requirements, but the aim of all techniques is to render the animal insensible to pain and ensure that it is immobile. The lamb is suspended from both front and hind legs, its oesophagus clipped or tied to prevent contamination and bled using a thoracic stick. With this technique most of the blood can be collected. The animal dies quickly, quietly and cleanly. Although this slaughter

system is accepted as 'humane' it was largely hygiene requirements rather than benevolence that forced its introduction. Traditional gash cutting made head skinning and identification of heads difficult but with electrical stunning and altered sticking procedures the head remains almost completely attached to the neck so that complete head skinning can be carried out mechanically.

Changes in the dressing procedures have been occurring almost continuously. Over the past 10 years the number of men on the chain has doubled in order to improve hygiene and dressing standards without slowing processing speeds. In order to increase throughput, cut costs and improve quality standards, mechanical aids are needed.

Mechanical Pelting

A mechanical pelting machine has been developed by the industry and is now undergoing commercial trials at Nelson. This technological giant which has 6 separate heads on a carousel is designed to handle the tally of a standard chain. After head skinning, the brisket and shoulders are cleared manually and the carcass is suspended from the forelegs and head. The skin is clamped, and internal ring is forced between the skin and the carcass and the carcass removed from the skin sock. After the sock is split the pelt is dropped from the clamp and the pelting head is sterilised before accepting its next carcass. The machine can give a consistent dressing standard with reduced contamination rates and has the potential to cut costs significantly by reducing chain manning. Several companies have already installed simpler American-made machines which also have the potential to improve the quality of dressing, reduce contamination rates and slightly alter mannings.

Evisceration, Weighing and Grading

Evisceration has remained relatively unchanged apart from more thorough inspection of all organs. There are suggestions that after mechanical pelting, evisceration could be carried out while the carcass is hanging from the foreshanks instead of inverting the carcass and removing viscera in the present manner. The techniques have been developed and look simple, but must be proved to give less contamination than conventional systems before they will be accepted.

Dressed carcasses are now commonly weighed automatically and grading information fed indirectly to computers. These 2 changes have reduced the number of errors in preparing killing sheets for producers. The logical development from this is to remove subjective grading and replace it with objective measurements taken and recorded automatically. Still some years away, automatic grading is an important potential change which

would have far reaching implications for producers and consumers.

Accelerated Conditioning

After the scales comes the most significant change affecting meat quality—the electrical stimulation tunnel. Most lamb is now electrically stimulated as 1 step in the Accelerated Conditioning (AC) process designed to ensure the tenderness of our lamb and mutton. Lamb is naturally tender, as can be shown by the tenderness of carcasses processed under conditions that do not cause meat to toughen. Chilling of muscles below 10°C during the early stages of post-mortem metabolism causes the muscles to toughen as a consequence of cold shortening. Freezing, before rigor is complete, sets the scene for substantial shortening and toughening if the meat is thawed rapidly, for example, when frozen meat is cooked. Therefore early and rapid chilling and freezing of lamb results in meat which, if cooked from the frozen state, is almost inedibly tough. Even if this meat is thawed slowly before cooking it is still tough. It was to overcome this process-induced toughness that AC was developed. To process lamb or beef without inducing toughness, temperatures below 10°C must be avoided while the meat is in a pre-rigor state; i.e., while the muscles can still respond. If the meat is to be frozen, it must be completely in rigor before freezing is complete. Processing for tender meat before the advent of AC, required carcasses to be held for at least 24 hours before going into blast freezers. With AC the carcasses are stimulated with alternating polarity pulses of high-voltage electricity for a short time. This stimulation increases the rate at which the muscles die, so that lamb carcasses can be frozen 90 minutes later without risk of cold shortening. Provided stimulation and freezing rate specifications are met, the meat will be tender even if cooked from the frozen state. Carcasses from cattle, deer and goats can be electrically stimulated to ensure tender meat.

The implications of AC for the producer are not as obvious as those changes that reduce costs. Although the costs of AC are small, there is no direct cost recovery but producers should be gratified that the tenderness of their lambs now approaches the quality they claim for home-killed animals. It must be hoped that the guaranteed improved product quality will help increase the popularity of New Zealand meats in overseas markets and thereby benefit the producers.

Shrink Wrapping

Another move towards improved quality is the proposed change from stockinet to shrink polythene as the wrapper for frozen lamb.

Since the first successful shipment of frozen lamb carcasses from New Zealand in the *SS Dunedin* 100 years ago, almost all have been wrapped in stockinet. Stockinet gives crude protection against gross soiling but affords no protection against drying out. More recently some carcasses have been bagged in loose polythene then in stockinet. This technique greatly reduces drying out but carcass appearance is not enhanced and the slippery polythene bag inside the stockinet causes stowage problems. A tightly fitting skin of polythene protects against drying out and maintains the carcass colour and appearance but unless a suitably surfaced plastic or coating is used the carcasses are extremely slippery. Recent developments in friction films have overcome the slipperiness so that shrink-wrapped carcasses can be stacked and handled safely.

A shrink-wrapping system has been developed by the industry. Frozen carcasses are automatically degambrelled and held by a vertical presentation conveyor so that shaped bags, suspended above the conveyor and inflated with an airjet can be manually pulled down over the carcass. The bagged carcass is picked up by a second conveyor system and conveyed through a sealing unit and a hot-air tunnel to shrink the bag tightly around the carcass thus completely sealing the carcass in moisture-impermeable plastic.

Besides being attractively presented, the shrink-wrapped carcass is protected against desiccation and soiling. Weight-loss savings as a result of shrink-wrapping are considerable. Stockinet wrapped carcasses lose approximately 1% of their weight in their first month of storage and 0.5% in each subsequent month in storage. Therefore, a 14 kg PM stockinet wrapped carcass loses about 500 g in 6 months' storage.

Losses are even greater in leaner carcasses. As well as the weight loss, carcass appearance will have suffered. Stockinet wrapped carcasses become bleached and may discolour during storage. Shrink-wrapped carcasses remain attractive for much longer periods of time without weight loss.

There are potential labour savings with the shrink-wrapping system but until final trials are complete and machines commercialised it will not be possible to estimate the financial effect. The greatly improved carcass appearance will assist the sales in competition with stockinet wrapped product and so market forces will determine whether shrink-wrapped product receives any increased return.

At present there is a 4.5% deduction from hot carcass weight to allow for weight loss during subsequent freezing and storage. About 1% is lost during freezing but with shrink-wrapping there is no storage loss. Logically, shrink-wrapping would lead to renegotiation of the 4.5% scale deduction. The producer has paid for the weight loss during freezing and storage over the past years and therefore the

producer should get some benefit from the extra return as a result of reduced losses. The processor will need to finance the new equipment but reduced labour costs could be significant.

Further Processing

This has been a catchcry for a number of years, generally with a lot of emotion but little fact. To many, further processing implies any processing beyond the carcass stage; others consider that further processing implies ending up with consumer-wrapped products. A recent survey of meat companies showed that most companies produce some further processed products for export. Seventy-five percent of this total volume is accounted for by lamb cuts, the majority of which are for sale in North America by DEVCO. Some companies, as well as cutting for DEVCO undertake special cutting and boning to customers' specifications. The volumes of these special orders, although small on a national basis, are extremely important to individual companies.

There is an increasing chilled meat trade, both in lamb and beef, which provides a further string to the marketing bow. The implication for the producer is that sometimes special stock is selected for the chilled trade. This selection may mean a premium over the schedule for well-finished stock. Stressed animals cannot be used for the chilled meat trade, because their meat spoils easily in vacuum packs and has a much reduced storage life.

Vacuum packaging is now being used for offals to such an extent that offals are emerging from the "plain Jane" class to be considered as a valuable product. The increased returns for 'variety meats' will help offset inflation's effect on processing changes.

Market information is vital in any further processing venture to ensure the products prepared are those desired by the market and not those the company wants to produce. With accurate market information further processing should give an increased return for the product. The producer should benefit from any moves by meat companies which increase the profitability of the entire operation. Further processing may have other financial implications for the producer in that freight charges per lamb can be reduced through greater stowing density in containers. Any reduction in the total costs of getting meat to the market must also contribute to profitability.

Although I have considered the implications of some processing changes for the producer's pocket, some changes may influence farm management practices. For example, DEVCO has recently undertaken to 'contract' for heavier lambs, for which the producer is paid a premium. In this way the ultimate buyers get what they want. Changes in the

schedule may be needed to encourage farmers to produce the heavier carcasses desired by some markets. Another issue that often goes hand in hand with any talk of heavier carcasses is that of overfat lambs. Surveys by the N.Z. Meat Producers Board generally lists fattiness and small loin muscle area as disadvantages of New Zealand lamb. Methods are available to measure fat thickness and muscle size in the live animal and therefore these measures can be added to other factors in selection indexes. It is up to the producers to ensure that their breeding stock has been selected on basis of performance for loin muscle size and leanness. If the producers do not take the initiative, how can they point the finger at freezing works for not introducing new technologies?

Changes in the processing industry, such as hot boning of beef, mechanical deboning, improvements

in by-product processing and upgrading of materials that normally are rendered have not been discussed but these changes also have an impact on costs and returns for the meat processors and therefore reflect in returns to producers. It is hoped that with the majority of works having faced the outlay of complying with present hygiene requirements, effort now can be directed to controlling costs and improving efficiency so that the producers do not face a continued decline in returns. Reduction of processing charges is just one step towards maintaining a viable meat industry. Costs from other sectors of the industry must also be controlled so that our meat can be sold at competitive prices overseas and still give realistic returns for the investment and labour inputs by those involved in the long sequence from production to final consumption.